Beliefs about Memory in Compulsive Checking and Obsessive-Compulsive Disorder: Assessment and Intervention

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ABSTRACT

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Checking is one of the most common compulsions in obsessive-compulsive disorder (OCD). Some have suggested that individuals who check repeatedly may have memory deficits, but findings of memory-related investigations have been inconsistent. In contrast, *beliefs* about memory have been shown to relate closely to checking behaviour. Thus, it is possible that mixed findings regarding the presence of memory deficits in association with OCD may be related to maladaptive beliefs influencing performance. Currently no measure exists to assess these beliefs, nor does an intervention to improve them, despite the existence of such measures and interventions for other known maladaptive beliefs central to OCD. The present studies were thus designed to measure and examine the relationships between beliefs about memory, actual memory performance, and checking compulsions. The first study encompassed the development of the Beliefs About Memory Inventory (BAMI) to assess maladaptive beliefs that individuals hold about their memory. Non-clinical (N = 697) and clinical (N = 24) participants completed the candidate items for the BAMI along with other relevant questionnaires to determine its psychometric properties. Results showed that the psychometrically-sound measure is comprised of two factors: beliefs about memory ability, and beliefs about the importance of memory. Furthermore, the BAMI was able to predict checking symptoms over and above existing belief domains known to be relevant to OCD. The second

study examined whether a brief cognitive intervention designed to improve beliefs about memory in a sample of compulsive checkers could decrease checking and increase memory performance. Individuals with OCD ($N = 24$) who exhibited clinical levels of checking symptoms monitored their checking behaviour over the course of a two-session intervention. Half were randomly assigned to the treatment condition, while the other half were randomly assigned to a waitlist control condition. Participants also completed neuropsychological tests pre- and post-treatment/waitlist. Results demonstrated that compared to those in the waitlist condition, individuals in the treatment condition decreased their maladaptive beliefs about memory, checking behaviour, and symptoms, while increasing their memory performance. The results of these studies are discussed in the context of implications for cognitive-behavioural theories of and interventions for OCD.

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It has been my great fortune to have been supervised by Adam Radomsky, an incredible role model. I am thankful to him for so much, from unique research opportunities, to his ability to create humour in every situation, but especially for his unwavering enthusiasm and shrewd advice for my scholarly endeavours and professional development.

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On a personal note, I am privileged to have been sustained by many others throughout this process. Particular recognition is owed to my fellow cohort members and former neighbours, not only for their friendship, but for their dissertation help as well. I am thankful to Hilary and Jana, for discussions regarding the neuropsychological tasks; to Elizabeth, for demographic and methodological advice; and to Sivan, for our writing sessions. No small part of my endurance has been due to my workout buddy, Kristin, who, rain, shine or snow, forced me to engage in a much-needed outlet for stress. To Andréa and Holly, lifelong friends, thank you for always finding the time to chat and for never asking why I am still in school.

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CONTRIBUTION OF AUTHORS

The following thesis is comprised of two manuscripts:

Study 1 (Chapter 2)

Alcolado, G. M., & Radomsky, A. S. (2014). *The assessment and impact of beliefs about memory: Development of the Beliefs About Memory Inventory and its relationship with compulsive checking.* Thesis-style manuscript to be condensed for future publication.

Study 2 (Chapter 4)

Alcolado, G. M., & Radomsky, A. S. (under review). *A novel cognitive intervention for compulsive checking: Targeting maladaptive beliefs about memory.* Manuscript submitted for publication.

I was responsible for the conceptualization of the program of research that is presented in this dissertation, as well as for the two specific studies that are reported therein. I chose the research questions, study designs, hypotheses, and statistical plans. I primarily recruited, scheduled, and tested participants (in conjunction with student volunteers, see below). I conducted all the statistical analyses, interpreted the results, and wrote this dissertation. My supervisor, Dr. Adam Radomsky, met with me regularly throughout all stages of this research and consulted on the development, interpretation, and writing of this document, as well as on the component that was submitted for review and publication (see above). My committee members, Drs. Michel Dugas and Karen Li, recommended methodological changes and approved my design and statistical analyses at my dissertation proposal meeting.

For Study 1, I was assisted by an honours thesis student (Samantha Wilson) and an undergraduate volunteer (Sarah McIlwaine) both of whom aided in data collection. They both emailed links to the online survey and granted credit to participants who expressed interest through the psychology department's participant pool website. The honours student (Samantha Wilson) also aided me

in configuring the online survey that was sent to participants. I provided training and supervision for these tasks. I also developed all the items for the BAMI in consultation with my supervisor, and via feedback solicited from our research team during a lab meeting. I completed all data entry, cleaning, and analyses. Finally, I wrote a full first draft of the manuscript, which I subsequently revised, based on input and recommendations from Dr. Adam Radomsky.

For Study 2, I was assisted by two honours thesis students (Sarah Schell and Kelsey Hannon) and an undergraduate volunteer (Sasha MacNeil). The honours students and I shared the recruitment responsibilities by placing advertisements around campus and online, and by conducting phone screens and booking appointments with potential participants. All three undergraduates completed the data entry. I was the study experimenter, and as such, completed the diagnostic assessments and conducted the therapy sessions with all participants at each of their visits, under the supervision of Dr. Adam Radomsky, a licensed clinical psychologist. I was additionally aided by a fellow lab member and graduate student (Jessica Senn) who completed all the cognitive testing as a blind assessor, also under the supervision of Dr. Radomsky. A laboratory research assistant and former honours student (Sarah Schell) scored a portion of the diagnostic assessments in order to assess for inter-rater reliability and the volunteer (Sasha MacNeil) coded the therapy sessions for adherence to study protocol. I conceptualized and developed the study intervention and treatment manual in consultation with my supervisor, Dr. Adam Radomsky. I created all other study materials including the protocol and phone screen interview. I cleaned the data and ran all analyses. I completed a full first draft of the study and revised it based on recommendations from Dr. Adam Radomsky.

I also wrote all other components of this dissertation, with recommendations from Dr. Adam Radomsky on the drafts. Study 1 will eventually be condensed for inclusion in a 2-part psychometric manuscript, but is

currently written in thesis format. Study 2 is currently under review, having been submitted to a peer-reviewed journal. It is the only study written in the third person, as it is written exactly as it appears in the submitted manuscript.

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CHAPTER 1
GENERAL INTRODUCTION

The relationship between intrusive thoughts, obsessions, compulsions, and obsessive-compulsive disorder

Unwanted thoughts, images, or impulses that come to mind unbidden, are incredibly prevalent (Rachman & de Silva 1978; Radomsky et al., 2014). Common intrusive thoughts and impulses reported by non-clinical participants include the urge to jump off a platform/in front of a moving vehicle, thoughts of harming others, or the image of engaging in unwanted sexual acts (Rachman & de Silva, 1978). It is understood that it is the misinterpretation of the significance of these thoughts as having personal importance that leads to the development of obsessions (Rachman, 1997; 1998), which are unwanted intrusive thoughts images or impulses that occur frequently and cause significant distress and anxiety (American Psychiatric Association [APA], 2013). As such, although most individuals have unwanted intrusive thoughts that occur seemingly out of the blue that are similar in content to those reported by individuals with obsessive-compulsive disorder (OCD), those who interpret the thoughts negatively as highly important and personally significant will be at further risk of developing OCD (Rachman, 1997). Indeed it has been demonstrated in a large international study of undergraduate participants that unwanted intrusions which are appraised in such a fashion and/or which individuals try to control, are associated with the most distress (Moulding et al., 2014). The most frequently reported intrusive thoughts are those associated with doubt (Radomsky et al., 2014). As such, doubt and related constructs will remain a focus throughout this introduction.

Intrusions often lead to neutralizing behaviours, i.e., compulsions, which are intended to reduce the distress caused by these thoughts, images and/or impulses (Salkovskis, 1985). In the case of doubt, these intrusions often involve

whether one has properly secured and/or checked locks, doors, and/or household appliances. The presence of repeated obsessions and/or compulsions that cause distress and interference in one's daily life are required for a diagnosis of OCD, considered until recently to be an anxiety disorder (APA, 2000), and which now comprises its own spectrum of related disorders (APA, 2013). Regardless of how OCD is classified, this disorder has received much theoretical, research, and clinical attention in part because of the often severe consequences for those who suffer from it. OCD can dramatically reduce quality of life for the individual (Eisen et al., 2006), and can equally cause immense interference in the lives of their loved ones (Cicek, Cicek, Kayhan, Uguz, & Kaya, 2013).

Heterogeneity of OCD

OCD can take many forms, and can involve few, or many different types of obsessions/compulsions (Radomsky & Taylor, 2005). OCD can be defined by specific concerns such as possessing a fear of contamination, a specific behaviour such as checking, or a specific attribute such as indecisiveness (Thordarson et al., 2004). As such, some have proposed that these symptoms are better viewed as existing along different dimensions (for a review, see Mataix-Cols, Rosario-Campos, & Leckman, 2005). The existence of checking, washing and other rituals, and impulses, as separate symptom domains has been supported by factor analytic methods (e.g., Wu & Carter, 2008). Another common symptom domain, hoarding, is now considered a separate diagnostic category (APA, 2013; Mataix-Cols et al., 2010; Rachman, Elliott, Shafran, & Radomsky, 2009). The frequency and combination of these symptom presentations differ drastically (Pinto et al., 2006). While the majority of sufferers report four or more symptom types concurrently, compulsive checking is one of the most commonly reported symptoms in individuals with a lifetime history of OCD (Ruscio, Stein, Chiu, & Kessler, 2010), perhaps not surprisingly given the prevalence of doubting-related concerns in the general population (Radomsky et al., 2014).

Neuropsychology and OCD

Neuropsychological investigations have been undertaken in an attempt to more fully understand OCD. An early review on neuropsychological performance in OCD suggested that there were small but measurable neuropsychological deficits in individuals with OCD with respect to executive function, motor and non-verbal memory abilities (e.g., Tallis, 1997). Although there was a lack of aetiological evidence to suggest these were causal factors in OCD, the possibility of memory dysfunction playing a role in the disorder, particularly with respect to doubt and compulsive checking, seemed a logical and parsimonious supposition. If one could clearly and accurately remember checking, surely one would not need to return to check again. The sample of individuals tested, however, did not necessarily have primary checking compulsions (Tallis, 1997). Another study by Savage and colleagues (1999) demonstrated that the memory impairments observed in OCD were likely due to deficits in *strategy* during encoding of visual memory, although again, the authors sampled a heterogeneous OCD population, and their investigation did not allow for any conclusions regarding causation. More recently, Muller & Roberts (2005) reviewed the literature on neuropsychology and OCD and concluded it was largely mixed. Although there was stronger evidence for a visual rather than a verbal memory deficit, the most consistent finding was that low memory *confidence* was symptomatic of OCD (Muller & Roberts, 2005). Further, they noted that low memory ability did not seem to account for checking in compulsive checking populations. They concluded by recommending that future studies examine checkers specifically, account for memory confidence, and use longitudinal methods to clarify causation (Muller & Roberts, 2005). Interestingly, compulsive checkers in particular have been found to report less memory confidence (but not exhibit poorer memory performance) than non-checking obsessive-compulsives or controls (Tolin et al., 2001). Thus, the doubt they

experience may be unfounded. A recent meta-analysis by Abramovitch, Abramowitz, and Mittelman (2013), containing studies conducted on heterogeneous samples of adult and child OCD cases, found that none of the previously documented memory impairments were of clinical significance.

Other research has found individuals with OCD to have *superior* memory abilities. Individuals with OCD have been found to have superior memory for particularly for threatening information (Radomsky & Rachman, 1999; Radomsky, Rachman & Hammond, 2001). This result has been found in studies of compulsive washers (Radomsky & Rachman, 1999) and compulsive checkers (Cougle et al., 2008; Radomsky et al., 2001).

These mixed findings on memory ability in OCD, combined with evidence of decreased memory confidence, have led some to suggest that perhaps memory confidence may interfere with memory performance (Cougle, Salkovskis, & Wahl, 2007; Radomsky & Alcolado, 2010). These suppositions are in line with related research which has found that rather than having deficits in reality monitoring, i.e., the process in differentiating reality from imagination (Rubenstein, Peynircioglu, Chambless, & Pigott, 1993), individuals with OCD only differed from controls with respect to reality monitoring *confidence* (Cougle et al., 2008; Hermans, Martens, De Cort, Pieters, & Eelen, 2003; McNally & Kohlbeck, 1993).

Interventions for OCD

Numerous treatments have been developed to reduce the symptoms and suffering associated with OCD, including, but not limited to, doubt and compulsive checking. Pharmacological treatments exist, although they only help about 60% of individuals (see Fineberg, Reghunandanan, Brown, & Pampaloni, 2012, for a review). The first effective psychological therapy for OCD, exposure and response prevention, has existed since the 1960's (Meyer, 1966), and has long been considered an extremely effective and empirically supported intervention

(Chambless et al., 1998). It is a primarily behavioural approach whereby individuals are asked to face situations that provoke their obsessive thoughts and are then instructed to refrain from engaging in their compulsive/neutralizing behaviour (Meyer, 1966). As such, it can be very easily applied to compulsive checking, for example, by requiring individuals to use electrical or gas-powered appliances and to then refrain from checking whether or not they have properly turned them off. This intervention, although efficacious and recommended as a first line of treatment (Podea, Suciu, Suciu, & Ardelean, 2009), is unfortunately marked by high dropout rates (e.g., Foa et al., 2005); and low levels of acceptability (e.g., Milosevic & Radomsky, 2013). Thus, there is clearly room for improvement.

Similar to Beck's cognitive model of depression and subsequent intervention (Beck, Rush, Shaw, & Emery, 1979), interventions based more on cognitive belief domains in OCD (see below; e.g., Clark, 2003; Rachman, 2003) have been developed. They allow for a focus on 'in the moment' interpretations/appraisals of a situation which gives rise to obsessions/compulsions, as well as the ability to target more long-standing, overarching distorted beliefs which make such thoughts/behaviours (including doubt/checking) more likely to occur. Unfortunately, there is currently a lack evidence to suggest such a focus in OCD treatment improves efficacy (Clark, 2005), although a recent meta-analysis suggests a more cognitive approach is equivalently effective to the earlier behavioural approach (Rosa-Alcásar, Sánchez-Meca, Gómez-Conesa, & Marín-Martínez, 2008). Regardless of which method is superior, all psychological interventions continue to lack large scale effectiveness, and exhibit low response rates (e.g., 48% Haland et al., 2010; 50% Jonsson, Hougaard, & Bennedsen; 2011; 59% Whittal et al., 2010). No trials have specifically examined the efficacy of a protocol for compulsive checking, although one has been suggested (Radomsky, Shafran, Coughtrey, & Rachman,

2010), which includes a module that examines memory confidence; preliminary testing of this approach is now underway.

Given the body of neuropsychological literature on OCD, a relative dearth still exists with respect to neurocognitive change following treatment, particularly with respect to mechanisms of change. Further, none of the studies which do measure memory were conducted specifically within the context of compulsive checkers, for whom such a deficit may have some theoretical grounding. Kuelz and colleagues (2006) found that neuropsychiatric performance, including visuospatial memory, improved in a heterogeneous OCD sample from pre- to post-implementation of a 12-week cognitive-behavioural therapy (CBT) protocol. Indeed, they found that post-treatment, performance improved to become equivalent to that of a non-clinical control sample, but they did not examine the possible mechanisms by which these changes occurred. Others (e.g., Kang et al., 2003) have focused on which cortical glucose metabolic changes (measured by positron emission tomography), rather than potential psychological changes, were associated with improvements in visuospatial memory following treatment. (They found decreases in orbital-frontal circuit activity, an area related to visuospatial memory and executive functioning, commonly over-activated in OCD as compared to controls.) Another study examining changes in neuropsychiatric scores following pharmacotherapy found no change (Nielen & Den Boer, 2003), which suggests that perhaps if cognitions are not targeted then performance cannot improve.

Distorted beliefs in OCD

Distorted beliefs have long been recognized to be central to OCD, particularly those relating to responsibility - the first to be described (Salkovskis, 1985) and tested (e.g., Lopatka & Rachman, 1995). Others, including those associated with the catastrophic misinterpretations of the meaning of thoughts, account for the development of obsessions (Rachman, 1997; 1998). We now

know that other maladaptive beliefs are also implicated in OCD symptomatology, as established by the Obsessive Compulsive Cognitions Working Group (OOCWG, 2005). Although not necessarily specific to OCD, these include beliefs about inflated sense of responsibility and overestimation of threat, the importance of and control over thoughts, and perfectionism and intolerance of uncertainty (OCCWG, 2005).

Based on the neuropsychological literature reviewed above, it seems that individuals with compulsive checking often appraise themselves as having poor memory in checking and memory-related situations, resulting in low memory confidence. Such thoughts might be more likely to occur in individuals with distorted beliefs about their memory ability. The OCCWG ultimately decided not to include beliefs about memory early on in their process (OCCWG, 1997), and as such, research in this particular domain is lacking.

Of course there are other models/treatments of OCD not based on the premise that a range of appraisals/distorted beliefs are responsible for its development. These include the inference-based approach, which is a therapy focused on challenging errors of logic made regarding the thoughts, rather than the interpretations of the specific thoughts (see O'Connor & Robillard, 1999). Similarly, meta-cognitive therapy proposes that distorted meta-cognitions, rather than cognitions themselves, are central in OCD development and therefore treatment (e.g., Fisher & Wells, 2008). In line with information processing theories of psychopathology, it has been proposed that deficits in inhibiting attention to irrelevant information (originating with Enright & Beech, 1993a,b, and elaborated on by Harkin and Kessler [2009] as a component of faulty working memory processes in this population) are what drive OCD. Finally, there is an intervention known as Danger Ideation Reduction Therapy which focuses exclusively on re-evaluating checking situations as non-threatening (e.g., Vaccaro, Jones, Menzies, & Wootton, 2010), rather than examining more general

faulty appraisals. However, given that the faulty appraisal model is the predominant model on which the majority of modern treatments are based, it was used to form the basis of this thesis.

Memory confidence, beliefs about memory, and compulsive checking

It is thus proposed that a generally held belief that one has a poor, bad, or otherwise impaired memory will predispose individuals to make interpretations of their memory as not good and to exhibit low memory confidence for their actions while checking. This in turn could lead one to be more likely to compulsively check in potentially threatening situations. I will now turn first to the theoretical underpinnings and then to the research evidence which supports investigations of beliefs about memory, as they pertains to compulsive checking.

Cognitive theory of compulsive checking. A cognitive theory pertaining specifically to compulsive checking has been developed (Rachman, 2002), which implicates distorted beliefs about memory in the maintenance of checking. Rachman (2002) proposed that checking transpires when one experiences a perceived increase in personal responsibility for preventing harm, under circumstances where one cannot be sure that the harm has been successfully prevented. Rachman (2002) proposed three cognitive multipliers that were posited to contribute to compulsive checking: 1) increased perceived responsibility for preventing harm, 2) increased perceived probability of said harm, and 3) increased perceived seriousness of the potential harm. It was suggested that over time, checking behaviour further increases the sense of personal responsibility, as well as perceptions of the probability and severity of the harm. It was theorized that checking lacks a clear end-point, as it is unlikely for one to achieve complete certainty that one has completely avoided all possible future catastrophic outcomes that could occur were the checking not to take place. Finally, checking was suggested to be maintained by the paradoxical nature of the act itself: checking was proposed to begin due to uncertainty/doubt, but rather

than alleviate doubt, the act of checking was posited to actually increase uncertainty. Although some would suggest that treatments should therefore simply target intolerance of uncertainty, a more parsimonious approach would suggest that it is the combination of these factors which creates a self-perpetuating cycle of checking (Rachman, 2002). Crucially, this theory states that the increased doubt caused by checking erodes memory confidence appraisals over time (Rachman, 2002), and thus implies that distorted beliefs about memory may play a role in maintaining compulsive checking.

Evidence for the erosion of memory confidence. In line with Rachman's (2002) theory proposing that compulsive checking erodes confidence over time, a meta-memorial (i.e., thoughts and beliefs *about* memory) mechanism underlying this process has also been suggested (van den Hout and Kindt, 2003a,b; 2004). As checking becomes a repeated, habitual act it is proposed to cause a shift from high (perceptual) to lower level (semantic) processing, which results in less vivid and detailed encoding of the check (van den Hout & Kindt, 2004). This shift creates the difference between a memory that is specifically "remembered" as compared to information which is just more generally and vaguely "known" (see Tulving, 1985). Thus, when one attempts to retrieve the memory for the check, it does not feel as reliable and low memory confidence results (van den Hout & Kindt, 2004). This is particularly problematic for those with compulsive checking, who have high standards for accuracy, completion, and certainty, and prefer to rely on "remembering" exactly what they have done, rather than just a vague "knowing", (van den Hout & Kindt, 2003b). This view has been supported by experimental evidence, as repeated checking has indeed been found to cause decreased memory vividness, detail, and confidence by a number of independent researchers (Boschen & Vuksanovic, 2007; Coles, Radomsky, & Horng, 2006; Radomsky & Alcolado, 2010; Radomsky, Dugas, Alcolado, & Lavoie, 2014, Radomsky, Gilchrist, & Dussault, 2006; van den Hout

& Kindt, 2003a,b; 2004). Thus it is possible that over time, individuals who check may come to believe they have a poor memory.

Evidence for the impact of beliefs about memory on compulsive checking. Not only does checking diminish memory confidence/beliefs about one's memory ability (e.g., van den Hout & Kindt, 2003a), such beliefs have now been found to predict and even cause checking. A psychometric investigation demonstrated that low meta-cognitive confidence, (as assessed by a measure that included a subscale of memory confidence), predicted checking beyond the typical maladaptive beliefs central to OCD (Nedeljkovic & Kyrios, 2007). Another more recent psychometric investigation found the interaction between beliefs about memory and other OCD-relevant beliefs to better predict checking symptoms than anxiety or depression (Cuttler, Alcolado, & Taylor, 2013). Additionally, an experimental investigation that manipulated beliefs about memory using a false-feedback paradigm for memory test performance, found that individuals who were led to believe they had a poor memory had subsequently higher urges to check on later tasks than individuals who were told they had a good memory (Alcolado & Radomsky, 2011). This experimental finding was also recently replicated and extended by manipulating beliefs about prospective memory ability (Cuttler, Sirois-Delisle, Alcolado, Radomsky, & Taylor, 2013). Therefore a focus on beliefs about memory, through careful assessment of this construct, may provide a fuller understanding of the aetiology of OCD and open avenues for possible treatment strategies and enhancements.

