School of Psychology and Speech Pathology

An Exploration of the Cognitive Mechanisms Underlying General Risk-Aversion in Obsessive-Compulsive Disorder: The Construction and Validation of the Multi-Dimensional Risk Assessment Scale

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DECLARATION

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Signature: ……

Date: ……**.....**

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ABSTRACT

Individuals with OCD avoid minor risks that are unrelated to their obsessive fears and this general risk-aversion is implicated in treatment failure and relapse. However, a lack of understanding of the cognitive biases driving general risk-aversion has hampered therapeutic efforts to address this problematic cognitive-behavioural pattern. This research was designed to advance understanding of these cognitive biases in order to potentially improve treatment outcomes for individuals with OCD.

Perception of threat is a significant causal factor in risk-aversion and this research was designed to investigate the cognitive biases driving threat overestimation, and consequent risk-aversion, in general situations among individuals with OCD. Beck, Emery, and Greenberg's (1985) model of threat perception formed the theoretical basis for this investigation. This model states that threat perception and consequent anxiety within a situation are the result of cognitive computations involving the perceived probability and perceived cost of potential negative events, along with perceived ability to cope with those events. However, no validated scales existed to measures these constructs, so the first undertaking in this research was to create the Multi-Dimensional Risk Assessment Scale (MDRAS) to perform this important task.

The aim of Study 1 was the development of the MDRAS, a scale designed to assess perceptions of the probability and cost of specific negative events, as well as perceived ability to cope with those events. The events selected were unrelated to typical OCD concerns and include some everyday risks as well as some risks that are situated in the future. Items were generated based on items from two existing scales, the Everyday Risk Inventory-Australian Revision (ERI-AUS, Cicolini & Rees, 2003) and the Social Readjustment Rating Scale (SRRS, Holmes & Rahe, 1967). Two hundred and twenty two non-clinical participants, consisting of students at Curtin University and community members recruited through snowball sampling, completed the 19-item MDRAS. Principal components analyses (PCA) revealed that the MDRAS conformed to its intended factor structure, with the Probability, Cost, and Coping scales containing two factors relating to everyday risks and future risks. However, several items did not load as planned and were removed from the scale. A second PCA demonstrated that the shortened, 14-item version of the MDRAS contained 7 items assessing threat perceptions for everyday risks, and 7 items assessing threat perceptions for potential future risks. Confirmatory factor analysis (CFA) indicated that, in addition to two subordinate factors, Total Probability, Total Cost, and Total Coping scores could also be

interpreted. As intended, the MDRAS appears to assess perceived probability and cost of potential negative daily and future events, and perceived ability to cope with those events.

In Study 2 the pattern of relationships between the MDRAS scales and a measure of negative affect, a measure of obsessive beliefs, and a measure of perceived control was examined. Participants were the same individuals who had participated in Study 1. They completed the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), the Obsessive Beliefs Questionnaire (OBQ; OCCWG, 2005), and the Anxiety Control Questionnaire (ACQ; Rapee, Craske, Brown, & Barlow, 1996) in addition to the MDRAS. Results provided evidence for the internal consistency as well as the convergent and discriminant validity of the MDRAS scales. It was concluded that the MDRAS appears to be a reliable and valid measure of perceptions of the probability and cost of negative events, and of perceived ability to cope with those events.

In Study 3 MDRAS scores were compared among 21 individuals with OCD, 17 anxious controls, and 29 non-anxious controls. Participants completed the MDRAS and the PANAS in addition to a measure of obsessive symptoms – the Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). Analyses of variance (ANOVAs) indicated that individuals with OCD perceived a higher cost of negative events and perceived their ability to cope with those events as lower than did non-clinical individuals. This was true for both the MDRAS Total Cost and Coping scales, as well as for the Everyday and Future Cost and Coping Scales, with medium to large effect sizes in each case. However, individuals with OCD did not estimate a higher probability of the occurrence of everyday or future negative events than did non-clinical individuals. This indicates that general risk-aversion among individuals with OCD is driven by inflated cost and reduced coping ability estimates. However, ANCOVAs revealed that, after controlling for negative affect, there were no differences between the OCD and the non-anxious groups on any of the MDRAS scales. This suggests that negative affect, rather than OCD specifically, is related to cost and coping ability biases, and consequent risk-aversion. In addition, ANOVAs revealed that the OCD group did not score differently from the anxious controls on any MDRAS scale, suggesting that all anxious individuals are likely to perceive heightened levels of cost associated with general negative events, and demonstrate low subjective ability to cope with those events. This is consistent with theories suggesting that general risk-aversion is a transdiagnostic risk factor for anxiety in general, rather than any specific diagnosis (Maner & Schmidt, 2006). It was concluded that individuals with OCD are risk-aversive because they overestimate the cost of potential negative events, and underestimate their ability to cope with those events.

However, a similar conclusion was drawn for other anxious individuals and there was no evidence that general risk-aversion is a phenomenon specific to OCD.

It was concluded that general risk-aversion is likely to be an important target for treatment across anxiety disorders and it would seem prudent to target biased estimates of the cost of negative events, and/or perceived ability to cope with those events, in order to reduce threat perception and general risk-aversion among anxious individuals. Methods for achieving this were discussed. In addition, it was concluded that the MDRAS has the potential to be a useful research and clinical tool for assessing the cognitive biases involved in threat overestimation and consequent risk-aversion among anxious individuals.

CHAPTER 1

GENERAL INTRODUCTION

General Introduction

Introduction to Risk-Aversion in OCD

Everyday life is filled with decisions involving risk, even when that risk is not explicitly recognised or acknowledged. This can include choosing to drive a car, cross the street, engage in social interaction with an unknown person, and many other "normal" activities. Risk decision making involves choices in situations that potentially involve positive and/or negative outcomes, but where the occurrence of those outcomes is uncertain (Maner & Schmidt, 2006; Yates & Stone, 1992). Although some individuals are risk-seeking (sensation seeking) and some are risk-avoidant (consistently choosing the 'safest' option in order to avoid harm, often at the cost of potential gains), the majority of individuals are risk-bearing, accepting and tolerating risk as a necessary, although not always enjoyable, part of healthy functioning (Nicholson, Soane, Fenton-O'Creevy, & Willman, 2005). An individual's tendency to take risks, or risk propensity, appears to be somewhat consistent across situations and is influenced by a multitude of factors including personality, age, and gender (Horvath & Zuckerman, 1993; Mishra & Lalumiere, 2011; Nicholson et al., 2005). Individuals also demonstrate a level of domain-specificity in their risk propensity, although those with strong risk-aversive or risk-taking tendencies are more consistent across domains (Nicholson et al., 2005). Most perspectives (e.g., Lejuez et al., 2002) assume that a balanced level of risk-taking is important for normal, adaptive functioning, with extreme risk-taking or risk-avoidance resulting in negative psychological, physical, interpersonal, and emotional consequences.

Pathological avoidance of disorder-specific risk (for example social risks for individuals with social phobia or bodily sensations for individuals with panic disorder) is a key feature of all anxiety disorders (Cisler & Koster, 2010; Foa, Franklin, Perry, & Herbert, 1996; Nelson, Deacon, Lickel, & Sy, 2010; Uren, Szabo, & Lovibond, 2004). Understandably, research has tended to focus on the cognitive biases (particularly overestimation of threat) contributing to avoidance in these disorder-specific situations. However, avoidance of general risks that are unrelated to specific disorders has received very little attention in the literature (Maner & Schmidt, 2006). It has been suggested, however, that individuals with obsessive-compulsive disorder (OCD) demonstrate a pervasive pattern of risk-aversion that is evident across life domains, even in situations not related to their obsessive fears (Cicolini & Rees, 2003; Frost, Steketee, Cohn, & Griess, 1994; Steketee & Frost, 1994). In this context, risk-aversion entails individuals' tendencies to respond intensely to signals of aversive stimuli, thereby learning to inhibit behaviour to avoid the possibility of

negative consequences (Lorian & Grisham, 2010; Steketee & Frost, 1994). Risk-aversion among individuals with OCD extends beyond their obsessive fears and permeates all aspects of their daily lives, resulting in and being reinforced by the perception of the world as a profoundly dangerous place (Cicolini & Rees, 2003; Steketee & Frost, 1994). As will be examined later in this chapter, and in more detail in Chapter 3, this is of potential clinical significance in terms of treatment failure and the high rates of relapse observed among individuals with OCD following therapy (Clark, 2005; Lyoo, Lee, Kim, Kong, & Kwan 2001; Rees, 2001; Simpson, Zuckoff, Page, Franklin, & Foa, 2008; Stobie, Taylor, Quigley, Ewing, & Salkovskis, 2007).

Theorists from various perspectives, in various cultures, have asserted that individuals with OCD appear to exhibit high levels of risk-aversion or harm-avoidance, and that this is central to OCD pathology (Abed & de Pauw, 1999; Alonso et al., 2008; Brune, 2006; Cicolini & Rees, 2003; Feygin, Swain, & Leckman, 2006; Frost et al., 1994; Lyoo, Yoon, Kang, & Kwon, 2003; McFall & Wollersheim, 1979; Pietrefesa & Coles, 2009; Rees, 2001; Rees, Anderson, & Egan, 2006; Salkovskis, Forrester, & Richards, 1998; Salzman, 1980, as cited in Frost et al., 1994; Steiner, 1972; Steketee & Frost, 1994). These claims have come from studies directly examining risk-taking among individuals with OCD (e.g., Cicolini & Rees, 2003; Frost et al., 1994; Rees et al., 2006; Steiner, 1972; Steketee & Frost, 1994), from studies into the personality of these individuals (e.g., Alonso et al., 2008; Ettelt et al., 2008; Kima, Kang, & Kima, 2009; Lyoo et al., 2003), and from evolutionary theories (e.g., Abed & de Pauw, 1999; Brune, 2006). It is important to note that risk-aversion as it applies to OCD involves avoidance of normal risks (for fear of negative consequences) that are involved in everyday functioning, rather than the avoidance of sensation-seeking risks or thrills (Cicolini & Rees, 2003; Steketee & Frost, 1994). This type of risk-aversion will subsequently be referred to as *general risk-aversion* or *everyday risk-aversion*.

Tallis (1995) suggested that individuals with OCD are hypersensitive to risks and appear to have heightened awareness of causal pathways to harm. They can easily articulate potential negative consequences within a situation and are likely to assume a negative outcome unless there is evidence that one will not occur (Pietrefesa & Coles, 2009). This tendency to appraise a situation as dangerous because of a lack of evidence that the situation is safe results in high levels of risk-avoidance in order to avoid the possibility of negative events (Frost et al., 1994).

Despite the lack of a comprehensive understanding of general risk-aversion, Rees and colleagues have provided evidence that it is central to the distinct personality profile of

individuals with OCD, and that it is critical to the aetiology and maintenance of the disorder (Cicolini & Rees, 2003; Rees et al., 2006). Rees et al. (2006) suggested that "individuals with OCD are generally risk-aversive and that this trait might underlie the more specific situations they avoid as part of the clinical disorder" (p. 38). Studies using various measures of risk-aversion or harm avoidance in diverse cultures have consistently demonstrated that it correlates positively with the severity of OCD symptomatology and might be linked to a primary diagnosis of OCD, with some specific relationship to OCD separate from its relationship with anxiety and negative affect (Cicolini & Rees, 2003; Frost et al., 1994; Lyoo et al., 2001; Lyoo et al., 2003; Mancini & Gangemi, 2004; Rees et al., 2006; Steiner, 1972; Steketee & Frost, 1994).

However, simply knowing that individuals with OCD are risk-aversive provides little clinically useful information. Understanding the factors that contribute to avoidance of general risk among this population is important to provide potential avenues for therapeutic gain. Indeed, the cognitive biases driving general risk-aversion among individuals with OCD are poorly understood (Woods, Frost, & Steketee, 2002). Given the possible treatment implications of reducing risk-aversion among individuals with OCD, it is important to investigate these biases. A key variable involved in avoidance is the cognitive evaluation of the level of threat/risk involved in a situation, or threat appraisal (Bouchard et al., 2007; Drabant et al., 2011; Field & Lester, 2010; Hazen, Vasey, & Schmidt, 2009; Horvath & Zuckerman, 1993; Kverno, 2000; Legerstee et al., 2009; Lu, Daleiden, & Lu, 2007; Muris & van Doorn, 2003; Warren, Zgourides, & Jons, 1989). Individuals who appraise a situation as containing a high level of threat will experience anxiety and are more likely to avoid that situation than individuals who perceive lower levels of threat (Bogels & Zigterman, 2000; Klumpp & Amir, 2010; Lapsekili, Uzun, & Ak, 2010; Rapee, 1997). Indeed, it has been suggested that risk/threat appraisal is the key cognitive variable that mediates the link between individuals' risk propensities and their risk-taking or risk-avoiding behaviour (Sitkin & Pablo, 1992).

Perception of threat is what initiates the anxiety process (Berenbaum, Thompson, & Bredemeier, 2007; Butler & Mathews, 1987; Cano-Vindel, Miguel-Tobal, Gonzalez-Ordi, & Iruarrizaga, 2009; Klumpp & Amir, 2010). Anxiety disorders involve persistent overestimation of threat, and consequent anxiety and avoidance (which fuels further threat overestimation), in situations that pose little objective danger. It follows, therefore, that among individuals with anxiety disorders, overestimation of threat is central to disorder-specific risk-aversion (Beck, Emery, & Greenberg, 1985; Butler & Mathews, 1987; Cisler &

Koster, 2010; Nelson et al., 2010; Stopa & Clark, 2000; Taylor et al., 2010; Uren et al., 2004; Voncken, Bogels, & Peeters, 2007). Like other anxiety disorders, OCD is characterised by high levels of perceived threat, and consequent avoidance of disorder-specific "threatening" situations (Belloch et al., 2010; Grayson, 2010; Rachman, 1997; Salkovskis, Forrester, & Richards, 1998). However, given the pervasive tendency of individuals with OCD to avoid risk in general situations, they would also appear to overestimate threat in a variety of everyday situations that are not related to their disorder.

However, from a cognitive perspective, perception of threat is multifaceted. Beck et al. (1985) proposed a model of threat perception that is commonly accepted as applicable across anxiety disorders (Field & Lester, 2010; Hazen et al., 2009; Uren et al., 2004). In essence, this model suggests that threat perception is based on several separate, although related, cognitive conceptualisations: the perceived probability of the occurrence of negative consequences; the perceived cost or awfulness of those consequences; and perceived ability to cope with those consequences. Perceived rescue factors such as intervention from other people are also likely to be involved although these are difficult to operationalise and will not be addressed in this study. Overestimation of threat/risk occurs when an individual overestimates the probability and/or cost of potential negative events within a situation, and/or underestimates his/her ability to cope with those events. Individuals with anxiety disorders demonstrate biases in at least one of these appraisal mechanisms (Beck et al., 1985). Therefore, avoidance of general risk among individuals with OCD is likely to be caused (at least partially) by one or more of these cognitive biases. However studies of these biases in OCD are scarce, with none to date focusing on cognitive distortions related to inflated perceptions of risk/threat driving avoidance of general events and situations. Before discussing general risk-aversion among individuals with OCD in more detail, it is necessary to review OCD as a disorder, and provide an overview of the current study.

OCD: The disorder

OCD is characterised by repetitive thoughts, images, and impulses. Interpretation of these intrusive, obsessive cognitions generates anxiety which the individual attempts to relieve through compulsive, ritualistic behaviour (Belloch et al., 2010; Salkovskis, 1985, 1989; Steketee, 1993; Tallis, 1995; Taylor et al., 2010). The diagnostic features of OCD are recurrent obsessions or compulsions, which have been recognised by the individual as being excessive or unreasonable, and which take more than one hour a day or cause "marked distress or significant impairment" (American Psychiatric Association, 2000, p. 456). Most

individuals with OCD experience several types of obsessions and compulsions (Chamberlain & Menzies, 2009). Factor analytic studies have suggested that OCD symptoms can be divided into six categories: checking compulsions; washing rituals; hoarding; ordering and symmetry compulsions; cognitive neutralising; and sexual, aggressive, or religious obsessions (Taylor et al., 2010).

Although it appears that culture can exert some influence on the form and content of OCD (Abramowitz, Deacon, Woods, & Tolin, 2004; Greenberg & Witzum, 1994), the core features of OCD are probably relatively independent of cultural variations, with the exception of the content of obsessions (Fontenelle, Mendlowicz, Marques, & Versiani, 2004). Washing and checking compulsions are highly prevalent in all cultures, suggesting that they "may represent an intrinsic feature of OCD" (Fontenelle et al., 2004, p. 408).

The lifetime prevalence of OCD has been estimated at 2-3% worldwide (Angst, 1994; Chamberlain & Menzies, 2009; Greenberg & Witzum, 1994; Hollander, 1997, Sasson et al., 1997). It is equally prevalent in men and women and, left untreated, is usually a chronic condition that follows a relapse-remit cycle beginning in late childhood or early adolescence (Chamberlain & Menzies, 2009; Taylor, 2005).

Individuals with OCD experience lower quality of life that non-clinical individuals, depressed individuals, haemodialysis patients, and heroin-dependent individuals (Bobes et al., 2001; Eisen et al., 2006). Indeed, they appear to have similar levels of quality of life to individuals with schizophrenia, leading Bobes et al. (2001) to suggest that "OCD is as devastating as schizophrenia" (p. 244). The greatest levels of disability among individuals with OCD appear to be in areas of social, familial, and occupational functioning, with severity of symptomatology significantly positively related to impairments in quality of life (Bobes et al., 2001; Eisen et al., 2006). The relatives of individuals with OCD also experience a lower quality of life than the general population (Stengler-Wenzke, Kroll, Matschinger, & Angermeyer, 2006). Unsurprisingly, 30-67% of individuals with OCD have a comorbid diagnosis of major depressive disorder (Fineberg, Fourie, Gale, & Sivakumaran, 2005; Sasson et al., 1997; Tukel, Meteris, Koyuncu, Tecer, & Yazici, 2006).

Treatment Difficulties for Individuals with OCD

Despite the success of cognitive-behavioural therapy (CBT) for OCD (e.g., Khodarahimi, 2009), the disorder remains renowned for its treatment resistance and high rates of symptom relapse following apparently successful therapy (Clark, 2005; Foa,

Franklin, & Kozak, 1998; Himle & Franklin, 2009; Rees, 2001; Simpson et al., 2008; Stobie et al., 2007; Tolin et al., 2007).

Among individuals who are offered CBT, a large number refuse treatment or terminate early. For example, Foa et al. (2005) reported that 22% of their 37 OCD clients withdrew from the study upon learning that they were to undergo CBT including exposure to feared stimuli, which is a crucial part of treatment for any anxiety disorder (Andrews et al., 2003). In addition, 28% of those who commenced ERP failed to complete treatment, resulting in only 21 of 37 clients (57%) completing therapy. Given that approximately 25% of treatment completers fail to respond optimally to ERP or experience relapse, often because of poor adherence to homework exposure exercises or covert neutralisation to avoid facing feared scenarios (Clark, 2005; Fairfax, 2008; Lyoo et al., 2001; Lyoo et al., 2003; Olsen, Mais, Bilet, & Martinsen, 2008; Stobie et al., 2007; Whittal, Robichaud, Thordarson, & McLean, 2008), this demonstrates that overall treatment success is modest. It is, therefore, not surprising that somewhere between 40-50% of individuals with OCD who seek treatment do not respond, taking treatment refusal, dropout, non-response, and relapse into consideration (Corchs et al., 2008; Simpson et al., 2008). In addition, even individuals who successfully complete treatment and experience significant long-term gains are likely to continue to experience residual symptoms (Abramowitz, Foa, & Franklin, 2003; Friedman et al., 2003; Rowa et al., 2007) and often to use medication to control these symptoms (Whittal et al., 2008). Although medical treatments such as SSRIs can be effective in reducing OCD symptoms, they do not appear to enhance the efficacy of cognitive behavioural therapy when used in combination (Foa et al., 2005). Treatment failure is the reason why individuals with OCD form a high percentage of those undergoing dangerous neurological procedures that are implemented as a final option for treatment-refractory cases (Stobie et al., 2007).

OCD is recognised as one of the most difficult clinical disorders to treat (Fairfax, 2008). There have been few attempts to uncover the reasons behind treatment failure in OCD (Stobie et al., 2007) and consequently the treatment literature offers few insights into how to deal with individuals who do not respond to CBT or medical treatments (Carmin, 2005). The effectiveness of treatments for OCD has currently reached a plateau and new perspectives are required to improve the efficacy of cognitive-behavioural treatments, in terms of treatment adherence, effectiveness in reducing symptoms, and maintenance (Carmin, 2005; Clark, 2005; Cottraux, Bouvard, & Milliery, 2005; Simpson et al., 2008; Tolin, 2009; Twohig, Hayes, & Masuda, 2006; Whittal et al., 2008). For reasons that will be explained in Chapter

3, a focus on general risk-aversion in OCD has the potential to improve treatment effectiveness and long-term maintenance among individuals with OCD.

This Research

Given its prevalence across cultures and its wide ranging negative social and emotional impact, it is not surprising that OCD is one of the leading causes of disability in the industrialised world (Catapano et al., 2006; Doron & Kyrios, 2005; Eisen et al., 2006). For this reason, it is imperative to continue efforts to improve OCD treatment outcomes and examine ways to enhance maintenance of therapeutic gains. A focus on general risk-aversion has the potential to achieve both of these goals.

In the current research, Beck et al.'s (1985) model will be utilised to investigate the perception of threat in general risk scenarios among individuals with OCD. In particular, estimates of the probability and cost of negative events, and perceived ability to cope with those events, will be examined. It is of clinical and theoretical significance to determine which of these cognitive mechanisms distinguishes the threat/risk perceptions of individuals with OCD from those of non-clinical individuals. Given that threat perceptions drive risk-aversive decisions (Butler & Matthews, 1987; Cano-Vindel et al., 2009; Eisenberg, Baron, & Seligman, 1998; Tallis, 1995; Yates & Stone, 1992), any observed distortions are likely to be responsible for heightened levels of anxiety and general risk-aversion among individuals with OCD, and could become a target for therapeutic intervention. In addition, this research will compare individuals with OCD to other anxious individuals to determine whether differences in patterns of threat perception are evident.