Measurement of beliefs about memory

The Obsessive Beliefs Questionnaire was developed to assess distorted beliefs central to OCD, but it does not assess beliefs about memory (OCCWG, 2005). Examinations of changes in meta-cognition, including confidence in memory, and reality monitoring in OCD (e.g., Nedeljkovic & Kyrios, 2007; Hermans et al., 2003) have led, however, to the development of measures which

do assess constructs related to beliefs about memory. All of the questionnaires described below contain items which assess memory confidence, in conjunction with assessment of confidence other domains, such as attention and perception. One such measure, the Brief Cognitive Confidence Questionnaire, has been developed but not validated, as it was not intended for broader use (Hermans et al., 2008). Others which have been validated are the Memory and Cognitive Confidence Scale (Nedeljkovic & Kyrios, 2007), and the Meta-Cognitions Questionnaire, which was originally developed to assess worry in the context of generalized anxiety disorder (Cartwright-Hatton & Wells, 1997), but has been found to have some applicability to OCD (Wells & Cartwright-Hatton, 2004). Thus, there is currently no measure that includes a focused assessment of *beliefs* about memory intended specifically for use in the study of OCD. This is not ideal for investigations which would seek to better understand the role of these beliefs in compulsive checking. Furthermore, there may be beliefs about memory beyond those related to memory *ability* (as assessed via a number of memory confidence items) which could be pertinent to the development/maintenance of compulsive checking. For example, the role of personal significance is known to be related to obsessive-compulsive symptomatology (Rachman, 1997; 1998), therefore I included questions pertaining to beliefs about the *importance* of memory. Relatedly, I measured the degree to which one might believe that memory is/should be a reliable entity, since if memory is believed to be fallible, then believing one's memory is poor might have less personal significance.

Rationale and implications for the current program of research

In summary, compulsive checking is an extremely common symptom of OCD, a disorder which causes significant distress and whose interventions lack wide scale effectiveness. Beliefs about memory appear to be implicated in checking and indeed may interfere with memory performance, but current assessment tools do not capture this construct, nor do current evidence-based

interventions target this domain. Thus, I developed a scale (Study 1) to assess beliefs about memory, and a cognitive intervention module to diminish these beliefs (Study 2), to determine whether such a therapy could decrease checking and increasing memory performance. The implications of this research are threefold. Firstly, a measure that directly assesses beliefs about memory would facilitate the assessment of this construct, both for research and clinical practice applications, and allow for a better understanding of the beliefs about memory that impact checking behaviour. Secondly, examining the effectiveness of a cognitive-behavioural intervention for maladaptive beliefs about memory would not only add to the evidence for the effect of beliefs about memory on checking, but could also increase the effectiveness of CBT for compulsive checking, by adding a potential new focus for intervention. Finally, studying the relationship between beliefs about memory and memory performance would help to clarify whether compulsive checking is associated with memory deficits, or whether obsessive-compulsive *beliefs* about memory are more closely linked to memory performance.

Design

Study 1 was a psychometric investigation. A large sample of non-clinical undergraduate participants completed the potential items which would form the Beliefs About Memory Inventory (BAMI; see Appendix A). The measure included items pertaining to beliefs about memory ability, and also questions regarding other potentially relevant belief domains, such as beliefs about how important memory is to an individual and beliefs about how reliable one's memory is perceived to be. Participants additionally completed several questionnaires concerning both to related and unrelated domains, included to allow for examination of the convergent and divergent validity of the measure. An exploratory factor analysis was planned to determine the factor structure of the

measure. As part of their pre- assessment for Study 2 (see below), a small sample of clinical participants also completed this battery of questionnaires.

Study 2 assessed a brief cognitive-behavioural treatment intervention focused on beliefs about memory (see Appendix B). The design was between-participants, with repeated measures, in which individuals diagnosed with OCD who exhibited clinically significant levels of checking were randomly assigned to a treatment or waitlist condition. A waitlist design was deemed appropriate as this was a preliminary and exploratory investigation of the utility of the novel intervention. Pre- and post- assessments included measures of beliefs about memory, time spent checking, checking symptoms, memory performance and processing speed. (Processing speed was assessed in addition to memory in order to have a control measure of a cognitive process that was expected to remain stable over time. As such, I could better evaluate the significance of any changes seen in memory performance.)

Both studies received ethical approval from the University Human Research Ethics Committee (see Appendices C and D for ethics certificates pertaining to Study 1 and 2, respectively). Copies of consent forms are also appended (see Appendices E and F for Study 1 and 2, respectively).

Hypotheses

For Study 1 it was hypothesized that the Beliefs about Memory Inventory (BAMI) would have three interrelated but distinct factors (memory confidence, importance of memory and reliability of memory). It was also hypothesized that the measure would have sound psychometric properties. Finally, it was hypothesized that the BAMI would predict checking symptoms over and above other obsessive-compulsive beliefs.

For Study 2 it was hypothesized that delivering a brief cognitive-behavioural intervention focused on beliefs about memory would 1) decrease maladaptive beliefs about memory, as well as 2) decrease checking behaviour,

and 3) increase memory performance (but not processing speed), for those in the treatment condition as compared to the waitlist condition. It was also hypothesized that decreases in maladaptive beliefs about memory would predict decreases in symptoms and increases in memory performance.

CHAPTER 2:
THE ASSESSMENT AND IMPACT OF BELIEFS ABOUT MEMORY: DEVELOPMENT OF THE BELIEFS ABOUT MEMORY INVENTORY AND ITS RELATIONSHIP WITH COMPULSIVE CHECKING

Checking is one of the most common symptoms of obsessive-compulsive disorder (OCD; Rachman & Hodgson, 1980; Ruscio, Stein, Chiu, & Kessler, 2010). OCD is a mental disorder characterized by obsessions (i.e., intrusive thoughts, images, or impulses), and/or compulsions (i.e., mental or physical rituals designed to reduce distress or anxiety; American Psychiatric Association [APA], 2000). The disorder can substantially impact the quality of life of the individual (Eisen et al., 2006) and the lives of their loved ones (Cicek, Cicek, Kayhan, Uguz, & Kaya, 2013). Although effective treatments exist (see Chambless et al., 1998), they have remained largely unchanged since their development in the late 1960s (Meyer, 1966; see Kozak & Coles, 2005 for a review), and leave an alarming number of individuals unwell (e.g., Foa et al., 2005).

Over a decade ago, a cognitive model of checking compulsions in OCD was proposed (Rachman, 2002). It included elements of established belief domains known to be relevant to OCD, such as inflated responsibility and overestimations of threat (see Salkovskis, 1985; Obsessive Compulsive Cognitions Working Group [OCCWG], 2005). It further proposed a self-perpetuating mechanism which maintains compulsive checking (Rachman, 2002). One of the elements of this mechanism was the contention that checking is paradoxical in nature, as the more one checks, the less one trusts their memory for the check, and thus the doubt and perceived need to continue checking is maintained. Indeed, the relationship between checking and memory confidence has received strong empirical support. Checking does decrease memory certainty in student populations using virtual checking tasks (van den Hout & Kindt

2003a,b; 2004), real appliances (Radomsky, Gilchrist, & Dussault, 2006; Coles, Radomsky, & Horng, 2006), during mental checks (Radomsky & Alcolado, 2010), and in clinical populations (Boschen & Vuksanovic, 2007; Radomsky, Dugas, Alcolado, & Lavoie, 2014). Thus there is the possibility that low confidence in memory, or rather, negative beliefs about one's memory ability, contribute to the aetiology and maintenance of compulsive checking.

This type of maladaptive belief, however, is not assessed by the Obsessive Beliefs Questionnaire (OBQ; OCCWG, 2005), a measure that was designed to capture six belief domains theoretically linked to OCD. Factor analysis revealed they comprised three constructs: 1) responsibility and threat overestimation, 2) perfectionism and intolerance of uncertainty, and 3) importance of and control over thoughts (OCCWG, 2005). Beliefs about memory were removed from consideration at a very early stage of measurement development (OCCWG, 1997). Furthermore, existing interventions do not typically target such beliefs (Rachman, 2003), although it has recently been proposed that memory confidence should be addressed in cognitive therapy for compulsive checking (Radomsky, Shafran, Coughtrey & Rachman, 2010). Thus, the role of beliefs about memory in contributing to our understanding and treatment of compulsive checking is currently largely unknown, and furthermore not testable using the OBQ.

There have been some preliminary investigations into the potential role of beliefs about memory in compulsive checking. Low memory confidence has been shown to predict checking, even over and above other beliefs related to OCD and depressive symptoms (Nedeljkovic, Moulding, Kyrios, &Doron, 2009; Nedeljkovic & Kyrios, 2007). More recently, the interaction between low memory confidence and other dysfunctional beliefs was shown to best predict checking, above and beyond depression and anxiety (Cuttler, Alcolado, & Taylor, 2013). This relationship has also been investigated experimentally. A paradigm was developed to manipulate students' beliefs about memory (Alcolado &

Radomsky, 2011). Nonclinical individuals were randomly assigned to receive one of two types of false feedback regarding their performance on a memory test. Those who were led to believe they had a poor memory had significantly more urges to check their performance on subsequent tasks compared to those who were led to believe they had an excellent memory (Alcolado & Radomsky, 2011). This result has recently been replicated within the context of prospective memory (Cuttler, Sirois-Delisle, Alcolado, Radomsky, & Taylor, 2013). Taken together, this body of work implies that *in situ* interpretations of memory as being poor (low confidence in memory), perhaps more broadly related to, or even caused by longstanding maladaptive *beliefs* about memory, could be an important factor for developing and/or maintaining compulsive checking. Indeed, research has shown that obsessive-compulsive checkers have poor memory confidence as compared to control participants (Cougle, Salkovskis, & Wahl, 2007).

One key weakness of previous investigations into beliefs about memory has been associated with measurement. In the experimental studies only 1-item prompts were used (Alcolado & Radomsky, 2011; Cuttler et al., 2013). Other studies have used items developed for use within their experiments only, and as such, have not been independently standardized or validated. These include the Brief Cognitive Confidence Questionnaire, which contains items regarding confidence in memory, attention, and perception (Hermans et al., 2008), and the Memory for Actions and Events Questionnaire which ascertains how confident one is for actions and memories related to ones they performed or watched others performed (Cougle et al., 2007).

To date, certain aspects of beliefs about memory can be assessed by using established subscales of validated measures of meta-cognition. The Memory and Cognitive Confidence Scale (MACCS; Nedeljkovic & Kyrios, 2007) also assesses confidence in decision-making and attention, and high standards for performance. Its general memory subscale contains items that assesses confidence in general

memory abilities, such as “I am never certain about my memory”, The Metacognitions Questionnaire (MCQ; Wells & Cartwright-Hatton, 2004) includes a similar subscale that they authors call ‘cognitive confidence’, although these items are actually more specifically related to memory, e.g., “I do not trust my memory”, and the items relate to memory ability and trust across different types of situations (e.g., memory for places, names, and actions). Its other subscales assess constructs including positive beliefs about worry, cognitive self-consciousness, negative beliefs about uncontrollability of thoughts and danger, and beliefs about need to control thoughts. Thus, both measures take a focus on doubt and trust with respect to specific instances of memory for situations and facts, and have few items related to more general trait-like beliefs about memory. Both scales also assess domains beyond memory, such as confidence in decision-making, and attention, and beliefs regarding perfectionism, worry, and uncontrollability of thoughts, rather than assessing additional domains within memory. This is useful in terms of breadth, but a more focused measure specifically assessing maladaptive beliefs about memory could have other advantages.

A measure that broadly assesses *beliefs* about memory rather than *meta-memory* (i.e., confidence in memory) would be more theoretically useful for the elaboration of cognitive models in understanding thoughts and beliefs that compulsive checkers hold and for the development of treatment strategies and protocols. The existing measures take a meta-cognitive approach to understanding doubt and low confidence in memory. The development of a measure of beliefs would be more practically useful for clinical scientists and therapists working within a cognitive-behavioural framework, as maladaptive thoughts and beliefs are common intervention targets. ‘Meta-cognition’ is not only an extremely broad concept, but it has also been the subject of an entire set of treatment approaches and packages (see Wells, 2009).

Thus, given the apparent association between beliefs about memory and checking, and the lack of existing measurement tools to specifically investigate this relationship, I developed a scale to assess beliefs about memory. The items developed for potential inclusion in the Beliefs About Memory Inventory (BAMI) included those associated with memory ability, but also other potentially relevant belief domains. In particular, items to assess beliefs about the importance of memory were included, as perceptions of poor memory ability might not particularly matter if one does not view a good memory as important or personally significant (see Rachman, 1997, on personal significance in OCD). In a similar vein, items to assess beliefs about how reliable memory is perceived to be were also developed, as if one views memory as being predominantly fallible, this could also decrease the relevance of perceived poor memory ability for checking. These items were administered to a large sample of undergraduate students as well as a smaller sample of participants diagnosed with OCD.

Study hypotheses were threefold. It was first hypothesis was that the BAMI would have three factors (memory confidence, importance of memory and reliability of memory). Secondly, to demonstrate the validity of the measure, it was predicted that the BAMI would be highly related to other measures of memory confidence and much less related to measures of depression or social anxiety. The third hypothesis was that the resulting version of the BAMI would significantly predict checking symptoms, even after accounting for the contribution of other already-known obsessive-compulsive beliefs.

Method

Participants

Seven hundred and sixty undergraduate psychology students participated and were compensated with course credit. Sixty-three cases were eliminated through the data cleaning process (22 for failing an instructional manipulation check and 41 for being multivariate outliers, see Results section). Thus, the final

student sample was comprised of 697 participants (83.4% female), with a mean age of 22.67 (*SD* = 5.32). Inclusion criteria were the ability to read, write, and understand English.

Twenty-four additional participants with a diagnosis of OCD who reported primary checking compulsions also completed the questionnaires, as part of an intake battery during their participation in a brief intervention study (see Chapter 4). An additional inclusion criterion for this sample was a diagnosis of OCD with the presence of significant checking compulsions, as evidenced by at least one hour of checking/doubting per day. Exclusionary criteria were a diagnosis of bipolar disorder, psychosis, or current substance dependence. The majority of individuals had a primary diagnosis of OCD (66.67%), followed by Generalized Anxiety Disorder (16.67%), Social Anxiety Disorder (12.50%), and Major Depressive Disorder (4.17%). The mean number of comorbid diagnoses was 3.25 (*SD* = 1.65), although a small portion of the sample met criteria for OCD only (16.67%). The mean clinical severity rating for OCD as measured by the Yale-Brown Obsessive Compulsive Scale (see Measures) was 22.42 (*SD* = 3.48).

For demographic information on both samples, see Table 1. Due to a data collection error, some demographic information is only available for a portion (*n* = 204) of the student sample. (Demographic questions were accidentally left out in the process of creating the original online questionnaire survey package. Once this error was noticed, they were added to the battery.) The two samples differed in terms of age, with the clinical sample being significantly older, $t(23.25) = -3.83$, $p = .001$, $d = -1.027$, but did not differ with respect to proportion of female to male participants, $\chi^2(1) = 2.57$, $p = .109$. Regarding education, there were significant differences $\chi^2(1) = 38.49$, $p < .001$ between the groups. To ascertain the nature of these differences, follow-up examination of the standardized residuals was conducted. A conservative α level was applied ($p < .001$) in both cases for determining significance of the standardized residuals as is appropriate

Table 1

Participant Characteristics by Group

		Group	
		Student	Clinical
Age		*M* = 22.67 (SD = 5.32)	*M* = 33.08 (SD = 13.30)
Sex	Female	83.4%	70.8%
BAI*		*M* = 9.96 (*SD* = 8.65)	*M* = 15.92 (*SD* = 12.57)
BDI-II**		*M* = 10.42 (*SD* = 9.58)	*M* = 15.42 (*SD* = 12.89)
VOCI***		*M* = 33.07 (*SD* = 27.41)	*M* = 85.33 (*SD* = 39.42)
Ethnicity	Caucasian	69.1%	75%
	Other	9.3%	4.2%
	Filipino	8.8%	0%
	Japanese	4.4%	0%
	Black	4.4%	0%
	Chinese	2.9%	0%
	South Asian	1.0%	8.3%
	Latin-American	0%	8.3%
Language	English	67.6%	70.8%
	French	10.3%	12.5%
	Spanish	4.4%	8.3%

	Arabic	2.9%	0%
	Chinese	2.0%	0 %
	Polish	0.5%	0%
	German	0.5%	0%
	Italian	0.5%	0%
	Portuguese	1.0%	4.2%
Education	Some high school	0.0%	4.2%
	High school diploma	6.9%	4.2%
	Some college	1.5%	8.3%
	College diploma	0.0%	4.2%
	Some university	53.4%	41.7%
	University degree	10.3%	16.7%
	Some graduate	0.5%	4.2%
	Graduate Degree***	1.5%	16.7%
Income	$0 - $24,999	85.2%	66.7%
	$25,000 - $49,999	8.9%	25%
	> $50,000	6%	8.4%

Note. BAI = Beck Anxiety Inventory (Beck et al., 1990) total score; BDI-II = Beck Depression Inventory II (Beck et al., 1996) total score; VOCI = Vancouver Obsessional Compulsive Inventory (Thordarson et al., 2004) total score. A series of independent samples *t*-tests confirmed that student and clinical groups differed with respect to anxious, depressive, and OCD symptomatology: * $p <$

0.05; ** $p < .01$, *** $p < .001$. Chi-squared tests conducted on categorical data revealed differences only on graduate-level education, *** $p < 001$.

for a large sample size (Field, 2009). Results revealed that there was a greater frequency of individuals in the clinical group with graduate level education than in the non-clinical group, ($z = 3.8$, $p < .001$), but no differences with the expected frequency of individuals who had other levels of education (all ps $> .001$). There were no group differences on income, language or ethnicity (all zs < 3.29, ps $> .001$).

Measures

The *Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV; Brown, DiNardo, & Barlow, 1994) is a semi-structured interview that assesses presence and severity of current Axis I disorder episodes in accordance with diagnostic criteria of the *Diagnostic and Statistical Manual of Mental Disorders, 4th edition* (APA, 2000). The ADIS-IV is characterized by good to excellent inter-rater reliability across disorders, and very good inter-rater reliability for OCD in particular, $\kappa = .85$ (Brown, Di Nardo, Lehman, & Campbell, 2001). The ADIS-IV was administered by trained graduate-level assessors to clinical participants to confirm their diagnosis of OCD, and to also ascertain existence of co-morbid diagnoses. A similarly trained independent rater evaluated twenty percent of the interviews at random and the inter-rater agreement on the presence and severity of the OCD diagnoses was 100%.

The *Yale-Brown Obsessive Compulsive Scale* (Y-BOCS; Goodman et al., 1989a) is a 10-item clinician-rated scale that assesses the nature and severity of obsessive-compulsive symptomatology along a scale of 0 (‘no symptoms’) to 4 (‘extreme symptoms’). Internal consistency of the scale is good ($\alpha = .89$), as is inter-rater reliability ($r = .89$; Goodman et al., 19889a). It has good convergent validity as it significantly correlates with another measure of OCD ($r = .79$), and good discriminant validity, as it does not significantly correlate with a measure of depression ($r = .26$; Goodman et al., 1989b). It was administered pre-treatment to

the clinical participants only in order to determine the nature and severity of the OCD, including the nature of their checking compulsions.

The potential items for the *Beliefs about Memory Inventory* (BAMI; Alcolado & Radomsky, 2012) were administered (see Appendix A). These forty items were thought to assess individuals' beliefs about their memory along three constructs: 1) beliefs about their memory abilities (MA); 2) beliefs about the importance of memory (MI), and 3) beliefs about the reliability of memory (MR). They were generated through theory, literature reviews, and consultation with colleagues. They were answered using a 6-point scale from 'disagree very much' to 'agree very much', similar in style to that used in the Obsessional Beliefs Questionnaire (OBQ, OCCWG, 2005; see below) with similar instructions, as it was also intended to measure beliefs relevant to OCD. Its properties are reported in the main analyses of the results section.

The *Memory and Cognitive Confidence Scale* (MACCS; Nedeljkovic & Kyrios, 2007) is a 28-item self-report questionnaire that assesses four domains of trait meta-memory, including confidence in general memory, decision-making, attention/concentration, and high standards for memory confidence, along a 5-point scale from 'strongly disagree' to 'strongly agree'. A confirmatory factor analysis has verified the 4-factor structure. Its item loadings range from .45 to .81on their respective factors. It has good to excellent reliability, and the overall internal consistency is .92, with α levels for the scales ranging from .79 to .93 (Nedeljkovic et al., 2009). Its subscale assessing confidence in one's general memory ability (MACCS-GC) was used to determine the validity of the BAMI at assessing this construct. The internal consistency of the measure in both the student and clinical groups was excellent (α = .93 and .95, respectively).

The short-form of the *Metacognitions Questionnaire* (MCQ; Wells & Cartwright-Hatton, 2004) is a 30-item questionnaire that assesses five domains of meta-cognitive beliefs, including cognitive confidence, positive beliefs about

worry, cognitive self-consciousness, negative beliefs about uncontrollability of thoughts and danger, and beliefs about the need to control thoughts, along a 4-point scale from 'do not agree' to 'agree very much'. It has good to excellent internal consistency, with α levels ranging from .72 to .93 and its retest reliability is r = .75 (Wells & Cartwright-Hatton, 2004). Its subscale assessing cognitive confidence (MCQ-CC) was used to determine the convergent validity of the BAMI at assessing a similar construct. Its internal consistency in the current sample was excellent (α = .91 in the student group and .90 in the clinical group).

The *Memory Functioning Questionnaire* (MFQ; Gilewski, Zelinski, & Schaie, 1990) is a 64-item self-report questionnaire that assesses an individual's perception of their memory functioning. Exploratory and confirmatory factor analysis revealed four factors: 1) general frequency of forgetting, 2) seriousness of forgetting, 3) retrospective functioning, and 4) mnemonics usage. It has good to excellent internal consistency across the four factors with α levels ranging from .83-.94 (Gilewski et al., 1990). Unlike the other measures used in the current study, higher scores on this measure indicate less pathology, i.e., better memory function. It was used to determine the convergent validity of the BAMI at assessing a similar construct. Its internal consistency in the current student and clinical samples was excellent (α = .93 and .98, respectively).

The *Vancouver Obsessional Compulsive Inventory* (VOCI; Thordarson et al., 2004) is a 55-item self-report questionnaire that assesses OCD symptoms (including obsessional thoughts, overt behaviours, and personality characteristics) along a 5-point scale from 'not at all' to 'very much'. A factor analysis revealed six factors including contamination, checking, obsessions, hoarding, 'just right', and indecisiveness. It has good internally consistency, with *Cronbach's alpha* levels ranging from .85 to .96 in a clinical sample for the total scale and subscales (Thordarson et al., 2004). Its retest reliability is excellent, as is its convergent and discriminant validity (Radomsky, Ouimet, et al., 2006). In a student sample, its

internal consistency is excellent (α =.96; Thordarson et al., 2004), and its convergent validity is good (*r* =.83; Radomsky, Ouimet, et al., 2006). It was administered to determine how well the BAMI was associated with OCD symptoms, especially checking (VOCI-check). Its internal consistency in the current student and clinical groups was excellent (α = .96 for both samples).

The *Obssessional Beliefs Questionnaire* (OBQ; OCCWG, 2005) is a 44-item self-report questionnaire that assesses belief domains thought to be associated with OCD symptomatology along a 7-point scale from 'disagree very much' to 'agree very much'. Factor analysis revealed three factors: responsibility and threat overestimation (OBQ-RT), perfectionism and intolerance for uncertainty (OBQ-PC), and importance of and control over thoughts (OBQ-IC). Internal consistency is good with α levels ranging from .89 to .93 across the subscales. Criterion, convergent, and discriminant validity are also good (OCCWG, 2005). It was administered to determine how strongly it was associated with the BAMI, as well to determine its ability to predict checking symptoms, as compared to the BAMI. Its internal consistency in the current sample was excellent (α = .95 for the student group and α = .94 for the clinical group).

The *Beck Anxiety Inventory* (BAI; Beck & Steer, 1990) is a 21-item self-report questionnaire that assesses anxiety along a 4-point scale from 'not at all' to 'severely - I could barely stand it'. Internal consistency is excellent with α = 0.92 with a clinical (Beck, Epstein, Brown, & Steer, 1988) and α = .90 with a non-clinical sample (Osman, Kooper, Barrios, Osman, & Wade, 1997). Its retest reliability is good (*r* = .75) and it exhibits convergent validity in both a clinical and a non-clinical sample (Beck et al., 1988; Osman et al., 1997). It was administered to determine whether the student sample was non-clinical in nature, and to establish whether the BAMI was associated with a measure of general

anxiety. Its internal consistency in the current student and clinical samples was excellent (α = .90, and α = .95, respectively).

The *Beck Depression Inventory II* (BDI-II; Beck, Steer, & Garbin, 1996) is a 21-item self-report questionnaire that assesses depression and suicidality. Internal consistency is excellent with an α of .91, and it has high convergent validity (Dozois, Dobson, &Ahnberg, 1998). It was administered to determine whether the student sample was non-clinical in nature, and to establish whether the BAMI would be associated with OCD symptoms more strongly than with the BDI-II, in order to help assess the BAMI's divergent validity. Its internal consistency in the current student and clinical samples was excellent (α = .93, and .95, respectively).

The *Social Phobia Inventory* (SPIN; Connor et al., 2000) is a 17-item self-report questionnaire that assesses social anxiety along a 5-point scale from 'not at all' to 'extremely'. Factor analysis revealed it is comprised of five factors, including fear and avoidance of speaking to strangers or at social gatherings, criticism and embarrassment, physiological changes, speaking to people in authority, and avoidance of being the centre of attention, such as with public speaking. Its internal consistency (α ranged from .87 to .94 across subscales), convergent validity and divergent validity, and retest reliability (r = .89) are good (Connor et al., 2000), and its psychometric properties in non-clinical student populations are sound as well (Radomsky, Ashbaugh, et al., 2006). It was administered to aid in assessing the divergent validity of the BAMI, i.e., whether the BAMI was associated more with OCD symptoms as compared to social anxiety symptoms. Any number of measures assessing another form of anxiety would have sufficed, but the SPIN was chosen in the current study for its brevity. Its internal consistency in the current study was excellent (α = .93 for both groups).

The *Instructional Manipulation Check* (IMC; Oppenheimer, Meyvis, & Davidenko, 2009) is a validated tool for determining whether participants are following instructions or responding at random, particularly crucial given this study's sole reliance on questionnaire data. It includes a lengthy instruction section, which begins by addressing the topic of hobbies, but ends by explaining the real purpose of the measure. Below the instructions is a checklist of potential hobbies. Participants who do not read the instructions in their entirety will select one or more hobbies as their response. Those who do read will follow the instructions by selecting "Other" as a hobby and writing "I have read the instructions" in the response field for that item (Oppenheimer et al., 2009).

Procedures

Student participants who enrolled in the study via the psychology department's participant pool were sent a link to the online survey via email. The survey was created using professional online survey software and was comprised of the BAMI, MACCS, MCQ, MFQ, VOCI, OBQ, BAI, BDI-II, SPIN, and the IMC. A subset of these participants were invited to complete the retest via an email notification sent six weeks after their initial participation, which included a link to the potential BAMI items only.

Clinical participants completed the questionnaires during the first visit of their participation in a treatment study (Study 2, see Chapter 4), before any intervention occurred. The ADIS-IV and Y-BOCS were administered by a graduate-level experimenter to confirm a diagnosis of OCD and clinically significant levels of compulsive checking. Subsequently, they completed the same online questionnaires as the student participants, on a laboratory computer.

Two sets of questionnaire packages were created to control for potential order effects and participants were assigned ID numbers in ascending numerical order as they enrolled in the study. In both packages, the IMC was presented first, but the order of the other questionnaires was randomized. Participants who were

assigned odd numbers completed the 'Order A' version, and participants who were assigned even numbers completed the 'Order B' package. Independent samples *t*-tests using questionnaire order as the independent variable and outcome variables of interest (such as depression, anxiety, and OCD symptoms) as the dependent variables revealed no significant differences between the Order A and Order B packages (all *p*s > .05). The two questionnaire orders were thus merged for analyses.

Statistical Plan

An Exploratory Factor Analysis (EFA) was conducted to determine a preliminary factor structure and to assess which items to retain for the BAMI. This method was chosen as I was interested in understanding the shared variance due to the underlying latent variables or constructs of different types of beliefs about memory, rather than using a data reduction method such as Principal Components Analysis to try and understand all of the variance (Costello & Osborne, 2005). EFA is an appropriate first step to questionnaire development (Hinkin, 1998) and it is a widely used and well-understood test that fits with the theoretical model of factor analysis (Tabachnik & Fidel, 2007). It is suitable for use when the underlying factor structure is unknown and one's goal is to generalize the conclusions to a larger sample (Field, 2009) and when one wishes to identify underlying processes that could produce correlations (Tabachnik & Fidel, 2007). Recommended sample sizes for EFAs range from four to ten responses per item (Worthington & Whittaker, 2006; Hinkin, 1998) depending on the resulting communalities and factor loadings. As such, a conservative approach was taken for this study, and with our 689 participants I well surpassed the minimum goal of obtaining 400 cases (10 cases per each of the 40 items).

Cronbach's alpha values were computed to determine the internal consistence of the measure. Pearson's correlation coefficient was calculated on the data from participants who completed the BAMI twice in order to determine

the re-test reliability. Correlational analyses were also conducted to examine validity. To examine convergent validity, correlations between the BAMI and memory confidence (MACCS-GC and MCQ-CC) as well as memory ability (MFQ) were conducted. Correlations between the BAMI and depression (BDI-II) and social anxiety (SPIN) were conducted to determine its divergent validity.

To examine the clinical participant data, correlational analyses were also conducted. Correlations within the clinical data and the student data were examined to determine if the relationships that emerged as significant between the items and the factors in the student sample, were also present in the clinical sample.

Finally, to test the hypotheses regarding the predictive power of the BAMI, regression methods were used. A hierarchical regression was conducted to determine how well the BAMI predicted OCD checking symptoms (VOCI-check) over and above known relevant obsessive-compulsive belief domains (using the OBQ subscales).

Results

Detecting random responders

Twenty-two student participants were removed because they failed to respond correctly to the ICM (Oppenheimer et al., 2009), indicating that they may have been ignoring instructions and answering questions at random. Indeed, a series of independent samples *t*-tests confirmed that their mean scores on many measures, including those assessing depression, anxiety, and OCD symptoms were significantly different than the mean scores of other participants ($ps < .05$).

Data preparation and cleaning

The student sample data was prepared in accordance with guidelines for factor analysis (see Field, 2009). There was no missing data in either sample as we used an online survey software package which alerted participants to unanswered items.

I first examined the student group dataset for outliers for both the individual BAMI items and the total BAMI score. Multivariate outliers for the BAMI items were examined using Mahalanobis distance. Forty-one cases exceeded the test of chi-square significance ($p < .001$) and these participants were therefore removed. Univariate outliers for the BAMI total were examined by converting these scores to *z*-scores. None were identified as being more than +/– 3.29 SD from the mean, thus no additional cases were removed.

Univariate normality of the individual BAMI items was also examined. Nineteen items had significant positive skew and thirteen items had significant negative skew (z-scores +/- 3.29, $p < .001$), comprising 80% of the items. Significant kurtosis was also common, evident in 52.5% of the items (10 positive, 7 negative, z-scores +/- 3.29, $p < .001$). The Kolmogorov-Smirnov (K.-S.) test indicated significant non-normality for all items (all $ps < .001$). Further, visual examination of histograms and Q-Q plots supported the tests in suggesting that most items deviated from normality. It should be noted that these statistical techniques often indicate non-normality in large sample sizes (Field, 2009), and as such these results should be interpreted with caution.

Univariate normality of the BAMI total score was also assessed. Visual inspection of a histogram of frequency distributions appeared approximately normal, although indicated a slight positive skew and a slightly leptokurtic shape. To test the significance of the skew and kurtosis, a very conservative α level was used (i.e., only *p* values less than .001 were considered significant), as is appropriate for these tests in very large samples (Field, 2009). The standardized skewness score was not significant (z[skew] = 3.27, $p > .001$). Likewise, the standardized kurtosis score was also not significant (z[kurtosis] = 2.37, $p > .001$). Univariate normality for the total scores was further examined by visual inspection of a Q-Q plot, which appeared non-normal. The K.-S. test was significantly non-normal, (D (697) = .04, $p < .01$), confirming this observation.

Violations of normality were not unexpected, due in part to the large size of the sample, as noted above, but also potentially caused by the characteristics of sample. Students would be expected to score lower and have a smaller distribution of scores than a clinical sample on a scale designed to measure clinically relevant distorted beliefs. Importantly, as the extraction method chosen (see below) does not require normality, I ultimately chose not to transform the data, despite some indication of a non-normal distribution on the total and individual BAMI items.

Exploratory factor analysis I

In order to understand the structure of the BAMI, an exploratory factor analysis (EFA) was conducted. I selected a Principal Axis Factoring (PAF) extraction method because it is not affected by violations of normality (Costello & Osborne, 2005), which is particularly important given the above-reported violations of normality.

An initial unrotated EFA was conducted. Examination of the correlation matrix revealed that most items were significantly correlated with most other items. Furthermore, no items were correlated above $r = .90$, suggesting the absence of problematic multicollinearity. The determinant of the correlation matrix suggested otherwise (the value was smaller than the necessary value to exceed), however, upon inspection of the correlation matrix, it was not clear which item(s) was/were problematic. As the extraction method chosen, however, assumes some degree of association between items, I decided to proceed with the analysis. Bartlett's Test of Sphericity was highly significant, $\chi^2(780) = 11030.85$, $p < .001$, indicating that the items did correlate significantly with each other, indicating some degree of association, which is necessary for EFA (Field, 2009). The Kaiser-Meyer-Olkin (KMO) measure of Sampling Adequacy was 'great' (KMO = .89; see Field, 2009), suggesting that the sample was adequate to run the EFA given the number of items. Examination of the diagonals of anti-image

matrix revealed that more than half of the individual items also had KMO values above .5, suggesting the sample was adequate for evaluating the majority of the individual items as well.

Examination of the eigenvalues revealed an initial 5-factor solution, using Kaiser's criteria of values greater than 1. However this method alone is not thought to be entirely reliable when the sample size is greater than 200, especially when one has more than 30 variables (the BAMI scale consisted of 40 potential items and the sample size was well over 600), and when the communalities are less than .7 (only 2 of the items exhibited communalities greater than .7). Examining the scree plot curve for points of inflection is thus thought to be a more reliable method of determining the number of factors (Field, 2009). Visual examination of the scree plot suggested 4 or 5 factors. Only 5% of the residuals (which are the difference between the observed correlations and the correlations based on the model) were larger than 0.05, suggesting this initial model was adequately fit to the data.

As both the eigenvalues and scree plot suggested 5 factors, an EFA which forced this extraction was conducted first. An oblique rotation (Direct Oblimin) was implemented because the factors were expected to correlate with each other (Tabachnik & Fidel, 2007). The solution as a whole explained 41.4% of the variance, although the 5th factor now had an eigenvalue less than 1. To determine factor loadings I examined the pattern matrix rather than the factor correlation matrix as this is a more appropriate indicator when using this type of rotation (Costello & Osborne, 2005). Inspection of the pattern matrix revealed that there was one hyperplane item which loaded on none of the 5 factors, and one complex item. Complex items throughout were defined as items with loadings greater than .32 across two or more factors, a common rule of thumb because this value indicates there is more than 10% overlapping variance with each factor (Costello & Osborne, 2005). The solution was re-run and new emerging problematic items

removed. This process was repeated until all problematic loadings were resolved. In total, three additional items were removed as a result of this process. Two were hyperplane items that no longer loaded on any factors, and one was an item with an extremely low communality (less than .2). This generated a five-factor solution which explained 43% of the variance. Factor loadings for remaining items were all greater than .32. The resulting factors were fairly interpretable, comprised of items which suggested factors assessing 1) memory ability, 2) memory importance, 3) memory reliability, 4) memory importance (with respect to negative consequences), and 5) memory reliability (reverse scored-items only).

A second EFA extracting only four factors was also run, as this solution had also been suggested by the scree plot. The initially extracted solution explained 38.87% of the variance. Following the removal of one complex item and five hyperplane items that loaded on none of the factors, the four-factor solution accounted for 41.68% of the variance in the data. The resulting factors were interpretable, comprised of items which suggested factors assessing 1) memory ability (MA), 2) memory importance (MI), 3) memory reliability (MR; now including reversed-items as well), and 4) memory importance (with respect to negative consequences; MIn).

As the interpretation of the 4-factor solution was clearer than the 5-factor (where revered scored items had loaded separately), these factors were retained for further examination. They exhibited adequate to excellent internal consistency (αs = .90, .80, .78, and .73 for MA, MR, MI, and MIn, respectively). The nature of the associations between factors, however, was unexpected. The MA factor was significantly correlated with MR and MIn (r = .39, and .34, respectively, both $ps < .001$), but not with the MI factor (r = -.03, $p > .1$). MR was significantly *negatively* correlated with both the MI and MIn factors (r = -.14, and -.10 respectively, all $ps < .05$). MI and MIn were correlated with each other (r = .27, $p < .001$).

To clarify the nature of these factors, I examined the correlations of each subscale with the main variables of interest, including the VOCI, VOCIcheck, MCQ-CC, MACCS-GC, OBQ, and BAI. The MA and MIn factors were significantly correlated with all of these measures (all *p*s < .001). The MR factor lacked a significant relationship with VOCI (r = -.01, p > .1), and the OBQ (r = -.09, p > .1), although it correlated with the MCQ-CC and the MACCS-GC (both *p*s < .001). The MI factor correlated significantly with all measures (*p*s < .001), except the MCQ-CC and MACCS-GC (both *p*s > .1). See Table 2 for a full list of correlations. As the individual factors were not all correlated with each other, there was a suggestion that they did not represent a unified scale. I looked to theory and research to determine which factors to retain. Based on previous research, from which I expected that the MA subscale would be the most likely to be implicated in checking, I prioritized its associations first. This suggested that MR and MIn would be important factors to retain as well, as they were both correlated with MA. Then I considered the associations of each factor with the theoretically related measures. However, only MIn was also related to metacognition, checking, and other OC/anxious constructs. Thus, it was decided to conduct an additional EFA on items solely pertaining to the MA and MIn subscales to determine the interpretability of such a solution. The retained MA and MIn items were included, as well as the other originally proposed MA and MIn items which had been previously excluded through the factor cleaning process.

Exploratory factor analysis II

An initial unrotated solution containing the above-mentioned items was run. The majority of correlations between items were significant, and thus items were acceptable for conducting factor analysis; furthermore there was no evidence of multicollinearity (all *rs* < .90). Although once again the value of the determinant of the correlation matrix suggested otherwise, it was not clear which

Table 2

Correlations of BAMI Factors and Related Constructs in the 4-factor EFA

	VOCI	VOCI-check	MCQ-CC	MACCS-GC	OBQ	BAI
MA	.33***	.20***	.69***	.79***	.26***	.23***
MR	-.01	.01	.28***	.35***	-.09	.02
MI	.22***	.15***	.02	.06	.42***	.15***
MIn	.43***	.23***	.29***	.33***	.49***	.32***

Note. MA = Memory Ability factor of the BAMI; MR = Memory Reliability factor of the BAMI; MI = Memory Importance factor of the BAMI; MIn = Memory Importance (with respect to negative consequences) factor of the BAMI; VOCI = Vancouver Obsessional Compulsive Inventory (Thordarson et al., 2004); VOCI-check = checking subscale of the VOCI; MCQ-CC = Cognitive confidence subscale of the Meta-Cognitions Questionnaire (Wells & Cartwright-Hatton, 2004); MACCS-GC = General memory confidence subscale of the Memory and Cognitive Confidence Scale (Nedeljkovic & Kyrios, 2007); OBQ = Obsessive Beliefs Questionnaire (OCCWG, 2005); BAI = Beck Anxiety Inventory (Beck & Steer, 1990). A Bonferonni correction was applied for the 24 correlations examined, as such, only correlations of $p < .002$ were considered to be significant.

items might be problematic. The overall KMO was excellent (KMO = .91), suggesting the sample was adequate for analysis (Field, 2009). Examination of the diagonals of anti-image matrix revealed that more than half of the individual items also had KMO values above .5 suggesting the sample size was adequate for most individual items as well (Field, 2009). Both Kaiser's criteria and visual inspection of the scree plot suggested a 2-factor solution. This solution accounted for 41% of the variance.

A solution extracting 2 factors was conducted to confirm this structure and variance explained. All factor loadings were above .4, and there were no complex items. The factors were interpretable, factor 1 contained all of the proposed MA items, and factor 2 contained all of the proposed MIn items (see Table 3). Thus, this version of the measure was retained.

BAMI properties

The internal consistency of the measure as a whole was very good (α = .88). The BAMI-MA subscale's internal consistency was also excellent (α = .90) and the internal consistency of the BAMI-MIn was adequate (α = .74). The measure as a whole, as well as both subscales, correlated significantly with each other and with measures of OC symptoms (VOCI), beliefs (OBQ), and anxiety (BAI; all *p*s < .001, see Table 4). Convergent validity was assessed by close examination of the correlations between the BAMI and measures of cognitive/memory confidence, including the MCQ, MACCS, and MFQ. Results revealed that the full measure and relevant subscales were all significantly correlated with these measures (see Table 5). Thus the measure demonstrated strong evidence of convergent validity.

Divergent validity was assessed by close examination of the association of the BAMI with the BDI-II and the SPIN (see Table 5). Results revealed that the BAMI was significantly correlated with these measures as well. In order to determine which associations were stronger, a series of dependent samples *t*-tests

Table 3

Final BAMI Factor Structure and Loadings

	Factor	
BAMI Item	MA	MIn
I have a poor memory	**.79**	-.04
I have a good memory	**.76**	-.10
I can't rely on my memory	**.72**	.03
Even when I try to remember something I have seen I find I can't remember it well	**.69**	.04
I have trouble remembering important actions	**.67**	.17
No matter how much I try I can't remember to do things that I need to do	**.63**	.16
No matter how much I try I always seem to forget what I've done	**.61**	.26
When I try to remember what I have done I find I have forgotten it/been incorrect	**.60**	.21
When I try to remember something I have seen I always remember it well	**.59**	-.22
My memory can be trusted most of the time	**.58**	-.08
I am good at remembering important events	**.56**	-.01
Often my memory turns out to have been incorrect	**.56**	.06
My memory always plays tricks on me	**.49**	.13
When I try I can remember exactly what I've seen	**.46**	-.22
I find that I usually can't remember what I've just done, even when it's really important	**.46**	.24
When I can't remember something, it means I'm a bad person	.11	**.66**
A poor memory means I am a bad person	.09	**.66**
When I can't remember something, it means I am stupid	.17	**.59**
A poor memory means I am at risk of becoming an irresponsible person	-.01	**.58**
A poor memory means I'm dangerous	-.09	**.49**

Note. BAMI = Beliefs About Memory Inventory; MA = Memory ability factor; MIn = Importance of memory (with respect to negative consequences) factor. Bold type face indicates the item loads > .40 on the given factor.

Table 4

Correlations between the Final BAMI, Subscales, and OC-related Measures

	BAMI-MA	BAMI-MIn	VOCI	VOCI-check	OBQ	BAI
Student Sample						
BAMI	.96***	.54***	.33***	.39***	.61***	.28***
BAMI-MA	-	.28***	.30***	.18***	.21***	.21***
BAMI-MIn		-	.46***	.24***	.39***	.32***
Clinical Sample						
BAMI	.98***	.67***	.46*	.35†	.55**	.58**
BAMI-MA	-	.51*	.44*	.36†	.47*	.56**
BAMI-MIn		-	.34	.20	.66***	.41*

Note. BAMI = Beliefs About Memory Inventory; BAMI-MA = Memory Ability factor of the BAMI; BAMI-MIn = Memory Importance (with respect to negative consequences) factor of the BAMI; VOCI = Vancouver Obsessional Compulsive Inventory (Thordarson et al., 2004); VOCI-check = checking subscale of the VOCI; OBQ = Obsessive Beliefs Questionnaire (OCCWG, 2005); BAI = Beck Anxiety Inventory (Beck & Steer, 1990). † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 5

Correlations between BAMI, Subscales, and Measures of Convergent and Divergent Validity in the Student and Clinical Samples

	MFQ	MCQ	MCQ -CC	MACCS	MACCS -GC	BDI-II	SPIN
Student							
BAMI	-.57***	.40***	.68*	.72***	.77***	.35**	.34**
BAMI-MA	-.55***	.33***	.70*	.70***	.78***	.29**	.29**
BAMI-MIn	-.28***	.39***	.26***	.37***	.30***	.33**	.31**
Clinical							
BAMI	-.19	.51*	.79***	.77***	.85***	.44*	.42*
BAMI-MA	-.26	.47*	.80***	.75***	.86***	.43*	.36†
BAMI-MIn	.13	.46*	.43*	.55**	.48*	.34	.47*

Note. Negative correlations are expected with the MFQ as higher scores on this measure indicate less pathology, in contrast to all other measures. BAMI = Beliefs about Memory Inventory; BAMI-MA = Memory Ability factor of the BAMI; BAMI-MIn = Memory Importance (with respect to negative consequences) factor of the BAMI; MFQ = Memory Functioning Questionnaire (Gilewski, Zelinski, & Schaie, 1990); MCQ & MCQ-30 = Meta-Cognitions Questionnaire and Cognitive Confidence subscale of the MCQ (Wells & Cartwright-Hatton, 2004); MACCS & MACCS-GC = Memory and Cognitive Confidence Scale and General memory confidence subscale of the MACCS (Nedeljkovic & Kyrios, 2007); BDI-II = Beck Depression Inventory II (Beck, Steer, & Garbin, 1996); SPIN = Social Phobia Inventory (Connor et al., 2000). † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

for comparing correlations (Field, 2009) was conducted. These revealed that the BAMI was significantly more strongly associated with the MACCS than with the SPIN ($t(694) = 7.59$, $p < .001$, $r = .08$), and also more strongly associated with the MACCS than with the BDI-II ($t(694) = 7.00$, $p < .001$, $r = .08$). Furthermore, the BAMI was significantly more strongly associated with the MCQ than with the SPIN ($t(694) = -4.60$, $p < .001$, $r = .03$), but not more strongly associated with the MCQ than with the BDI-II ($t(694) = -1.63$, $p > .05$, $r = .003$). Finally, the BAMI was significantly more strongly associated with the MFQ than with the SPIN ($t(694) = -6.00$, $p < .001$, $r = .05$), and also more strongly associated with the MFQ than with BDI-II ($t(694) = -7.92$, $p < .001$, $r = .08$). Thus, there was good evidence of divergent validity for the BAMI.