Chapter 2 will present general cognitive-behavioural models of OCD and studies that have examined various belief patterns amongst this population, with emphasis on concepts relevant to risk-aversion. Chapter 3 will introduce the concept of general risk-aversion as it pertains to OCD and to other anxiety disorders. The evidence for risk-aversion in OCD will be from evolutionary theories, personality research, and studies that have directly researched risk-taking. Recent evidence that general risk-aversion represents a transdiagnostic factor across anxiety disorders will also be reviewed, along with evidence that general risk-aversion might be linked to treatment failure and relapse. Following this, Chapter 4 will present Beck et al.'s (1985) model of threat perception and anxiety and evidence for its general validity. Chapter 5 will examine this model as it applies specifically to OCD, highlighting available evidence that individuals with OCD are likely to demonstrate biased probability, cost, and/or coping ability judgements. The aims of this research will also be presented, along with a

discussion of the lack of suitable measures to assess threat perceptions in general risk scenarios. Chapter 6 will present Study 1, involving the creation and factor analysis of the Multi-Dimensional Risk Assessment Scale (MDRAS), which is designed to measure the various elements (perceived probability, perceived cost, and perceived ability to cope) of Beck et al.'s model in general scenarios that are unrelated to typical OCD concerns. Chapter 7 will present Study 2, involving the initial validation of MDRAS using a measure of obsessive beliefs, a measure of perceived control, and a measure of negative affect. Chapter 8 will present Study 3, examining threat perception biases among individuals with OCD, anxious control participants, and non-clinical individuals using the MDRAS. Finally, Chapter 9 will involve a discussion of the implications of the findings of the three studies and provide conclusions.

CHAPTER 2
COGNITIVE-BEHAVIOURAL THEORIES OF OCD

Cognitive-Behavioural Theories of OCD

General Principles of Cognitive-Behavioural Theories of OCD

Obsessions are intrusive and repetitive thoughts, images, or impulses that are unacceptable to the individual and serve no functional purpose (e.g., Rachman & Shafran, 1998). Obsessive content is ego-dystonic and involves themes of violence/aggression, contamination, doubting, unwanted sexual imagery, or unwanted urges such as blasphemy or swearing in church. In addition, obsessions are not excessive worries about everyday problems, but are focused on events that have very low probability of occurring (APA, 2000). The occurrence and/or content of obsessions are viewed as threatening by the individual, invoking anxiety and the urge to resist the thoughts or to prevent the consequences (usually involving harm to the self or to other people) that could arise if the obsessive content were actualised (Rachman & Shafran, 1998; Radomsky, Rachman, & Hammond, 2001; Tallis, 1995; Taylor et al., 2010; Wells & Papageorgiou, 1998).

Obsessions often lead to compulsions, which are repetitive, stereotyped, intentional acts that are driven by an internal pressure to neutralise obsessions and reduce anxiety (Moulding, Kyrios, Doron, & Nedeljkovic, 2009; Rachman & Shafran, 1998; Salkovskis, 1985, 1989; Steketee, 1993; Tallis, 1995; Taylor et al., 2010). Because compulsive behaviour is driven by various obsessive thoughts, it can manifest in various and highly idiosyncratic ways, including cleaning, checking, hoarding, obsessional slowness, counting, covert cognitive neutralisation, and many others (Radomsky et al., 2001). Although levels of insight can vary, individuals with OCD usually regard compulsions as irrational or excessive (APA, 2000). This creates resistance against the urge to perform them and results in negative self-perceptions when these behaviours do occur (Rachman & Shafran, 1998; Sasson et al., 1997). Attempts to neutralise obsessive thoughts and anxiety can also involve avoidance of feared situations or reassurance seeking (Salkovskis, Forrester, & Richards, 1998).

Cognitive-behavioural theories are currently the most widely accepted paradigm for the explanation of OCD maintenance and resulting treatments have successfully reduced symptoms and improved long-term prognosis for individuals with OCD (Belloch et al., 2010; Foa & Franklin, 2001; Julien et al., 2008; Wheaton, Abramowitz, Berman, Riemann, & Hale, 2010). An important step towards current cognitive-behavioural theories of OCD was the recognition that unpleasant intrusive thoughts, images, and impulses are not categorically separate from normal thinking and are, in fact, an almost universal human phenomenon (e.g., Rachman & de Silva, 1978) that are not, by themselves, indicative of pathology (Rachman, 1997). Cognitive-behavioural theorists have hypothesised that individuals with OCD make

negative, dysfunctional appraisals of naturally occurring intrusions, and that these cognitive appraisals are what drive OCD (Taylor et al., 2010).

Complete consensus has not been reached regarding the cognitive biases that lead to misinterpretation of intrusive thoughts as threatening (Tolin, Brady, & Hannan, 2008). However, a large group of experts in the field, the Obsessive Compulsive Cognitions Working Group (OCCWG, 1997) suggested that six types of beliefs are commonly accepted as being important in OCD. The first of these beliefs is overestimation of threat (Rachman, 1997, 2002), involving perceptions of elevated probability and cost of negative events. Another is inflated responsibility for harm (Salkovskis, 1985, 1989), which involves the belief that one has the power to cause or prevent negative events. Over-importance of thoughts is also implicated in OCD and involves the belief that the occurrence of a negative thought is enough to signal that thought's importance (this includes thought-action fusion, another cognitive error in OCD that will be discussed later) or that the thought reveals the individual's true nature (Teachman, Woody, & Magee, 2006). Need to control thoughts is another OCD-related bias that involves the belief that it is necessary and possible to control one's thinking (Clark & Purdon, 1993; Wells, 2000). Perfectionism refers to beliefs that mistakes and imperfections cannot be tolerated, and that it is possible to avoid mistakes and reach perfect solutions (Frost & Steketee, 1997). Intolerance of uncertainty (IU, Carr, 1974) is also associated with OCD and is the excessive tendency to perceive the potential occurrence of negative events as unacceptable, regardless of their probability (Holaway, Heimberg, & Coles, 2006; OCCWG, 1997). The OCCWG (1997, 2001, 2003, 2005) has proposed that all of these cognitive biases are likely to operate in OCD, although research (Faull, Joseph, Meaden, & Lawrence, 2004; OCCWG, 2003, 2005; Taylor, McKay, & Abramowitz, 2005; Woods, Tolin, & Abramowitz, 2004; Wu & Carter, 2008) has suggested that they can be grouped into three belief domains – Responsibility and Threat Overestimation (RT); Importance/Control of Thoughts (ICT); and Perfectionism/Intolerance of Uncertainty (PC). Each of these constructs will be briefly examined later, however it is first necessary to illustrate the interplay between cognitive and behavioural factors in OCD. This will be done using the example of Salkovskis' (1985, 1989) widely established cognitive-behavioural model.

Salkovskis' Cognitive-Behavioural Model of OCD

Clinical observations suggest that, unlike in other disorders, the anxiety of individuals with OCD often centres on potential harm occurring to other people, rather than the self. In

addition, the individual fears being the source of that harm (Ehntholt, Salkovskis, & Rimes, 1999). Based on this, Salkovskis (1985) hypothesised that, in OCD, negative appraisals of intrusive thoughts are typically linked to maladaptive beliefs concerning personal responsibility or blame for possible harm to others or to the self. When an individual with OCD experiences an intrusion, he/she perceives him/herself as responsible for preventing the negative events within it from occurring. In this context, responsibility is defined as the belief that one has the power to bring about or prevent subjectively important negative outcomes. These outcomes are perceived as essential to prevent, can be physical or moral in nature, and can be situated in the past, present, or future (Salkovskis, 1989; Salkovskis, Forrester, Richards, & Morrison, 1998; Salkovskis et al., 2000). Researchers have argued that most individuals with OCD tend to believe that having any influence over an outcome renders them responsible for that outcome. In addition, they lack the 'omission bias' exhibited by non-clinical individuals, whereby responsibility is assumed primarily for actions, rather than inactions (Foa et al., 2001; Salkovskis, Forrester, & Richards, 1998; Salkovskis, Forrester, Richards, & Morrison, 1998; Siev, Huppert, & Chambless, 2010). In other words, individuals with OCD perceive themselves as responsible for preventing negative outcomes that could occur through their own actions or inactions and they perceive the failure to prevent harm as equivalent to directly causing harm (Siev et al., 2010). Importantly, it is now clear that individuals with OCD can experience inflated responsibility even when they recognise that they cannot actually exert influence over a situation (Salkovskis & Freeston, 2001). In essence, Salkovskis and colleagues argued that, although perception of high levels of threat is necessary for the development of anxiety, it is only when this is regularly coupled with perceived responsibility for that threat that OCD (as opposed to another anxiety disorder) will develop.

Importantly, for some individuals with OCD, the occurrence of intrusions, rather than their content, can be the main focus of responsibility appraisals. This appears to be attributable to a cognitive phenomenon known as "thought action fusion" (TAF) that is commonly exhibited by individuals with OCD (Altin & Gencoz, 2011). TAF will be discussed in more detail later in this chapter, but individuals who experience TAF perceive the occurrence of negative obsessional thoughts as inherently bad, and perceive themselves as responsible for preventing the future occurrence of those thoughts (Rachman, 1997; Salkovskis, 1989). However, consequent efforts to suppress intrusive thoughts are counterproductive and actually result in increased frequency of intrusions (Grisham & Williams, 2009; Magee & Teachman, 2007). This failure to control one's own thinking is

then interpreted as a sign of an impending loss of control over one's thinking or of oneself. Further counterproductive attempts to control the occurrence of the thoughts ensue, as the individual attempts to prevent or avoid perceived negative consequences associated with losing control (Salkovskis, Forrester, & Richards, 1998). Interestingly, this demonstrates Salkovskis' recognition of the other cognitive biases (i.e., importance and control of thoughts) that might operate in OCD. Salkovskis, Forrester, and Richards (1998) considered various cognitive biases to be important in OCD, particularly overimportance of thoughts and the importance of controlling thoughts, as well as perfectionism. However in this theory they are believed to be triggered by, or a variant of, perceptions of inflated responsibility for harm.

Salkovskis (1985) suggested that if the occurrence or content of intrusive cognitions is appraised as an indication that the individual has become responsible for harm to him/herself or others, then several important and reciprocal effects are likely: The intrusions elicit mood disturbance (typically heightened levels of anxiety), which increases the attention focused on them. This makes the intrusions and related ideas more accessible, resulting in the urge to neutralise them and their potentially harmful consequences. Subsequent attempts to achieve this goal can include behavioural and cognitive neutralising responses such as compulsive behaviour, covert cognitive neutralisation (such as thinking a "good" thought to counteract the "bad" obsession), reassurance seeking, avoidance, and attempted thought suppression. These attempts are usually counter-productive and result in a spiral of intrusive thoughts leading to maladaptive cognitive, behavioural, and affective responses (Salkovskis, Forrester, & Richards, 1998).

Neutralising (including rituals or compulsive behaviours) consists of voluntarily initiated activity that is designed to avert the possibility of being blamed by oneself or by others for any possible harm, to bring relief from the mood disturbance elicited by negative automatic thoughts, and to control the further occurrence of intrusive cognitions (Rachman, 1997; Rachman & Shafran, 1998; Salkovskis, 1985, 1989). For example, an individual who experiences constant intrusive images associated with harming others may avoid using sharp objects, or may check constantly for 'danger' such as electrical appliances being left on. The individual believes that these actions prevent the occurrence of potential negative outcomes and this temporarily relieves the anxiety and guilt that arise from the fear of being held responsible for those outcomes.

Neutralising and avoidance of feared situations are successful in providing the desired reduction in anxiety, resulting in them being adopted in similar situations in the future (Lovibond, Mitchell, Minard, Brady, & Menzies, 2009; Salkovskis, 1985; Salkovskis,

Thorpe, Wahl, Wroe, & Forrester, 2003). However the reduction in anxiety is temporary and the individual does not learn that obsessional anxiety dissipates naturally over time without the performance of rituals or avoidance. In addition, neutralising is credited with preventing feared outcomes (which would not have occurred regardless of neutralising behaviours), reinforcing the belief that neutralising is necessary and increasing the probability of it being used to cope with subsequent perceived threats and anxiety. Therefore, neutralising and avoidance prevent both long-term anxiety reduction and the disconfirmation of the individual's negative beliefs but are likely to generalise to other anxiety inducing situations (Salkovskis, 1989; Salkovskis, Forrester, Richards, & Morrison, 1998).

Salkovskis, Forrester, and Richards (1998) suggested that the behaviour of individuals with OCD is best understood from a safety seeking/risk-avoiding perspective, whereby they react in ways that they believe will be most effective in reducing the threat of being responsible for avoidable harm. Safety behaviours can therefore be directed either at preventing harm or at preventing responsibility for harm. However, if an individual with OCD accepts that they might be able to prevent even potential harm, responsibility may be increased by this knowledge alone.

Evidence for the role of inflated responsibility in OCD.

The important role of inflated responsibility appraisals in OCD has been demonstrated in numerous studies using various methodologies including questionnaires (e.g., Altin & Gencoz, 2011; Foa, Amir, Bogert, Molnar, and Przeworski, 2001), manipulation of responsibility (e.g., Arntz, Voncken, & Goosen, 2007; Bouchard, Rheaume, & Ladouceur, 1999), and treatment outcome measures (e.g., Ladouceur, Leger, Rheaume, & Dube, 1996). In addition, Responsibility/Threat Estimation appears to be a vulnerability factor for OCD development across cultures (Yorulmaz, Gencoz, & Woody, 2010).

Salkovskis et al. (2000) examined responsibility attitudes and responsibility appraisals among 83 individuals with OCD, 48 anxious controls, and 218 non-clinical individuals. Results indicated that individuals with OCD had significantly higher scores than either comparison group on the measure of responsibility attitudes and the measure of responsibility appraisals, with this result remaining after controlling for negative affect. The combination of responsibility attitudes and interpretations accounted for an additional 33% of unique variance in OCD symptoms after anxiety and depression accounted for only 14% of the variance in the first step of the analysis (Salkovskis et al., 2000). Overall, Salkovskis et al. suggested that their results are consistent with the theory that individuals with OCD are

characterised by an inflated sense of responsibility for potential harm which is somewhat specific to OCD, rather than anxiety in general. Similarly, Foa et al. (2001) found that individuals with OCD exhibited greater responsibility in low-risk and OCD-relevant situations than did non-clinical or anxious control participants. Likewise, Cougle, Lee, and Salkovskis (2007) demonstrated that individuals with checking and non-checking OCD had more general responsibility beliefs than did anxious or non-anxious controls. They suggested that evidence indicates that inflated responsibility beliefs are a causal factor in OCD. Bouchard et al. (1999) found that manipulation of responsibility among non-clinical individuals influenced levels of checking behaviours, also suggesting a causal role for inflated responsibility in OCD rituals. Responsibility and threat appraisals predict significant variance in intention to act to avert threat (i.e., neutralise) (Moulding, Kyrios, & Doron, 2007). Finally, Ladouceur et al. (1996) demonstrated that directly targeting inflated responsibility beliefs is an effective therapeutic option for individuals with OCD, furthering the argument that this cognitive bias is central to OCD pathology.

O'Leary, Rucklidge, and Blampied (2009) found evidence that inflated responsibility beliefs are specific to OCD, rather than to anxiety in general. They demonstrated that individuals with OCD endorsed significantly more responsibility attitudes and beliefs than did either an anxious or a non-anxious control group, which did not differ on either measure. This result remained after controlling for depression. Both anxious groups scored higher on TAF than did the non-anxious group, but there were no differences between the two anxious groups. This is consistent with the findings of Steketee, Frost, and Cohen (1998) and Bouchard et al. (1999). TAF, however, appears to occur in a variety of anxiety disorders, particularly those where superstitious beliefs are present (O'Leary et al.). Consistent with this finding, Altin and Gencoz (2011) demonstrated that inflated sense of responsibility mediated the relationship between OCD symptoms and TAF among a large non-clinical sample. This lends support to Salkovskis, Forrester, and Richard's (1998) assertion that other cognitive beliefs relevant to OCD might be mediated by inflated responsibility beliefs.

Other Cognitive Distortions in OCD

Since Salkovskis (1985, 1989) introduced his cognitive-behavioural account, several theorists have suggested cognitive distortions other than inflated responsibility that might also underlie OCD. As previously mentioned, distortions regarding inflated responsibility, overestimation of threat, intolerance of uncertainty, perfectionism, importance of thoughts, and control of thoughts are involved in OCD (Faull et al., 2004; Taylor et al., 2005;

OCCWG, 1997, 2001, 2003, 2005). Studies using the Obsessive Beliefs Questionnaire (OBQ; OCCWG 1997, 2005) demonstrated that these constructs were stable cognitive processes among individuals with OCD, but that they were closely correlated and could be grouped into three belief domains: RT; PC; and ICT. RT involves perceived responsibility for bad things happening, a desire to prevent harm, and beliefs about the consequences of inaction. High scores on PC indicate high and absolute standards for task performance, rigidity, and concern about mistakes. ICT involves fear of the consequence of having intrusions and feeling the need to get rid of them (OCCWG, 2005).

It is important to note that theories emphasising various beliefs as important in OCD do not directly challenge Salkovskis' (1985, 1989) cognitive-behavioural framework or suggest that inflated responsibility is not important in OCD, they simply expand on cognitive-behavioural understanding of this disorder. All cognitive-behavioural theories of OCD recognise that interpretation of intrusions, rather than intrusions themselves, is the basis for OCD (Abramowitz, Nelson, Rygwall, & Khandker, 2007). The behavioural mechanisms discussed above are similar across theories, it is only the cognitive beliefs/distortions that drive these mechanisms that differ. These distortions will be briefly reviewed because they are likely to relate to overestimation of threat in general situations among individuals with OCD.

Overestimation of threat.

Individuals with OCD overestimate threat in a variety of situations (e.g., Moritz & Jelinek, 2009; Moritz & Pohl, 2009; Overton & Menzies, 2005; Rachman, 1998). The OCD-specific application of the cognitive biases involved in Beck et al.'s (1985) model of threat perception will be reviewed in Chapter 5. Although of crucial importance to OCD maintenance (Rachman, 1998) overestimation of threat is not unique to OCD and is, as already discussed, a cognitive distortion associated with all anxiety disorders. However, among individuals with OCD, overestimation of threat is multifaceted (Moritz & Pohl, 2009) and is likely to be linked to other cognitive errors. For example Rachman (1997) linked ICT to threat overestimation in OCD. He suggested that individuals with OCD interpret intrusive cognitions as revealing important but hidden elements of their personality, such as "I am evil" or "I am dangerous". These personally salient negative cognitions are too threatening to be ignored or dismissed and therefore they persist, often resulting in fear of specific negative consequences, such as harming another person, losing control, or being rejected by anyone who discovers the content of the obsessive thoughts. These negative interpretations then

serve to make a range of previously neutral stimuli potentially threatening (Rachman, 1998). For example, if an individual misinterprets intrusive thoughts about harming others as a sign that he/she is evil, any object that could potentially be used to harm other people can be perceived as a source of threat, generating anxiety and provoking further obsessions. This strengthens the catastrophic misinterpretation and results in a cycle of increased frequency of obsessions that are triggered by a widening array of external stimuli and accompanied by avoidance and/or neutralising (Rachman, 1998).

Importantly, Salkovskis, Forrester, and Richards (1998) linked inflated responsibility beliefs directly to overestimation of threat among individuals with OCD by suggesting that if individuals with OCD judge themselves as responsible for preventing negative outcomes, this increases the perceived cost/awfulness of those outcomes, resulting in heightened threat perception. Salkovskis and colleagues were the first researchers to directly link their cognitive-behavioural theory of OCD to Beck et al.'s (1985) model of threat perception and their contention is supported by evidence that responsibility and threat estimation appear to form the same construct in OCD (OCCWG, 2003, 2005). This, along with how other cognitive distortions in OCD might be linked to threat perceptions, will be addressed more thoroughly in Chapter 5.

Perfectionism/intolerance of uncertainty.

Unhealthy perfectionism is common among individuals with OCD (Moretz & McKay, 2009; Wu & Cortesi, 2009), as well as other clinical disorders (Egan, Wade, & Shafran, 2011; Frost & Steketee, 1997; Rheaume, Freeston, Dugas, Letarte, & Ladouceur, 1995). The distinguishing feature of clinically significant perfectionism is the presence of personally demanding standards and overdependence on self-evaluation in at least one important life domain, which continues despite the occurrence of adverse consequences (Shafran, Cooper, & Fairburn, 2002). Unhealthy perfectionism is primarily involved in OCD subtypes involving symmetry and "not-just right experiences", rather than those involving overestimation of threat (e.g., Polman, O'Connor, & Huisman, 2011). However, individuals with OCD are particularly averse to making mistakes, doubt their ability to perform tasks competently (to their own high standards), and have a high fear of failure (Frost & Steketee, 1997; Shafran et al., 2002; Sassaroli et al., 2008). From this perspective, unhealthy perfectionism can be tentatively linked to low perceived ability to cope with negative events (and consequent threat overestimation and risk-aversion) among individuals with OCD. It is also possible that high levels of perfectionism could predispose individuals to overestimate

their level of responsibility in various situations (Bouchard et al., 1999), thereby indirectly driving inflated cost estimates of negative events. In addition, unhealthy perfectionism is related to intolerance of uncertainty – individuals with OCD often perceive perfectionism as a means to avoid any potential mistakes or unexpected outcomes.

As early as 1974, Carr suggested that individuals with OCD commonly have difficulty tolerating any level of uncertainty. More recently, IU has been suggested to be an important cognitive variable contributing to OCD symptoms (Tolin, Abramowitz, Brigidi, & Foa, 2003). It is heightened among individuals with OCD compared to non-clinical individuals and most anxious groups (Gentes & Ruscio, 2011; Grayson, 2010; Holaway et al., 2006; Steketee et al., 1998; Tolin, Abramowitz, et al., 2003). Lind and Boschen (2009) found that IU predicted OCD symptoms among a mixed sample of individuals with OCD and non-clinical individuals. Holaway et al. (2006) obtained similar results, although IU was no higher among individuals with OCD than those with GAD.

IU involves behavioural efforts to prevent uncertainty by controlling events and outcomes, and the inhibition of action in the presence of any uncertainty. It also involves interpreting being uncertain as reflecting negatively upon the self, with consequent anxiety, stress, and frustration (Tolin, Abramowitz, et al., 2003). It is likely that IU is prevalent among individuals who believe that they lack adequate skills to cope with potential threats and consequently attempt to prevent any probability of the occurrence of negative events (OCCWG, 1997). Tolin, Abramowitz, et al. (2003) suggested that the pathological doubt commonly displayed by individuals with OCD is likely to be related to their inability to tolerate uncertainty.