Retest reliability data was received from a proportion of the student sample ($n = 48$) using a 6-week retest window. This longer interval was chosen to determine whether the BAMI would be suitable for use in Study 2 as an outcome measure (see Chapter 4), where the interval between initial assessment and final data collection point for the waitlist condition would be six weeks in length. The retest reliability of the full scale was adequate ($r = .62$). The retest reliability of both the BAMI-MA subscale and the BAMI-MIn subscale were also in the adequate range (rs =.65, and .64, respectively).

Characteristics of the clinical sample

As can be seen in Table 4, in the clinical sample, the BAMI scale and subscales were significantly and highly correlated with each other, as was the case for the non-clinical sample. The internal consistency of the scale's items were also good to excellent in the clinical sample, with a *Cronbach*'s *alpha* of .95 for the total scale, .96 for BAMI-MA, and .84 for BAMI-MIn. With respect to convergent validity, most correlations between the BAMI scales and measures of OCD were either significant or exhibited trend-level associations, with the exception of some of the associations with the BAMI-MIn (see Table 4). This

was not unexpected, given the small number of items in this subscale and the small sample size, and as such the analyses were likely underpowered. Further, the subscales and full BAMI were significantly and highly correlated with all other measures of convergent validity, with the exception of the MFQ (see Table 5).

With respect to divergent validity, the BAMI was significantly correlated with the BDI and the SPIN, the BAMI-MA was significantly correlated with the BDI-II and marginally correlated with the SPIN, and the BAMI-MIn was not significantly associated with the BDI-II but was significantly associated with the SPIN (see Table 5). All dependent sample *t*-tests found no differences between the degree of association between the full scale BAMI and measures of convergent vs. divergent validity, all *p*s > .05.

Predictive power of the BAMI

To determine whether beliefs about memory contributed to checking behaviour, a multiple hierarchical regression was run with VOCI-check as the dependent variable. The three subscales of the OBQ, OBQ-RT,-PC, and -IC, were entered in Step 1, and the BAMI subscales of BAMI-MA and BAMI-MIn were entered in Step 2. The final model accounted for 19% of the variance, and was a significant predictor of VOCI-check, $F(5,691) = 31.59$, $p < .001$. BAMI-MA contributed significant additional variance, $t(696) = 2.25$, $p = .02$, but BAMI-MIn did not, $t(696) = 0.80$, $p = .42$ (see Table 6).

Discussion

The goal of the current study was to develop a self-report measure of maladaptive beliefs about memory, as there is reason to believe there is a role for such beliefs in compulsive checking. Results were partially consistent with hypotheses. The first hypothesis was that the BAMI would have three factors, 1) beliefs about memory ability, 2) reliability of memory, and 3) importance of memory. Exploratory factor analyses revealed that the BAMI had four factors.

Table 6

Multiple Hierarchical Regression Predicting VOCI-check from the OBQ and BAMI Subscales

	Model 1			Model 2		
	B	*SE B*	*β*	*B*	*SE B*	*β*
OBQ-RT	.09	.01	.34***	.09	.01	.32***
OBQ-PC	.01	.01	.03	.01	.01	.03
OBQ-IC	.03	.02	.09†	.02	.02	.06
BAMI-MA				.03	.02	.08*
BAMI-MIn				.04	.05	.03
R^2		.18			.19	
F for R^2 change		50.08***			3.35*	

Note. VOCI-check = checking subscale of the Vancouver Obsessional Compulsive Inventory (Thordarson et al., 2004); BAMI = Beliefs about Memory Inventory; BAMI-MA = Memory Ability factor of the BAMI; BAMI-MIn = Memory Importance (with respect to negative consequences) factor of the BAMI; OBQ = Obsessive Beliefs Questionnaire (OCCWG, 2005); OBQ-RT = Responsibility/Threat subscale of the OBQ; OBQ-PC = Perfectionism/Certainty subscale of the OBQ; OBQ-IC = Importance/Control of thoughts subscale of the OBQ. † $p < .10$; * $p < .05$; *** $p < .001$.

This was because one of the factors, importance of memory, was split into two factors, one containing items pertaining to the negative consequences of a bad memory (e.g., "A poor memory means I'm dangerous"), and to do with importance with less dire consequences (e.g., "Having a good memory is the key to success"). Finally, however, only two factors were retained, as they were the only ones found to be both significantly associated with each other, and with related obsessive-compulsive constructs. These were the beliefs about memory ability (BAMI- MA) and beliefs about the importance of memory (with negative consequences; BAMI-MIn) factors.

The second hypothesis pertained to the validity of the BAMI. It was hypothesized that the BAMI would be associated with other measures of memory confidence and not at all related to less relevant constructs, such as depression and social anxiety. This hypothesis was also partially supported. The BAMI was significant associated with all of the above constructs, however, for the most part it was significantly more closely associated with measures pertaining to cognitive confidence than with those assessing social anxiety or depression, with the exception of the MCQ measure of memory confidence. The BAMI was found to be equally associated with the MCQ as with social anxiety. The MCQ is a much broader measure, of which only one subscale targets beliefs about memory, and which has been found to be associated with other anxiety disorders such as generalized anxiety disorder (Wells & Cartwright-Hatton, 2004). Thus, it is not surprising that the BAMI would be as equally associated with it as with the SPIN, which assesses another form of anxiety, that related to social concerns. Overall, the convergent and divergent validity of the measure was good, and the retest reliability adequate, suggesting that it is a valid and reliable measure of beliefs about memory. Additionally, the measure showed similar relationships to these variables in the clinical sample, suggesting its use is appropriate in the OCD population for which it is primarily intended.

The third and final hypothesis stated that the BAMI would predict OC checking symptoms, over and above other OC beliefs. This hypothesis was also partially supported as the BAMI additionally contributed a small but significant additional amount of variance. When examining the contribution of the two subscales, BAMI-MA added significant incremental predictive power over and above other OC beliefs. The BAMI-MIn subscale on its own did not emerge as a significant predictor. This finding is reasonable, as the BAMI-MIn is only a 5-item factor and thus may have limited predictive power. Furthermore, the small amount of additional variance explained is to be expected as beliefs about memory are thought to be one *additional* idiosyncratic belief that may play a role in checking for some individuals, and not meant to be the only driving factor that predicts checking in all individuals. Finally, it is possible that the nature of memory importance amongst individuals is extremely idiosyncratic, and as such, an individual who endorses such items might endorse one, but not all, thus reducing the ability of this collection of items to be more powerfully predictive.

The results of this study are consistent with theory that supports a role for beliefs about memory in promoting checking (Rachman, 2002), and with previous experimental research that has found that instilling the belief that one has a bad memory causes urges to check (Alcolado & Radomsky, 2011; Cuttler et al., 2013). They also extend the finding that memory confidence can predict checking (Nedeljkovic & Kyrios, 2007), by demonstrating that broader beliefs about memory did as well, although the current study found so in a non-clinical sample, whereas the former did so in a sample of individuals diagnosed with OCD. Further, the findings suggest that previous investigations which ultimately decided not to include memory-related beliefs in their OC beliefs scale may have been premature in doing so (OCCWG, 1997).

Meta-cognitive research on OCD has found beliefs about confidence in memory to be an important domain for understanding and intervening in OCD

(see Rees & Anderson, 2013, for a review). Thus, it is not surprising that in the current study a belief domain regarding memory, which could be construed as meta-cognition, has a role to play in checking, and perhaps other obsessive-compulsive-related phenomenology. Indeed, the production of this measure is timely, as newer cognitive-behavioural intervention recommendations for OCD include addressing beliefs about memory (Radomsky et al., 2010; Shafran, Radomsky, Coughtrey, & Rachman, 2013). Thus there now exists a measure to assess it.

This study is not without limitations. This paper reported on the first step to developing a novel measure to assess beliefs about memory, and as such used an exploratory factor analysis. These results should be considered tentative until and unless they are shown to be replicable via a confirmatory factor analysis. Additionally, the use of a non-clinical sample was necessary for data collection requirements of the magnitude required to run psychometric analyses, but they do potentially limit the generalizability of the findings to a clinical sample. Although correlational analyses demonstrated that the clinical sample's results were similar in some ways to that of the non-clinical sample's, a larger clinical sample would help clarify whether or not there are meaningful differences between the two, and whether or not the BAMI can predict checking in a clinical sample as well. The low correlations seen in our small clinical sample between the BAMI subscales and VOCI-check may have hampered our ability to adequately address this question in the present study. These correlations may have resulted from the fact that all clinical participants reported primary checking symptoms; a more heterogeneous sample of participants with a broader range of OCD symptoms may help to clarify the nature of the relationship between beliefs about memory and checking symptomatology. Relatedly, although OC symptoms may well lie along a continuum in the population (see Mataix-Cols, Rosario-Campos, & Leckman, 2005), and although analogue samples are appropriate for studying OC

symptoms and beliefs in general (see Abramowitz et al., 2014, for a recent review) it has not yet been investigated whether potentially maladaptive beliefs about memory related to OCD exhibit the same properties.

A notable strength of this study was the large sample size, which allowed for appropriate testing of the study hypotheses and confidence in the results. Similarly, the inclusion of a clinical sample of individuals who not only had OCD, but who exhibited clinical levels of compulsive checking, was another strong design choice, but may have hampered our power with respect to the strength of the correlations due to restricted range.

There are some notable implications of the current findings. This was the first attempt, to our knowledge, to develop a measure for assessing beliefs about memory, which could prove to be valuable both for future research investigating this construct, as well as for clinicians seeking to evaluate it and address it within a treatment context. Further, the results demonstrated that beliefs about memory are not only associated with checking, but that they have the potential to predict checking over and above known relevant belief domains. These findings imply that beliefs about memory are an important construct to be further explored in our understanding of the theory, etiology, maintenance, treatment, and prevention of compulsive checking. Finally, these results have shown that not only do beliefs about memory *ability* play a role in checking, but that beliefs about the *importance* of memory do as well. This finding has implications not only with respect to the need to adequately assess these constructs, but also suggest they may need to be addressed in treatment. With respect to comparing memory ability to memory importance, it may be that memory ability only matters if one thinks that memory is important, which suggests the relationship between these two should be investigated further, and in clinical samples.

There are a number of pertinent future directions that follow directly from this study's findings. The next logical step would be to collect further data on this

instrument in order to conduct a confirmatory factor analysis that could clarify the stability of the current findings. The measure may also benefit from refinement with respect to number of items in each factor, such as expanding the number of items relating to beliefs about the importance of memory and/or decreasing the number of items relating to beliefs about memory ability, such that the factors are given more equal weight in the measure. With respect to investigations with clinical populations, additional information on how the measure works in a larger clinical sample, both within compulsive checkers and individuals with other forms of OCD, is warranted to clarify the range of utility of the measure. Firstly, such an investigation would also allow exploration of whether or not the BAMI has the power to predict checking in a clinical sample as well as a non-clinical one. Secondly, a reasonable question that follows from these findings is whether beliefs about memory are only pertinent to compulsive checking or whether they play a role in other OC symptoms. Beyond the context of OCD, it may also be that beliefs about memory contribute to symptomatology in other affective disorders where repeated information is sought and/or repeated behaviour. For example reassurance seeking is often sought in the context of depression for social-related reasons (e.g., concerns about abandonment and loss of social support; Parrish & Radomsky, 2010). The BAMI may be a useful measure for answering these and other pertinent empirical questions in which measurement of beliefs about memory would be useful. These could include psychometric investigations to further our theoretical understanding of the predictive power of these constructs as well as longitudinal survey and treatment studies where the BAMI could be used to monitor change over time. Outside the research realm, the utility of such a measure in a treatment setting would be useful to both the clinician and the client who wish to potentially effect changes in checking symptoms by exploring this relevant target.

Chapter 3:
BRIDGE

Maladaptive beliefs about memory are known to predict checking (Nedeljkovic & Kyrios, 2007) and to cause urges to check (Alcolado & Radomsky, 2011; Cuttler, Sirois-Delisle, Alcolado, 2013). Study 1 was designed to develop a focused measure of beliefs about memory in order to be able to more easily assess these beliefs in future psychometric, experimental, and treatment-related investigations. Potential items for the Beliefs About Memory Inventory (BAMI) were generated along three purported dimensions: beliefs relevant to memory ability, memory reliability, and importance of memory. Items were administered, in conjunction with other relevant measures, to a large sample of undergraduates and a small sample of individuals with OCD who had clinically significant levels of checking and doubt. An exploratory factor analysis was conducted on the student sample data in order to determine the factor structure and items to retain.

Results indicated that the BAMI was comprised of two factors, 1) beliefs about memory ability, and 2) beliefs about the importance of memory (with respect to negative consequences). The measure was shown to have sound psychometric properties and to be acceptable for use with a clinical sample. Finally, regression analyses demonstrated that the measure was able to predict checking symptoms over and above known relevant OCD-relevant belief domains. These findings demonstrate that the BAMI is a useful tool for capturing these beliefs, and moreover, provide further evidence that beliefs about memory are implicated in compulsive checking.

Bearing in mind that existing treatments for OCD do not target maladaptive beliefs about memory, and that they still have considerable room for improvement (e.g., Shafran, Radomsky, Coughtrey, & Rachman, 2013; Whittal, Woody, McLean, Rachman, & Robichaud, 2010), it would seem intervening with

respect to beliefs about memory has the potential to increase treatment effectiveness. Indeed, including this type of intervention in treatments for compulsive checking has been suggested (Radomsky, Shafran, Coughtrey, & Rachman, 2010; Shafran et al., 2013), but not yet tested.

Theory of compulsive checking also implicates maladaptive beliefs about memory in the checking cycle (Rachman, 2002). Further, there is a wealth of evidence as to the detrimental effects of checking on memory confidence (e.g., van den Hout & Kindt, 2003a). Current cognitive interventions for OCD, although they include a focus on doubt/checking, do not address maladaptive beliefs about memory directly (e.g., Clark, 2003; Rachman, 2003). Of relevance, elsewhere in the literature it has been proposed that maladaptive beliefs about memory may better account for the inconsistent findings with respect to memory deficits in OCD (Cougle et al., 2007; Muller & Roberts, 2005; Radomsky & Alcolado, 2010).

Study 2, therefore, drawing from theory and recent experimental evidence, endeavoured to develop and test an intervention specifically targeting beliefs about memory. I sought to determine whether such an intervention could change these beliefs, alleviate checking symptoms, and improve memory performance. Participants with clinical levels of checking and doubt were randomly assigned to receive a brief 2-session treatment focused on beliefs about memory or to a waitlist control group, as a preliminary, exploratory test of this hypothesis. Utilizing the newly developed BAMI, beliefs about memory were measurable, and thus were assessed via this instrument at pre- and post- assessment, as were checking symptoms and memory ability.

CHAPTER 4:
A NOVEL COGNITIVE INTERVENTION FOR COMPULSIVE CHECKING: TARGETING MALADAPTIVE BELIEFS ABOUT MEMORY

Checking is one of the most frequently reported compulsions in obsessive-compulsive disorder (OCD; Rachman & Hodgson, 1980; Ruscio, Stein, Chiu, & Kessler, 2010), and is associated with profound doubt and uncertainty (Rachman, 2002). A major advance in understanding the nature of checking behaviour came from a series of experiments by van den Hout and Kindt (2003a,b; 2004). The authors proposed that checking causes less detailed and vivid encoding of one's memory for the check, which in turn causes less confidence when one tries to precisely recall what has occurred. They posited that these decrements in meta-memory occur because the more one checks, the more familiar the event becomes. This probably-universal phenomenon was proposed to be particularly problematic in the context of OCD, wherein individuals may have higher standards for certainty and likely prefer to rely on an exact, precise recall of events, rather than a general sense of knowing, in order to be sure they have checked properly (van den Hout & Kindt, 2003b).

Support for the paradoxical nature of repeated checking, whereby checking erodes, rather than increases aspects of meta-memory, was first demonstrated using a virtual checking paradigm (van den Hout & Kindt, 2003a). Non-clinical participants provided ratings of their memory confidence, vividness, and detail about virtual stove checking pre and post a series of repeated checking trials. During these repetitions, half of the participants checked virtual stove burners 20 times (relevant checking), while half checked virtual light bulbs 20 times (irrelevant checking). Only those who engaged in relevant checking reported decreases in memory confidence, vividness, and detail, from pre- to post-repeated checking. Importantly, participants in the relevant checking condition

were just as accurate as individuals completing irrelevant checking at reporting which stove burners they had operated. Those in the relevant checking condition also demonstrated a shift from relying on "remembering" to "knowing" (Tulving, 1985; van den Hout & Kindt, 2003b; 2004). Declines in meta-memory following repeated checking are robust, and have been replicated using real working appliances (Coles, Radomsky, & Horng, 2006; Radomsky, Gilchrist & Dussault, 2006), during mental checking (Radomsky & Alcolado, 2010) and with clinical samples (Boschen & Vuksanovik, 2007; Radomsky, Dugas, Alcolado & Lavoie, 2014).

Declines in aspects of meta-memory following repeated checking are consistent with the cognitive theory of compulsive checking (Rachman, 2002). A key component of this theory is a "self-perpetuating mechanism" (p. 629) wherein checking is perpetuated in part because although individuals may check to reduce initial uncertainty, the act of checking paradoxically increases uncertainty. This increased uncertainty propels the individual to continue to check.

A potential consequence of the decrements in meta-memory caused by checking is that over time, following attempts to retrieve memories that are by nature lacking in detail and vividness, individuals may come to believe that they possess a poor memory. Indeed, low confidence in memory has been shown, psychometrically, to predict checking over and above known OCD-relevant belief domains (Nedeljkovic & Kyrios, 2007). This body of work led us to question whether manipulating beliefs about memory ability could impact checking phenomenology (Alcolado & Radomsky, 2011). Undergraduate students completed a battery of memory tests and were then randomly assigned to receive either positive or negative false feedback about their performance. Those individuals who were told they had a very poor memory had significantly greater urges to check their performance on a series of subsequent tasks, as compared to those who were told they had an excellent memory. This finding has now been

replicated in the context of prospective memory (Cuttler, Sirois-Delisle, Alcolado, Radomsky, & Taylor, 2013). As such, maladaptive beliefs about memory may be a hitherto neglected belief domain pertinent to compulsive checking (Alcolado & Radomsky, 2011).

A number of other belief domains have been proposed to be central to OCD. Building upon Paul Salkovskis's (1985) earlier work positing inflated responsibility as central in maintaining OCD symptoms, the Obsessive-Compulsive Cognitions Working Group (OCCWG; 1997) set out to determine the beliefs most relevant to OCD. The group ultimately found six belief domains within three categories: 1) inflated responsibility/threat overestimation; 2) importance of/control over thoughts, and 3) perfectionism/intolerance of uncertainty (OCCWG, 2005). Importantly, beliefs about memory were removed from consideration at the first phase of their investigations (OCCWG, 1997), and as such, in our view, have not received sufficient attention in the literature on maladaptive beliefs in OCD.

As beliefs about memory may be implicated in checking and memory performance, perhaps targeting them in treatment would alleviate checking-related symptomatology. van den Hout and Kindt (2004) suggested, based on their findings, that treatment for OCD include learning to tolerate decreased meta-memory. Beyond increasing tolerance, therapeutic psychoeducation and behavioural experiments could perhaps additionally increase positive beliefs about memory ability, countering decreased meta-memory. Indeed, a new cognitive-behavioural therapy (CBT) protocol for compulsive checking which includes these elements has been proposed (Radomsky, Shafran, Coughtrey, & Rachman, 2010), although a clinical investigation is still underway.

Examining the impact of beliefs about memory on checking symptomatology also provides an ideal opportunity to assess the degree to which such beliefs are related to memory performance. Compulsive checking has

previously been proposed to be associated with a deficit in memory, particularly in non-verbal recall (e.g., Tallis, 1997), but this view remains controversial, as others have suggested that any deficits observed may be secondary to the disorder. In particular, these deficits are not specific to checkers (Cuttler & Graf, 2009), and providing threat-relevant information can negate the 'memory deficit' (Marsh et al., 2009). Moreover, individuals with OCD have been found to have superior memory for stimuli that are personally significant (Constans, Foa, Franklin, & Mathews, 1995; Radomsky & Rachman, 1999; Radomsky, Rachman, & Hammond, 2001; Tolin et al., 2001), especially under ecologically valid conditions (Coles & Heimberg, 2002). To explain these seemingly opposing results, it has been suggested that negative beliefs about one's memory ability may undermine memory performance (Cougle et al., 2007; Radomsky & Alcolado, 2010; Radomsky & Rachman, 2004; Radomsky, Rachman, & Hammond, 2001). Indeed, a study by Nedeljkovic (2006) found that after controlling for meta-cognitions (including confidence in memory, decision making, attention, concentration, and perfectionistic standards for memory) impaired neuropsychological performance did not significantly predict OCD symptoms in a sample of clinical checkers.

As the ability of an intervention designed specifically to target beliefs about memory to impact checking and memory performance has not yet been conducted, this was the primary goal of the current pilot, exploratory study of the potential utility of such an intervention. It was hypothesized that a two-session cognitive intervention focused on beliefs about memory would a) decrease maladaptive beliefs about memory, b) decrease checking behaviour, and c) increase memory performance in individuals receiving treatment, as compared to those in a waitlist condition. In addition to measuring visuospatial recall, processing speed was also assessed as a cognitive control task that was expected to remain stable across time. Finally, it was expected that changes in maladaptive

beliefs about memory would be predictive of lower checking symptoms, and enhanced memory performance.

Method

Participants

Participants ($N = 24$) were individuals with a diagnosis of OCD who reported significant checking and/or doubting symptoms. Thoughts of doubt/uncertainty and behaviours of checking compulsions were required to cause significant distress and/or interference and to be evident for at least one hour per day. Exclusion criteria were the presence of current substance dependence, bipolar disorder, or psychosis. Participants were recruited from a registry of individuals with OCD interested in research studies, via campus flyers, classroom recruitment, and through advertisements placed online. Participants were compensated financially for the assessment visits (see below), but not for the treatment. See Table 7 for demographic information.

The majority of the sample had a primary diagnosis of OCD (66.67%). Other primary diagnoses included Generalized Anxiety Disorder (16.67%), Social Anxiety Disorder (12.50%), and Major Depressive Disorder (4.17%). A minority of participants presented solely with OCD (16.67%), and the mean number of co-morbid diagnoses in the remainder of the sample was 3.25 ($SD = 1.65$). There were no differences between the treatment and waitlist conditions with respect to primary diagnosis, $\chi^2(4) = 3.93$, $p = .42$. There were also no condition differences with respect to mean number of co-morbid diagnoses, $t(1,22) = 1.39$, $p = .18$, $d = .56$ (treatment $M = 3.58$, $SD = 1.83$, waitlist $M = 2.67$, $SD = 1.37$). See Table 7 for clinical severity ratings.