IU is postulated to drive OCD symptoms because it causes any possibility of negative outcomes to be deemed unacceptable (i.e., threatening), and therefore rituals and/or avoidance behaviour are initiated in order to prevent even the remote possibility of negative outcomes (Grayson, 2010). In addition, it is likely that IU is partially responsible for the repetitive nature of OCD rituals – individuals repeat rituals because of inability to tolerate uncertainty regarding whether they completed the ritual correctly (Tolin, Abramowitz, et al., 2003). As will be discussed in Chapter 5, IU suggests that perceptions of elevated threat among individuals with OCD need not involve overestimates of the probability of negative outcomes in order to generate anxiety – the possibility, however remote, of a feared/negative event is enough to cause anxiety among individuals who fear uncertainty (Grayson, 2010).

Importance/control of thoughts.

As previously mentioned, many individuals with OCD believe that merely having a thought, particularly a recurring one, signals that the thought is important (OCCWG, 1997; Teachman et al., 2006). Some individuals with OCD believe that not neutralising following an intrusive thought is equivalent to wanting the events within that thought to actually occur. They consequently regard themselves as being responsible for taking steps to prevent any harm, and subsequent responsibility for that harm, that may result from intrusions (Greenberg & Witzum, 1994; O'Leary et al., 2009; Rachman & Shafran, 1998; Salkovskis, Forrester, Richards, & Morrison, 1998; Tallis, 1995).

Teachman et al. (2006) conducted an experimental study involving 156 non-clinical participants split into three groups. Individuals who were informed that their intrusive thoughts are important and indicative of their true values made stronger evaluations of the self as dangerous than did individuals who received no instructions, or who were told that their intrusive thoughts are unimportant. There was a stronger effect for individuals with higher levels of preexisting OCD beliefs. In addition, self-reported beliefs about the importance of intrusions were positively related to OCD-relevant beliefs. Similarly, Teachman and Clerkin (2007) demonstrated that manipulation of beliefs about the immorality of intrusive thoughts led to changes in implicit evaluations of the self as dangerous and immoral, and that these changes interacted with preexisting levels of obsessive beliefs.

TAF involves assigning excessive importance to thoughts and is common among individuals with OCD. It can involve two separate, although related elements: Moral TAF and Likelihood TAF. Moral TAF is a process whereby thoughts and actions regarding harm are perceived as morally equivalent (Altin & Gencoz, 2011; Greenberg & Witzum, 1994; O'Leary et al., 2009; Salkovskis, Forrester, Richards, & Morrison, 1998). Likelihood TAF involves the belief that the occurrence of a negative thought increases the likelihood that the contents of that thought will be actualised (OCCWG, 1997). Hence, TAF can cause thoughts of negative consequences, such as harm occurring to a loved one, to be perceived as being threatening because of increased perceived probability of harm, or because of increased perceived cost of harm due to the perception that the individual is morally responsible for the potential occurrence of those outcomes. This can produce counterproductive attempts at preventing the occurrence of intrusions, which actually serve to increase their occurrence (Grisham & Williams, 2009; Magee & Teachman, 2007), resulting in a spiral of thought control attempts and increased frequency of intrusions (Purdon & Clark, 2000; Rassin, Diepstraten, Merckelbach, & Muris, 2001).

Therefore, ICT appears to drive OCD symptoms by resulting in increased salience and frequency of obsessive cognitions, as well as inflated beliefs in the importance of acting to ensure that the content of thoughts does not eventuate (O'Leary et al., 2009; Rassin et al., 2001). However, it is likely that assigning high levels of importance to thoughts, and subsequent attempts to control those thoughts, are features of pathological anxiety rather than OCD specifically, although they might be more important in OCD (Abramowitz, Whiteside, Lynam, & Kalsy, 2003; OCCWG, 1997; Rasin et al., 2001). Nevertheless, TAF in particular is likely to be related to primary appraisal of threat – influencing the perceived probability and/or cost of feared events that are contained in obsessive thoughts.

However, given the commonly observed close correlations between various obsessive beliefs, the utility of studying them separately is questionable. As a result, the majority of recent studies have attempted to address them simultaneously.

Comparison of Cognitive Distortions in OCD

In general, research (e.g., Taylor et al., 2005; Wu & Carter, 2008) has supported the structure of obsessive beliefs proposed by the OCCWG (2005). Current models of OCD indicate that these three types of dysfunctional beliefs are involved in OCD development and maintenance (Kaiser, Bouvard, & Milliery, 2010; Taylor et al., 2010), although some studies have continued to assess them as six separate constructs (e.g., Myers, Fisher, & Wells, 2008). It is clear that dysfunctional beliefs, particularly RT, are important factors in OCD symptomatology and are likely to be premorbid risk factors for OCD development (e.g., Abramowitz, Khandker, Nelson, Deacon, & Rygwall, 2006; Abramowitz et al., 2007; Belloch et al., 2010; Calleo, Hart, Bjorgvinsson, & Stanley, 2010; Myers et al., 2008; Tolin, Woods, & Abramowitz, 2003). There have not, however, been consistent findings regarding how these specific beliefs relate to OCD symptoms (Belloch et al., 2010; Tolin et al., 2008; Wheaton et al., 2010; Wu & Carter, 2008). Wu and Carter (2008) suggested that "it does not appear that unambiguous one-to-one relations between OBQ beliefs and OCD symptoms are typical" (p. 833). However, when measured as a combined construct as recommended by the OCCWG (2005), it appears that RT is consistently related to OCD symptom dimensions, with the possible exception of ordering (Belloch et al., 2010; Calleo et al., 2010; Taylor et al., 2010; Tolin et al., 2008; Wheaton et al., 2010). ICT and PC have also been consistently linked to OCD symptoms, but specific relationships have varied across studies.

Using a sample of 5015 non-clinical participants, Taylor et al. (2010) found that RT significantly predicted all six OCD symptom types. PC only predicted ordering symptoms

and ICT predicted obsessing as well as weakly predicting washing and neutralising. Overall, dysfunctional beliefs accounted for 23% of the variance in OCD symptoms. Taylor et al. (2010) tested the fit of a model in which RT drove ICT and PC, and where PC drove ICT. This model was a good fit for the data, suggesting that RT might be driving other OCD beliefs. Taylor et al. suggested that RT is particularly important in predicting OCD symptoms, which is consistent with Salkovskis' (1985, 1989) theory of OCD. Consistent with this, Tolin et al. (2008) found that RT was significantly related to all OCD symptoms assessed except for ordering, whereas the ICT and PC were not related to all symptoms.

Belloch et al. (2010) suggested that consensus has been reached regarding the general dysfunctional belief domains involved in OCD, although the dimensionality of these domains remains to be delineated, as does their specific relationship to OCD versus anxiety disorders in general. In particular, although individuals with OCD have higher levels of obsessive beliefs than non-clinical individuals, it is unclear whether any of these beliefs are, in fact, specific to OCD given the inconsistency of results obtained using the OBQ (Belloch et al., 2010; Viar, Bilsky, Armstrong, & Olatunji, 2011). However, Tolin et al. (2008) suggested that research using the OBQ has largely, although not uniformly, indicated that individuals with OCD endorse more obsessional beliefs than do other anxious individuals. Similarly Julien et al. (2008) found that their OCD group scored higher than the anxious control group and the non-anxious group on all obsessive belief domains.

It is possible that none of the obsessive belief domains hypothesised to be central to OCD are, in fact, unique to the disorder (although inflated responsibility for harm is not prominent in cognitive models of other anxiety disorders). It is plausible that it is their pattern of interaction that is directly involved in OCD symptoms (Taylor et al., 2010). Given that they are closely correlated with each other (Belloch et al., 2010; Myers et al., 2008; Taylor et al., 2010 Tolin et al., 2008) it is also possible that obsessive beliefs are representative of a broader, as yet undefined, cognitive construct that drives OCD (e.g., Doron & Kyrios, 2005). This is consistent with studies suggesting that the OBQ, although assessing the constructs suggested by the OCCWG, also contains a larger, general factor (e.g., Faull et al., 2004; Taylor et al., 2005; Woods et al., 2004; Wu & Carter, 2008).

It is also possible that the high level of intercorrelation between obsessive beliefs can be attributed to the reciprocal nature of these beliefs, which interact to generate OCD symptoms (Frost & Steketee, 2002; Taylor et al., 2010). For example, heightened levels of responsibility are likely to increase the need to act perfectly, reinforcing beliefs about the importance of controlling thoughts. Rheaume et al. (1995) also provided an example whereby

the occurrence of an obsessive thought might be interpreted as indicating that the individual is likely to cause harm to others (i.e., increased threat), while also indicating that the individual is inherently flawed (violating perfectionistic standards). Responsibility for the prevention of the harm, as well as moral responsibility, is then assumed.

The importance of "obsessive cognitions" in OCD pathology is not in dispute, only their unique contributions and interrelationships remain unclear. However, although cognitive biases predict OCD symptoms, significant variance in each symptom dimension is typically unaccounted for by these biases, indicating that other variables are also involved in OCD symptoms (Moulding, Doron, & Kyrios, 2007; Moulding et al., 2009; Wheaton et al., 2010). In addition, it appears likely that some individuals with OCD do not endorse any of the beliefs typically associated with the disorder (Chik, Calamari, Rector, & Riemann, 2010; Polman et al., 2011; Taylor et al., 2006), increasing the likelihood that other cognitive factors might be involved. In particular, low sense of control over situations and a sense of low self-efficacy have been hypothesised to be involved in OCD pathology (Doron & Kyrios, 2005).

The Role of Variables Related to Control in OCD

Doron and Kyrios (2005) suggested that "Traditional cognitive theories of OCD have also neglected some important aspects of Beck's (1976) cognitive triad" (p. 417). The individual's perceived ability to cope with potential negative events, although central to Beck et al.'s (1985) cognitive model, is largely ignored. This is evident in the OCCWG's (1997) definition of heightened threat estimation in OCD as involving overestimates of the probability and cost of negative events, without considering perceived coping ability.

Doron and Kyrios (2005) suggested that the individual's self-perceptions and world-view, although not widely studied, are important in the development and maintenance of OCD. Guidano and Liotti (1983) argued that, although all anxious individuals perceive the world as threatening, what differentiates individuals with OCD is that they also perceive the world as controllable, at least to some extent. Doron and Kyrios posited that this perception of controllability drives the individual to assume responsibility for preventing negative outcomes, and consequent rituals or avoidance.

However, perception of the world as controllable does not equate to the perception of the self as competent to provide this control, and individuals with OCD often do not perceive themselves as capable of exerting the desired level of control over potentially aversive situations (Doron & Kyrios, 2005). Building on the notion that the perception of the world as threatening but controllable underlies OCD (Doron & Kyrios, 2005; Guidano & Liotti, 1983),

Moulding and Kyrios (2006) discussed two broad concepts relating to control: Sense of control (SC) and desire for control (DC). SC incorporates self-efficacy, internal locus of control, and other variables contributing to the perceived level of control that is available to the individual in a particular situation. DC relates to the individual's general desire to exert control over events in their daily lives. Individuals who have a high DC but low SC in a given situation are prone to psychological distress, particularly anxiety and depression (e.g., Baron & Logan, 1993, as cited in Moulding & Kyrios, 2006).

Based on previous findings that OCD symptoms were related to low SC (McLaren & Crowe, 2003; Zebb & Moore, 2003), Moulding and Kyrios (2006) suggested that discrepancies between an individual's DC and SC could generate anxiety and motivate compulsive behaviour as a means to reduce anxiety and exert control, even in situations where high levels of magical thinking are involved. As such, DC-SC discrepancies are likely to be involved in OCD pathology (Moulding & Kyrios, 2006).

Moulding and colleagues have provided evidence that DC-SC discrepancies are important in the prediction of OCD symptoms. For example, Moulding et al. (2007) demonstrated that manipulation of responsibility and perceived threat influenced appraisals of DC in a large non-clinical sample. DC was significantly higher in the high versus low responsibility condition and the high versus low threat condition, with moderate effect sizes. SC, however, was not influenced by threat manipulation, and was only influenced to a small degree by manipulation of responsibility (Moulding et al., 2007). Moulding, Doron, Kyrios, and Nedeljkovic (2008) replicated these results in a clinical sample of individuals with OCD. This suggests that perception of potential threat, and/or perceived responsibility for potential harm, generates a high desire to control potential negative outcomes among individuals with OCD. However, increased desire for control in the presence of potential negative outcomes is accompanied by perceived inefficacy to exert that control, resulting in individuals with OCD feeling responsible but incapable of preventing negative outcomes. This is consistent with Salkovskis and Freeston's (2001) suggestion that inflated responsibility for harm does not necessarily equate with increased perceptions of ability to prevent that harm. Importantly, Moulding et al. (2008) demonstrated that DC-SC discrepancies were not present in an anxious control group, suggesting specificity to OCD and the possibility that coping self-efficacy might be lower among individuals with OCD compared to other anxious groups.

Higher DC and lower SC predict OCD symptoms after controlling for anxiety and depression (Moulding & Kyrios, 2007; Moulding et al., 2009). Lower SC drives OCD symptoms directly and indirectly, whereas higher DC drives OCD symptoms indirectly via

increased obsessive beliefs (Moulding et al., 2009). It appears that higher levels of DC are not a risk factor for OCD unless they are coupled with significantly lower SC. In other words, individuals with OCD lack a sense of being able to control the occurrence of potential negative events. This is indirect evidence that individuals with OCD are likely to underestimate their ability to cope with negative events and that this could underlie their general risk-aversion.

Summary of Cognitive-Behavioural Theories of OCD

In summary, cognitive-behavioural theorists have suggested that several cognitive distortions are involved in the development and maintenance of OCD. It is clear that each of these distortions is important in OCD, but it is equally clear that they are overlapping constructs and the dimensionality of obsessive beliefs remains somewhat ambiguous. One important over-arching construct that encompasses many of the cognitive distortions outlined in this chapter is risk-aversion. The link between risk-aversion and cognitive constructs in OCD will be made in Chapter 5. General risk-aversion will now be reviewed as it pertains to OCD and other anxiety disorders.

CHAPTER 3

RISK-AVERSION IN OCD AND OTHER ANXIETY DISORDERS

Risk-Aversion in OCD and other Anxiety Disorders

Chapter Overview

The discussion of risk-aversion among individuals with OCD will be divided into three sections. The first section will briefly review evolutionary theories suggesting that OCD is related to risk-aversion. The second section will examine personality research suggesting that individuals with OCD are harm-avoidant. Finally, evidence from studies employing specific scenarios to directly assess risk-taking and risk attitudes among individuals with OCD will be outlined. Following this, evidence that risk-aversive/harm-avoidant personality is present in other disorders, and that general risk-aversion might be implicated in the pathogenesis of other anxiety disorders, will be examined. A discussion of the possible role of general risk-aversion in treatment failure and relapse will conclude the chapter.

Evolutionary Theories of OCD as a Risk-Aversive Disorder

Abed and de Pauw (1999) proposed that OCD involves overactivity of the evolved cognitive process used to generate risk scenarios in the absence of actual experience of those scenarios. In other words, obsessive cognitions and behaviour can be conceptualised as an "off-line risk avoidance process" (Abed & de Pauw, 1999, p. 245) designed to anticipate and avoid potential risks at some future time, even if those risks have not been experienced.

Building on this, Brune (2006) proposed that from an evolutionary perspective, OCD can be considered as "an extreme on a continuum of evolved harm-avoidance strategies" (p. 317), involving a pathological exaggeration of the evolved ability to cognitively represent potential consequences of thoughts, actions, and situations. The brain areas involved in the imagination of future scenarios and detecting threat (in particular the prefrontal cortex, the anterior cingulate cortex, the thalamus, the insula, and the caudate nucleus) are overactive in individuals with OCD (Brune, 2006; Feygin et al., 2006). This cognitive and behavioural threat detection process evolved as a means of anticipating and avoiding potential threats to wellbeing and of anticipating future events. For the majority of human existence it has been far more adaptive to falsely respond to a situation as a threat than to ignore a genuinely dangerous scenario. However, in the modern environment, where genuine threats to safety are less common, this tendency is prone to false alarms, resulting in some individuals erroneously perceiving a multitude of potential threats (potentially located at an unspecified future time). Over-anticipation of potential threats and attempts to avoid these threats can result in behavioural rigidity, the extreme of which is seen in OCD symptoms (Brune, 2006;

Feygin et al., 2006). These evolutionary processes are unlikely to be restricted to OCD-specific concerns and could be linked to general risk-aversion in OCD.

Although research into the evolutionary basis of OCD remains speculative, theories relating it to risk-aversion are congruent with the notion of obsessions as involving the cognitive anticipation of negative events that need to be controlled (Brune, 2006). This research is also congruent with research into the personality profile of individuals with OCD which suggest they are highly harm-avoidant.

Evidence of Risk-Aversive Personality in OCD

Research investigating the personality profile of individuals with OCD has consistently demonstrated that this population is high in personality traits relating to risk-aversion. Largely, this research has been conducted using Cloninger's (1987) psychobiological model of personality.

Cloninger's (1987) psychobiological model proposed three temperament dimensions, termed novelty seeking (NS), harm avoidance (HA), and reward dependence (RD). A fourth dimension, labelled persistence (P) was subsequently added (Cloninger, Svrakic, & Przybeck, 1993). Temperament is posited to involve a large (40-60%) heritable component (Alonso et al., 2008; Lyoo et al., 2003). NS involves excitement and approach in response to novel stimuli and impulsiveness in decision making and is negatively related to risk-aversion, although more from a sensation-seeking perspective (Alonso et al., 2008). RD involves the tendency to be sociable and sensitive, and is related to feelings of attachment towards other people (Ongur, Farabaugh, Iosifescu, Perlis, & Fava, 2005). P involves the tendency to be hard working, industrious, and stable (Cloninger et al., 1993).

Of particular relevance to risk-aversion is the temperament of HA, which is "the tendency to respond intensely to signals of aversive stimuli, thereby learning to inhibit behavior (sic) to avoid punishment, novelty, and frustrative non-reward" (Cloninger, 1987, p. 575). Individuals high in HA tend to be cautious, fearful, tense, apprehensive, nervous, timid, doubtful, discouraged, insecure, passive, negativistic, or pessimistic even in situations that do not worry other people (Cloninger et al., 1993). They are usually characterised by anticipatory anxiety and concern about future problems, fear of uncertainty, shyness, and fatigability (Alonso et al., 2008; Kima et al., 2009; Pfohl, Black, Noyes, Kelley, & Blum, 1990). Thus, the personality dimension of HA is closely related to risk-aversive attitude and behaviour (Cloninger et al., 1993). Each temperament dimension appears to be related to a

specific neurotransmitter system, with HA relating to the serotonin system (Richter, Summerfeldt, Joffe, & Swinson, 1996).

To date, research utilising Cloninger's (1987) Tridimensional Personality Questionnaire (TPQ) and its successor, the Temperament and Character Inventory (TCI; Cloninger, 1994) has consistently demonstrated that individuals with OCD are highly harm avoidant, regardless of their treatment status (Alonso et al., 2008; Ettelt et al., 2008; Gothelf, Aharonovsky, Horesh, Carty, & Apter, 2004; Kima et al., 2009; Lyoo et al., 2001; Lyoo et al., 2003; Marchesi, Ampollini, DePanfilis, & Magini, 2008; Pfohl et al., 1990; Richter et al., 1996; Savron, Montanaro, Mordent, & Pitti, 2007).

For example, Pfohl et al. (1990) compared 25 individuals with OCD to 35 non-clinical controls on the TPQ. Individuals with OCD scored significantly higher on the HA dimension than did non-clinical individuals, with this result remaining after controlling for age and gender. Similar results were reported by Richter et al. (1996), who demonstrated that higher HA among individuals with OCD (N = 32) compared to matched non-clinical individuals (N = 32) remained after controlling for depressed mood. Furthermore, Alonso et al. (2008) demonstrated that higher levels of HA among individuals with OCD remained after excluding participants with comorbid diagnoses.

Results from differing cultural contexts have consistently demonstrated higher levels of HA among individuals with OCD compared to non-clinical individuals, even after accounting for the impact of negative mood (Cruz-Fuentes, Blas, Gonzales, Camarena, & Nicolini, 2004; Kima et al., 2009; Lyoo et al., 2001; Lyoo et al., 2003; Savron et al., 2007). It therefore appears that high levels of HA are a universal feature associated with OCD.
It also appears that HA predicts OCD severity independently of mood factors, with symptom severity increasing as HA increases (Kima et al., 2009; Lyoo et al., 2001; Lyoo et al., 2003; Savron et al., 2007). With the exception of Alonso et al. (2008), research has suggested that there is specificity in the OCD-HA relationship after accounting for mood factors (Kima et al., 2009; Pfohl et al., 1990; Richter et al., 1996). However, it should be noted that depression is also closely related to HA so the degree of specificity might be small (Alonso et al., 2008; Lyoo et al., 2003).

Ettelt et al. (2008) demonstrated that individuals with OCD (N = 75) scored significantly higher on HA than did matched controls (N = 75). In addition, first degree relatives of individuals with OCD demonstrated higher levels of HA than controls. This is important because studies into other personality dimensions among relatives of OCD sufferers have typically not demonstrated personality pathology (Ettelt et al., 2008),

suggesting that HA might be a distinguishing feature of the personality profile of OCD relatives. This led Ettelt et al. to suggest that HA might be a familial risk factor for OCD, both in terms of inherited temperament and because of overprotective parenting from harm-avoidant parents engendering risk-aversive behaviours and beliefs in their children.