Measures

Beliefs about Memory Inventory (BAMI; Alcolado & Radomsky, 2012). The BAMI self-report questionnaire comprises twenty items that assess individuals' beliefs about their memory. It contains two subscales, 1) beliefs

Table 7.

Participant Characteristics by Condition

		Condition	
		Treatment (N = 12)	Waitlist (N = 12)
Age		*M* = 35.83, *SD* = 14.43 (20-65)	*M* = 30.33, *SD* = 12.06 (21-62)
Sex		66.7% Female (N = 8)	75% Female (N = 9)
ADIS-IV	OCD Severity	*M* = 4.67 *SD* = 0.78	*M* = 4.75, *SD* = 0.87
Y-BOCS	Total	*M* = 22.08, *SD* = 2.81	*M* = 22.75, *SD* = 4.14
	Obsessions	*M* = 10.67, *SD* = 2.06	*M* = 11.00, *SD* = 2.22
	Compulsions	*M* = 11.42, *SD* = 1.56	*M* = 11.75, *SD* = 2.38
Ethnicity			
	Caucasian	83% (N = 10)	66.7% (N = 8)
	South Asian	0%	16.7% (N = 2)
	Latin American	8.3% (N = 1)	8.3% (N = 1)
	Arab/West Asian	0%	8.3% (N = 1)
	Mixed Race	8.3% (N = 1)	0%
Language spoken at home			
	English	75% (N = 9)	66.7% (N = 8)
	French	8.3% (N =1)	16.7% (N = 2)
	Spanish	8.3% (N =1)	8.3% (N = 1)
	Portuguese	8.3% (N =1)	0%
	Persian	0%	8.3% (N = 1)
Education			
	Some High School	8.3% (N = 1)	0%

	High School Diploma	0%	8.3% (N = 1)
	Some College	0%	8.3% (N = 1)
	College Diploma	8.3% (N = 1)	0%
	Some University	58.3% (N = 7)	33.3% (N = 4)
	University Degree	16.7% (N = 2)	16.7% (N = 2)
	Some Graduate	8.3% (N = 1)	0%
	Graduate Degree	0%	33.3% (N = 4)
Income			
	$0 - $24,999	66.67% (N = 8)	66.67% (N = 8)
	$25,000 - $49,999	25% (N = 3)	25% (N = 3)
	>$50,000	8.3% (N = 1)	8.3% (N = 1)

Note. ADIS-IV = Anxiety Disorders Interview Schedule for DSM-IV (Brown et al., 1994); Y-BOCS = Yale-Brown Obsessive-Compulsive Disorders Inventory (Goodman et al., 1989a); No differences were found between conditions with respect to continuous variables, as calculated by independent samples *t*-test (all *p*s > .10), or categorical variables, as calculated by *chi square* tests (all *p*s > .10).

about memory ability (e.g., "No matter how much I try, I always seem to forget what I've done"), and 2) beliefs about the importance of memory (e.g., "A poor memory means I'm dangerous"). Items are rated along a 6-point scale from *disagree very much* to *agree very much*. The measure has very good internal consistency (α = .88), good convergent and divergent validity, and adequate retest reliability (r = .62). In the current sample internal consistency was excellent, α = .95. Please note that participants actually completed all 40 items from the original BAMI (see Chapter 2) but that only those 20 retained as part of Study 1's analyses were extracted to form the BAMI as used herein.

Vancouver Obsessional Compulsive Inventory, checking subscale (VOCI-check; Thordarson et al., 2004). The VOCI is a 55-item self-report questionnaire that assesses OCD symptoms along a 5-point scale from *not at all* to *very much*. The measure contains six subscales, including checking, contamination, obsessions, hoarding, 'just right', and indecisiveness. The VOCI has excellent convergent and divergent validity. The checking subscale, comprised of six items, exhibits excellent internally consistency, α = .96, and retest reliability, r = .96 (Radomsky, Ouimet, et al., 2006; Thordarson et al., 2004). In the current sample, the internal consistency of the checking subscale was α = .92.

Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; Brown, DiNardo, & Barlow, 1994). The ADIS-IV is a semi-structured interview that assesses presence and severity of Axis I disorders. It exhibits good inter-rater reliability, κ = .81 (Brown et al., 1994). In the current study, an independent rater evaluated twenty percent of the interviews at random and there was 100% agreement for all OCD diagnoses.

Yale-Brown Obsessive Compulsive Scale (Y-BOCS; Goodman et al., 1989a). The Y-BOCS is a 10-item clinician-rated scale that assesses the nature and severity of obsessive-compulsive symptomatology along a scale of 0 ('no

symptoms') to 4 ('extreme symptoms'). Internal consistency of the scale is good ($\alpha = .89$), as is inter-rater reliability ($r = .89$; Goodman et al., 1989a). It has good convergent ($r = .79$ with a measure of OCD) and divergent ($r = .26$ with a measure of depression) validity (Goodman et al., 1989b).

Daily monitoring forms. These were completed by participants at the end of each day. The monitoring forms were used primarily to track total time spent checking in minutes. Additionally, participants provided ratings of the degree to which they believed they had a poor memory using a 0-100 point scale, where 0 indicated no belief they had a poor memory that day, and 100 indicated absolute belief they had a poor memory that day. To obtain average daily time spent checking in minutes and average daily monitoring-beliefs about memory (DM-BAM) for each time period an 'average daily rating' score was calculated. Ratings for each day during a given period were summed and divided by the number of days each participant was in that period (typically 6 or 7 days).

Complex Figures (CF). The Rey Complex Figure Test (RCFT; Meyers & Meyers, 1995) assesses visuospatial memory. The Modified Taylor Complex Figure (MTCF; Hubley, 1996) was developed as an alternate form of the RCFT to minimize practice effects and was used as such in the current study (see Procedure). Although the Copy and Immediate recall trials were administered as per guidelines (Meyers & Meyers, 1995), we were interested specifically in immediate recall trial performance. Retest reliability for the immediate recall of the RCFT is good, $r = .76$. Convergent validity is good ($r = .33$), as is construct validity, $r = .58$ (Meyers & Meyers, 1995). The RCFT and the MTCF figures have been shown to be comparable in difficulty (Hubley & Jassal, 2006: Hubley & Tremblay, 2002).

Trail 1 of the Comprehensive Trail-Making Test (CTMT-1; Reynolds, 2002). The CTMT-1 (Reynolds, 2002) is a visual scanning, search, and sequencing task, measuring basic processing speed. Trail 1 exhibits good internal

consistency, reliability coefficient = .73, retest reliability, *r* = .74, and construct validity, *r* = .70 (Reynolds, 2002).

Procedure

All design details, including the screening, assessments, and therapy visits, were administered using a standardized protocol to ensure uniformity of administration across participants.

Screening and Baseline. Participants were screened by phone and if eligible, were scheduled for a first assessment visit to take place approximately one week later. They were also sent the monitoring forms, which they were asked to complete daily for the duration of the study, regardless of condition assignment. This first week of monitoring was used as a baseline measure of time spent checking and beliefs about memory.

'Pre-' assessment. At the pre-treatment/waitlist assessment, participants completed the RCFT or the MTCF (in a randomized, counterbalanced manner) and the CTMT-1 with an independent graduate-level assessor trained in cognitive assessment. The study therapist (GA) was a doctoral-level graduate student with extensive training in cognitive-behavioural therapy. She administered the ADIS-IV and the Y-BOCS to participants to confirm eligibility. Participants finished the assessment by completing the VOCI-check and BAMI questionnaires before being randomly assigned to the treatment or waitlist condition. Time spent checking and beliefs about memory ratings from the monitoring forms during the week immediately following this visit were used for the 'pre-' assessment scores.

Treatment Visits. For participants in the treatment condition, the first therapy session occurred approximately one week following the pre- assessment. The second therapy session occurred approximately one week after the first. Each session was approximately 50 minutes in duration. Time spent checking and beliefs about memory ratings from the monitoring form during the week immediately following the second therapy visit were used for the 'post-'

assessment scores. During this time, participants in the waitlist condition continued to complete the daily monitoring forms but did not attend any type of laboratory visit.

'Post-' assessment. For individuals in the treatment condition, this visit occurred approximately one week after the second therapy session. For individuals in the waitlist condition this visit occurred after a similar amount of time had elapsed (i.e., approximately three weeks after their pre-waitlist assessment). At the post-treatment/waitlist assessment, participants completed the CTMT-1 once more and the version of the CF they had not previously completed (either the RCFT or the MTCF), administered by an independent assessor who was blind to participant condition. Participants then completed the BAMI and VOCI-check before being fully debriefed. For ethical reasons, those participants in the waitlist condition were subsequently offered the study intervention, although data obtained from these participants were not included in the current study. As monitoring is known to be therapeutic (e.g., Korotitsch & Nelson-Gray, 1999), the two conditions would not be equivalent in nature at treatment commencement. Therefore, data across the two conditions was not collapsed for any analysis.

Treatment. The intervention was a manualized cognitive-behavioural module developed by the authors for the purpose of the current study, in collaboration with their research team, and in consultation with other experts in the cognitive-behavioural treatment for OCD. Agenda elements, psychoeducation, discussion prompts, and between-session exercises were standardized across all participants.

In the first session, the therapist taught participants about the self-perpetuating nature of checking, provided psychoeducation about the research that has supported this mechanism and explained the role that beliefs about memory may have in checking behaviour. The participants and the therapist discussed participants' beliefs about their memory ability, the possibility that their memory

might be better than they thought, and the need to gather evidence about the true state of their memory ability for the objects they check. For the between-session exercise, participants were asked to gather information about their checks four times during the week. Participants recorded their prediction before checking (e.g., "I think the light is still on"), and the outcome after checking (e.g., "Actually, the light was already off").

In the second sessions the results of the between-session exercise were reviewed. The existence of a possible discrepancy between beliefs about memory and actual memory ability was presented. Participants discussed with the therapist whether or not they thought they had symptoms of any neuropsychological impairment in memory. Different types of memory were defined and examples of memory failures in these areas were described (see below). A second between-session exercise pertaining to beliefs about memory was assigned. Participants were given a light switch and were asked to use it four times during the week in order to assess whether they had any of three possible types of memory failures (discussed during the session) after using it. The possible types of memory failures discussed during the session were with respect to: 1) episodic memory (i.e., ability to remember having used the switch); 2) semantic memory (i.e., ability to recall the name of the object); and 3) procedural memory (i.e., ability to remember how to manipulate the switch).

An independent rater coded audio recordings of all intervention visits to ensure that the therapist followed the treatment protocol, using the manual to divide each treatment session into 44 distinct elements. The experimenter delivered, on average, 92% and 86% of session elements for the first and second sessions, respectively.

Results

Effect of intervention on beliefs about memory

A 2 x 2 repeated measures MANCOVA was conducted, with baseline DM-BAM as a covariate, condition (treatment vs. waitlist) as the between participants variable, and time (pre- vs. post- assessment) as the within-participants variable. The two dependent variables of interest were DM-BAM and BAMI scores. Results showed that the covariate accounted for significant variance in the dependent variables, $F(1,21) = 30.49$, $p < .001$, $\eta_p^2 = .59$. There was no main effect of time, $F(1,21) = 1.01$, $p = .33$, $\eta_p^2 = .05$, or condition, $F(1,21) = 0.02$, $p = .89$, $\eta_p^2 = .00$, but there was a significant interaction between time and condition, $F(1,21) = 25.43$, $p < .001$, $\eta_p^2 = .55$.

Follow-up analyses were run for each dependent variable separately. A repeated measures ANCOVA with DM-BAM as the dependent variable and baseline DM-BAM as a covariate was conducted. There was no main effect of time, $F(1,21) = 0.07$, $p = .79$, $\eta_p^2 = .00$ or condition, $F(1,21) = 1.86$, $p = .19$, $\eta_p^2 = .08$. Unsurprisingly, baseline DM-BAM was significantly related to post-assessment DM-BAM, $F(1,21) = 54.84$, $p < .001$, $\eta_p^2 = .72$. Consistent with hypotheses, there was a significant interaction between time and condition, $F(1,21) = 22.84$, $p < .001$, $\eta_p^2 = .52$. As predicted, there were decreases in DM-BAM in the treatment but not the waitlist condition (see Figure 1).

A repeated measures ANOVA with BAMI scores as the dependent variable revealed no main effect of time, $F(1,22) = 0.02$, $p = .90$, $\eta_p^2 = .00$, or condition, $F(1,22) = 0.25$, $p = .62$, $\eta_p^2 = .01$, but a significant interaction between the two, $F(1,22) = 10.48$, $p = .004$, $\eta_p^2 = .32$. As predicted, there were decreases in BAMI scores in the treatment but not the waitlist condition (see Figure 1).

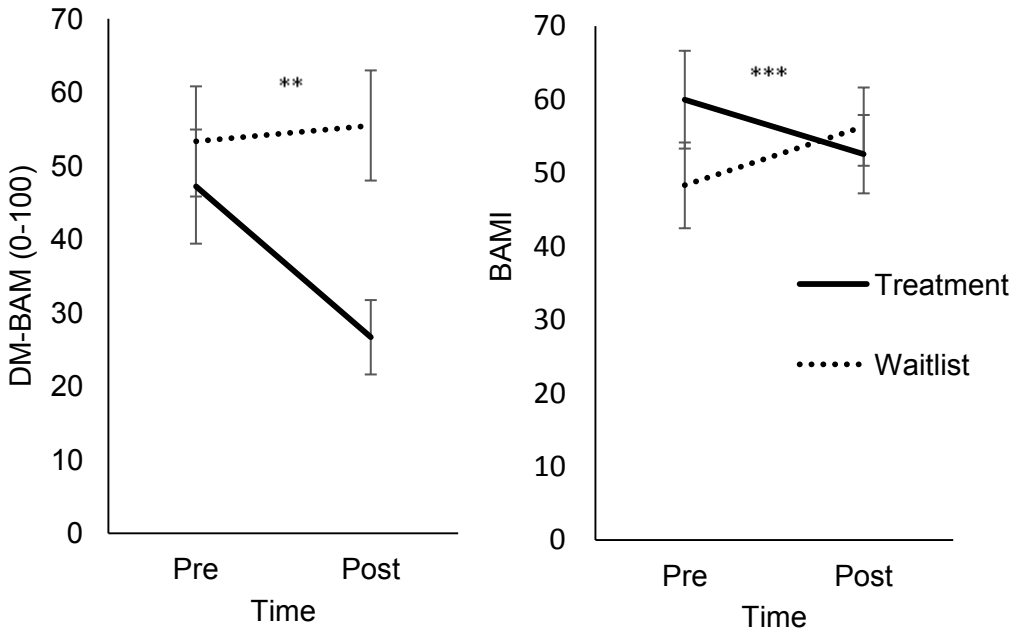

Figure 1. Beliefs about memory pre- and post- assessment, as measured by DM-BAM (average Daily Monitoring-Beliefs About Memory) and BAMI (Beliefs About Memory Inventory [Alcolado & Radomsky, 2012]) scores. Asterisks indicate significant interactions between time and condition, ** $p < .01$, *** $p < .001$.

Effect of treatment on checking

A 2 x 2 repeated measures MANCOVA was conducted, with baseline daily monitoring time spent checking as a covariate, condition (treatment vs. waitlist) as the between participants variable, and time (pre- vs. post- assessment) as the within-participants variable. The two dependent variables of interest were time spent checking as measured by the daily monitoring forms and VOCI-check scores. Baseline time spent checking was entered as a covariate to control for initial differences between conditions. The covariate accounted for significant variance in the dependent variables, $F(1,21) = 25.17$, $p < .001$, $\eta_p^2 = .54$; however, after controlling for this variance, there was the expected significant interaction between time and condition, $F(1,21) = 17.64$, $p < .001$, $\eta_p^2 = .46$. There were no main effects of time, $F(1,21) = 5.12$, $p = .12$, $\eta_p^2 = .11$, or condition, $F(1,21) = 0.37$, $p = .55$, $\eta_p^2 = .02$.

Follow-up analyses were run for each dependent variable separately. A repeated measures ANCOVA with time spent checking as the dependent variable and baseline time spent checking as a covariate was conducted. There was no main effect of time, $F(1,21) = 2.66$, $p = .12$, $\eta_p^2 = .11$, or condition, $F(1,21) = 1.18$, $p = .29$, $\eta_p^2 = .05$. Although baseline time spent checking was significantly related to post- assessment time spent checking, $F(1,21) = 34.69$, $p < .001$, $\eta_p^2 = .62$, there was, as expected, a significant interaction between time and condition, $F(1,21) = 13.72$, $p = .001$, $\eta_p^2 = .40$, such that there were decreases from pre- to post- assessment in time spent checking for the treatment but not the waitlist condition (see Figure 2).

A repeated measures ANOVA with VOCI-check as the dependent variable revealed no main effect of condition, $F(1,21) = 1.38$, $p = .25$, $\eta_p^2 = .06$. There was a main effect of time, $F(1,22) = 2.56$, $p = .034$, $\eta_p^2 = .19$, which should be interpreted within the context of a significant interaction between time and

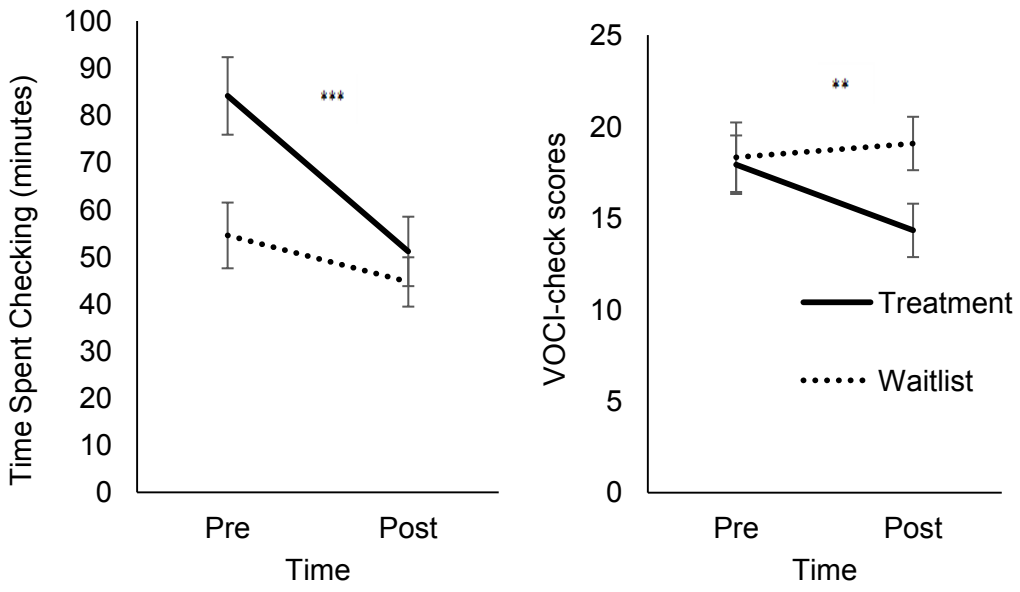

Figure 2. Checking symptom ratings pre- and post- assessment, as measured by average daily time spent checking and VOCI-check (Vancouver Obsessional Compulsive Inventory [Thordarson et al., 2004] checking subscale) scores. Asterisks indicate significant interactions between time and condition: ** $p < .01$, *** $p < .001$.

condition, $F(1,21) = 11.97$, $p = .002$, $\eta_p^2 = .35$. As expected, there were decreases from pre- to post- assessment in symptoms for the treatment but not the waitlist condition (see Figure 2).

Effect of treatment on cognitive performance

A 2 x 2 repeated measures MANOVA was conducted, with condition (treatment vs. waitlist) as the between participants variable, and time (pre- vs. post- assessment), as the within-participants variable. The two dependent variables of interest were CF (memory) and CTMT-1 (processing speed). Results revealed a main effect of time, $F(1,21) = 9.54$, $p = .006$, $\eta_p^2 = .31$. There was no main effect of condition, $F(1,21) = 0.06$, $p = .80$, $\eta_p^2 = .00$.

Follow-up ANOVAs examining each dependent variable separately were conducted. When CF was entered as the dependent variable, there was a main effect of time, $F(1,21) = 14.20$, $p = .001$, $\eta_p^2 = .40$, but not condition, $F(1,21) = 0.06$, $p = .81$, $\eta_p^2 = .00$. These results should be interpreted within the context of a significant interaction between time and condition, $F(1,21) = 5.98$, $p = .02$, $\eta_p^2 = .22$, such that, as expected, memory performance improved in the treatment but not waitlist condition (see Figure 3).

When CTMT-1 was entered as the dependent variable, there were no significant effects (all ps > .12). Thus, as expected, processing speed did not change over time in either condition (see Figure 3).

Predictors of treatment changes

Three hierarchical linear regressions were conducted as a preliminary examination of the hypothesized mechanism of change. We were specifically interested in knowing whether the intervention was effective because of the specific beliefs which it targeted. All participants across both study conditions (treatment and waitlist) were included in each analysis. The relevant pre-assessment scores for each dependent variable of interest were entered in Step 1

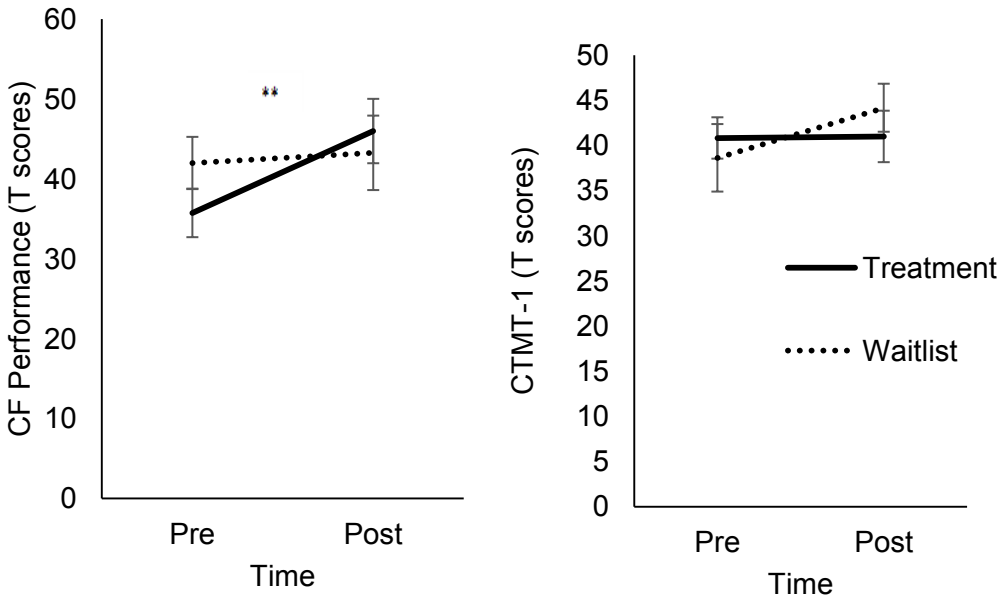

Figure 3. Cognitive performance pre- and post- treatment/waiting, as measured by CF (Complex Figure) and CTMT-1 (Comprehensive Trail Making Test [Reynolds, 2002], Trail 1) T-scores. Asterisk indicates a significant interaction between time and condition: ** $p < .01$.

Table 8.

Summary of Hierarchical Regression using Beliefs about Memory to Predict Post- Assessment Time Spent Checking

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*B*	*B*	*SE B*	*β*
Pre- Time Spent Checking	.56	.09	.79***	.59	.10	.82***	.73	.10	1.02***
Pre- DM-BAM				.10	.15	.12	-.38	.24	-.45
Pre- BAMI				-.18	.18	-.18	-.10	.26	-.10
Post- DM-BAM							.52	.23	.63*
Post-BAMI							.16	.26	.13
R^2		.62			.64			.76	
F for R^2 change		35.44***			0.50			4.51*	

Note. BAMI = Beliefs about Memory Inventory (Alcolado & Radomsky, 2012); DM-BAM = average Daily Monitoring-Beliefs About Memory; * $p < .05$, *** $p < .001$.

of each analysis (see below). Pre- assessment DM-BAM and BAMI scores were entered in Step 2, and post- assessment DM-BAM and BAMI scores were entered in Step 3 of all regressions.

To predict post- assessment time spent checking, pre- assessment time spent checking was entered as the Step 1 predictor. The final model accounted for 76% of the variance and significantly predicted post- assessment time spent checking, $F(5,18) = 11.22$, $p < .001$. Beliefs about memory contributed significant unique variance, although when examining the individual measures, only the contribution of average DM-BAM was a significant predictor of post-assessment time spent checking (see Table 8).

To predict post- assessment checking symptoms, the pre- assessment VOCI-check score was entered in Step 1. The final model accounted for 86% of the variance and significantly predicted post- assessment VOCI-check scores, $F(5,18) = 22.58$, $p < .001$. Beliefs about memory contributed significant unique variance, although the contribution of average DM-BAM to the prediction of post- assessment VOCI-check scores was at trend-level only, and BAMI score was not a significant predictor (see Table 9).

To predict post- assessment memory performance, pre- assessment CF scores was entered in Step 1. The original model accounted for 67% of the variance and significantly predicted post- assessment CF scores, $F(1,21) = 43.24$, $p < .001$. Beliefs about memory did not contribute significant additional variance and neither BAMI nor average DM-BAM scores were significant predictors of post- assessment CF scores (see Table 10). As the small sample size suggests we were underpowered, it is worth noting that the beta weights for the belief about memory variables were in the expected direction.

Discussion

A preliminary pilot investigation of a two session cognitive intervention targeting maladaptive beliefs about memory found it decreased these beliefs, time

Table 9.

Summary of Hierarchical Regression using Beliefs about Memory to Predict Post- Assessment VOCI-Check Scores

	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Pre-VOCI-check	.73	.12	.79***	.80	.10	.86***	.81	.09	.88***
Pre- DM-BAM				.07	.03	.33*	.00	.04	-.00
Pre-BAMI				-.13	.03	-.52**	-.14	.05	-.57*
Post- DM-BAM							.06	.04	.31^{+}
Post-BAMI							.06	.05	.20
R^2		.63			.79			.86	
F for R^2 change		36.95***			8.11**			4.49*	

Note. BAMI = Beliefs about Memory Inventory (Alcolado & Radomsky, 2012); DM-BAM = average Daily Monitoring-Beliefs About Memory; VOCI-check = checking subscale of the Vancouver Obsessional Compulsive Inventory (Thordarson et al., 2004); $^{+}$ $p < .12$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 10.

Summary of Hierarchical Regression using Beliefs about Memory to Predict Post- Assessment CF Scores

Variable	Model 1			Model 2			Model 3		
	B	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Pre-CF	1.12	.17	.82***	1.08	.17	.79***	1.26	.19	.92***
Pre-DM-BAM				-.16	.09	-.29^{++}	-.03	.17	-.05
Pre-BAMI				.17	.10	.25^{+}	.29	.22	.42
Post-DM-BAM							-.12	.14	-.21
Post-BAMI							-.26	.23	-.32
R^2		.67			.73			.77	
F for R^2 change		43.24***			1.99			1.67	

Note. BAMI = Beliefs about Memory Inventory (Alcolado & Radomsky, 2012); DM-BAM = average Daily Monitoring-Beliefs About Memory; CF = Complex Figure; $^{++}$ $p < .08$, $^{+}$ $p < .12$, * $p < .05$, *** $p < .001$.

spent checking and symptoms, and increased memory performance. Further, we found some support for our prediction that the changes in beliefs about memory were responsible for post- assessment checking behaviour and symptoms. These findings, although preliminary, are consistent with theory regarding the relationship between checking and memory beliefs (Rachman, 2002), as well as a host of previous research that has shown memory confidence and checking to be connected (e.g., van den Hout et al., 2003a,b, 2004; Nedeljkovic & Kyrios, 2007). Moreover, they are consistent with experimental studies of the ability of maladaptive beliefs about memory to cause urges to check (Alcolado & Radomsky, 2011; Cuttler et al., 2013), and suggestions that they should be targeted in treatment (e.g., Radomsky et al., 2010; Shafran et al., 2013). The increase in non-verbal recall performance is also consistent with previous suppositions that negative beliefs about one's memory could undermine performance (e.g., Cougle et al., 2007; Radomsky, Rachman, & Hammond, 2001), and that any deficits seen are more likely to be a secondary consequence, rather than causal (Nedeljkovic, 2006; Radomsky & Alcolado, 2010; Radomsky, Dugas, et al., 2014). They also offer a possible explanation for why a recent CBT outcome trial found that individuals with OCD improved their spatial working memory following treatment (Nedeljkovic, Kyrios, Moulding, & Doron, 2011), although their intervention did not specifically target or measure beliefs about memory. The current findings are in contrast to recent experimental studies (in student samples) that did not find increasing memory confidence to decrease checking (Jennings, Nedeljkovic, & Moulding, 2011) or to increase memory performance (FitzGerald, Nedeljkovic, Moulding, & Kyrios, 2011).

In the current study, regression analyses did not show beliefs about memory to predict post- assessment memory performance. This may have been due to low power, caused by our small sample size. Alternatively, perhaps memory performance improvements were due to decreases in anxiety; although if

that were the case, we would have expected to see improvements in processing speed as well, as processing speed and anxiety are related (e.g., Mathews & McLeod, 1985; Egloff & Hoff, 2001). Replication of these findings and further investigations are needed to clarify these issues, and also to more strongly ascertain the reliability of the current results.

This investigation is not without limitations. As this was the first examination of the intervention, a waitlist control was deemed appropriate for this pilot and exploratory investigation. The use of such a control however, makes it difficult to conclusively determine whether any observed changes were due to changes in beliefs about memory, or to nonspecific therapeutic factors; nonetheless all participants, regardless of condition assignment, completed daily self-monitoring, so we can be confident that this was not the source of improvements in the treatment condition (for a review, see Korotitsch & Nelson-Gray, 1999). Further, the small sample size precluded our ability to definitively determine the predictors of changes seen in the current study. There were also measurement limitations in this investigation. In order to precisely capture the construct of maladaptive beliefs about memory, we utilized the BAMI (Alcolado & Radomsky, 2012), a scale that is still in development and which has not yet been validated in a clinical sample. Additionally, our secondary measure of beliefs about memory, taken from the daily monitoring forms, was a 1-item measure.

To our knowledge, this is the first study to develop and test the effects of an intervention specifically focused on beliefs about memory. It was also the first time, to our knowledge, that the effects of treatment on recall performance were examined specifically within compulsive checkers, rather than in a heterogeneous OCD sample, since memory deficits have been theoretically linked particularly to checking and doubt (e.g., Tallis et al., 1997).

These results, if replicable, have several important implications. It appears that targeting beliefs about memory in compulsive checking can be effective at reducing these symptoms, and therefore further replication and investigation into the effectiveness of this intervention are warranted. The current findings also suggest maladaptive beliefs about memory may be an important belief domain in OCD. These results also lend further credence to the view that individuals with OCD do not have inherent memory deficits, but rather that lower scores on tests of memory may result from negative beliefs about memory. Indeed, a recent meta-analysis of the neuropsychological literature on OCD (Abramovitch, Abramowitz & Mittelman, 2013) supported the theory that visual memory impairments are likely accounted for by executive dysfunction (Savage et al., 1999), but more importantly, that none of the dysfunctions seen in any of the cognitive domains appeared to be clinically relevant. Given recent findings on the extreme prevalence of doubting intrusions worldwide (Radomsky et al., 2014), the development of an intervention targeting a maladaptive beliefs about memory, a potential source of doubt, is timely.

Future research should endeavour to determine the value of the current treatment module for treating compulsive checking as integrated within the context of a larger treatment package. Indeed, such a study is currently underway in Montreal. With respect to improving upon the current design, the inclusion of follow-up assessment points and comparison to an active treatment control would allow for stronger conclusions regarding the durability and effectiveness of the intervention. Another important avenue of investigation would be to determine whether this component of treatment is useful for anyone who checks compulsively, or only certain individuals, e.g., those with pre-existing maladaptive beliefs about their memory. More broadly, this intervention has not yet been tested for its utility to decrease other types of obsessive or compulsive symptoms that are repetitive, such as compulsive washing. Finally, it is probable

that changing beliefs about memory could also have important transdiagnostic implications. Reassurance seeking, a common extension of compulsive checking (Rachman, 2002), is also extremely repetitive in nature. Therefore it is possible that individuals who seek reassurance suffer from the same decrements in metamemory as seen in repeated checking. As such, an intervention that builds confidence in knowledge gleaned only once, could also help reduce reassurance seeking in the context of OCD and beyond, such as in social and generalized anxiety disorder (Cougle et al., 2012), and in depression (Joiner & Metalsky, 2001). This intervention shows early promise to enhance effective treatments for compulsive checking and potentially other symptom domains associated with doubt and/or repetition.

CHAPTER 5:
GENERAL DISCUSSION

This program of research was designed to evaluate the role of beliefs about memory in compulsive checking first by developing a tool to measure them, and then by assessing a novel cognitive-behavioural intervention for checking focused on re-evaluating these maladaptive beliefs. I sought to determine the ability of the intervention to reduce checking and increase memory performance in a sample of compulsive checkers. The need for these studies became apparent when the role for beliefs about memory in checking had been elaborated on in theoretical (Rachman, 2002), psychometric (Cuttler, Alcolado, & Taylor, 2013; Nedeljkovic & Kyrios, 2007; Nedeljkovic, Moulding, Kyrios, & Doron, 2009) and experimental (Alcolado & Radomsky, 2011; Cuttler, Sirois-Delisle, Alcolado, Radomsky, & Taylor, 2013) research. Further, it has been suggested that these beliefs may explain (Cougle, Salkovskis, & Wahl, 2007; Radomsky & Alcolado, 2010) the mixed findings in the neuropsychiatric literature on memory performance in OCD (e.g., Muller & Roberts, 2005). Finally, it seemed this was a neglected area in OCD-related cognition as this type of belief was not viewed as central to the disorder, nor was there a tool uniquely designed to capture it (OCCWG, 2005). Thus, Study 1 was a psychometric study that developed and tested the preliminary psychometric properties of the Beliefs About Memory Inventory (BAMI), allowing for assessment of this construct, and Study 2 was a pilot intervention study wherein individuals received 2 sessions of cognitive-behavioural therapy focused on maladaptive beliefs about memory.

Summary of findings

Study 1. In order to develop the BAMI, a large sample of undergraduate participants completed it within a battery of other measures which assessed related constructs. The measure was found to have two factors: beliefs about memory ability and beliefs about the importance of memory. This was in partial

contrast to my hypotheses, as I expected a third factor relating to memory reliability to emerge, but these items were either removed or subsumed into the memory ability category as a result of the factor analytic process. The measure, however, displayed good convergent and divergent validity, as it was more highly and significantly correlated with measures of meta-cognition than other more general mood constructs, including depression and social anxiety. It also exhibited excellent internal consistency and adequate retest reliability over a long period. Finally, and most importantly, the BAMI was able to predict compulsive checking over and above other belief domains known to be relevant to OCD, extending previous work on the role of memory confidence in checking (e.g., Nedeljkovic & Kyrios, 2007). These findings add an entirely new candidate belief domain to those considered central to OCD (OCCWG, 2005), whose specificity to checking has already been demonstrated, unlike the belief domains assessed in the Obsessive Beliefs Questionnaire (OCCWG, 2005; see Tolin, Brady, & Hannon, 2008).

Study 2. Crucially, the results from Study 1 (see Chapter 2) allowed for the measurement of beliefs about memory in the Study 2 (see Chapter 4) preliminary pilot treatment investigation. A sample of individuals with obsessive-compulsive disorder who reported clinically significant checking behaviour were randomly assigned to either a treatment condition where they received two sessions of a novel cognitive intervention regarding beliefs about memory or to a waitlist control condition. Immediate visuospatial recall and processing speed were also measured at pre- and post- assessment visits. Results demonstrated that those individuals in the treatment condition decreased their maladaptive beliefs about memory, as well as their time spent checking and checking symptoms, as compared to individuals in the waitlist condition. Further, immediate visuospatial memory performance improved from pre- to post- assessment in the treatment but not the waitlist condition, while processing speed remained stable throughout in

both conditions. Importantly, beliefs about memory at the post- assessment were predictive of improvements in post- assessment symptoms and time spent checking, although not of memory performance. Thus, this study was the first to demonstrate that beliefs about memory can be challenged in cognitive therapy, and moreover, that doing so can decrease checking symptoms. Of course, as this was a small n study with a waitlist design, replication is needed to determine the reliability of the results.

Limitations and strengths

The implications of these findings, should, of course be tempered by the acknowledgement that this body of research was not without its limitations. Firstly, the BAMI is a measure that is still under development, and as such, the finding from Study 1 that it was able to predict checking may be premature until its properties and its power to predict checking have been replicated. (In fact, further changes have been made to the measure and evaluation of a newer version of the BAMI is now underway.) Further to this point, its use in Study 2 as the main measure of this construct also limits the implications of the successful results of the novel cognitive intervention.

Another important limitation of this work relates to the clinical sample. First of all, the number of participants in both studies was quite small, due in part to recruitment difficulties, but also because of the design of the treatment study. The intervention was purposely tested in a pilot fashion due to its novel nature. Secondly, both studies lacked clinical control groups. The inclusion of an anxious control, depressive control and/or a non-checking OCD control group(s) would have allowed me to not only determine the relationship of beliefs about memory to compulsive checking, but also to elucidate its specificity/generalizability to/beyond this symptom type.

A final design limitation with respect to the treatment study was the use of a waitlist control condition, which, although appropriate for this preliminary and

exploratory investigation of a novel intervention, limits the interpretability of the results. As such, I was not able to control for non-specific therapeutic factors (e.g., warmth of therapist, regular meetings) or improvements due to the passage of time. This limited the extent to which I could be confident in the effectiveness of this novel intervention. Future studies should include a randomized controlled trial (RCT) or another study design which incorporates an active control treatment condition (see below).

There are also several strengths of this program of research that allowed me to cautiously draw some conclusions and implications (see below). Firstly, the use of a specific sample of individuals with OCD who exhibit clinical levels of checking behaviour (rather than allowing a more a heterogeneous symptom presentation) aids in determining the extent to which beliefs about memory are associated specifically with checking, rather than with OCD in general. Regarding Study 1, the main strength in the design was the use of a very large sample, making the study well-powered for conducting the exploratory factor analysis. With respect to Study 2, the decision to evaluate a specific component of treatment (and drawing from cognitive-behavioural theory to develop it), rather than evaluating a treatment package, which may have effective and non-effective elements, was a unique decision. This provides the advantage to any clinician wishing to use this intervention that the specific techniques developed herein are to some extent, evidence-based, and therefore would probably be useful in symptom reduction, bearing in mind the limitations noted above.

Theoretical implications

Broadly, the main theoretical implication of this body of work is the relevance of maladaptive beliefs about memory to checking and doubting phenomenology (e.g., OCCWG, 1997). We can now measure this construct reliably, allowing increased theoretical understanding of the mechanisms of compulsive checking, and alter it in treatment, fostering the amelioration of

symptoms. These findings are consistent with the cognitive theory of compulsive checking (Rachman, 2002), which implies that negative beliefs about memory may propel one to check. The findings replicate and extend previous research demonstrating that these beliefs do seem to have the power to contribute to checking. The link between checking and beliefs about memory has been found psychometrically, where a related but distinct construct, memory confidence, predicted checking symptoms more strongly than other constructs (e.g., Nedeljkovic & Kyrios, 2007). This link has also been demonstrated experimentally, as participants led to believe they had poor memory had stronger urges to check than those who were told they had good memory (e.g., Alcolado & Radomsky, 2011). There also exists a hypothesis regarding low confidence in more general convictions, not just memory, that may exist in OCD, and checking specifically (Dar, 2003). This proposition has now been supported by research in non-clinical and clinical samples demonstrating decreased confidence on general knowledge tasks and increased vulnerability to false biofeedback (see Dar, 2004; Lazarov, Dar, Oded, & Liberman, 2010; Lazarov, Liberman, Hermesh, & Dar, 2014). The current results are certainly consistent with these findings. How much overlap there is between general distrust of one's general convictions and distrust of memory, and which may be more central to the development of checking, are theoretical and empirical questions that remain to be resolved moving forward. Nevertheless, future efforts to refine our understanding of the nature of compulsive checking should naturally include the consideration/incorporation of maladaptive beliefs about memory, by assessing their contribution to predicting symptoms and outcome in research and treatment investigations (see below for more detailed suggestions).

More specifically, the results of Study 1 extend previous psychometric findings demonstrating that low meta-memory can predict checking (Nedeljkovic & Kyrios, 2007), by showing that maladaptive *beliefs* about memory (ability *and*

importance) can predict checking, over and above known-relevant belief domains in OCD. Thus, rather than targeting meta-cognition, a broad construct, a more clinically germane and specific target would be beliefs about memory, which, for example, could be focused on through cognitive-behavioural investigations of and interventions for compulsive checking. As such, beliefs about memory are a novel belief domain that should be considered when conducting assessments for compulsive checking, whether it be within the context of more fully understanding the variables to be studied or when conceptualizing a given client's case for the purposes of planning treatment.

The results of Study 2, although preliminary, have important implications for current psychological treatments for compulsive checking. As suggested in a recent theoretical article (Radomsky et al., 2010), an intervention focused on beliefs about memory can indeed prove to be effective at decreasing checking symptoms. Indeed, this is not surprising given that there are other treatments for OCD targeting doubt more broadly which have had good success (O'Connor et al., 2005). Therefore a module focusing on psychoeducation and changing maladaptive beliefs about memory may be a fruitful component to incorporate in future treatment packages for those who suffer from compulsive checking, particularly those who express pre-existing beliefs that they have poor memory abilities and/or that an optimally functioning memory is personally significant and important. The intervention need not be limited to individuals with these beliefs, however, and may have clinical utility beyond symptoms of checking. These are empirical questions which need to be addressed in future research (see below).

There are also several implications regarding the neuropsychological findings reported in Study 2. Firstly, with respect to the aetiological relevance of memory deficits in OCD (e.g., Tallis, 1997), the current findings do not support this premise, as the intervention altered (i.e., improved) memory performance. If a memory deficit were a precursor or risk factor to developing OCD, one would

not expect poor memory accuracy in a clinical sample to be malleable (particularly as the intervention did not provide any type of memory training). Indeed, it should not be surprising that memory performance is malleable. These findings mirror results from other areas of psychological investigations of memory, as memory performance has been shown to be impacted by activating stereotypes and by offering monetary rewards (Levy & Leiftheit-Limson, 2009; Murayama & Kuhbandner, 2011). Moreover, beliefs about memory are already considered an important factor in neuropsychological testing in older adults where such negative beliefs have been found to influence memory performance (see Beaudoin & Desrichard, 2011, for a review).

Secondly, these results shed some light on previous mixed findings in the literature (see Muller & Roberts, 2005, for a review). Perhaps as previously suggested (e.g., Radomsky & Alcolado, 2010), doubt can negatively influence performance. This may be why some studies of repeated checking have found small but significant decrements in memory performance (e.g., Ashbaugh & Radomsky, 2007; Coles et al., 2006; Radomsky & Alcolado, 2010), and why some neuropsychological studies have found memory deficits in OCD (e.g., Sher, Man & Frost, 1984). Clearly, however, this effect is not uniform or consistent, as other repeated checking studies have failed to find such problems in memory performance (e.g., van den Hout & Kindt, 2003a,b; 2004), and other studies of memory in OCD have failed to find neuropsychological deficits (e.g., Radomsky & Rachman, 1999). The current body of research may clarify why these findings have been inconsistent, by illuminating that perhaps doubt is only able to affect memory performance in those who have or acquire maladaptive beliefs about their memory ability (although this supposition has not yet been tested). These findings are also consistent with a recent meta-analytic review demonstrating that memory deficits are probably non-existent in OCD and definitely not of clinical relevance (Abramovitch, Abramowitz, & Mittelman, 2013).

Finally, these results may help explain the mechanism by which previous treatment studies have found memory improvements following CBT for OCD (e.g., Nedeljkovic, Kyrios, Moulding, & Doron, 2011), i.e., perhaps beliefs about memory may shift during the learning that takes place over the course of therapy.

Clinical implications

This research has several important clinical implications. Generally speaking, there is a growing body of evidence that demonstrates the importance of interpretations of and beliefs about memory to understanding the nature of compulsive checking. Thus, this construct warrants clinical attention during assessment and treatment of checking-related symptomatology.

Study 1's clinical relevance pertains to the BAMI, as this questionnaire will allow these beliefs to be measured in clinical treatment studies and may help elucidate potential mechanisms of change. Further, for the clinician, the BAMI can be used for screening purposes in potential patients and clients who present with OCD and/or compulsive checking symptoms in order to determine whether targeting maladaptive beliefs about memory should be included in the intervention plan.