Studies using the TPQ and TCI have consistently demonstrated that individuals with OCD have high levels of HA, but findings for the other temperament dimensions have been inconsistent (Alonso et al., 2008; Kima et al., 2009). For example, Pfhol et al. (1990) found that individuals with OCD scored higher on RD (although this difference was small), but not on NS, than did non-clinical individuals. However, Lyoo et al. (2001) did not find significant differences in RD between individuals with OCD and non-clinical individuals. Findings of low NS among individuals with OCD are also not ubiquitous, with some studies (e.g., Alonso et al., 2008; Lyoo et al., 2001) suggesting NS is low among individuals with OCD and others suggesting that it is not (e.g., Gothelf et al., 2004; Kima et al., 2009; Richter et al., 1996). Inconsistent findings on NS suggest that individuals with OCD are not necessarily averse to taking risks in order to obtain positive outcomes or pleasure. Rather, it is the avoidance of risks/potential threats related to potentially aversive stimuli (related to HA) that is likely to be central to OCD. From a personality standpoint, HA appears to be the feature that consistently distinguishes individuals with OCD from non-clinical individuals (Richter et al., 1996). Alonso et al. (2008) suggested that the observed high levels of HA among individuals with OCD is consistent with the theory that high levels of estimated risk, combined with distorted estimates of one's ability to prevent harm, result in individuals with OCD viewing situations as being dangerous until proven safe.

Interestingly, and consistent with the proposition that high levels of HA are central to OCD, dysfunction of the serotonin system is posited to play a role in OCD (Gross, Sasson, Chopra, & Zohar, 1998) and selective serotonin reuptake inhibitors (SSRIs) are an effective medical treatment for OCD (Abramowitz, Brigidi, & Roche., 2001; Foa et al., 1998). Given that HA is believed to involve the serotonin system (Richter et al., 1996), it is possible that the effectiveness of SSRIs is linked to their alteration of HA-related cognitive functions, although this is speculative.

High levels of risk-aversive personality among individuals with OCD have also been reported using other personality measures. For example Wu, Clark, and Watson (2006) found that individuals with OCD scored significantly lower than non-clinical individuals on the risk-taking scale of the SNAP-2 personality scale (Clark, 1993). For most of the personality constructs assessed, there were no significant differences between the groups, again

suggesting that avoidance of risk might be part of the unique personality profile of individuals with OCD.

Sensitivity to punishment is a personality construct that is also closely associated with avoidance of risk (e.g., Demaree, DeDonno, Burns, & Everhart, 2008). Fullana et al. (2004) demonstrated that students with high levels of OCD symptoms (N = 25) were significantly more sensitive to punishment than were students with low levels of OCD symptoms (N = 28). In addition, individuals with clinical OCD (N = 56) were significantly more sensitive to punishment than were non-clinical individuals (N = 40), with OCD symptom severity significantly positively correlated with sensitivity to punishment in the clinical group. These results remained after controlling for anxiety and depression. Greater sensitivity to punishment among individuals with OCD is a likely contributor to the high levels of risk-aversion commonly observed in this population, and relates to increased sensitivity to causal pathways to harm (e.g., Tallis, 1995).

Studies using the NEO-PI-R (Costa & McCrae, 1992) will be discussed in more detail in Chapter 5. However, findings have consistently suggested that individuals with OCD score low on the competence facet of the conscientiousness domain (Rector, Hood, Richter, & Bagby, 2002; Rees et al., 2006; Samuels et al., 2000). This facet is likely to be related to avoidance of risk because individuals who have low self-rated competence are likely to believe that they cannot cope with the potential negative consequences of risk (Beck et al., 1985; Boekaerts, 1991; Nicholls, Polman, & Levy, 2010; Ozer & Bandura, 1990). Importantly, the items comprising the NEO PI-R are not related to any typical OCD concerns or symptoms, reinforcing the notion of general risk-aversion in OCD.

Another interesting finding is that individuals with OCD score significantly lower than depressed individuals on the actions facet of the NEO-PI-R Openness domain (Rector et al., 2002; Rees et al., 2006). This indicates that they are unwilling to try new activities, and find it difficult to adapt to change (Costa & McCrae, 1992). The actions facet correlates highly with the construct of harm avoidance and general risk-aversion (Costa & McCrae, 1992), further supporting the notion that individuals with OCD might be particularly risk-aversive and suggesting that interventions for OCD should begin to directly target risk-aversion in general, not only as it specifically applies to OCD symptoms (Rees et al., 2006).

Overall, results of personality studies have consistently indicated that individuals with OCD are highly harm-avoidant. However, it is somewhat unclear whether high HA among individuals with OCD is primarily related to their OCD symptoms, depression, anxiety, a combination of these, or some other factor/s (e.g., Alonso et al., 2008; Kima et al., 2009;

Lyoo et al., 2001). Overall, the evidence suggests that there is some specificity to OCD, although negative affect is also clearly important. Only a small number of studies have directly compared individuals with OCD to other groups of clinical individuals on the TCI.

Lochner et al. (2005) demonstrated that individuals with OCD were more harm-avoidant (and lower on NS) than individuals with trichotillomania when assessed on the TCI, although both groups scored above non-clinical means. There were no differences between the groups on other personality dimensions assessed by the TCI, again suggesting that HA might be central to the personality profile of individuals with OCD. However, depressive severity was not controlled in the analyses, suggesting that differences in depressive severity could have contributed to the observed difference in HA between groups. Similarly, Kim and Grant (2001) found that individuals with OCD were more harm-avoidant than pathological gamblers or non-clinical individuals on the TPQ. Gamblers, however, did not differ on HA compared to non-clinical controls. Kusunoki et al. (2000) found that individuals with OCD and those with major depression both scored higher on HA than non-clinical individuals, but no different to each other. A complicating factor, however, is the use of medical treatments in this study because it appears likely that anti-depressant medication can influence HA scores (e.g., Spittlehouse et al., 2010), rendering interpretation of the results somewhat difficult.

Although some evidence suggests that individuals with OCD have higher levels of HA than some other clinical groups, these studies, with the exception of Lochner et al. (2005), have not compared individuals with OCD to other groups of anxious individuals who would be expected to be highly harm-avoidant (e.g., Maner & Schmidt, 2006). Gothelf et al. (2004) found that children with OCD scored higher on HA than non-clinical children, but not higher than other clinically anxious children. Gothelf et al. suggested that harm-avoidant personality might be involved in the development of anxiety disorders in general.

Regardless of its disorder specificity, harm-avoidant personality is clearly prevalent among individuals with OCD. Although not necessarily directly causing risk-aversive behaviour, high levels of HA and related personality constructs are likely to engender a risk-aversive propensity, which is likely to drive overestimation of threat in various scenarios (Sitkin & Pablo, 1992). Overestimation of threat, which will be examined later, does drive risk-aversive behaviour (Beck et al., 1985; Berenbaum, Thompson, & Bredemeier, 2007; Klumpp & Amir, 2010; Maner & Schmidt, 2006). Therefore, the personality of individuals with OCD is likely to be indirectly involved in their risk-aversive cognitive and behavioural patterns. However, direct evidence for risk-aversive preferences is best elicited through research that directly assesses risk intentions and behaviour, and this will now be reviewed.

Specific Evidence of General Risk-Aversion in OCD

Steiner (1972) designed a risk-taking questionnaire to "make a rapid and simple assessment of risk-taking attitudes" (p. 365). This scale assessed attitudes to risk-taking in the areas of driving, money, danger, conscientiousness, social risks, and alcohol and drugs. Steiner administered the questionnaire to a group of psychiatric patients (including "obsessional", "manic-depressive", "depressive neurosis" "other neurosis", "schizophrenic", "personality disorder", and "antisocial" diagnoses) and non-psychiatric control groups (doctors, accident patients, and surgery patients). The obsessional group scored significantly lower on risk-taking compared to all other participant groups, apart from the manic-depressive, depressive neurosis, and other neurosis groups. However, given the relatively small number of obsessional participants, Steiner suggested that it is possible that significant effects were missed. Steiner commented that the observed low risk-taking scores among the obsessional group are consistent with clinical experience that suggests that these individuals tend to be cautious. Given that the questionnaire assessed risk attitudes in non-OCD situations, these results are highly suggestive of general risk-aversion in OCD, although it must be noted that the precise diagnostic nature of the "obsessional" group is unclear, and some individuals might have met criteria for obsessive-compulsive personality disorder (OCPD) rather than OCD.

Most validated measures of risk-taking or risk-aversion assess sensation-seeking risks that are performed in pursuit of pleasure. This type of risk-taking, although possibly reduced in individuals with OCD compared to non-clinical individuals (Lapsekili et al., 2010) is not directly relevant to OCD, which appears to be characterised more by attempts to avoid or prevent harm through the avoidance of general, mild, but non-pleasurable risks (Cicolini & Rees, 2003; Steketee & Frost, 1994). With this rationale, Steketee and Frost (1994) developed and validated the Everyday Risk Inventory (ERI), which assesses risk-taking intention relating to these ordinary general activities.

The ERI and a version of the ERI revised for use with Australian samples (Cicolini & Rees, 2003) have demonstrated good psychometric properties, with high levels of internal consistency and test-retest reliability (Cicolini & Rees, 2003; Garratt-Reed, 2004; Steketee & Frost, 1994). The ERI also correlates in the expected direction with other risk-taking measures and has good discriminant validity (Cicolini & Rees, 2003; Steketee & Frost, 1994).

Steketee and Frost (1994) found that individuals with OCD (N = 23) scored significantly lower on the ERI (indicating lower levels of general risk-taking) than did non-

clinical participants (N = 38) even after controlling for age and gender. This same pattern was demonstrated on the Jackson Personality Inventory (JPI, Jackson, 1970) risk-taking scale. Results remained unchanged when any ERI items that might be considered relevant to OCD checking or washing concerns were eliminated, suggesting that risk-aversion is a trait that permeates all aspects of the lives of individuals with OCD.

Frost et al. (1994) compared individuals with sub-clinical OCD symptoms (13 in sample 1, 21 in sample 2) with non-clinical individuals (15 in sample 1, 23 in sample 2) on the ERI and the JPI. Results indicated that individuals with sub-clinical OCD symptoms reported significantly higher risk-aversion on the ERI and the JPI than did non-clinical individuals. This was consistent across both samples used. It therefore appears that risk-aversion is important across the spectrum of OCD severity, from sub-clinical to highly impaired.

Using a version of the ERI adapted for use with Australian samples (the ERI-AUS), Cicolini and Rees (2003) replicated the results of Steketee and Frost (1994) and Frost et al. (1994) using a sample of 143 non-clinical individuals and 17 individuals with OCD. Non-clinical participants were classified as either sub-clinical or non-clinical based on a measure of OCD symptomatology. Individuals with OCD scored lower than non-clinical individuals on the ERI-AUS, indicating higher levels of general risk-aversion. Consistent with Steketee and Frost (1994), the same pattern of results was obtained after deleting items that could be related to OCD symptoms, indicating that individuals with OCD make risk-aversive decisions even in situations that are not relevant to OCD concerns. Although the clinical group scored lower on the ERI-AUS than the sub-clinical group, this difference failed to reach significance. It should be noted, however, that this appears to have been related to the relatively small sample size in the clinical group. The magnitude of the difference in ERI-AUS scores between the clinical and sub-clinical group was higher than the magnitude of the significant difference between the sub-clinical and non-clinical groups. Cicolini and Rees reported a positive relationship between risk-aversion and OCD severity, even when items relevant to OCD were excluded from the analysis (this relationship was also reported by Rees and van der Klift, 2000). Cicolini and Rees acknowledged that it remained unclear whether individuals with OCD would be more risk-aversive than other anxious individuals on the ERI-AUS.

Overall, findings using the ERI have indicated that individuals with OCD are more risk-aversive than non-clinical individuals (Cicolini & Rees, 2003; Frost et al., 1994; Steketee & Frost, 1994). Importantly, Garratt-Reed (2004) demonstrated that general risk-aversion,

assessed using the ERI-AUS, was not reduced by standard cognitive-behavioural therapy for OCD despite significant reductions in both OCD symptoms and depressive severity. This indicates that, although risk-aversion related to OCD concerns is reduced by OCD therapy, core level beliefs surrounding threat and risk are not. These beliefs are therefore maintained, constituting a risk for future relapse (Maner & Schmidt, 2006; Rees, 2001). The findings of Garratt-Reed are congruent with suggestions that the cognitive patterns involved in risk-aversive behaviour among individuals with OCD permeate all aspects of an individual's thinking and behaving, and are not simply a result of OCD symptomatology (Cicolini & Rees, 2003; Frost et al., 1994; Lyoo et al., 2003; Steketee & Frost, 1994).

Foa et al. (2003) found that, for objectively low risk and OCD-relevant events, individuals with OCD (N = 18) required more information about the scenario before making a risk-related decision than did non-clinical individuals (N = 18). They also required more time to make the decision. Difficulties in making decisions were related to perceived level of risk/threat, rather than to obsessionality (Foa et al., 2003). This suggests that individuals with OCD are risk-aversive because of heightened perceptions of threat in a situation. It also indicates that they are not risk-aversive because of their OCD symptoms, suggesting that risk-aversion could be a premorbid risk factor for OCD rather than a symptom of the disorder (Foa et al., 2003), which is consistent with the finding that it is not ameliorated during therapy (Garratt-Reed, 2004).

Individuals with OCD typically experience high levels of guilt, often associated with the belief that they have not lived up to their responsibilities (Frost et al., 1994; Mancini & Gangemi, 2004). Mancini and Gangemi experimentally manipulated participants' feelings of guilt and innocence and demonstrated that, among non-clinical participants, guilt for having acted irresponsibly was associated with the avoidance of risks. In contrast, individuals who perceived themselves as victims were more likely to engage in risky behaviour. Mancini and Gangemi suggested that it might be possible to link obsessive-compulsive individuals' risk-aversion to their moral assumptions. In other words, individuals with OCD might prefer riskless choices because of fear of guilt and feelings of not living up to their responsibilities.

A recent study (Lorian & Grisham, 2011) did not find significant differences between individuals with OCD and non-clinical individuals in terms of general risk-taking on the Domain-Specific Risk-Taking Scale (DOSPERT; Blais & Weber, 2006). However, this result might have been largely due to low power, with the OCD group demonstrating a non-significant trend towards lower risk-taking compared to the control group (Lorian & Grisham, 2011).

Although relatively few in number, studies have consistently demonstrated that individuals with OCD demonstrate high levels of risk-aversive preferences in a wide range of daily situations that do not relate to their OCD. However, risk-aversive cognitive biases among individuals with OCD are not well understood. Before examining the importance of delineating these biases, it is necessary to briefly examine emerging evidence that general risk-aversion is present in other clinical disorders and might, in fact, represent a transdiagnostic risk factor for anxiety disorders. Evidence of high HA in other clinical disorders will be examined, followed by evidence of risk-aversive decisions among anxious individuals.

Risk-Avoidant Personality in Other Disorders

Cloninger's (1987) theory suggests that individuals with anxiety disorders are likely to score high in HA (Allgulander, Cloninger, Przybeck, & Brandt, 1998). Although some studies have suggested higher levels of HA among individuals with OCD than other clinical groups (e.g., Kim & Grant, 2001; Lochner et al., 2005), few direct comparisons have been made between OCD samples and other anxious samples. One study did not find significant differences in HA or NS between OCD and anxious control participants (Gothelf et al., 2004). Therefore, the extent to which risk-aversive personality is specifically related to OCD, or more prevalent in OCD compared to other anxiety disorders, is unclear. However, a large body of evidence suggests that high HA is associated with a variety of psychological disorders, and some authors have suggested that high levels of HA might be a predisposing factor for psychological difficulties in general, or at least for anxiety difficulties (e.g., Mortberg, Bejerot, & Wistedt, 2007; Olatunji, Unoka, Beran, David, & Armstrong, 2009).

For example, depressed individuals have been found to score higher on TCI HA than non-clinical individuals and HA is positively correlated with, and accounts for a large proportion of variance in, depressive severity (Halvorsen et al., 2009; Ongur et al., 2005). HA appears to be a vulnerability factor contributing to depression (Halvorsen et al., 2009), although it is also influenced by depression and appears to reduce during therapy that reduces depressive symptoms (Hruby, Nosalova, Ondrejka, & Preiss, 2009; Spittlehouse et al., 2010).

Individuals with social anxiety score higher than non-clinical individuals in HA (Cho et al., 2009; Lochner et al., 2007; Mortberg et al., 2007; Pelissolo et al., 2002). Pelissolo et al. suggested that HA appears to be more central to social anxiety than are other personality dimensions on the TCI, although whether it is a risk factor or a symptom of the disorder is unclear.

It also appears likely that individuals with generalised anxiety disorder (GAD) or panic disorder (PD) score higher than non-clinical individuals on HA (Allgulander et al., 1998; Rettew, Doyle, Kwan, Stanger, & Hudkiak, 2006; Starcevic, Uhlenhuth, Fallon, and Pathak, 1996), although not significantly differently from each other (Starcevic et al., 1996). High levels of HA have been found in many anxiety and non-anxiety disorders, including anorexia nervosa (Rousset, Kipma, Ades, & Gorwood, 2004), psychosomatic disorders (Gulec, 2010), body dysmorphic disorder (Pavan et al., 2006), and bipolar disorder (Huynh, Guile, Breton, Desrosiers, & Cohen, 2010). In addition, Etter (2010) found that daily smokers had higher scores on TCI HA than former smokers or non-smokers. Among daily smokers, higher HA was related to higher levels of tobacco dependence.

Olatunji et al. (2009) found that TCI HA was significantly positively associated with all scales of the Symptom Checklist-90 (SCL-90, Derogatis, 1977) among a sample of 121 non-clinical individuals. These scales include obsessive-compulsive, anxiety, depression, phobic anxiety, somatisation, interpersonal sensitivity, hostility, paranoid ideation, and psychoticism. This suggests that HA might be involved in a wide range of clinical disorders, operating as a "higher order generalized risk factor for the development of psychopathology in general" (Olatunji et al., 2009, p. 141). Claims that HA is a general risk factor for internalising disorders have also been made by Starcevic et al. (1996) and Rapee, Schniering, and Hudson (2009).

Kotov, Gamez, Schmidt, and Watson (2010) conducted a meta-analysis of 175 studies assessing personality structure according to the Big 5 (neuroticism, extraversion, conscientiousness, agreeableness, and openness) or Big 3 (negative emotionality, positive emotionality, and disinhibition versus constraint) models of personality among individuals with various anxiety disorders and depression. There was little disorder-specificity regarding personality profiles, again suggesting that personality traits related to risk-aversion (such as inhibition-disinhibition) might be relatively similar across clinical disorders.

Findings have also indicated that individuals with anxiety disorders exhibit inhibited temperaments (similar to a harm-avoidant personality) early in life (Gladstone, Parker, Mitchell, Wilhelm, & Malhi, 2005; Schwartz, Snidman, and Kagan, 1999). Rapee et al. (2009) suggested that high levels of inhibition among children are associated with greater risk for a variety of clinical disorders in later life, although inhibition does not necessarily result in significant levels of discomfort or interference for the individual. Rettew et al. (2006) also postulated that not all individuals with high levels of HA develop psychological disorders,

and that individuals with high HA but good coping or emotion regulation skills might be protected from clinical impairment.

Although it is possible that individuals with OCD have higher levels of HA than individuals with other disorders, the evidence suggests that harm-avoidant personality is involved in a range of psychological difficulties, although whether it represents a risk factor for their development, or a consequence of their symptoms, remains unclear (Starcevic et al., 1996). This is supported by studies (e.g., Alonso et al., 2008; Lyoo et al., 2003) suggesting that depressive symptoms largely mediate the OCD-HA relationship, although it should be noted that not all studies have found this (e.g., Kima et al., 2009; Richter et al., 1996). It remains possible, however, that there is a specific (albeit probably small) relationship between OCD and harm avoidant personality that is not accounted for by negative affect.

In addition to evidence indicating that various anxiety disorders (along with other clinical disorders) are linked to harm-avoidant personality traits, recent evidence has suggested that anxiety disorders might be related to general (as opposed to simply disorder-specific) risk-aversive behavioural preferences and that general risk-aversion is a transdiagnostic risk factor for anxiety disorders (e.g., Lorian & Grisham, 2011; Maner & Schmidt, 2006).

General Risk-Aversion as a Transdiagnostic Risk Factor for Anxiety Disorders

Butler and Mathews (1983, 1987) demonstrated that individuals with high levels of trait anxiety perceived higher levels of risk/threat in various situations than did individuals with lower levels of trait anxiety. Other studies have replicated this finding (e.g., Constans & Mathews, 1993; Gasper & Clore, 1998). Anxiety has been demonstrated to correlate positively with risk-aversion in situations relevant to the self (Eisenberg et al., 1998; Zhou & Kong, 2010). It is, therefore, possible that a high level of trait anxiety, rather than a specific diagnosis of OCD, is related to general risk-aversion. Nicholson et al. (2005) demonstrated that, in general, risk propensity in daily situations is positively related to extraversion and negatively related to neuroticism. Given that anxious individuals tend to be low on extraversion and highly neurotic (Glinski & Page, 2010; Naragon-Gainey & Watson, 2011), they would be expected to be somewhat risk-aversive. Indeed, Steketee and Frost (1994) and Cicolini and Rees (2003) suggested that the ERI should be utilised with various other anxious groups in order to determine whether general risk-aversion is prevalent.

However, until recently, despite widespread acknowledgement of the overestimation of threat/risk, and consequent risk-aversion, in disorder-specific situations among anxious

individuals, little research has been done regarding the possibility that anxious individuals possess a "fundamental and pervasive tendency to avoid risks" (Maner & Schmidt, 2006, p. 181) independent from their specific diagnoses. However, recent research has suggested that high levels of general risk-aversion might be present among a range of anxious individuals and represent a risk factor for the development of anxiety disorders (e.g., Lorian, 2011; Lorian & Grisham, 2010, 2011; Maner et al., 2007; Maner & Schmidt, 2006).

Maner and Schmidt (2006) proposed that individuals with various anxiety disorders are likely to periodically overestimate threat (probability and/or cost of negative events) in situations that are not related to their disorder, and that this propensity to overestimate threat might be involved in the development of anxiety disorders. Given that anxiety is an emotional state designed to signal the presence of possible danger, it is likely that it would predispose the individual to risk-avoidant decisions, as a means to avoid potential threats (Maner & Schmidt, 2006). Maner and Schmidt suggested that risk-avoidant decision making and anxiety are reciprocally influential, whereby overestimation of threat causes anxiety, which drives risk-aversion. Subsequently, this anxiety predisposes the individual to overestimation of threat in different situations, resulting in a spiral of faulty risk assessments eliciting anxiety, which causes risk-aversion and perpetuates appraisal biases.