Study 2`s preliminary results could have the clearest implications for treatment as the results demonstrated that intervening with respect to beliefs bout memory has great potential to be effective for those who check excessively. Further study of this treatment module (see below) may lead to improvements in cognitive interventions for OCD, which until now have not shown to improve upon existing behavioural interventions, as was hoped (see Clark, 2005, for a review). Further study may also, and more importantly perhaps, improve upon the previously studied belief domains (OCCWG, 2005) targeted in cognitive therapy (Clark, 2003). These domains have recently been shown not to be as specific to OCD as was theorized (Tolin, Worhunsky, & Maltby, 2006), and furthermore not to consistently predict checking/doubting symptoms (Tolin, et. al,

2008). This may help explain why targeting them in therapy has not improved upon previous behavioural interventions (see Rosa-Alcásar et al., 2008, for a review). Moreover, the specific cognitive interventions related to beliefs about memory may likely be more helpful than previous intervention techniques suggested to aid meta-memory in compulsive checkers. For example, it was previously suggested the best way to compensate for decreased meta-memory would be to check more carefully to create distinctive memories (Tallis, 1997). This effect has been demonstrated, as changing visual cues during checks does attenuates decreased memory confidence (Boschen, Wilson, & Farrell, 2011); however, any benefit of such an approach would likely be transient, as eventually this new type of memory would lose its distinctiveness. Further, this technique would be directly counter-therapeutic to behavioural intervention strategies, wherein one is trying to reduce, rather than increase, ritualistic behaviour (such as constantly changing the environment to help encode the memory of the check; see Kozak & Coles, 2005, for a review). Another recommendation related to the decreased meta-memory literature has been to help individuals who compulsively check to accept that their meta-memory is not good (van den Hout & Kindt, 2003b). The current intervention goes beyond that to building beliefs in a strong memory *despite* the decreased meta-memorial phenomenon. Therefore, the current research suggests a much more clinically appropriate and useful intervention than those previously suggested in this area.

Implications for other psychopathologies

The current body of work also has potential implications outside of compulsive checking, and indeed beyond OCD. One can imagine that if the belief that one has a poor memory can increase repetitive checking, perhaps such beliefs may induce other repetitive behaviours. For example, reassurance seeking is a construct understood to exist transdiagnostically, although differing in content among different disorders (e.g., Parrish & Radomsky, 2010). Therefore it is

possible that those with depression, social anxiety, and/or generalized anxiety, may repeatedly seek reassurance repeatedly in part because they do not trust themselves to remember exactly the content of the previously received reassurance, or perhaps whether they actually *really* asked for it. If so, this intervention may have relevance to these problems, and the BAMI may be of use in studying the phenomenon. Although these are yet untested questions, empirical studies could be designed to address them (see below).

Implications for non-psychopathological behaviour

These results could have implications outside the realm of psychopathology as well. Firstly with respect to individuals who occasionally check in a subclinical manner, this kind of intervention/psychoeducation may be helpful in reducing or eliminating the occurrence of the occasional bout of checking. Given that doubt is so ubiquitous in the population (Radomsky et al., 2014), widespread psychoeducation could perhaps even prevent the development of pathological checking behaviour.

Moving away from checking specifically and focusing on the repetitive aspect of such behaviour, there is also the possibility that individuals who do repetitive tasks in the course of their daily lives or work (e.g., assembly line workers, line cooks) may be susceptible to developing poor memory beliefs. It would be interesting to test the applicability of the checking model, and indeed the impact of pre-existing or newly developed maladaptive beliefs about memory in these types of populations. Might such individuals (over time) come to believe they cannot remember their tasks, and then perhaps over-perform, by repeatedly but unnecessarily checking their work? Moreover, could such a phenomenon lead to mistakes at work (perhaps through checking one aspect of a task to the detriment of another aspect), and/or interfere with efficiency and productivity?

Perhaps most directly relevant are the implications for research in processes associated with learning and memory. We know already that memory

performance can be altered by activating cognitive biases or introducing a reward (e.g., Levy & Leiftheit-Limson, 2009; Murayama & Kuhbandner, 2011). It is possible that individuals who believe themselves to have 'bad memories' are over-performing on memory tasks, i.e., checking their work, or repeating themselves, which may lead to un-optimal task performance (e.g., changing a correct selection in favour of an incorrect one) and therefore incorrect assessment of their abilities. This could affect scores on several different types of memory tests. For example, in a test of recognition memory, where one typically has to choose between a yes/no response, and does not trust one's memory, second-guessing might reduce one's performance. Similarly, during tests of recall memory, poor memory beliefs could interfere with retrieval by reducing the confidence that one has in the memory that was retrieved. As such, individuals with such beliefs might start to question the information they have recalled, perhaps even before they communicate a response. They may speculate, erroneously, that they are recalling information from an unrelated occasion, or question whether they recalled an altered or incomplete version of the information, which could result in non-use of the correctly retrieved response. I can also envision that these beliefs could interfere at the encoding stage of memory. If one has low confidence in one's memory, one might perseverate on early items or aspects to recall in an unnecessary act of compensation for perceived poor ability, and therefore fail to encode the pertinent details. If this is occurring, there are implications for the daily lives of such individuals, as well as for research which seeks to study so-called 'normal' memory processes. Furthermore, this may have implications for those studying the difference between normal memory and abnormal memory, such as in aging research, where it is already known that poor memory confidence interferes with performance (Beaudoin & Desrichard, 2011, for a review). An intervention such as the one presented in Study 2 may be very helpful for both researchers interested in

studying aging and memory and individuals who suffer from age-related memory decline/neuropsychological memory deficits.

Future directions

There are a number of questions that emerge from the results of this body of work. First of all, with respect to the measurement of beliefs about memory, the current questionnaire could be refined to better capture its second factor, beliefs about the importance of memory, which is currently under-represented in the BAMI. This could be accomplished through the development of more items that assess beliefs about the importance of memory, and conducting subsequent exploratory and confirmatory factor analyses to create a more succinct, balanced measure with strong psychometric properties. In fact, this process is already under way, as data is currently being collected on a newer version of the BAMI which contains more items potentially related to beliefs about the importance of memory. Once this is completed, future investigations could better determine whether both beliefs about memory ability and beliefs about memory importance are central to checking, or whether one belief type can better predict checking, and moreover, which belief type is best targeted in treatment. Based on the current results where the overall scale but not the individual subscales best predicted checking, I would hypothesize that both beliefs about memory ability and beliefs about the importance of memory are necessary but not sufficient to predict checking behaviour, i.e., that individuals who have both types of distorted beliefs are those who check compulsively.

A longitudinal investigation wherein both the BAMI and measures of checking symptoms are administered could help determine the aetiological nature of these maladaptive beliefs. That is, whether individuals begin checking compulsively due to pre-existing beliefs they have a bad memory, or whether these beliefs solely develop as a result of the detrimental effects of repeated checking (see van den Hout & Kindt, 2003a). In the current theory (Rachman,

2002), both possibilities are left open. More long-term projects could include testing the relevancy of the measure and its constructs to other obsessive-compulsive symptom domains, such as whether such beliefs predict onset, maintenance, or severity of washing, ordering, etc.

The next logical step with respect to the intervention would be to compare its effectiveness to that of an active control condition, rather than to a waitlist, using a small RCT design. It would also be useful to know whether this intervention is fruitful only for those who come in with these pre-existing maladaptive beliefs about their memory in order to best target therapy for a given individual. Although the current study was not powered to examine this, I would propose that the intervention would be most (but not exclusively) helpful to those who have pre-existing maladaptive beliefs about memory Further to this point, Study 2's treatment module contained two distinct sessions, one focused on memory for checking, and the other focused more on memory in general. I would hypothesize that for those who come in with existing beliefs that they have a bad memory, the second session would be most helpful as it focuses on *general* memory abilities. Those who do not have such beliefs, however, may still benefit particularly from session one to boost their *trust* in their memory for previously completed checks. This would merely be a new useful way of responding to the doubting thoughts that they may not have previously considered. This could be easily tested within a larger sample wherein the BAMI beliefs could be measured prior to treatment to determine whether ratings on the scale differentially impacted treatment outcome.

In the longer-term, I would want to determine the utility of the current intervention within the context of a full CBT treatment package as it was never meant as a standalone treatment, but instead, as a useful component to be added to existing effective therapies. Specifically, I would want to discover whether the module adds anything to our current treatments? Further, might it be useful at

eliminating other types of symptoms? Does it matter at which point in the intervention the module is delivered?

Study 2 (Chapter 4) focused primarily on delivering an intervention based on maladaptive beliefs about memory ability. Another future direction would be to develop an intervention module that focuses more directly on examining and intervening with respect to the importance of memory. To what extent such a module would ameliorate the suffering of obsessive-compulsive checkers and others (see below) is unknown in the current study. As both constructs predicted checking (see Study 1, Chapter 2), a treatment that includes challenging both types of beliefs would likely be superior to one which targets either alone.

More broadly, while the role for beliefs about memory has been demonstrated in the context of compulsive checking, what remains to be seen is whether there is any role for beliefs about memory in other compulsions. For example, as mentioned above, perhaps beliefs about memory may have some impact on other repetitive symptoms of OCD, such as washing, ordering or arranging. Even if this new belief domain proves to be predictive of these symptoms, it is plausible that other beliefs more closely tied to the behaviours may better explain these symptoms than maladaptive beliefs about memory. Despite this, it would be worth investigating whether the intervention could be helpful for those struggling with these other symptoms of OCD. It is possible that it would aid those individuals who engage in repetitive rituals and who *also* have poor beliefs about their memory. For others, they may remember having arranged the objects on a shelf, for example, but other types of beliefs may propel them to repeatedly re-order it. In this type of case an intervention focused on memory might not be directly relevant to the problem, however, perhaps the knowledge that repeated actions become less clear could still be helpful in reducing repeated engagement with the compulsion. A future treatment study wherein the intervention is modified and implemented for a heterogeneous group of

individuals with OCD (who do not compulsively check) would clarify these questions.

Finally, maladaptive beliefs about memory may have broader transdiagnostic implications, which could be the subject of future theoretical and treatment investigations. There are many disorders, including OCD, in which reassurance seeking, called checking "by proxy" (Parrish & Radomsky, 2006, 2011; Rachman, 2002) is common, such as in depression (Joiner & Metalsky, 2001) and other anxiety disorders (Cougle et al., 2012). It would be interesting and potentially quite useful to assess and determine if this intervention could be implemented to reduce reassurance seeking.

In summary, the emergence of beliefs about memory ability/importance, and their link to compulsive checking promise to enrich our understanding, assessment, and treatment of OCD. Future investigations of this construct would clarify whether maladaptive beliefs about memory contribute to processes underlying other obsessive-compulsive symptoms, as well as beyond to symptoms of other psychopathologies and indeed normal behaviour and memory. In the interim, the BAMI and related intervention techniques could aid in answering these questions and potentially contribute towards improving evidence-based psychotherapies for compulsive checking.

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Appendix A

Beliefs About Memory Inventory (Potential Items)

BAMI

This inventory lists different attitudes or beliefs that people sometimes hold. Read each statement carefully and decide how much you agree or disagree with it.

For each of the statements, choose the number matching the answer that *best describes how you think.* Because people are different, there are no right or wrong answers.

To decide whether a given statement is typical of your way of looking at things, simply keep in mind what you are like *most of the time.*

Use the following scale:

1	2	3	4	5	6
disagree very much	disagree moderately	disagree a little	agree a little	agree moderately	agree very much

In making your ratings, try to avoid using the middle point of the scale (4), but rather indicate whether you usually disagree or agree with the statements about your own beliefs and attitudes.

1. A poor memory means I'm dangerous	1 2 3 4 5 6
2. Memory plays the most important role in my life	1 2 3 4 5 6
3. When I can't remember something it bothers me a lot	1 2 3 4 5 6
4. A weak memory can interfere with your life	1 2 3 4 5 6
5. Without a good memory, you don't make much progress in life	1 2 3 4 5 6
6. I am good at remembering important events	1 2 3 4 5 6
7. A good memory is a sign of intelligence	1 2 3 4 5 6
8. Often my memory turns out to have been incorrect	1 2 3 4 5 6
9. When I try I can remember exactly what I've seen	1 2 3 4 5 6

10. I have a good memory	1 2 3 4 5 6
11. Memories are facts that don't change over time	1 2 3 4 5 6
12. It is important that I am able to clearly remember how to do things	1 2 3 4 5 6
13. My memory is like a website, the content is always changing between accesses	1 2 3 4 5 6
14. My memory always plays tricks on me	1 2 3 4 5 6
15. When I can't remember something, it means I'm a bad person	1 2 3 4 5 6
16. Memories are never false	1 2 3 4 5 6
17. My memory can be trusted most of the time	1 2 3 4 5 6
18. When I'm tired I should <u>never</u> rely on my memory	1 2 3 4 5 6
19. Memory cannot be trusted to be accurate and true	1 2 3 4 5 6
20. Memories are always true	1 2 3 4 5 6
21. A poor memory means I am at risk of becoming an irresponsible person	1 2 3 4 5 6
22. When I try to remember something I have seen I always remember it well	1 2 3 4 5 6
23. My memories don't change over time	1 2 3 4 5 6
24. I find that I usually can't remember what I've just done, even when it's really important	1 2 3 4 5 6
25. My memory is like a library full of books, I can always access the same non-changing information	1 2 3 4 5 6
26. My memory is not an accurate representation of my true experiences	1 2 3 4 5 6
27. When I'm stressed I should <u>never</u> rely on my memory to be consistent	1 2 3 4 5 6
28. I have trouble remembering important actions	1 2 3 4 5 6

29. No matter how much I try I always seem to forget what I've done	1 2 3 4 5 6
30. Being able to clearly remember past events is important	1 2 3 4 5 6
31. Having a good memory is the key to success	1 2 3 4 5 6
32. When I try to remember what I have done I find I have forgotten it/been incorrect	1 2 3 4 5 6
33. When I can't remember something, it means I am stupid	1 2 3 4 5 6
34. My memory captures everything that happens to me in perfect detail	1 2 3 4 5 6
35. Memory can save lives	1 2 3 4 5 6
36. A poor memory means I am a bad person	1 2 3 4 5 6
37. I have a poor memory	1 2 3 4 5 6
38. Even when I try to remember something I have seen I find I can't remember it well	1 2 3 4 5 6
39. I can't rely on my memory	1 2 3 4 5 6
40. No matter how much I try I can't remember to do things that I need to do	1 2 3 4 5 6

Appendix B

Beliefs About Memory Treatment Protocol

Preamble Guidelines for Treatment Manual:

- Exact wording/content need not be standardized. Each treatment component/principle should be covered with all participants, but examples can be idiosyncratic and the Socratic questions/guided discovery will depend on the participant's responses.
- Although portions of the script below are written as if the participant were mute, this is for example purposes to show the content that must be instructed. It is important to introduce each principle using Socratic questioning/guided discovery so that the participant can be an active one and so that the treatment will be collaborative (see General Therapist Characteristics below). For example, rather than stating that checking is universal, ask the participant what they know about checking, how common do they think it is, etc., and then provide the information. Another example is when explaining the research, rather than stating the results right away, ask them what they think would happen.

General Therapist Characteristics to keep in mind (from CTS):

1. Set the Agenda (Yes – Set at the beginning of each session)
2. Elicit Feedback (Yes – check at each section ending, ask patient to summarize session and report which part was most important to verify what they understood)
3. Understanding the Patient (Not explicitly, but implied)
4. Interpersonal Effectiveness (Not explicitly, but implied)
5. Collaboration (In the agenda, ask if those topics are okay)
6. Pacing and efficient use of time (Yes – structure and pacing will be standardized)
7. Guided discovery (Yes – the discussion sections, homework assignments, and homework reviews are set up in this manner)

8. Focus on key cognitions or behaviours (Yes - The therapy is based on a single belief)
9. Strategy for change (Yes it's appropriate – psychoeducation & behavioural experiments)
10. Application of CB techniques (Not explicitly, but implied)
11. Homework (Yes – after each session)

Treatment Session 1:

The purpose of this visit is to collect the daily monitoring forms that the participant has brought in, to have them complete the questionnaires, and to have the first treatment session. During the visit they will:

1) Hand in their daily monitoring form
2) Complete the VOCIcheck and the BAMI; Medication and suicidality check-in
3) Undergo Treatment Session 1(audio record with two devices)

1) "Do you have your checking monitoring form? Thank you very much for completing this. As you know this is a vital part of our study and we appreciate your cooperation, as we could not continue without this part. Did you have any difficulties with it this week, or any questions about how to complete it?"
2) "Please complete these two questionnaires and then we will get started. There are no right or wrong answers to any of these questions. Please do not spend too much time on any one question; usually your first instinct is the best answer. Do you have any questions?" *(Complete VOCIcheck & BAMI)* "I just have a couple of more questions before we get started. *(If on medication at intake)* Have you changed your medication or dose since our last appointment?" *(If suicidality was identified at intake)* "Have you been having any suicidal thoughts this week? More than usual? Do you have a plan?"
3) Treatment Session 1 components: (Start audio recorders)

A) Introduction

a. Bridge: Thank you for completing the questionnaires. We are now ready to start our treatment sessions.
b. Overview: These two treatment sessions will involve some education about checking and memory, and some discussions about your checking and memory. This therapy uses a cognitive-behavioural approach, which means we are interested in the link between your thoughts (or cognitions), behaviours, and emotions, and the effect they all have on each other. Our behaviour is influenced by our thoughts and emotions, and in turn our behaviour affects our subsequent thoughts and emotions. So if we can examine and adjust some current ways of thinking this should change your emotions and behaviour. Similarly if we examine and modify some current behaviour, this should also change your thoughts and emotions. Are you aware of the difference between a thought and an emotion? Sometimes they come really fast together and it can be hard to tease them apart. Let's do an example now together to see if that makes sense. (Draw triangle). Can you remember a recent time that you checked? What thoughts where you having? What emotions? What did you end up doing? That means I will be asking you about the thoughts, feelings and emotions that you experience around your checking behaviour. I will be asking you about your experiences and impressions because the cognitive-behavioural approach is a collaborative one where we will discuss your issues together and come to a consensus about them. Finally, we will attempt to be scientists, and create hypotheses about at least one of the reasons why you might check, and conduct experiments to gather evidence that will

either support or disconfirm our hypotheses/predictions. Do you have any questions?

B) Agenda: We are now ready to start today's treatment session. Today we are going to cover three topics. We will start with a psychoeducation (1) component where I will give you some information about what we know and understand from research about the relationship between checking and memory. Then we'll have a discussion (2) to try to reach an understanding together about your beliefs about your memory ability, and about how those beliefs might relate to your checking behaviour. We'll finish by discussing and practicing a between-session exercise (3) that I will ask you to complete before our next session (this is important, because it will help you make the most of our in-session conversation). Does that sound alright? Do you have any questions? Is there anything I've said with which you disagree?

C) Psychoeducation:

   a. Universality of checking: Checking behaviour is extremely common, if not universal. Like many symptoms of anxiety disorders, it exists on a continuum whereby most people check at some point in their lives over certain things, but it only becomes a problem if the time spent checking begins to interfere with your daily life and causes distress. Do you have any questions about that? Does it make sense to you? Can you think of one or two things that nearly everybody checks?

   b. Cognitive theory of checking: I'd like to share the theory now. It's important to go through our understanding of how checking works because the first step to change is understanding where it comes from so we know what needs to

be changed. A cognitive theory (meaning about the mind, rather than a biological theory meaning about hormones and chemicals and genes) has been developed to explain excessive checking behaviour, and part of that theory includes something called the self-perpetuating cycle of checking. We can imagine that individuals who check must be doing so for a reason. Do you have any idea what some of the reasons could be for your checking? For some people, the theory suggests that their checking may be in part because they have a doubt, have low confidence in their memory, or a belief that their memory is poor or flawed in some way. (That fits with our earlier discussion about the link between thoughts and behaviours – the doubting thought is one that can cause checking behaviour.) The theory also suggests however, that the act of checking itself is actually quite paradoxical, because even though individuals may be checking to become more certain, the act of checking actually might *reduce* certainty so that the more you check the *less* certain you become. (Draw the cycle) Now if you're feeling more uncertain, what are you going to do? You may guess that this continued feeling of uncertainty leads to continued checking. That is what the theory suggests. As you can see, it is very easy therefore to get caught in a vicious cycle of checking. Do you have any questions about that? Does it make sense to you?

c. Research support: This theory has been supported. It's important to scientifically test theory so we can know whether our hunches are true or not, so that we can be more confident that what we're targeting in treatment will work. A number of

different research studies have now shown that it is true that the more an individual checks, the less certain they become. This work has been conducted many times in laboratories across the world (including some here at Concordia), with people who have OCD and those that don't, and using real checking tasks, imagined checking tasks and virtual checking tasks, and they have all found the same thing. Basically participants were taught to check a stove once. They were then asked to indicate which knobs they checked, and also how certain they were about their answers. All participants were highly accurate and very confident in their responses. Then, half the participants were told to continue checking the stove many more times, and the other half instead checked a sink or a light. Then they all checked the stove once more, and were asked to indicate which knobs they checked most recently. They found that although everyone was still highly accurate, those who had kept checking the stove were no longer confident, while those who had checked the sink or light still reported high levels of confidence in their memories for what they had most recently checked. (Draw this out) So you see, repeated checking decreases confidence, but not accuracy. So even though the participants who had checked no longer *felt* certain, they were actually still correct! Interestingly studies have suggested that as few as 2 checks are necessary to start to feel uncertain. So what does that suggest about repeated checking and the way to feel certain? You might be thinking that if you could, it would be really better to not check at all.

Research has supported the other part of the cycle as well. In that study (conducted here at Concordia), participants completed a memory test and were either told that they did very well or very poorly. Subsequently they completed some tasks and were asked about their urges to check. We found that participants who now believed they had a bad memory had greater urges to check than those who now believed that they had a good memory, even though the groups did not differ at all on actual memory ability. (Draw this out) So you can see that both parts of the paradoxical cycle of repeated checking are heavily supported by evidence from research. (Draw check marks on the cycle) From that we can also draw the conclusion that what you think about your memory is probably very important in checking behaviour, because if you're uncertain all the time, it's possible that you don't think you have a very good memory – at least for actions you have completed and/or for the final resting state of things you have checked. We know that beliefs play a role in many different adaptive behaviours, as well as behaviours associated with OCD and other problems. Here it seems that beliefs about memory are one important type of belief related to checking. Do you have any questions so far? Does that make sense to you?

d. Contributing factors to negative beliefs about your memory: So how is it that checking makes you start to feel like you have a bad memory? Research has now shown that the act of checking seems to reduce certainty because when someone engages in a repetitive action such as continually checking, it actually changes the type of memory that is being encoded from a

distinct event (which is stored in your mind like an autobiographical memory, such as the memory of your 10th birthday) to a more habitual event (which is stored in your memory like other procedural memory, such as how to ride a bike or tie a shoe). Once the memory is more procedural in nature, it becomes more difficult to retrieve (for example, have you ever been driving a familiar route and not remembered how you arrived at your destination?). So this is one way that explains why repeated checking makes you feel like your memory is getting worse, because the type of memory that you have is changing. This doesn't mean that your memory is bad, in fact, as we saw above, those individuals still had good memories, it just led them to *think* and feel like their memories were bad.

Another linked explanation is that we find that the amount vividness and detail of the memory that gets stored memory decreases the more habitual it becomes, you're no longer going to be aware of everything that's going on in your environment as you conduct the check and store that in your memory. Unlike the first time when you might notice the smell in the room, the light quality, how the object you are checking feels, and the sound it makes, the more habitual the action, the less of this gets encoded. This also makes that memory more difficult to retrieve because there is less information associated with it, and when you do retrieve it, it seems less real. Again, it's not that the actual memory is bad or incorrect, it's just its difference in type from other memories you might have makes you feel like you can't remember or that you have a bad

memory. Do you have any questions about that part? Does it make sense?