Maner and Schmidt (2006) utilised a sample of 171 students and took measures of trait anxiety, trait depression, risk-taking orientation (willingness to make risky decisions), and risk appraisals in various types of situations. Results revealed that trait anxiety was significantly positively correlated with the perceived likelihood and severity of negative outcomes, and significantly negatively correlated with perceived control over the occurrence of those outcomes. All of these significant relationships remained after controlling for the influence of depressed mood. There were no significant relationships between trait anxiety and any appraisals of positive outcomes. Trait anxiety was also significantly negatively correlated with risk-taking orientation, and this relationship remained significant after controlling for depressed mood. It is noteworthy that, after controlling for trait anxiety, the relationships between depressed mood and risk perceptions were all non-significant (Maner & Schmidt, 2006).

Although risk-avoidant orientation was positively related to perceived probability and perceived costliness of negative events, Maner and Schmidt (2006) demonstrated that perceptions of severity of negative events uniquely predicted risk-avoidant orientation, although perceptions of likelihood did not. This suggests that perceptions of severity might mediate the link between trait anxiety and risk-avoidance (Maner & Schmidt, 2006), although

self-efficacy/perceived ability to cope with negative events (an important element of risk/threat appraisals) was not assessed, and it is possible that this factor might have mediated the observed results (Maner & Schmidt, 2006).

Maner and Schmidt (2006) suggested that their results indicate that anxiety might be uniquely linked to pervasive risk-avoidant patterns and that this link is unlikely to be the result of spurious associations with depressed mood. The results also suggested that anxious people primarily avoid risky situations because they overestimate the costliness of potential negative outcomes. Consistent with this finding, Mitte (2007) demonstrated that trait anxiety was positively related to risk-aversive choices across various life domains when individuals were asked to choose either a risky or a safe alternative. This result was mediated by the subjective cost of the negative event – highly anxious individuals perceived negative events as more costly (in this case indicated by how bad they would feel if the event occurred) and this drove their risk-aversion. Individuals with higher levels of trait anxiety perceived negative events as more likely to happen to them than to other people, which Mitte suggested could be related to low perceived coping ability.

Maner et al. (2007) conducted three studies, the results of which suggested that anxiety is associated with risk-aversive decisions in general situations. In the first study it was found that social anxiety is related to a tendency to make risk-avoidant decisions among non-clinical individuals. The second study demonstrated that high trait anxiety is related to risk-aversion among non-clinical individuals. The third study demonstrated that clinically anxious individuals are more risk-aversive than individuals with mood disorders, learning disorders, and non-clinical individuals (Maner et al., 2007).

Several other recent studies have also suggested that general risk-aversion might be common among anxious individuals. For example, Lorian and Grisham (2010) demonstrated that, among non-clinical individuals, social anxiety symptoms were significantly negatively correlated with a behavioural measure of risk-taking, and were negatively related to self-reported risk-taking in social and recreational domains (although not in the domains of financial, ethical, or health and safety) on the DOSPERT. In addition, risk-avoidance appeared to mediate the relationship between behavioural inhibition (a personality dimension similar to HA) and social anxiety, suggesting that it could be an important link between personality and pathological anxiety (Lorian & Grisham, 2010). Lorian and Grisham suggested that risk-avoidance might be an important component of the development of pathological social anxiety. It should be noted, however, that there was also evidence of disorder-specific risk-aversion given that the only self-report domains of risk-taking that were

related to social anxiety symptoms (social and recreational) are conceptually related to social anxiety symptoms, as acknowledged by the authors. This is especially important to consider given that other studies have suggested that individuals with social phobia only overestimate threat for events of a social nature (Nelson et al., 2010; Stopa & Clark, 2000; Uren et al., 2004; Voncken et al., 2007). It appears likely that individuals with social phobia overestimate threat in some general situations but not others.

In a subsequent study, Lorian and Grisham (2011) found that individuals with GAD and individuals with social phobia were significantly less willing to engage in risky behaviour than were non-clinical individuals when assessed on the DOSPERT. Closer inspection again revealed that risk-aversion among these groups was restricted to social and recreational domains and was not present in the financial, ethical, or health and safety domains.

Lorian and Grisham (2011) suggested that their results provide preliminary evidence for the notion that anxious individuals are risk-aversive in general situations. However, they also suggested that this risk-aversive bias is likely to be more complicated than suggested by Maner and Schmidt (2006) and that it is also likely to involve disorder-specific components. This would suggest that investigation of general risk-aversion on a disorder-specific basis is necessary. However, the results strongly indicate that general risk-aversion is unlikely to be a phenomenon that is specific to OCD, contrary to the suggestions of other researchers (e.g., Cicolini & Rees, 2003; Rees et al., 2006; Steiner, 1972; Steketee & Frost, 1994).

Somewhat surprisingly, however, Lorian (2011) demonstrated that, as assessed on the ERI-AUS, 31 individuals with anxiety disorders (primarily social phobia or GAD) were no more risk-aversive than 27 non-clinical participants, even after accounting for the influence of age and gender. Consistent with previous studies, the anxious group was more risk-avoidant on the DOSPERT scales relating to social, recreational, and financial risks, but not ethical or health and safety risks. Lorian suggested that anxious individuals are risk-aversive in various situations, but not consistently so. Interestingly, the ERI-AUS appears to assess less serious risks than the DOSPERT, and it is possible that the avoidance of these minor general risks is specific to OCD, rather than anxiety in general.

In combination, the results of Lorian and Grisham (2010, 2011) and Lorian (2011) suggest that anxious individuals are risk-aversive in domains that are not related to their anxiety disorder. However, the results also indicate that risk-aversion is not present in all domains. In addition, the samples used in these studies primarily consisted of individuals with social phobia (who would be expected to overestimate risk in social and recreational

domains) and individuals with GAD (who would be expected to overestimate risk in a multitude of domains, Steketee & Frost, 1994). Therefore, although important preliminary evidence, these studies do not demonstrate unequivocally that general risk-aversion is present across anxiety disorders. However, they do highlight the complexity of the construct of risk-aversion and demonstrate the importance of studying general risk-aversion in all anxiety disorders in order to delineate the cognitive errors that drive it, as well as to determine the level of disorder-specificity (if any) associated with these biases.

It no longer appears likely that general risk-aversion is a phenomenon unique to OCD. However, as Maner and Schmidt (2006) suggested, the evidence of a pervasive risk-avoidant cognitive set among anxious individuals does not preclude disorder-specific cognitive patterns of risk appraisal. The results of Lorian and Grisham (2010, 2011) in particular suggest that, although there is likely to be some general risk-aversive bias among anxious individuals, there might also be a level of disorder-specificity to this bias. The finding of a general risk-aversive tendency among individuals with anxiety disorders does not diminish the importance of studying this bias in each disorder. Indeed, if general risk-aversion is implicated in a range of clinical disorders then the importance of delineating its cognitive basis is magnified, especially given its apparent negative impact on treatment outcomes.

General Risk-Aversion and Treatment Difficulties in Individuals with OCD

A reduction of general risk-aversion is a potential avenue for improving treatment outcomes among individuals with OCD. Indeed, general risk-aversion is speculated to be a significant factor relating to treatment failure, treatment dropout, and relapse among individuals with OCD (Cicolini & Rees, 2003; Lyoo et al., 2001; Lyoo et al., 2003; Rees, 2001; Rees et al., 2006).

Risk-aversion and the behavioural component of therapy.

Risk-aversion is a core dimension underlying OCD (Summerfeldt, 2004) and has been linked to failure of the behavioural component of therapy because many individuals with OCD are not prepared to take the "risk" involved in non-neutralisation following exposure to feared situations (Lyoo et al., 2001). This could partially account for high rates of treatment refusal and treatment dropout. In addition, it could explain why treatment adherence is often low among individuals with OCD (e.g., Simpson et al., 2008). Reduction of the general risk-aversive tendency among individuals with OCD is likely to increase their willingness to face feared scenarios (i.e., take the necessary risks to make therapy effective), improving

treatment seeking, treatment adherence (including the completion of homework exposure exercises), and overall treatment effectiveness (Lyoo et al., 2001; Maner & Schmidt, 2006; Rees, 2001).

Risk-aversion and the cognitive component of therapy.

In terms of the cognitive component of therapy, general risk-aversion presents problems because most individuals with OCD seem to perceive any probability of threat, or responsibility for negative outcomes, to be worth avoiding (this is related to IU). This renders reappraisal of estimates of the probability of negative events (the "cornerstone" of traditional cognitive therapy) ineffective when attempting to reduce obsessive avoidance or compulsivity (Grayson, 2010; Rees, 2001). Cognitive techniques aiming to disconfirm feared consequences of not neutralising are further complicated because many obsessive fears involve events that are situated in the distant future and individuals with OCD, because of their risk-aversive bias, are unwilling to accept the risk, however small, that these events might occur (Rees, 2001; Salkovskis, Forrester, Richards, & Morrison, 1998; Woods et al., 2004). Therefore, reduction of general risk-aversion is likely to result in improved effectiveness of cognitive therapy for OCD (Rees, 2001).

Risk-aversion and relapse.

General risk-aversion among individuals with OCD is likely to cause the greatest problems during the maintenance phase of treatment, increasing the likelihood of symptom relapse (Lyoo et al., 2001; Lyoo et al., 2003). Given that general risk-aversion remains high following treatment (Garratt-Reed, 2004), individuals with OCD can be assumed to continue to perceive heightened levels of threat/risk in daily scenarios (Beck et al., 1985; Berenbaum, Thompson, & Bredemeier, 2007; Cano-Vindel et al., 2009; Klumpp & Amir, 2010), even if not actively exhibiting OCD symptoms. As Maner and Schmidt (2006) suggested, high levels of perceived general threat result in anxiety, which drives risk-aversion. However, this anxiety is also likely to drive further overestimation of risk/threat in a range of daily scenarios, resulting in a spiral back into heightened threat perceptions for OCD-relevant events and a consequent return of OCD symptoms (Rees, 2001; Rees et al., 2006). In addition, individuals are likely to resort to habitual coping mechanisms to deal with threat and anxiety (Beck et al., 1985), suggesting that heightened anxiety is likely to be dealt with through the use of familiar rituals among individuals with OCD. It is therefore likely that reduction of the general risk-aversive bias, and consequent reduction of risk-aversive

behaviour in everyday life, could enhance long-term therapeutic outcomes among individuals with OCD (Rees, 2001; Rees et al., 2006). Maner and Schmidt (2006) made a similar suggestion pertaining to improving treatment across anxiety disorders.

The Importance of Reducing General Risk-Aversion in Individuals with OCD

It is important to note that, although risk-aversion appears to be somewhat linked to the personality of individuals with OCD (Alonso et al., 2008; Ettelt et al., 2008; Gothelf et al., 2004; Kima et al., 2009; Lyoo et al., 2001; Lyoo et al., 2003; Marchesi, et al., 2008; Pfohl et al., 1990; Richter et al., 1996; Savron et al., 2007) evidence has suggested that personality traits can be altered with therapy (Corruble, Duret, Pelissolo, Falissard, & Guelfi, 2002; Glinski & Page, 2010; Helson, Kwan, John, & Jones, 2002; Hoffart & Hedley, 1997; McCrae et al., 2000; Piedmont, 2001; Roberts, 1997; Santor, Bagby, & Joffe, 1997; Srivastava, John, Gosling, & Potter, 2003). Evidence has also suggested that HA among individuals with OCD and other clinical disorders is amenable to therapeutic influence and is likely to be partially dependent on symptoms (Allgulander et al., 1998; Corchs et al., 2008; Hruby et al., 2009; Lyoo et al., 2003; Mortberg et al., 2007; Savron, Bartolucci & Pitti, 2004; Spittlehouse et al., 2010).

If therapy can reduce risk-aversion in all aspects of the lives of individuals with OCD, then a potential causal or maintaining mechanism of OCD will have been minimised (Lyoo et al., 2001). However, reducing general risk-aversion is likely to require specially designed therapeutic strategies separate to those employed when focusing on risk-aversion that is specific to OCD-related situations (Garratt-Reed, 2004; Rees et al., 2006). Maner and Schmidt (2006) and Rees et al. suggested that these strategies should focus directly on the cognitive mechanisms underlying overestimation of threat in general situations. Therefore, the cognitive mechanisms through which general risk-aversion operates in individuals with OCD must be delineated. Steketee and Frost (1994) suggested that examination of risk perceptions in general situations, using Beck et al.'s (1985) model, is required in order to achieve this goal. However, to date no studies appear to have addressed this issue, either in OCD or any other anxiety disorder. It is consequently unclear to what extent individuals with OCD exhibit distorted estimates of the probability and/or cost of negative outcomes, or of their ability to cope with those outcomes, in general risk situations.

Recent evidence that general risk-aversion is likely to be a transdiagnostic risk factor for anxiety (e.g., Lorian & Grisham, 2010, 2011) suggests that the importance of this research extends beyond improving treatment efficacy for OCD and that determining the nature of the

cognitive biases driving general risk-aversion could improve treatment outcomes across anxiety disorders. Indeed, Maner and Schmidt (2006) suggested that treatments for anxiety disorders might be improved with the addition of a component that focuses specifically on "global decision-making processes regarding risk" (p. 186). They suggested that "reducing risk-avoidant decision-making biases in apparently nonsymptomatic domains could reduce the presence of basic risk-avoidance and, in turn, could facilitate reductions in anxiety" (p. 186). Maner and Schmidt also suggested that the cognitive distortions that drive heightened risk/threat perceptions in daily situations among different groups of anxious individuals would appear to be the most likely therapeutic avenue for reducing general risk-aversion. Delineating these distortions among individuals with OCD is the goal of the current research.

Given that perception of elevated levels of threat drives anxiety and risk-aversion, understanding the cognitive mechanisms driving elevated threat perceptions among individuals with OCD and other anxious individuals is crucial to further the understanding of general risk-aversion among these individuals (Maner & Schmidt, 2006; Rees et al., 2006). From a cognitive perspective the reasons why individuals perceive heightened levels of threat can vary. Beck et al.'s (1985) model of threat perception and anxiety will be used to explore these in the current study. An understanding of these distortions would advance understanding of why individuals with OCD perceive high levels of general threat and consequently avoid general risks. It would also have potential implications for improving treatments for OCD and possibly for other disorders. Before examining existing evidence for the potential impact of various cognitive threat biases among individuals with OCD, Beck et al.'s model of threat perception, along with evidence for its validity, will be outlined.

CHAPTER 4
BECK ET AL.'S MODEL OF THREAT PERCEPTION AND ANXIETY

Beck et al.'s Model of Threat Perception and Anxiety

Chapter Overview

This chapter will briefly review Beck et al.'s (1985) model of threat perception and anxiety. Initially, the cognitive processes involved in primary and secondary threat appraisal will be examined, before exploring the link between threat perception and anxiety. The role of threat misappraisal in anxiety disorders will be reviewed, and finally evidence for the validity of the model will be presented.

Beck et al. (1985) suggested that automatic cognitive processing serves to simplify any encountered situation by reducing the amount of information that the individual perceives. The relevant environment is scanned and the individual determines which aspects of the situation, if any, warrant attentional resources. This cognitive operation results in much information being discarded and distorted, with the individual's expectations, interests, motives, and concerns influencing the way in which the situation is perceived by determining which aspects of the situation are magnified, which are minimised, and which are ignored. Sometimes, cognitive processing leads to the perception of threat, which generates anxiety. Beck et al. suggested that appraisal of potentially threatening cues or situations involves primary appraisal, secondary appraisal, and reappraisal.

Primary Appraisal – The Nature of the Threat

During primary appraisal, the individual forms an initial impression of the situation. This can be generated on the basis of inadequate data but is crucial because it is the basis for the individual's conceptualisation of, and response to, the situation. If an individual appraises a situation as posing a threat to his/her survival, functioning, or interpersonal attachment, a "critical response" (Beck et al., 1985 p. 39) is activated. This response is egocentric and involves appraisal in terms of "how does it affect me?" The individual selects and interprets data to provide a meaningful answer to this question.

Carr (1974) proposed a model whereby "threat, upon which the experience of anxiety depends, is some multiplicative function of the subjective cost of an event and its subjective probability" (p. 315). Beck et al. (1985) expanded this concept. Once a threat (real or imagined) is detected, the probability of the occurrence of unpleasant outcomes is evaluated, along with the cost/awfulness of those outcomes if they were to occur (Beck et al., 1985). Initial estimates of the probability and cost of the potential negative event can be inaccurate, but are nevertheless used to determine the threat valence of a situation.

Secondary Appraisal – Perceived Ability to Cope

At the same time as assessing the nature of the threat (primary appraisal), the individual assesses his/her resources for dealing with the threat. During this secondary appraisal process, the individual assesses the availability and effectiveness of internal and external resources that could be utilised to deflect or manage potential damage within the threatening situation. Although the individual has relatively separate conceptualisations of the dangers posed by a situation and his/her ability to cope with those dangers (Rapee, 1997), primary and secondary appraisals are usually integrated into the same overall evaluation (Beck et al., 1985). The individual considers the amount and probabilities of damage inherent in the threat in relation to his/her capacity to deal with it. The balance between perceived levels of threat and perceived ability to cope with potential consequences of threat drives the intensity of anxiety experienced within the situation. Beck et al.'s (1985) model of threat perception and consequent anxiety can be seen in Figure 1.

$$\text{Anxiety} = \frac{\text{Perceived probability of threat} \times \text{Perceived cost/awfulness of danger}}{\text{Perceived ability to cope} + \text{Perceived 'rescue' factors}}$$

Figure 1. Beck et al.'s (1985) model of threat perception and anxiety.

Reappraisal

As the situation develops, the individual constantly reappraises the properties of the threat itself, as well as his or her own coping mechanisms. This facilitates a clearer delineation of the danger and of coping resources. These calculations are influenced by personality factors, learning experiences, and memories, as well as by consideration of any possible benefits of the situation. As such they are susceptible to considerable error and variation (Beck et al., 1985). However, the more time and cognitive resources that are

devoted to the processing of the situation, the more accurate the perception of the level of threat and one's ability to cope are likely to become (Beck et al., 1985).

Threat and Anxiety

When an individual perceives threat, his or her cognitive-motor apparatus is mobilised to deal with it immediately. If threat is judged to be low relative to the individual's coping mechanisms, the individual might choose to eliminate the threat, perhaps through attacking the source. Conversely, if the individual judges threat/risk as being high relative to his or her coping resources, anxiety is generated and he or she is impelled to escape or avoid the threat, thereby reducing anxiety. The degree of anxiety experienced, and the amount of behavioural arousal, is proportional to the subjective estimate of danger (Beck et al., 1985). Therefore, high levels of anxiety, and consequent avoidance behaviour, can be experienced when a negative event is perceived as highly likely and/or highly costly, and/or when the individual believes that he/she cannot adequately cope with the potential negative outcomes.

Beck et al. (1985) posited that when an individual perceives his/her coping ability to be insufficient to protect him/her from potential internal or external dangers, a cognitive-affective schema state termed "the sense of vulnerability" (p. 67) is triggered. This self-protective pattern automatically functions to terminate risk-taking behaviour, preventing the individual from moving closer to, or remaining within, the 'dangerous' situation (Beck et al., 1985). Importantly, however, the individual can often overcome these inhibitory responses by approaching the threat. In addition, reappraisal can occur, whereby the individual recognises that the situation is either non-threatening, or can be adequately dealt with, thereby terminating the sense of vulnerability.

Complex appraisals need not be completed in their entirety each time a situation is encountered because past experience in similar scenarios warns the individual what to expect and informs him/her of potential coping mechanisms (Beck et al., 1985; Butler & Mathews, 1983). This involves the activation of cognitive schemas that facilitate the selection of relevant details of the situation and recollection of relevant information. Schemas are subconscious cognitive structures that are used to organise information that is processed. When a schema (or set of schemas) is activated, its content influences the way in which the individual perceives, interprets, and evaluates objects and events. In the majority of cases, these schemas facilitate rapid processing and problem solving, however once activated, they minimise the perception of information that is not relevant to the content of the schema (Beck

et al., 1985; Young, 1999). This can be problematic, particularly among individuals with anxiety disorders.

Anxiety Disorders

Anxiety has obvious evolutionary and self-protective importance. Therefore it follows that in anxiety disorders, anxiety itself is not the main problem. Rather:

> …the unremitting generation of anxiety represents a persistent, ineffective mechanism designed to impel the organism to reduce supposed danger that is activating the anxiety response. When, however, the problem is not an actual danger, but a misperception or exaggeration of the danger, the experience of anxiety is inappropriate for initiating remedial action. If the danger is nonexistent or exaggerated, the individual has no way to head it off (Beck et al., 1985, p.15).

Anxiety disorders occur when cognitive processes continually, erroneously, structure external and/or internal experiences as signs of danger. All individuals regularly incorrectly appraise situations as threats but then reappraise them as non-threatening (from a survival standpoint it is clearly more adaptive to respond as if a situation is threatening when it is not, than to ignore situations that genuinely pose a threat). However, Beck et al. (1985) suggested that in anxiety disorders, these false alarms are not terminated by contradictory information because reappraisal either does not occur or fails to incorporate information that is inconsistent with the dominant cognitive vulnerability schema, which is more elaborate among individuals with anxiety disorders than among non-anxious individuals.

To explain the source of this cognitive disregulation, Beck et al. (1985) used findings from earlier studies (e.g., Butler & Mathews, 1983) indicating that, in situations resembling past negative events or perceived failures, anxious people have enhanced access to negative memories of similar events compared to positive memories of those events. Therefore, in individuals with anxiety disorders the sense of vulnerability is easily triggered in situations resembling past failures or negative experiences. Once triggered, the vulnerability schema results in incoming data being processed in terms of the dangerous aspects of the situation, with the individual selectively attending to signs of danger or failure while ignoring safety signals. This heightened vigilance for potential threat can serve to further heighten perceived probability and cost of potential negative events. Similarly, recollection of past failures results in a focus on the individual's weaknesses rather than his/her strengths, reducing

estimates of his/her ability to cope with possible negative outcomes. This selective processing results in biased and self-perpetuating perceptions of the situation as dangerous, and of the individual as being incapable of coping with potential negative outcomes. Thus, in anxiety disorders, "an upset of the regulatory functions of the cognitive system leads one to indiscriminately interpret environmental events as dangers" (Beck et al., 1985, p. 86).

The behavioural element of anxiety disorders is also important. The perception of being unable to cope with a threat (which might be perceived as unrealistically likely and/or costly) results in difficulty instigating goal-oriented action and problem solving strategies (Beck et al., 1985). Even if the individual possesses the necessary skills to deal with the threat, these skills are likely to be overridden or inhibited by escape tendencies, expectations of failure, and anxiety. Thus, cognitive appraisals of threat generate anxiety, the experience of which feeds back into the cognitive system and results in the decision to prepare for defensive action. Escape from, or avoidance of the perceived threat is then initiated. In this manner, cognitive biases, anxious arousal, and behavioural changes interact to produce a self-perpetuating cycle in which the individual perceives high levels of threat, generating high levels of anxiety that impair performance. In order to extinguish anxiety, the individual avoids or retreats from the situation, thereby confirming his/her fears of negative outcomes or belief in his/her inability to cope with the threatening situation. This causes similar situations to be appraised as even more threatening in the future.

Disorder-specific cognitive biases.

Beck et al. (1985) proposed that the sense of vulnerability is triggered largely in disorder-specific situations and that the cognitive biases involved in the generation of distorted perceptions of probability, cost, and coping ability are likely to vary across anxiety disorders, given that people with different disorders fear different, and often highly specific, events. It has been suggested by other researchers (e.g., Uren et al., 2004) that different elements of the model may be primarily important in the threat overestimation and anxiety associated with different disorders. As a result, it is necessary to examine Beck et al.'s (1985) model as it applies to various anxiety disorders. Salkovskis, Forrester, and Richards (1998) were the first researchers to adapt and apply Beck et al.'s (1985) model to OCD. However, prior to examining this work in detail, it is first necessary to briefly examine the wide body of literature asserting the validity of the model as it applies to various clinical and non-clinical groups.

General Evidence for Beck et al.'s Model

Beck et al. (1985) asserted that when individuals are vigilant for danger within a situation they selectively attend to threatening cues and consequently perceive heightened levels of threat. This generates anxiety and results in avoidance or maladaptive behaviour. They also suggested that because individuals with anxiety disorders are hyper-vigilant for signs of danger, this results in frequently elevated threat perceptions and consequent anxiety. It is important to briefly examine evidence supporting this conceptualisation of anxiety and anxiety disorders. Following this, evidence for the theoretical and clinical utility of the various elements (perceived probability, perceived cost, and perceived coping ability) of the model proposed by Beck et al. will be discussed. To date, no studies appear to have attempted to integrate evidence relating to this model across anxiety disorders, so this represents an important step towards exploring its general validity.

Evidence for the importance of elevated threat perception in anxiety and anxiety disorders.

Evidence has strongly supported Beck et al.'s (1985) proposal that anxiety arises from the processing of events as threatening. For example, Cano-Vindel et al. (2009) demonstrated that anxiety can be more effectively generated by presenting non-clinical individuals with a threatening situation than by inducing physiological arousal, suggesting that perception of threat is an important causal mechanism for anxiety. The fact that perception of threat causes anxiety has been further evidenced by studies that have manipulated or trained attention towards threat and demonstrated consequent effects on situational anxiety (e.g., Amir, Weber, Beard, Bomyea, & Taylor, 2008; Hazen et al., 2009; Klumpp & Amir, 2010; MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002).

Similar to Beck et al. (1985), Butler and Mathews (1983, 1987) proposed that individuals with high levels of trait anxiety possess more extensive and elaborate threat schemata than other individuals, and as such are more prone to perceive threat in a variety of situations. Recent behavioural and neurological evidence has supported this "spread of activation" hypothesis (MacNamara & Hajcak, 2010). Cisler and Koster (2010) asserted that "A wealth of research demonstrates that anxious individuals display an attentional bias towards threatening sources of information" (p. 204). This bias operates in anxious adults and children and is positively related to anxiety severity (Roy et al. 2008; Waters, Mogg, Bradley, & Pine, 2008). It occurs to a similar extent in all anxiety disorders and across cultures (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007; Lu et al., 2007)

and appears to involve facilitated attention towards threatening stimuli, difficulty disengaging attention from threatening stimuli, and in some cases deliberate but counterproductive attempts to avoid attending to threatening stimuli (Cisler & Koster, 2010; Verkuil, Brosschot, Putman, & Thayer, 2009). These processes are not typically observed in non-anxious individuals or individuals with depression (Eldar, Yankelevitch, Lamy, & Bar-Haim, 2010; Muris & van Doorn, 2003).

Research has consistently demonstrated that anxious individuals perceive higher levels of threat than non-anxious individuals, and that perceived threat predicts situational anxiety in both clearly threatening situations and in ambiguous situations (Bogels & Zigterman, 2000; Rapee, 1997; Stober, 1997; Zvolensky, Heffner, Eifert, Spira, & Feldner 2001). Because it drives anxiety, perceived threat is highly predictive of situational avoidance (Cisler & Koster, 2010; Nelson et al., 2010; Stopa & Clark, 2000; Taylor et al., 2010; Warren et al., 1989; Weinstein, 2000), which is a significant maintaining factor in anxiety disorders (Poulton & Andrews, 1996). It appears that perception of heightened threat causes anxiety, which then predisposes people to risk-aversive decisions and results in a spiral of further threat perception and anxiety (Maner & Schmidt, 2006). For this reason, attentional biases towards threat, and consequent overestimation of threat, are suggested to be important causal factors in the development and maintenance of anxiety disorders in adults and children, and the elimination of such biases is linked to large reductions in anxiety symptoms (Bouchard et al., 2007; Drabant et al., 2011; Field & Lester, 2010; Hazen et al., 2009; Kverno, 2000; Legerstee et al., 2009; Lu et al., 2007; Muris & van Doorn, 2003).

Evidence has demonstrated that, as Beck et al. (1985) suggested, individuals with anxiety disorders exhibit interpretive biases for threat-related stimuli. However it is less clear to what extent these biases are disorder-specific versus being related to trait anxiety (Zvolensky et al., 2001). It is likely that both are involved to differing degrees in various anxiety disorders (Uren et al., 2004). High levels of trait anxiety appear to interact with biases in vigilance for threatening information to generate situational anxiety (Klumpp & Amir, 2010; Mathews, Mackintosh, & Fulcher, 1997). Therefore, it is likely that individuals with anxiety disorders perceive heightened levels of threat largely when specifically vigilant for threatening cues, and not merely as a function of high trait anxiety. For example, worriers selectively attend to threatening information that is relevant to the content of their worries (Verkuil et al., 2009), individuals with panic disorder demonstrate threat vigilance and threat estimation biases for panic-related cues (Amir, McNally, Riemann, & Clements, 1996; Ehlers & Breuer, 1995; Teachman, 2005; Teachman, Smith-Janik, & Saporito, 2007), and

individuals with GAD are vigilant for more general threat (Coles, Turk, & Heimberg, 2007). However, what is not clear is the extent to which threat vigilance extends beyond disorder-specific situations among individuals with anxiety disorders, or whether certain anxiety disorders are more likely to involve perceptions of elevated threat in a wide range of situations (De Cort, Hermans, Spruyt, Griez, & Schruers, 2008; Uren et al., 2004). Mathews et al. (1997) suggested that although individuals are usually vigilant for disorder specific threats, highly anxious individuals become more attentive threat cues once a potential threat is detected, suggesting that threat vigilance could partially generalise to non-disorder related scenarios. This is consistent with Maner and Schmidt's (2006) conceptualisation of the link between anxiety and general risk aversion. It is also consistent with evidence suggesting that avoidance of general risk is common among anxious individuals (Lorian & Grisham, 2010, 2011).

Importantly, cognitive theories of anxiety disorders, although often differing in certain aspects, "all consider a selective bias for threat information in attention, interpretation and memory a central characteristic that distinguishes anxious and non-anxious states" (Beck & Clark, 1997, p. 49). The core feature of cognitive theories of anxiety disorders (e.g., Clark, 1986; Salkovskis, 1985, 1989; Stopa & Clark, 1993; Wells, 1995) is that overestimation of threat associated with disorder-specific situations or stimuli (i.e., social situations for individuals with social phobia or bodily sensations for individuals with panic disorder) is the cause of anxiety in those situations. This anxiety subsequently results in further increases in vigilance for threat, resulting in further increases in anxiety (Waters, Mogg, et al., 2008).

Research evidence strongly supports Beck et al.'s (1985) assertion that clinically anxious individuals are vigilant for, and perceive heightened levels of threat, which drives their anxiety (Cisler & Koster, 2010; Verkuil et al., 2009). In addition, attenuation of threat vigilance biases can reduce threat perception and consequent anxiety (Mathews et al., 1997). However, as previously discussed, Beck et al. (1985) suggested that the cognitive bias driving threat overestimation can involve overestimation of the probability and/or cost of negative outcomes, as well as underestimation of one's ability to cope with negative events. Evidence that these specific biases are linked to anxiety and anxiety disorders will be briefly reviewed.

Primary appraisal - probability and cost.

There is considerable empirical evidence to support Beck et al.'s (1985) assertion of the importance of the perceived probability and perceived cost of danger in determining situational anxiety (Rapee, 1997). Research has consistently demonstrated that "anxious

patients systematically overestimate the probability and/or cost of negative events in a variety of situations" (Poulton & Andrews, 1996, p. 413). Anxiety is positively related to the perceived probability and cost of negative events and to subsequent avoidance of situations in which these events might occur (Butler & Mathews, 1987; Gasper & Clore, 1998; Maner et al., 2007; Maner & Schmidt, 2006; Stober, 1997). These biases maintain high levels of anticipatory anxiety and consequently play an important role in maintaining various anxiety disorders (Stober, 1997).

Warren et al. (1989) demonstrated that avoidance behaviour among various anxious and non-anxious groups was predicted by the product of the perceived probability and perceived cost of imagined negative consequences. Consistent with this, Weinstein (2000) demonstrated that perceived probability and perceived severity of harm made significant and substantial contributions to the prediction of motivation to act to obtain protection from hazards. When perceived probability was low to moderate (which would be expected for most clinical-anxiety relevant feared events) then a multiplicative relationship represented the data accurately – if perceived severity is held constant, motivation to act is approximately a linear function of perceived probability (and vice-versa).

It is clear that increased probability and cost estimates for negative events drive anxiety. However, individuals with anxiety disorders are likely to perceive elevated threat primarily when specifically vigilant for danger (Klumpp & Amir, 2010). It is, therefore, likely that they particularly overestimate probability and cost for events that are directly related to their disorder (Foa et al., 1996; Nelson et al., 2010; Uren et al., 2004) and that these biases "play a causal or maintaining role" in the development of these disorders (Uren et al., 2004, p. 482). Consequently, it is necessary to assess each disorder separately. Given the likely degree of disorder-specificity in exaggerated perceptions of the probability and cost of negative events (Nelson et al., 2010), the evidence for the importance of these biases will be briefly reviewed separately for several anxiety disorders.

Primary appraisal biases in worry.

Worry consists of uncontrollable and repetitive cognitions about future threatening events. As such it is considered to be the cognitive component of anxiety and is central to many anxiety disorders (Suarez & Bell-Dolan, 2001; Wells, 1995). Studies have consistently demonstrated that individuals who report excessive worries also overestimate the probability and cost of potential negative events related to their worry, and that these biases predict a large amount of variance in worry scores even after controlling for negative mood

(Berenbaum, Thompson, & Pomerantz, 2007; Macleod, Williams, & Bekerian, 1991; Suarez & Bell-Dolan, 2001). Evidence has largely suggested that, among worriers, elevated cost estimates for negative events is likely to be the cognitive distortion that primarily drives worry. Elevated probability estimates, although still somewhat related to worry, appear to be more closely linked to depression in this population (Berenbaum, Thompson, & Bredemeier, 2007; Berenbaum, Thompson, & Pomerantz, 2007; Szabo, 2009).

These results provide strong support for the role of primary threat appraisal in worry. Given that worry is considered to be a cognitive process that is involved in most forms of anxiety (Suarez & Bell-Dolan, 2001), this also provides evidence for the general importance of these processes in anxiety, supporting Beck et al.'s (1985) theory.

Primary appraisal biases in social phobia.

Individuals with social phobia and social anxiety symptoms perceive unpleasant social events as being more probable and more costly than do non-anxious individuals, and these biases are predictive of symptom severity even after controlling for negative mood (Foa et al., 1996; Lucock & Salkovskis, 1988; McManus, Clark, & Hackman, 2000; Rheingold, Herbert, & Franklin, 2003; Smari, Petursdottir, & Porsteinsdottier, 2001; Stopa & Clark, 2000; Voncken, Bogels, & de Vries, 2003; Voncken et al., 2007). Elevated probability and elevated cost estimates both appear to drive social anxiety symptoms although perceived cost appears to be more influential (McManus et al., 2000; Nelson et al., 2010; Uren et al., 2004).

Individuals with other anxiety disorders typically do not have strong probability or cost perception biases for negative social events (McManus et al., 2000; Stopa & Clark, 2000). This suggests that inflated probability and cost estimates for negative social events are largely specific to social anxiety and are important in the maintenance of social anxiety in particular. Further evidence of the specificity of these biases is that socially anxious individuals do not generally estimate higher probability or cost of negative non-social events compared to other individuals – their biases are restricted to social situations (Foa et al., 1996; Rheingold et al., 2003; Voncken et al., 2003; Voncken et al., 2007, although see Stopa & Clark, 2000, for conflicting results). It should be noted, however, that McManus et al. (2000) demonstrated weak elevation in probability and cost estimates of negative social events among anxious control participants, compared to non-clinical participants. This suggests that threat overestimation might occur to a small degree among anxious individuals in general situations not related to their anxiety disorders.

Comparison of primary appraisal biases in social phobia and panic disorder with agoraphobia.

Evidence for different patterns of cognitive distortions across anxiety disorders has arisen from studies comparing various disorders. For example, Poulton and Andrews (1996) found that individuals with panic disorder with agoraphobia appraised significantly higher probability and cost of negative physical events than did individuals with social phobia. Conversely, individuals with social phobia rated negative social events as significantly more probable and costly than did individuals with panic disorder with agoraphobia.

Uren et al. (2004) found that individuals with social phobia made significantly higher probability and cost ratings for negative social, but not physical, events compared to non-anxious controls. In contrast, individuals with panic disorder rated both social and physical events as more likely and more costly than did the non-clinical participants. The results of this study are particularly interesting because they suggest the possibility that some anxiety disorders, such as social phobia, are characterised by primary appraisal biases in situations that are specific to the disorder in question. However other anxiety disorders, such as panic disorder, might involve primary appraisal biases in a wide range of situations that are not disorder-specific. These disorders are likely to be characterised by general risk-aversion However, McNally and Foa (1987) demonstrated that individuals with untreated agoraphobia only overestimated probability and cost for negative physical events, with no generalisation to other scenarios, so this hypothesis requires further investigation.

In addition, Uren et al. (2004) found that perceived cost of negative social events was the strongest predictor of fear of negative evaluation among individuals with social phobia. Among individuals with panic disorder, perceived probability of physical events predicted self-reported body symptoms. This suggests that in some anxiety disorders perceived cost influences anxiety more strongly than does perceived probability, whereas in other anxiety disorders the opposite is true (e.g., Foa et al., 1996).

Primary appraisal biases in specific phobias.

Individuals with specific phobias overestimate the probability and cost of negative events related to their fears (de Jong & Peters, 2005). However, Williams and Watson (1985) found that perceived probability of negative outcomes did not predict significant variance in phobic behaviour, after controlling for the effects of self-efficacy, among 15 individuals with height phobia. Williams and Watson suggested that this raises the possibility that perceived coping ability is the most important threat variable for these individuals. This variable is

studied less frequently than primary appraisal processes, but evidence for its importance in threat perception and anxiety will be briefly reviewed.

Secondary appraisal – coping.

Prior to Beck et al.'s (1985) threat model, researchers had already demonstrated that anxiety is caused by the perceived loss of control over potential negative outcomes or the belief of being unable to cope with those outcomes (Geer, Davidson, & Gatchel, 1970; Lazarus, 1966). Bandura (1977) introduced the concept of "self-efficacy" as an individual's beliefs about his or her ability to succeed in a situation. Although self-efficacy is situation specific, it can generalise, resulting in some individuals developing feelings of low self-efficacy across situations and domains (Bandura, 1977, 1997; Benight & Bandura, 2004; Ozer & Bandura, 1990).

Coping self-efficacy is closely related to general self-efficacy and is "a person's belief in his or her ability to deploy strategies that will assist in coping with diverse threats or stressors" (Nicholls et al., 2010, p. 97). Coping self-efficacy is an important determinant of the level of threat perceived, and consequent amount of anxiety experienced, in a given situation. In general, people experience anxiety and consequently avoid situations in which they believe their coping resources will be exceeded, whereas they engage in situations and activities that they believe that they are capable of handling (Boekaerts, 1991; Ozer & Bandura, 1990; Wyatt, 1992). Indeed, risk-aversion and avoidance behaviour are strategies to cope with a situation or activity with which the individual does not feel confident (Hoffart, 1995a; Williams & Zane, 1989).

Similarly, Beck et al. (1985) suggested that clinically anxious people often have low self-confidence and diminished beliefs in their own ability to cope with threats. Indeed, a sense of diminished efficacy to cope with threat can "dominate the experiences of individuals with anxiety disorders" (Cloitre, Heimberg, Liebowitz, & Gitow, 1992, p. 570), resulting in many difficulties being perceived as unbearable threats and consequently generating anxiety. Hence, low self-confidence and perceived competence is associated with focus on the possible consequences of failure, and consequent escape (risk-aversion) or protective behaviours.

It should be noted that there is a vast literature on the topic of coping, which is a multifaceted construct that requires further definition and understanding (e.g., Folkman & Moskowitz, 2004; Skinner, Edge, Altman, & Sherwood, 2003). However, for the purposed of this thesis, the focus will be on perceptions of one's ability to cope with negative events,

rather than on coping behaviours themselves. Therefore, a review of the literature on coping behaviours, and on how these should be categorized (e.g., emotion-focused coping, problem-focused coping), will not be attempted.

Low perceived coping ability among clinically anxious individuals.

Among individuals with clinical disorders, low perceived coping ability appears to be central to the experience of anxiety, and is closely related to symptom severity (Bogels & Zigterman, 2000; Bouchard et al., 2007; Casey, Oei, Newcombe, & Kenardy, 2004; Hoffart, 1995b; Waters, Mogg, et al., 2008). In addition, improvements in self-efficacy regarding coping with anxiety symptoms have been demonstrated to predict symptom improvement in anxiety disorders (Bouchard et al., 2007; Casey, Oei, & Newcombe, 2004). Some of the evidence presented here involves studies that have assessed perceived control or general self-efficacy. Although not the same as directly assessing perceived ability to cope, these studies still provide indirect evidence for the presence of a negative self-concept that ould be expected to relate to low perceived ability to cope among anxious individuals (Bandura, 1977, 1997).

Among individuals with post-traumatic stress disorder (PTSD), secondary appraisal processes appear to be more closely related to symptom severity and anxiety than are primary appraisal processes (Cieslak, Benight, & Lehman, 2008; Kibler & Lyons, 2004). Indeed, low perceived ability to cope with PTSD-related events is actively involved in symptom maintenance and is an important target for treatment (Benight & Bandura, 2004; Kibler & Lyons, 2004). It appears likely that perceived inability to cope with trauma-related negative events is central to the development of PTSD (Cieslak et al., 2008).

Lack of perceived control over symptoms is also widely recognised as being a significant vulnerability factor for panic disorder and a risk factor for the development of agoraphobia (White, Brown, Somers, & Barlow, 2006). This is indirect evidence for the presence of low perceived coping ability among individuals with panic disorder. Consistent with this, Ehlers (2002) found that perceived ability to cope with panic symptoms was lower among individuals with panic disorder than among non-clinical individuals.

Cloitre et al. (1992) demonstrated that individuals with social phobia and individuals with panic disorder had significantly lower belief in their ability to exert control over events than did non-clinical individuals, which is consistent with the hypothesis that perceptions of diminished coping ability in specific situations are central to the experience of chronic anxiety. Stopa and Clark (1993) demonstrated that individuals with social phobia rated their

coping ability and their social skills in a social situation as lower than did anxious controls or non-anxious controls. In addition, individuals with social phobia gave themselves significantly lower ratings of their social skills than did an observer. This bias was not evident in either control group. This is further evidence that individuals with social phobia underestimate their ability to cope with (through using appropriate social skills) the potential threats involved in social situations specifically. Similarly, Smari et al. (2001) demonstrated that perceived social competence was strongly predictive of situational anxiety among individuals with social phobia, whereas other areas of competence were not.

Williams and Watson (1985) found evidence that the level and strength of coping self-efficacy strongly predicted phobic behaviour among 15 individuals with height phobia. In addition, self-efficacy remained a strong predictor of phobic behaviour when anxiety and primary threat appraisals were held constant, whereas when self-efficacy was held constant, primary threat appraisals did not predict phobic behaviour. Williams and Watson hypothesised that treatment for phobias "might be more effectively directed toward raising clients' perceptions of self-efficacy than toward disconfirming their beliefs in danger" (p.136).

Perceived coping ability among non-clinical samples.

Evidence also indicates that perceived coping ability is an important determinant of anxiety in potentially threatening situations among non-clinical individuals. For example, in a sample of 307 athletes, Nicholls et al. (2010) demonstrated that coping self-efficacy was negatively correlated with cognitive and somatic anxiety but positively correlated with performance satisfaction. Henselmans et al. (2010) found that, among women recently diagnosed with breast cancer, higher perceived ability to cope with their illness resulted in lower levels of distress. Consistent with this, Karademas and Kalantzi-Azizi (2004) demonstrated that perceived ability to cope with an exam was the key cognitive variable determining level of perceived threat and psychological symptoms among 291 university students, with higher perceived coping ability predicting lower perceived threat.

In addition, lower coping self-efficacy is related to heightened perceptions of threat, and consequent avoidance and emotion-focused coping for internal and external negative events among various groups of non-clinical individuals (e.g., Oportot, 2004; Riley, Dennis, & Powell, 2010; Zvolensky et al., 2001). Conversely, higher coping self-efficacy for negative situations predicts approach towards potential threats and problem-focused coping behaviours (Dorsey, Miller, & Scherer, 1999; Oportot, 2004). High coping self-efficacy also predicts

positive psychological adjustment to pain (Altman, 2004; Feldner & Hekmat, 2001). Wyatt (1992) found that global self-efficacy was the strongest predictor of risk-taking in hypothetical scenarios among students (N = 682) and suggested that self-efficacy can influence risk-taking behaviour across a variety of situations.