D) Discussion of the client's beliefs about their memory: So what has stuck with you so far? Do you think you could give me the take-home message/newspaper headline? That's right so we know that checking is a self-perpetuating cycle whereby people check because they are uncertain, but the more they check the less certain they become. Factors that contribute to people feeling uncertain and like they have a bad memory are the fact that the memory changes from an episodic to procedural memory, and because the memory has less vividness and detail associated with it.

So now that you've learned about the role that beliefs about memory play in checking behaviour, what do you think about how that might apply to you? Do you ever check because you are uncertain? What do you think about your memory abilities? Do you think you have a bad memory? Are parts of your memory better than others? Which ones? Is that part of why you check sometimes? What do you think about gathering some evidence about the true state of your memory ability? Is your memory actually good or bad? How would you know if you needed to check? What do you think of your memory while you are actually checking? Would you be willing to find out now? What do you predict that we will uncover? What would it mean to you if we discover that your memory was not actually that bad, but that the problem was only that your confidence in memory was too low? What would that mean for whether or not you would need to check? What would it mean to you if we discover the alternative? What would that discovery mean about whether or not you needed to check? What would that change for you? If discovering that you didn't need to check would make you check less as you have just stated, does it seem like this might be an important and relevant thing to find out?

And if you discovered that you did have a bad memory that would also be important, because it would show that the checking is probably useful and necessary for you to do. Do you think the outcome of this exercise will impact your checking behaviour?

E) Assignment and practice of the between-session exercise: Today's between session exercise will be to get some information about our hypothesis that you may in fact have an excellent memory, even though you may (sometimes) feel like you do not. This kind of information could impact your checking behaviour because it will tell us whether or not it's actually necessary. We will gather evidence during four checks this week to see whether the item in question was actually as it was supposed to be or not. This is different from looking at past experiences of having left something unlocked, on or otherwise unsafe because we're planning something specific to try over the coming days, just as a scientist might do. We will record it using this recording sheet. Then we will have some experimental evidence about how good or bad your memory is. Does that make sense to you? Does it seem like an important thing to check out? What are your predictions?

Let's practice doing this together now and recording the items to make sure that you understand how to do it. Can you think of some task you could complete and check here in session that might cause you some anxiety and desire to re-check? What do you predict the outcome will be? *(Practice checking to see that the door is locked and recording the information in the form –* ***stand near the door to make sure the participant doesn't check before they have been asked)*** Example: Let's go lock this door. Now we'll come back and write down the date and the object we used. Now ask yourself if the door is locked and record your prediction. Now check the door. Record whether or not your answer to the

previous question was supported. Now write any thoughts and emotions you were having just before you checked. Now rate your anxiety just as you have been doing during your regular checking monitoring.

Alright so that's the exercise. Do you have any questions about it? Are you willing to do it? Do you think it will provide us with important information?

I would like you to practice on four separate occasions before our next session. Is that feasible? Will you have enough checking instances to do so? Will you have the opportunity to write about them? Do you see any obstacles to completing this exercise? How can we work around those obstacles?

In addition to this I'd like to give you this handout that we worked on together to take home, along with the things we wrote out today. I think it's important that you have a way to review what we discussed. I know it was a lot and although it makes sense now, these things can fade over time. Will you make time to read this over this week? Great! I'd also like you to make time to listen to our session once this week. You can see in your handout out there is a place to record when you've done this, so you can be reminded to do it. Would you like to set a time now together? It is extremely important that remember to bring the audio-recorder back as you will need it again next week. Thank you.

Also please continue to monitor your checking and beliefs about memory as usual, using the form provided in your booklet.

F) Wrap up:

a. Summarize: Could you summarize today's session for me?

b. Most important: What was the one thing you remember best, that was either most interesting to hear, or that you'll take away

with you? (ask them to write it down on the bottom of the page you've been writing on)

Sample form for between-session exercise:

Date	Item to Check	Prediction (just before you check) about the status of object (e.g., Locked/Unlocked)	Emotions	Thoughts	Max Anxiety (0-100)	Was your prediction correct?

Treatment Session 2:

The purpose of this visit is to collect the between-session exercise and daily monitoring form, to assess how successful the homework assignment was and complete the usual questionnaires, to complete the second treatment session.

1) Hand in their daily monitoring form and between-session exercise

2) Complete the VOCIcheck and the BAMI; Medication and suicidality check-in

3) Undergo Treatment Session 2 (audio record with two devices)

1) "Do you have your daily monitoring form? Thank you very much for completing this. As you know this is a vital part of our study and we appreciate

your cooperation, as we could not continue without this part. Did you have any difficulties with it this week, or any questions?"

2) "Please complete these two questionnaires and then we will get started. There are no right or wrong answers to any of these questions. Please do not spend too much time on any one question; usually your first instinct is the best answer. Do you have any questions?" *(Complete VOCIcheck & BAMI)* "I just have a couple of more questions before we get started. *(If on medication at intake)* Have you changed your medication or dose since our last appointment?" *(If suicidality was identified at intake)* "Have you been having any suicidal thoughts this week? More than usual? Do you have a plan?"

3) Treatment Session 2 components: (Start audio recorders)

A) Set Agenda: We are now ready to start today's treatment session. Today we are going to cover five topics. We will start with reviewing what we discussed last session (1). Then we'll have a discussion about the results of your between session exercise (2). Then we'll have talk about that feeling like you need to check and the difference between that feeling and actually needing to check (3) and then we'll talk about types of memory failures and see if you have them or not (4). We'll finish by discussing and practicing a between-session exercise (5) that I will ask you to complete before our next session (this is important, because it will help you make the most of our in-session conversation). (Draw out items for them) Does that sound alright? Do you have any questions? Is there anything I've said with which you disagree?

B) Bridge from last session and review of the between-session exercise: Okay let's get started then. Last time we talked about the self-perpetuating cycle of checking – that even though individuals check to become more certain, the act of checking itself actually reduces certainty, and that it's uncertainty that leads to more checking. We also talked about research that

shows that it isn't actual performance that's impaired, just confidence in that performance. We said that these beliefs about your memory abilities are influenced by the change in type and depth of memory that occurs through checking. Then we talked about your own beliefs about your memory ability and the need to gather evidence over it. So we agreed on a between-session exercise to test it. Do you have any questions about our last session?

C) Review of the between-session exercise: How did the between-session exercise go? What happened? Did you have any difficulties? If so, how can we remove those obstacles for the next exercise?

What were the results? What did you learn from it? How can you apply this moving forward? Does this change the way you think about your memory? Was it worthwhile to do? If these results showed that you didn't need to check, even though you felt like you did, what does that mean about you? What does this mean about the difference between actually needing to check and just feeling like you do? What does that mean about what you thought previously about your memory abilities? What do you think about your memory abilities now? Does that change anything about how you'll act going forward?

D) So regardless of how you feel from last time, if you feel now like you have a good memory but just can't stand the feeling, or if you're still not sold on whether or not you think you have a good memory, we probably need to have a discussion about that and then gather more evidence to really solidify what we've been doing together. What do you think?

E) Discussion of the discrepancy between beliefs about memory and actual memory ability: As we discussed last time, research shows us that even though individuals in the study felt unconfident about their check, like

they couldn't remember and wanted to check, they actually did not need to. This shows that how we *feel* about our memory/the check, and the actual state of the check are not actually the same thing, i.e., just because you feel you need to check, doesn't mean that you actually left something in an improper way, your feelings are misleading you into thinking that you did. Is there anything about this that might apply to you? Did the results of your between-session exercise fit with that idea? What do you think about that? Have you ever felt that something was true, when it later turned out not to be true? Have you ever had a bad dream and felt that it was true? Can you rely on your feelings of uncertainty to give you a true indication of the state of things? This is the idea that you might believe that you have a bad memory, but you don't actually have one. Remember how in the first session we discussed that study where all the people who checked a lot *thought* they were reporting the wrong answer, but they weren't actually? And how that other study showed that if people thought they had a bad memory to begin with they would want to check more? What does this mean about the difference in belief about your memory vs. your actual memory ability? How might this apply to you? This shows that our beliefs might actually not be correct, and that our feelings that tie to these beliefs might not actually be correct. Maybe we could gather some extra evidence to see if how you feel should be indicative of the actual state of your memory, or if it should be ignored. In any case, more practice and more evidence will help you deal with that uncomfortable feeling, and trust your knowledge of your memory ability over your feelings about it.

F) <u>What an actual bad memory looks like</u>: Now you still might think you have a bad memory, despite the results of our first experiment, and you might need to see more evidence to help you feel more comfortable with this new idea of your memory being good and therefore you not needing to

check, so that you can ignore that feeling that you have despite evidence to the contrary, and help strengthen the idea that the feeling you have is not necessarily a correct belief. If you had a bad memory how would you know? What would your life look like? You'd presumably have trouble with a lot of things, not just items related to checking. What do the lives of people with bad memories look like? How would their daily lives be different? Is your life like that?

There are actually three types of memory (draw this out): There's semantic memory, which is memory for stuff you know but don't necessarily remember learning, like the capital of Canada, the colour of the sky. Do you know that kind of information? Do you often forget it?

There's also procedural memory. This is memory for how to do things, like how to tie your shoes or how to ride a bike or drive. Have you forgotten any of that recently?

Finally, there's episodic memory, which is memory for events. Are there recent important events in your life that you have absolutely no memory of? Do you remember anything about any recent trip to the grocery story? Any recent time you brushed your teeth?

Huh, so what does that say about the likelihood that you actually have a bad memory? Now what is it that you do that makes you think you have a bad memory? Oh it's checking. Do you think that the lives of individuals with bad memories are characterized by checking? You might be surprised to know that it is not one of the symptoms of a bad memory. People with bad memories don't even know that they need to check! Their lives are more likely to include the previous failures we talked about, forgetting entire events, not remembering facts about the world, and forgetting how to take care of their own basic needs, like how to take a shower and brush their teeth. If that's what someone with a bad memory's

life looks like, and it's not what yours looks like, what does that say about your memory? Okay, and if your memory isn't so bad after all, what does that say about your need to check? Does that make it more likely that you just have a feeling that you have a bad memory, rather than it being likely that you actually have a bad memory?

G) Assignment and practice of the between-session exercise: Okay so what have we talked about so far today? We've talked about how there's a difference between the belief you might have about your memory and your actual memory ability, and therefore that even though you might feel like you need to check, you might not actually need to, but that we might need more evidence to help you ignore that feeling that you do, and the uncomfortable anxiety that comes with it. We also talked about what a bad memory looks like and how that doesn't really fit with your life. But I understand that it can be hard to ignore that feeling, so let's gather some more evidence about the difference between the feeling and the actual need to check.

How could we gather that evidence in a new way? We need to gather some evidence to test out this idea that you don't have a good memory just because you feel you don't, i.e. that your feelings about your memory are not a good indication of your memory abilities. We need more evidence to help you ignore that feeling. Especially as we just saw from our conversation about memory, it doesn't seem to be that you lack actually memory ability, in terms of the different types of memory and memory failures that exist, but that you can't help feeling like you have a bad memory. We should also double check those abilities as well, as part of the exercise. I have an idea of how we can test that this week. Would you be interested in trying it? I'm going to give you a light switch, and I'd like you to switch it on and off four times this week. Also if your

prediction is that you don't need to check, you don't need to follow it up with a check. You could just leave it as is.

How confident do you think you'll feel about the status of this? If it turns out you feel okay about it and they were as they should have been, how is that different from the other things that you check? What would that mean? If it turns out you are bad at it that would also be important to know. What would that mean about your checking? We will also monitor whether you remember doing it, and remember how to use it, and that will show us about whether your memory is actually like someone who has a bad memory or not. Do you think you're likely to forget what this object is called? Do you think you're likely to forget that you actually checked them? Do you think you're likely to forget how to use them? Would learning that help us to see if you experience the type of memory failures that are truly indicative of a bad memory, rather than just feeling like you have a bad memory? So in that case this really would be important information to have.

I'd like you to record, before using the object how certain you were about it, and how you expect it to be, how you expect your memory for it to be, and how you actually find them (in addition to writing your thoughts, emotions, and rating your anxiety). Then we can see if you really do have a bad memory, of if it's just that your feelings about your bad memory make you feel that you do. Let's try it now together so you can see how it's done and how to write about it. (*Practice and fill out form together.)*

Do you see any obstacles to completing this exercise? How can we work around those obstacles?

Also please continue to monitor your checking and beliefs about memory using the form provided.

Here is the form for monitoring your between-session exercise.

In addition to this I'd like to give you this handout that we worked on together to take home, along with the things we wrote out today. I think it's important that you have a way to review what we discussed. I know it was a lot and although it makes sense now, these things can fade over time. Will you make time to read this over this week? Great! I'd also like you to make time to listen to our session once this week. You can see in your handout out there is a place to record when you've done this, so you can be reminded to do it. Would you like to set a time now together? It is extremely important that remember to bring the audio-recorder back as you will need it again next week. Thank you.

H) Wrap up:

a. Summarize: Could you summarize today's session for me?

b. Most important: What was the one thing you remember best, that was either most interesting to hear, or that you'll take away with you? (get them to write it in the space provided)

Sample form for between-session exercise:

Date	Prediction about status of object (Correct/	Prediction about memory failures about this object (Will have/Won't have)	Emotions	Thoughts	Max Anxiety (0-100)	Can you remember the name of the object?	Can you remember how to use the object?	Can you remember the time when you did use the object?	Was your prediction about the status of the object correct? (Y/N)	Was your prediction about memory failures correct? (Y/N)

1)										
2)										
3)										
4)										

Troubleshooting:

If the participant is not convinced that their memory plays a role: Grant that you are the expert on research and they are the expert on their own situation. Wonder if you're using different definitions or thinking of different times. Ask if regardless it would be important to test it out.

Appendix C

Study 1 Ethics Certificates

UNIVERSITÉ Concordia UNIVERSITY

CERTIFICATION OF ETHICAL ACCEPTABILITY
FOR RESEARCH INVOLVING HUMAN SUBJECTS

Name of Applicant:	Dr Adam Radomsky
Department:	Psychology
Agency:	CIHR
Title of Project:	Compulsive Reassurance Seeking in OCD: A New Focus on an Old Problem
Certification Number:	UH2006-080-4
Valid From: June 7, 2011	to: June 6, 2012

The members of the University Human Research Ethics Committee have examined the application for a grant to support the above-named project, and consider the experimental procedures, as outlined by the applicant, to be acceptable on ethical grounds for research involving human subjects.

Dr. James Pfaus, Chair, University Human Research Ethics Committee
01/29/2009

UNIVERSITÉ Concordia UNIVERSITY

CERTIFICATION OF ETHICAL ACCEPTABILITY FOR RESEARCH INVOLVING HUMAN SUBJECTS

Name of Applicant:	Dr Adam Radomsky
Department:	Psychology
Agency:	CIHR
Title of Project:	Compulsive Reassurance Seeking in OCD: A New Focus on an Old Problem
Certification Number:	UH2006-080-6
Valid From: April 19, 2012	to: April 18, 2013

The members of the University Human Research Ethics Committee have examined the application for a grant to support the above-named project, and consider the experimental procedures, as outlined by the applicant, to be acceptable on ethical grounds for research involving human subjects.

Dr. James Pfaus, Chair, University Human Research Ethics Committee

01/29/2009

Appendix D

Study 2 Ethics Certificates

Concordia

CERTIFICATION OF ETHICAL ACCEPTABILITY
FOR RESEARCH INVOLVING HUMAN SUBJECTS

Name of Applicant: Dr. Adam Radomsky

Department: Faculty of Arts and Science\Psychology

Agency: Canadian Institutes of Health Research

Title of Project: A New Cognitive Intervention for Obsessive-compulsive Checking

Certification Number: 10000575

Valid From: July 05, 2012 to: July 04, 2013

The members of the University Human Research Ethics Committee have examined the application for a grant to support the above-named project, and consider the experimental procedures, as outlined by the applicant, to be acceptable on ethical grounds for research involving human subjects.

Dr. James Pfaus, Chair, University Human Research Ethics Committee

Concordia

CERTIFICATION OF ETHICAL ACCEPTABILITY FOR RESEARCH INVOLVING HUMAN SUBJECTS

Name of Applicant: Dr. Adam Radomsky

Department: Faculty of Arts and Science\Psychology

Agency: Canadian Institutes of Health Research

Title of Project: A New Cognitive Intervention for Obsessive-compulsive Checking

Certification Number: 10000575

Valid From: September 16, 2013 to: September 15, 2014

The members of the University Human Research Ethics Committee have examined the application for a grant to support the above-named project, and consider the experimental procedures, as outlined by the applicant, to be acceptable on ethical grounds for research involving human subjects.

Dr. James Pfaus, Chair, University Human Research Ethics Committee

Appendix E

Study 1 Consent Form

Consent Form

This is to state that I agree to participate in a program of research being conducted by Dr. Adam S. Radomsky (adam.radomsky@concordia.ca; 514-848-2424 ext 2202) in the Psychology Department of Concordia University.

A. PURPOSE
I have been informed that the purpose of this study is to examine beliefs and thoughts related to different kinds of anxiety.

B. PROCEDURES
If I agree to participate in this study, I will be asked to complete a questionnaire package. The package should take approximately 45 to 60 minutes to complete. These questionnaires ask no questions regarding my name and they will not be connected in any way with my contact details. I am aware that the data collected from these questionnaires will be hosted on a Concordia University server, but none of my identifying information will be linked to the questionnaires or hosted on the server. Finally, I will be fully debriefed about the purpose of the study as well as the hypotheses. For my participation, I will receive the opportunity to submit my name in a draw for cash prizes, OR course credit if I am part of the undergraduate participant pool at Concordia University. I am aware that this study employs a standardized protocol for which anxious and depressive symptoms are assessed. I will be provided access to a treatment resource manual containing information about self-help books and local treatment services.

Finally, I am aware that following my participation, I may be recontacted in approximately 4 weeks to complete a second set of questionnaires. These questionnaires will also be completed online using the Concordia server. I consent ONLY to being re-contacted about these questionnaires. At that time I can decide whether or not I would like to participate.

C. CONDITIONS OF PARTICIPATION
I understand that I am free to withdraw my consent and discontinue my participation in this study at any time, without any negative consequences whatsoever. I understand that all information obtained will be kept strictly confidential and will be stored under lock and key for a period of seven years

after which they will be shredded. Access to this information will be made available only to restricted members of Dr. Radomsky's research team. I understand that to ensure my confidentiality all data will be coded by number only and will be kept separate from my name. I understand that data from this study may be published, but that no identifying information will be released.

If you have any questions concerning the study, please feel free to contact our lab at (514) 848-2424, ext. 2199.

Adam S. Radomsky, Ph.D., Associate Professor
Gillian Alcolado, M.A., Graduate Student

If at any time you have questions about your rights as a research participant, please contact Adela Reid, Research Ethics and Compliance Office, Concordia University, at 514-848-2424, ext. 7481 or by e-mail at adela.reid@concordia.ca

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

Appendix F

Study 2 Consent Form

CONSENT TO PARTICIPATE IN RESEARCH

I understand that I have been asked to participate in a program of research being conducted by Gillian M. Alcolado, M.A. under the supervision of Dr. Adam Radomsky of the Psychology Department of Concordia University. She can be reached by telephone at 514-848-2424 ext. 5965 or by email at galcolad@live.concordia.ca.

A. PURPOSE

I have been informed that the purpose of the research is to determine the usefulness of a brief treatment component for obsessive compulsive checking.

B. PROCEDURES

I understand that if I agree to participate in this research my participation will consist of 4 or 5 visits to the Anxiety and Obsessive Compulsive Disorders laboratory, depending on whether I am randomly assigned to receive the treatment right away, or randomly assigned to wait 4 weeks before receiving the treatment. I understand that I will be instructed in how to monitor my checking each week and expected to do so EVERY DAY for the course of my participation in this project, so that the researcher can monitor my progress.

I understand that the first visit will be an assessment consisting of a short series of cognitive tests, followed by an interview and some questionnaires. I understand that I may choose to do the questionnaires on a lab computer, or from the comfort of my own home, provided that they are completed within the next 3 days. I understand that at the end of the first visit I will be randomly assigned to begin treatment within a week, or to wait three weeks until I am assessed again and that the treatment will start the following week.

I understand that the two treatment visits will be approximately one week apart and will last about 1 hour each. I understand that my participation will

include discussing my checking behaviour, thoughts, and feelings with my therapist as well as completing an exercise after each treatment session and recording my experiences in a treatment exercise form, so that the researcher can monitor my progress. I also understand that I will complete a few short questionnaires at each visit so the researcher can monitor my progress.

I understand that the final visit will consist of a second series of cognitive tests, an interview, and questionnaires that I may again choose to complete in the lab or in my home within the next 3 days. I understand that all my information is completely confidential.

I understand that the study consists of four 1-3 hour visits over the course of approximately 4 weeks, or, if I am assigned to the waitlist condition, five 1-3 hour visits over the course of approximately 8 weeks.

I understand that I will be offered compensation of $90 total across all the assessments. If I am in the immediate condition, I understand I will be offered $45 at the pre-treatment assessment and $45 at the post-treatment assessment. I understand that if I am in the waitlist condition, I will require an extra assessment visit and be offered compensation of $30 at each of my 3 assessment visits, for the same total of $90 for all the assessments. I understand I will not be offered compensation for receiving the treatment itself.

I understand that my clinical assessments will be audio recorded for reliability purposes, and that my cognitive assessments will be video-recorded. This information will be kept completely confidential and under lock and key and only accessible by members of Dr. Radomsky's research team.

C. RISKS AND BENEFITS

I understand that that the potential risks of participation in this study are that this treatment might not work for me or that this treatment will make my OCD worse. In the event of either of these unlikely occurrences, the researcher will offer treatment resources with no pressure or judgement. I understand that benefits of

participation will be to receive a component of treatment for my obsessive compulsive checking.

D. CONDITIONS OF PARTICIPATION

• I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences.

• I understand that my participation in this study is: CONFIDENTIAL (i.e., the researcher will know, but will not disclose my identity). My data will be identified by number only, kept separate from any of my identifying information, and that access to this information will be limited to the members of Dr. Radomsky's research team.

• I understand that the data from this study may be published but that no identifying information will be released.

• I understand that if I withdraw my participation at any point, data collection will cease and no new data will be included. Any data collected prior to my decision to withdraw from the study will be retained by the researchers and stored in the manner described above.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

NAME (please print)

_____

SIGNATURE

_____

AGE _____ ETHNICITY _____

GENDER M / F

If at any time you have questions about the proposed research, please contact the study's Principal Investigator Dr. Adam Radomsky of the Psychology Department by telephone at 514-848-2424 ext. 2202 or by email at adam.radomsky@concordia.ca.

If at any time you have questions about your rights as a research participant, please contact the Research Ethics and Compliance Advisor, Concordia University, 514.848.2424 ex. 7481 ethics@alcor.concordia.ca