Evidence for the validity of Beck et al.'s model from treatment studies.

Further evidence of the validity of Beck et al.'s (1985) model can be derived from studies demonstrating that therapy for anxiety disorders among adults and children must successfully reduce the level of threat perceived in disorder-specific situations in order to be effective (e.g., Beck & Clark, 1997; Jones & Menzies, 1998a, Legerstee et al., 2009; Muris & van Doorn, 2003; Nelson, et al., 2010; Poulton & Andrews, 1996; Waters, Mogg, et al., 2008; Waters, Wharton, Zimmer-Gembeck, & Craske, 2008). Indeed, this is the primary goal of cognitive and behavioural treatments for all anxiety disorders (Beck & Clark, 1997).

Changes in primary or secondary appraisal processes are important targets for the treatment of anxiety (Bouchard et al., 2007; Cieslak et al., 2008; Poulton & Andrews, 1996; Williams & Watson, 1985; Zvolensky et al., 2001) and other disorders (e.g., Senbanjo, Wolff, Marshall, & Strang, 2009; Tucker, Brust, Pierce, Fristedt, & Pankratz, 2004). For example, reductions in the severity of social phobia symptoms are closely linked to, and appear to be caused by, reductions in the perceived probability and cost of negative social events (Foa et al., 1996; Lucock & Salkovskis, 1988; McManus et al., 2000; Nelson et al., 2010). Similar results have been found for individuals with agoraphobia (e.g., McNally & Foa, 1987). Bouchard et al. (2007) demonstrated that changes in cognitive variables and self-efficacy appear to precede symptom changes among anxious individuals, suggesting a causal role for these biases in symptomatology.

Summary

The body of evidence reviewed above provides clear validation of Beck et al.'s (1985) assertion that perceived threat generates anxiety. In addition, the claim that heightened levels of anxiety among individuals with anxiety disorders involves at least one cognitive bias related to threat perception (inflated probability and/or cost estimates, or low perceived coping ability) for disorder-specific events is conclusively supported. Indeed, the summarising of this literature represents an important contribution of the current research.

However, most studies have focused only on primary or secondary appraisal processes, rather than Beck et al.'s (1985) model as a whole. This renders the possibility that

important mediation effects have been overlooked – for example studies suggesting that perceived cost is crucial to anxiety (e.g., Nelson et al., 2010; Uren et al., 2004) might have obtained different results if they had assessed perceived coping ability as well. This is clearly illustrated by the finding that, among individuals with height phobia, primary appraisal biases were present, but did not contribute to anxiety after accounting for perceived coping ability (Williams & Watson, 1985). Somewhat differently, Smari et al. (2001) found that biased estimation of probability, cost, and coping all independently predicted social anxiety. This highlights the need to explore primary and secondary threat perception simultaneously in a disorder-specific manner.

It remains somewhat unclear to what extent individuals' threat perception biases extend to events not directly connected to their anxiety disorder. Given the spread of activation proposed by Butler and Mathews (1983), evidence that trait anxiety is related to threat perception (Maner et al., 2007; Maner & Schmidt, 2006; Stober, 1997), and evidence of general risk-aversion among anxious individuals (Lorian & Grisham, 2010, 2011), it is likely that individuals with anxiety disorders sometimes perceive elevated threat in situations not directly related to their disorder. However this has received little attention in the literature and the specific cognitive biases involved in overestimation of general threat in various disorders are unclear (Maner & Schmidt, 2006). It is also likely that some disorders are characterised by distorted probability, cost, and/or coping estimates for a range of events, whereas other disorders are not (e.g., Uren et al., 2004). In order to effectively target threat perception biases through cognitive therapy (whether for disorder-specific or general events), the mechanisms involved in overestimation of threat for the anxiety disorder in question must be delineated.

This further highlights the need for disorder-specific examination of threat perception biases pertaining to general risks. It is therefore important to examine threat perception biases for general events among individuals with OCD. Before this is attempted in the current study, however, the available evidence for Beck et al.'s (1985) threat model as it applies to OCD will be examined, largely focusing on evidence that individuals with OCD are likely to demonstrate distortions in primary and/or secondary appraisal processes.

CHAPTER 5
BECK ET AL.'S MODEL IN OCD

Beck et al.'s Model in OCD

As previously discussed, Beck et al.'s (1985) theory of threat perception and anxiety ascribes primary importance to biased processing of information as threatening. It is clear that individuals with OCD overestimate threat in situations relevant to their OCD (Amir, Najmi, & Morrison, 2009; Moritz & Jelinek, 2009; Moritz & Pohl, 2009; Overton & Menzies, 2005; Rachman, 1998) and, most likely, in general situations (Cicolini & Rees, 2003; Cisler & Olatunji, 2010; Steketee & Frost, 1994). Numerous studies have demonstrated that individuals with OCD have biases to preferentially process and recall threat-related information. These will be briefly reviewed before evidence for specific biases in primary and secondary threat appraisals among individuals with OCD are discussed.

Processing Biases for OCD-Specific Threats

In a review of the literature on threat perception biases in OCD, Muller and Roberts (2005) suggested that the evidence indicates that individuals with OCD have an attentional bias towards threatening information as well as difficulty inhibiting attention towards threat. Threat vigilance bias appears to be positively correlated with OCD symptom severity but not with depression, suggesting that it is OCD, rather than general mood disturbance, that is related to threat perception biases (Amir et al., 2009). In addition, these biases increase as perceived responsibility increases (Radomsky et al., 2001). Evidence from various methodologies, including dot-probe tasks, directed forgetting, and Stroop tasks suggests that individuals with OCD preferentially process task-irrelevant, threat-related information (Irak & Flament, 2009).

Tata, Leibowitz, Prunty, Cameron, and Pickering (1996) found that individuals with OCD were vigilant for OCD-relevant threat on a dot probe task. The same was true for the anxious control participants for threat words relevant to their anxiety disorder. Because 26 low trait anxious individuals demonstrated no threat vigilance biases or threat interference effects, the vigilance process observed in the OCD and highly trait anxious groups "may reasonably be considered as the active allocation of resources towards the location of a recently detected threat" (Tata et al., 1996, p. 58). Other studies have also demonstrated that individuals with OCD selectively attend to ideographic threat stimuli, whereas non-clinical individuals do not (e.g., Amir, Cobb, & Morrison, 2008; Foa & McNally, 1986; Lavy, van Oppen, & van den Hout, 1994).

Evidence using Stroop tasks has consistently demonstrated that individuals with OCD selectively process OCD-relevant threat information and that the magnitude of this bias is

positively related to OCD severity (Amir et al., 2009; Foa, Ilai, McCarthy, Shoyer, & Murdock, 1993). Non-clinical individuals appear to demonstrate the opposite bias - being inclined to divert their attention away from threat (Foa et al., 1993; Muller & Roberts, 2005).

Cisler and Olatunji (2010) found that increased threat vigilance among individuals with high levels of OCD symptoms (compared to individuals with low levels of OCD symptoms) appeared to be particularly linked to difficulty disengaging attention from potentially threatening stimuli. This indicates that individuals with OCD deliberately maintain attention on stimuli they perceive to be threatening, or alternatively exhibit deficits in the ability to inhibit the allocation of attention to threatening sources (Cisler & Olatunji, 2010; Najmi, Hindash, & Amir, 2010). Selective attention deficits might be somewhat specific to OCD and do not appear to occur among individuals with panic disorder (Clayton, Richards, & Edwards, 1999). This suggests that individuals with OCD have a specific deficit relating to their ability to selectively ignore irrelevant internal and external threatening stimuli (Clayton et al., 1999). This process is likely to cause constant preoccupation with potential threats and consequent interference with daily functioning (Najmi et al., 2010). Najmi and Amir (2010) found that, among individuals with sub-clinical contamination fears, a therapy component focused on directing attention away from threatening stimuli effectively reduced attention bias to threat and increased behavioural approach toward feared stimuli, suggesting a causal role for attentional biases towards threatening information in OCD symptoms.

It should be noted that several studies have failed to find evidence of enhanced threat vigilance for ideographically threatening stimuli among individuals with OCD (e.g., Kampman, Keijsers, Verbraak, Naring, & Hoogduin, 2002; Moritz et al., 2008; Moritz & von Muhlenen, 2008). However, Amir et al. (2009) demonstrated that this is likely to be because this bias is attenuated over successive trials within an experiment.

In addition to threat vigilance, individuals with OCD have enhanced memory for OCD threat-related cues, difficulty forgetting negative information, and enhanced awareness of OCD-relevant potential negative outcomes compared to anxious controls and non-clinical individuals (Muller & Roberts, 2005; Olatunji, Connolly, Lohr, & Elwood, 2008; Wilhelm, McNally, Baer, & Florin, 1996). This suggests that they preferentially process threat-relevant information from memory. Irak and Flament (2009) demonstrated that individuals with high levels of OCD symptoms display a bias to preferentially process ideographic threat-related information when assessed in various memory paradigms, including cued recall, recognition memory, divided attention (i.e., simultaneously attending to two stimuli), and passive

attention (i.e., attempting to ignore threat-relevant stimuli). Given that individuals with low levels of OCD symptoms did not demonstrate this bias, Irak and Flament suggested that individuals with OCD are likely to be constantly preoccupied with threat-relevant stimuli within their environment, regardless of the presence of other stimuli or the performance of other tasks.

Overall, the evidence presented clearly demonstrates that individuals with OCD are biased towards ideographically threatening information, both in terms of their attention and their memory, resulting in increased perception of threat and consequent anxiety and risk-aversion in these situations (Muller & Roberts, 2005). Little effort has been directed towards examining attention or memory biases for general threats among individuals with OCD, although several studies have addressed this as a secondary issue in addition to studying OCD-specific threats.

Processing Biases for General Threats

Cisler and Olatunji (2010) found evidence that individuals high in contamination fear had difficulty disengaging attention from general sources of threat, not only those relevant to contamination. Similarly, Endrass, Kloft, Kaufmann, and Kathmann (2011) found that individuals with OCD benefited more from learning experiences involving negative events, but less from positive learning experiences, than did non-clinical individuals. Given that the learning tasks used were unrelated to OCD, this suggests that individuals with OCD are motivated to attend to potential negative events in general, in order to be able to avoid risks and potential harm (Endrass et al., 2011). Tata et al. (1996) demonstrated that individuals with OCD exhibited a general 'threat interference effect', whereby disruptions to cognitive processing were evident when threatening stimuli (regardless of whether they were relevant to OCD or social anxiety) were presented, as opposed to neutral stimuli. Foa et al. (1993) found that individuals with OCD were vigilant for general threat cues, not only OCD-relevant threat, on a Stroop task. In combination, these results suggest that individuals with OCD are hyper-vigilant for general threats, which is consistent with the notion that they are risk-aversive in general situations (Cicolini & Rees, 2003; Steketee & Frost, 1994).

Individuals with OCD are clearly vigilant for threat. More central to the current study, however, is an investigation of the cognitive elements that drive overestimation of threat in this population in general situations. Surprisingly little research has been conducted into what, from a cognitive perspective, causes individuals with OCD to perceive high levels of threat in various situations and the core distortion/s driving threat overestimation among

individuals with OCD remains unclear (Moritz & Pohl, 2009). Indeed, no study to date has examined the cognitive underpinnings of general risk-aversion among individuals with OCD. As was discussed in Chapter 3, the examination of the cognitive basis for general threat overestimation and consequent risk-aversion in OCD has potentially important therapeutic implications (e.g., Grayson, 2010; Maner & Schmidt, 2006; Rees, 2001). Before investigating this issue, existing evidence for the potential role of misperceptions of probability, cost, and coping ability in the threat perceptions and anxiety of individuals with OCD will be examined. It should be noted, however, that the evidence largely pertains to risk perceptions of events that are directly relevant to OCD symptomatology, rather than general events.

Probability Estimates in OCD

Early cognitive theorists assumed that individuals with OCD overestimated the probability of the occurrence of negative outcomes related to their OCD. For example, Carr (1971) asserted that individuals with OCD always overestimate the probability of the occurrence of unfavourable outcomes. Carr (1974) stated that because of this "all situations that have any potentially harmful outcome, however minimal, will generate a relatively high level of threat with its consequent anxiety" (p. 316). Carr (1974) proposed that compulsive behaviour is developed to reduce the subjective probability of harm in situations that are perceived as sufficiently costly to constitute a level of threat necessitating threat-reducing behaviour. This point of view received support from Foa and Kozac (1986).

As has been previously discussed, individuals with high levels of negative affect and/or trait anxiety, and individuals with high levels of depression, tend to overestimate the probability of negative outcomes (Butler & Mathews, 1987; Constans & Mathews, 1993; Gasper & Clore, 1998). Individuals with OCD demonstrate heightened levels of all of these constructs (Alonso et al., 2008; Rachman, 1997; Salkovskis, Forrester, Richards, & Morrison, 1998; Steketee, 1993; Tallis, 1995; Tukel et al., 2006), suggesting that they would be likely to overestimate the probability of the occurrence of negative events.

The obsessive belief domain of likelihood TAF involves the belief that having an unacceptable thought actually increases the probability that unacceptable/negative consequences within the thought will occur (Altin & Gencoz, 2011; Greenberg & Witzum, 1994; OCCWG, 1997; O'Leary et al., 2009; Rachman, 1997). It appears likely, therefore, that individuals with OCD who exhibit likelihood TAF beliefs would overestimate the probability of negative events related to their obsessions. It should be noted, however, that many individuals with OCD do not have elevated likelihood TAF beliefs (O'Leary et al., 2009).

Despite the aforementioned theoretical reasons to assume that individuals with OCD overestimate the probability of negative events, cognitive therapy that emphasises the reduction of estimated probability of the occurrence of feared events has proven to be far less efficacious among individuals with OCD than among those with other anxiety disorders (Grayson, 2010; Rees, 2001; Salkovskis, Forrester, & Richards, 1998, although see Krochmalik, Jones, Menzies, and Kirkby, 2004, for conflicting evidence). This suggests that overestimates of the probability of negative outcomes might not be typical among individuals with OCD. Indeed, Salkovskis (1985) disputed the notion that individuals with OCD necessarily perceive unrealistically high probabilities of negative events. He stated that the cognitive distortion involved in OCD involves an "inflated belief in the probability of *being the cause* of serious harm to others or self, or failing to avert harm where this may have been possible rather than an increased belief in the probability of harm *per se*" (p. 575). Other researchers have also suggested that probability overestimation is unlikely to be central to OCD threat overestimation (Grayson 2010; Rees, 2001).

Unlike other anxiety disorders, such as social phobia, where it is clear that individuals have inflated estimates of the probability of negative events (Foa et al., 1996; Lucock & Salkovskis, 1988; McManus et al., 2000; Rheingold et al., 2003; Smari et al., 2001; Stopa & Clark, 2000; Voncken et al., 2003; Voncken et al., 2007), OCD appears to be different. Often the individual with OCD will feel very anxious about events that he/she knows have extremely low probabilities (Cicolini & Rees, 2003; Grayson, 2010; Rees, 2001; Salkovskis, Forrester, & Richards, 1998). This anxiety is likely to be driven by high estimates of the cost/awfulness of aversive events, and/or low estimates of ability to cope with such events. Because many obsessive-compulsive fears relate to events perceived to lie in the distant future, it is often impossible for individuals with OCD to be certain that their feared events will not occur, or that there is no probability of threat (Rees, 2001).

The obsessive belief domain of IU is commonly elevated among individuals with OCD (e.g., Holaway et al., 2006; Tolin, Worhunsky, & Maltby, 2006). Individuals high in IU need not overestimate the probability of negative events in order to overestimate the threat involved in a situation. Grayson (2010) argued that in many cases, individuals with OCD recognise the low probability of their feared events, but cannot cope with the uncertainty around whether those events, however unlikely, might occur. This is likely to be the reason for the failure of probability re-estimation to reduce symptoms among many individuals with OCD (Grayson, 2010). It should be noted that IU does not preclude the possibility that individuals with OCD overestimate probability (it is possible to perceive exaggerated levels

of probability of negative events as well as having a low tolerance for uncertainty surrounding those events), however it renders probability overestimates unnecessary for the generation of anxiety. Indeed, it has been argued that, among individuals with OCD, it is the *possibility*, rather than the probability, of negative events, that drives obsessive anxiety (Salkovskis, 1985; Woods et al., 2002).

There are, therefore, theoretical reasons to believe that individuals with OCD do overestimate the probability of negative events (e.g., likelihood TAF, high levels of NA). However, there are equally strong reasons to believe that they do not (e.g., IU, the failure of treatments based around probability re-estimation). One way of examining the presence and impact of inflated estimates of the probability of harm in OCD is to examine research that has directly investigated this cognitive distortion. Menzies and colleagues have conducted several studies into this issue.

Jones and Menzies (1997) proposed that the primary cognitive distortion of individuals with contamination-related OCD is overestimation of threat. They demonstrated that perceived likelihood of catching a disease was strongly positively correlated with anxiety and urge to wash among OCD washers. Similarly, Overton and Menzies (2005) found that changes in beliefs about the probability of negative outcomes relating to their most salient OCD concern were significantly correlated with changes in OCD symptoms with treatment among 14 individuals with clinical checking OCD. In the nine participants who demonstrated major symptom change, beliefs in the likelihood of negative consequences underwent significant change in the two weeks prior to the change in symptoms. However there were also significant reductions in perceptions of the cost/severity of negative events and in the obsessive beliefs of IU and ICT, which could also have been responsible for the symptom reduction. Indeed, partial correlations revealed that changes in beliefs about the probability of negative events were no longer significantly correlated with changes in OCD symptoms on one measure of OCD symptoms (although they were to a small extent on the other) after the belief domains of severity, IU, and ICT were controlled (Overton & Menzies, 2005). Therefore, evidence for the importance of subjective probability of harm in the symptomatology of individuals with OCD from these studies is equivocal at best.

Overton and Menzies (2002) found that individuals with OCD (N = 21) rated the probability and cost of danger associated with their most salient OCD fear as being significantly higher than did non-clinical participants (N = 21). However the relative importance of perceived probability and perceived cost was not explored.

Jones and Menzies (1998b) recruited a sample of 18 undergraduate students with sub-clinical OCD washing symptoms. Participants underwent a behavioural avoidance test whereby they were asked to place their hands in a mixture of potting mix, animal hair, raw meat, and food scraps for five minutes. Participants were randomly assigned to either a high-danger condition (whereby they were instructed that there was a possibility of serious illness) or a low-danger condition (whereby they were instructed that there was no possibility of serious illness). The mean rating of probability of disease was higher among the high-danger group than among the low-danger group. However, there were no differences in anxiety or urge to wash between the two groups, suggesting that manipulation of perceived probability of negative events does not influence obsessive anxiety or behaviours (Jones & Menzies, 1998b). This study once again does not unequivocally demonstrate the importance of subjective probability of harm in the symptomatology of individuals with OCD, although small group sizes must be considered as a possible reason for failure to detect significant effects.

A recent study has cast further doubt on the role of perceived probability of harm in OCD anxiety. Using the same method as Jones and Menzies (1998b), Thorpe, Barnett, Friend, and Nottingham (2011) demonstrated that perceived probability of harm following exposure to contaminants was not related to subsequent time spent hand washing, or anxiety experienced during the task among 35 non-clinical individuals. Perceived severity of disease, in contrast, was positively related to both anxiety and time spent hand washing. Thorpe et al. suggested that the results indicate that the perceived cost of disease, but not its perceived probability, is likely to be an important treatment target for OCD washing. Similar results were reported by Simos, Vaiopoulos, Giouzepas, and Parasehos (1995, as cited in Steketee et al., 1998), who found no relationship between OCD severity and probability estimation of dangerous events.

Moritz and Jelinek (2009) found that individuals with OCD did not demonstrate higher estimates of the probability of OCD-relevant or negative events than did non-clinical individuals. A separate study by Moritz and Pohl (2009) replicated these findings and demonstrated that probability estimation was not correlated with OCD symptom severity. Critically, although individuals with OCD did not estimate the probability of negative events as higher than did non-clinical individuals, the provision of corrective information regarding the actual probability of negative events was less effective in appeasing the concerns of individuals with OCD than it was in appeasing the concerns of non-clinical individuals (Moritz & Pohl, 2009). This suggests that probability overestimation is not central to OCD

and that therapeutic efforts aimed at probability re-estimation are unlikely to be successful for this clinical group.

The evidence to date is inconclusive regarding the role of inflated estimates of the probability of harm in threat overestimation among individuals with OCD. Menzies and colleagues reported evidence that individuals with OCD overestimate the probability of negative outcomes related to their OCD concerns. They also reported that symptoms change was related to changes in subjective probability of negative outcomes. However perceived probability was not uniquely related to changes in OCD severity after controlling for other cognitive distortions (Overton & Menzies, 2005). The majority of research has indicated that probability overestimation is not central to inflated risk/threat estimates among individuals with OCD (Grayson, 2010; Moritz & Jelinek, 2009; Moritz & Pohl, 2009; Salkovskis, Forrester, & Richards, 1998; Woods et al., 2002). Some evidence has indicated a possible role for inflated probability estimates in obsessive anxiety (Jones & Menzies, 1997; Overton & Menzies, 2005). Others (e.g., Thorpe et al., 2011) have argued that probability estimation for negative events is not involved in obsessive anxiety, whereas perceived cost of those events is important in the prediction of this anxiety. It is also unclear whether any biases in perceived probability are specifically related to OCD or predominantly related to inflated levels of negative affect and trait anxiety.

Overall, the available evidence suggests that overestimates of the probability of negative outcomes in feared scenarios might be less central to OCD than to other anxiety disorders. Indeed Menzies, Harris, Cumming, and Einstein (2000) demonstrated that manipulating perceived levels of responsibility for negative outcomes (a key feature of Salkovskis' cognitive-behavioural theory of OCD) among a non-clinical sample did not influence the perceived probability of those outcomes. Perceived responsibility did, however, influence the perceived cost/awfulness of negative outcomes, with higher levels of responsibility resulting in higher levels of perceived cost. Given the importance of perceived responsibility in OCD, it is possible that perceptions of the cost of negative outcomes are more important that the perceived probability of those outcomes in this disorder. This is consistent with other findings (e.g., Overton & Menzies, 2005; Thorpe et al., 2011), as well as with Salkovskis, Forrester, and Richard's (1998) assertion that perceived responsibility for harm drives OCD by inflating estimates of the cost of that harm. Evidence for inflated perceptions of the cost of negative outcomes will now be reviewed.

Cost Estimates in OCD

Early theorists suggested that individuals with OCD overestimate the cost associated with potential negative events (e.g., Carr, 1974). As previously discussed, Salkovskis' (1985, 1989) cognitive-behavioural theory of OCD ascribes primary importance to the role of inflated responsibility for potential harm in the maintenance of obsessive-compulsive problems. Salkovskis, Forrester, and Richards (1998) reported that individuals with OCD perceive negative outcomes as being particularly awful or costly if they believe that they will be held responsible for those outcomes. They also suggested that these inflated cost estimates are likely to be what drives the inflated risk perception of individuals with OCD, especially given that individuals with OCD are usually aware that their feared consequences are unlikely. Therefore, according to Beck et al.'s (1985) model, they will experience high levels of anxiety in any situation in which they assume responsibility for possible negative outcomes, even if they make correct estimates of the low (but not zero) probabilities of the occurrence of those outcomes. This is in line with the work of Rachman (1997, 1998), who suggested that catastrophic misinterpretation of obsessive thoughts (i.e., perceiving them as particularly costly) is what drives OCD. Salkovskis, Forrester, and Richard's work is important because, to date, it is the only cognitive-behavioural theory of OCD that directly links OCD cognitive biases to Beck et al.'s (1985) model of threat perception. Evidence has supported the hypothesis that inflated levels of responsibility for harm increase the subjective cost of an event, thereby generating heightened estimates of threat and obsessional anxiety.

For example, Menzies et al. (2000) reported that, among a non-clinical sample, negative outcomes related to both checking and cleaning concerns were perceived as significantly more aversive by the group who felt personally responsible for those outcomes than by the group who did not feel personally responsible. Menzies et al. proposed that "perceived severity of potential outcomes is the driving mediator of OCD behaviour" (p. 1031) but that perceived responsibility influences danger expectancies by influencing perceived cost of negative outcomes. Importantly, perceptions of responsibility did not influence the perceived probability of negative events (Menzies et al., 2000), which is consistent with the notion that probability overestimation might not be central to OCD threat perception. Other studies (Jones & Menzies, 1997; van Oppen & Arntz, 1994, as cited in Menzies et al., 2000) have also suggested that inflated personal responsibility for harm influences OCD indirectly by influencing estimations of the severity (but not the probability) of negative outcomes.

Another theoretical reason to believe that individuals with OCD overestimate the cost of negative events is the presence of moral TAF, which can include beliefs that a thought is equivalent to an action or is indicative of the individual's true desires or intentions (Altin & Gencoz, 2011; O'Leary et al., 2009; Rachman, 1998). Hence, individuals with OCD who experience intrusive thoughts related to harming other people might interpret these thoughts as being as bad as if they had actually caused the harm and as evidence that, at a core level, they are evil or immoral people. Thus, they feel responsible for the perceived effects/immorality of their bad thoughts, which increases the cost associated with such ego-dystonic cognitions (Rachman, 1998). In addition, individuals with OCD expect other people to blame them for any negative consequences that may arise (whereas other anxious individuals tend to expect people to be more lenient), which is likely to further increase the perceived cost/awfulness of these consequences (Salkovskis et al., 2000).

Several studies have directly addressed the issue of perceived cost of negative events among individuals with OCD. Overton and Menzies (2002) demonstrated that individuals with OCD perceive negative events relevant to their OCD concerns as being more costly or aversive than do non-clinical individuals. Moritz and Jelinek (2009) found that individuals with OCD rated the cost of checking, interpersonal violence, and traffic accident-related events as significantly higher than did a psychiatric control group. Given that there were no differences in perceived probability between the groups, this again suggests that the perceived cost of negative outcomes is more important than their perceived probability to OCD threat perception and anxiety. Given that not all events in Moritz and Jelinek's study were directly relevant to OCD, this provides preliminary evidence that overestimation of the cost of negative events might be involved in general threat overestimation among individuals with OCD.

Perceived cost of negative events also appears to be related to OCD symptoms and anxiety. For example, Jones and Menzies (1997) found strong positive correlations between anxiety and perceived severity of potential consequences, and between urge to wash and perceived severity of potential consequences among OCD washers. Overton and Menzies (2005) demonstrated that changes in beliefs about the severity of consequences of ideographically important OCD-related events were significantly correlated with changes in symptom severity among their sample of 14 individuals with OCD. In addition, perceived severity of negative events accounted for unique variance in OCD severity, whereas perceived probability did not (Overton & Menzies, 2005). These results suggest that, for

OCD-related concerns, perceived severity/cost of potential negative outcomes is an important determinant of OCD threat perceptions and anxiety.

In their study of sub-clinical OCD washers (details reported above), Jones and Menzies (1998b) reported that the mean cost of disease rating among the high-danger group was significantly higher than among the low-danger group. Jones and Menzies suggested that their results are consistent with the suggestion that experimental manipulation of perceived cost of negative events resulted in changes in behavioural components of OCD washing, although given that individuals in the high danger group did not demonstrate significantly higher levels of anxiety that individuals in the low danger group, firm conclusions cannot be drawn. However, Thorpe et al. (2011) demonstrated that perceived severity of disease was the central mediator of time spent washing following exposure to contaminants, whereas perceived probability of contracting a disease was unrelated to time spent washing. This recent study is highly suggestive of the importance of perceived cost of negative events in driving OCD anxiety and behaviours.

Evidence (e.g., Menzies et al., 2000; Moritz & Jelinek, 2009; Overton and Menzies, 2002, 2005; Salkovskis, Forrester, & Richards, 1998; Thorpe et al., 2011) suggests that perceived cost/awfulness (which is probably related to inflated responsibility for harm) is central to risk perceptions of events related to obsessive-compulsive fears among individuals with OCD. However, little is currently known about the role of responsibility in perceptions of risk for general events that are not related to these fears. It is possible that the inflated estimates of threat in general situations (Cicolini & Rees, 2003; Steketee & Frost, 1994) exhibited by individuals with OCD are not due to inflated cost/awfulness estimates stemming from heightened levels of perceived responsibility. However, Steketee and Frost (1994) reported a positive correlation between responsibility and ERI risk-aversion, strengthening the possibility that perceived responsibility (and consequently high levels of perceived cost) is elevated in general risk scenarios among individuals with OCD. In addition, given their apparently heightened awareness of the causal pathways through which negative outcomes might eventuate, individuals with OCD might be hypersensitive to threats in a multitude of situations (Tallis, 1995), and might temporarily assume responsibility for averting danger in situations in which they detect possible threats to themselves, or critically, to other people. This is especially the case given that individuals with OCD lack the ‘omission bias’ that is exhibited by most individuals, whereby responsibility is assumed primarily for actions rather than inactions (Foa et al., 2001). Therefore, individuals with OCD are likely to perceive

possible negative outcomes as particularly costly even in situations that are not directly linked to their obsessive concerns.

Overall, evidence for primary threat appraisal biases among individuals with OCD suggests that, in situations related to their OCD fears, overestimation of the cost/awfulness of potential negative events is likely to be more important in predicting anxiety than is overestimation of the probability of those outcomes. However, secondary appraisal involving low perceived coping ability is also likely to be involved in threat overestimation and anxiety among individuals with OCD.

Coping Ability Estimates in OCD

McFall and Wollersheim (1979) suggested that "the obsessive-compulsive individual evidences distortion in his (sic) secondary appraisal process by underestimating his (sic) abilities to cope with the threat in an adaptive or realistic manner" (p. 335). This results in anxiety and feelings of uncertainty. Indeed, McFall and Wollersheim suggested that rituals in OCD can be conceptualised as a means of attempting to cope with a perceived threat when individuals erroneously believe that they have no alternative means of coping. Guidano and Liotti (1983) and Steketee et al. (1998) echoed these sentiments.

Mancini, D'Olimpio, and Cieri (2004) found that experimentally reducing non-clinical individuals' perceived ability to cope with a negative situation resulted in increases in obsessive-compulsive behaviour (checking, slowness, and uncertainty regarding performance) without influencing actual task performance within the situation. The increases in obsessive-compulsive behaviour were additional to those attributable to increased responsibility within the task. Mancini et al. proposed that, in conditions of high perceived responsibility, the belief that one is incapable of producing appropriate or positive outcomes, or is likely to make mistakes, will result in anxiety and an increase in the incidence of efforts to control one's behaviour through checking and being overly careful. This is similar to the argument that perfectionism in OCD is related to low perceived ability to cope with potential negative events, as was discussed in Chapter 2. Mancini et al. also suggested that feelings of low perceived competence (low coping self-efficacy) might drive risk-aversion in OCD, and result in obsessive-compulsive behaviours, at least in situations where the individual believes that he or she is responsible for the outcomes of the situation.

Steketee et al. (1998) demonstrated that individuals with OCD (N = 62) had lower beliefs in their ability to cope with negative events salient to OCD than did anxious controls (N = 45) or non-anxious controls (N = 34). Steketee et al. suggested that perceptions of low

coping ability appeared to have greater relevance to OCD than to other anxiety disorders. However this conclusion is somewhat problematic because the questionnaire used to measure perceived coping involved events that were related to obsessive thinking, so it is possible that individuals with OCD have lower coping self-efficacy than anxious controls in OCD-specific situations, but not general situations. Anxious control participants had lower beliefs about their coping ability than did non-anxious participants and Steketee et al. suggested that low coping self-efficacy is likely to play a role in the maintenance of anxiety disorders in general, even if it is more pronounced in OCD.

Other than the studies by Mancini et al. (2004) and Steketee et al. (1998), surprisingly little research has been conducted into examining the coping self-efficacy of individuals with OCD for aversive events. In fact, only one other study (Woods et al., 2002), which will be reported later, has directly addressed this issue. However, indirect evidence for the importance of low perceived coping ability in the erroneous threat estimates of individuals with OCD is available in the form of studies demonstrating that individuals with OCD have low perceived self-competence, low levels of self-esteem and self-efficacy, and low levels of confidence in their ability to monitor and recall their own behaviour. As was discussed in Chapter 4, self-confidence and self-efficacy (particularly coping self-efficacy) are central to threat perception and anxiety (Boekaerts, 1991; Bouchard et al., 2007; Nicholls et al., 2010; Ozer & Bandura, 1990).

Wu et al. (2006) demonstrated that individuals with OCD have lower self-esteem and lower self-entitlement than other psychiatric outpatients, suggesting that they exhibit a stable self-perception that is highly negative. Consistent with this, Lochner et al. (2005) demonstrated that individuals with OCD scored highly on the shame/defectiveness schema of the Young Schema Questionnaire (YSQ, Young, 1994). This suggests that they would perceive themselves as unable to cope with negative events. Individuals with trichotillomania did not score highly on this schema, suggesting that low coping self-efficacy is not simply the result of anxiety. Similarly, Doron, Kyrios, and Moulding (2007) found that low perceived competence in subjectively important life domains was related to higher OCD symptom levels. Finally, Fava et al. (1996, as cited in Ehntholt et al., 1999) found evidence that individuals with OCD reported having low self-esteem prior to the onset of their OCD symptoms, suggesting that it might be a risk factor for OCD development.

Evidence suggests that individuals with OCD have low self-confidence and low self-competence, which would be expected to reduce their perceived ability to cope with aversive outcomes (Aelterman, De Clercq, De Bolle, & De Fruyt, 2011; Rector et al., 2002; Rees et

al., 2006; Samuels et al., 2000). This is likely to further increase the level of threat perceived, and anxiety experienced, in various situations and result in avoidance of, or attempts to prevent aversive outcomes within, these situations (Boekaerts, 1991; Dar, Rish, Hermesh, Taub, & Fux, 2000; McNally & Kohlbeck, 1993; Salkovskis, Forrester, & Richards, 1998; van den Hout & Kindt, 2003).

Samuels et al. (2000) found that individuals with OCD scored lower than non-clinical individuals on the competence and self-discipline facets of the Conscientiousness domain of the Revised NEO Personality Inventory (NEO-PR-R, Costa & McCrae, 1992). In an effort to expand on this result Rector et al. (2002) utilised a sample of 98 individuals with OCD and 98 individuals with major depression. Consistent with Samuels et al. (2000), results indicated that individuals with OCD had scores in the low range on the competence and self-discipline facets of the NEO PI-R (compared to non-clinical averages). This result might appear surprising, given that individuals with OCD are typically thorough, organised, and persistent (Rector et al., 2002). However, what it appears to reflect is the self-perception held by individuals with OCD that they are unable to perform tasks to an acceptable level and that they are inept and unable to adequately cope with their everyday lives (Rector et al., 2002). This strengthens the possibility that low coping self-efficacy might be central to threat overestimation and consequent risk-aversion among individuals with OCD. It should be noted, however, that after controlling for depressive symptoms, individuals with OCD did not score significantly differently from depressed individuals on the competence or self-discipline facets (Rector et al., 2002), again suggesting that low coping self-efficacy might be present among various groups of clinical individuals.

Rees et al. (2006) also found that individuals with OCD (N = 21) scored lower than a clinical control group (N = 39) on the competence and self-discipline facets of the NEO-PI-R. Interestingly, in the OCD group these facets were closely related to levels of OCD symptomatology (with scores declining as OCD severity increased) but were not related to levels of depression. Overall, individuals with OCD had particularly low estimates of their competence (Rees et al., 2006). NEO-PI-R competence items assess general self-beliefs and are not related to OCD symptoms, suggesting that individuals with OCD are likely to underestimate their ability to cope with various general threatening situations, which could underlie their high levels of general risk-aversion (e.g., Cicolini & Rees, 2003; Steketee & Frost, 1994).

Ehntholt et al. (1999) reported further evidence that OCD might be particularly related to low perceived coping ability. Compared to the anxious and non-anxious controls,

individuals with OCD believed that other people would have a stronger negative reaction towards them if it were possible that they might cause harm or problems for other people. This suggests that in conditions of perceived responsibility for potential harm, individuals with OCD are likely to perceive others to judge them harshly, and consequently experience low self-esteem. This is likely to result in low perceived ability to cope with the situation and/or its potential negative consequences (Ehntholt et al., 1999). It should be noted, however, that perceptions of harsh judgement from others and the consequent effects on self-esteem could also result in inflated cost estimates for potential negative events among individuals with OCD.

Other studies have also demonstrated that individuals with OCD doubt their ability to cope successfully with negative outcomes, and that this bias might be more pronounced among individuals with OCD than among other anxious groups (although not individuals with major depression), including individuals with panic disorder (Frost & Steketee, 1997; Sassaroli et al., 2008).

Further evidence for potentially low perceived coping abilities among individuals with OCD is found in several studies that demonstrate this population lack confidence in their memory, their ability to monitor their own actions, and their performance on tests, despite no objective performance deficits in these areas (Cougle, Salkovskis, & Thorpe, 2008; Dar et al., 2000; Hermans, Martens, De Cort, Pieters, & Eelen, 2003; MacDonald, Antony, Macleod, & Richter, 1997; McNally & Kohlbeck, 1993; Moritz et al., 2007; Radomsky et al., 2001; Tolin et al., 2001; van den Hout & Kindt, 2003). TAF and heightened perceptions of responsibility also appear to result in 'perceived impulsivity', whereby individuals with OCD doubt their ability to control their actions or to prevent harm, and therefore perform compulsive behaviour repetitively (Cottraux & Gerard, 1998). Although this research is not directly linked to coping self-efficacy, it again suggests the presence of a highly negative, stable self-concept among individuals with OCD. This is consistent with low perceived ability to cope with potential negative events.

Low levels of self-competence and self-esteem among individuals with OCD suggest that they are likely to have low coping self-efficacy relating to potential negative events or threats (Boekaerts, 1991), thereby believing themselves to be incapable of adequately coping with these events. This implies that they will perceive high levels of threat/risk, and consequently exhibit risk-aversive behaviour in various situations, according to Beck et al.'s (1985) model. This is consistent with McFall and Wollersheim's (1979) suggestion that therapy for OCD should include a component designed to improve the self-worth of clients.

More recently, Grayson (2010) also argued that enhancing coping self-efficacy in threatening situations is likely to be essential for long-term treatment gains among individuals with OCD.

Another line of evidence for the importance of lowered perceived coping ability among individuals with OCD stems from the recent work of Moulding and colleagues (reviewed in Chapter 2) examining discrepancies between desire for control and sense of control among individuals with OCD. Overall, the evidence for the importance of SC and DC in the psychopathology of OCD is mounting (Moulding & Kyrios, 2006, 2007; Moulding et al., 2007; Moulding et al., 2009). In particular, it appears that OCD symptoms and obsessive beliefs are related to discrepancies between DC and SC. Individuals with OCD appear to have a high level of DC in threatening situations, which, although not directly problematic, is expressed through obsessive beliefs such as responsibility to prevent harm. High DC becomes problematic when paired with lower SC in a particular situation (Moulding et al., 2009). In essence, a primary appraisal suggesting that a threat is present results in increased desire for control of the situation. However, individuals with OCD often do not perceive themselves as possessing adequate control, which results in low coping self-efficacy and consequently high levels of anxiety. Neutralising responses such as rituals and avoidance are motivated by the desire to reduce this anxiety. This is evidence (albeit indirect) of the role of low perceived ability to cope with threat in OCD pathology and suggests that secondary appraisal processes are likely to be central to the threat perceptions among individuals with OCD. Evidence of low SC in the presence of threat is also consistent with findings of low self-competence and self-confidence among individuals with OCD (e.g., Rector et al., 2002; Rees et al., 2006).

Importantly, Moulding and Kyrios (2006) suggested that individuals with OCD are likely to have a high DC in many unpleasant situations, even those not related to their OCD. Clearly, this suggests that, if their SC is undermined in these situations, this will result in low coping self-efficacy and consequent high levels of threat appraisal. This indicates that general risk-aversion among individuals with OCD could be related to low coping self-efficacy for general negative events. Moulding and Kyrios (2007) suggested that it is likely to be important to identify factors that undermine SC in various situations (OCD-specific and general) among individuals with OCD as a means to improve coping self-efficacy.

Steketee et al. (1998) suggested that low perceived coping ability would be expected to be present across the range of anxiety disorders, having a role in their development and maintenance. Consistent with this, Malouff, Thorsteinsson, and Schutte (2005) found that low levels of self-rated conscientiousness were associated with a variety of clinical disorders.

However, Kotov et al. (2010) found that OCD was one of the few disorders (along with panic disorder and depression) that remained significantly associated with conscientiousness after controlling for the effects of neuroticism. This suggests that low levels of perceived ability to manage daily activities might be more central to OCD and panic disorder than to anxiety in general. It should be noted, however, that facet-level traits within the conscientiousness domain (including competence) were not assessed.

The available evidence suggests that individuals with OCD are likely to underestimate their ability to cope with various situations. Importantly, the findings of Rector et al. (2002), Rees et al. (2006), and Moulding and Kyrios (2006) indicate that low self-competence is likely to occur in a range of situations that are not related to typical OCD concerns. Therefore, it can tentatively be hypothesised that individuals with OCD are likely to underestimate their coping ability, and consequently overestimate threat, in a wide range of situations. Potentially this could account for the high levels of general risk-aversion among individuals with OCD. However, the evidence for low perceived coping among individuals with OCD is largely from studies that have not directly assessed this construct among this population. In addition, it is unclear whether individuals with OCD are more prone to underestimating their coping potential than are individuals with other clinical disorders, or whether low perceived coping ability among individuals with OCD is largely a product of negative affect (e.g., Ehntholt et al., 1999; Frost & Steketee, 1997; Rector et al., 2002; Rees et al., 2006; Sassaroli et al., 2008).

Woods et al.'s Study into Probability, Cost, and Coping Ability Estimates in OCD

The evidence presented to this point is largely derived from studies that have assessed (directly or indirectly) either the primary appraisal process or the secondary appraisal process among individuals with OCD. However, given that they are related constructs, it is important to assess perceived probability, perceived cost, and perceived coping ability simultaneously in order to obtain a more accurate perception of risk/threat judgements among individuals with OCD. The only study to have directly attempted this will now be reviewed.

In Woods et al.'s (2002) study 1, 18 individuals with OCD wrote about three ideographically important negative events that they feared might happen to them in the future. The events that the respondents reported were typical OCD concerns (Woods et al., 2002). Participants rated the probability that the event would occur, the severity of the consequences if it did occur, and how well they would cope if the event transpired. Probability, severity, and coping ratings were obtained by averaging the scores across all

three events, with coping ability reverse-scored so that lower scores indicated higher perceived coping ability. The correlation between OCD symptoms and perceived coping ability was significant (r = .72), indicating that as OCD severity increased, perceived coping ability decreased. There was also a significant positive correlation between perceived severity and OCD symptoms (r = .51). The correlation between perceived probability and OCD severity was not significant. In a simultaneous multiple regression analysis with obsessive-compulsive symptom severity as the criterion, perceived coping ability was the only variable that contributed significantly to the prediction of OCD symptoms (sr^2 = 0.43). As perceived coping ability increased, OCD symptoms decreased (Woods et al., 2002). Perceived probability, severity, and their interaction did not significantly contribute to prediction of OCD symptom severity.

In study 2, 73 female undergraduate students wrote about two personally salient potential negative events. The events reported on were "typical student-related concerns" (Woods et al., 2002, p. 108). In this study, perceived probability, cost, and coping ability all related to OCD symptom severity, with effect sizes ranging from small to medium (Woods et al., 2002). In a simultaneous multiple regression analysis, perceived probability was the only variable that significantly predicted OCD symptoms (sr^2 = 0.26), although a trend was evident for perceived severity.

Overall, the results of Woods et al. (2002) indicate that as OCD symptoms increase, severity estimation increases and perceived coping ability decreases. These effects were larger in the clinical OCD sample than in the non-anxious control sample. Perceived probability was not significantly related to OCD severity in the clinical sample, which indicates that individuals with OCD might realise that the probability of their feared events is low (e.g., Grayson 2010, Rees, 2001; Salkovskis, Forrester, & Richards, 1998). Given that average OCD symptom severity among the clinical group was high this suggests that probability overestimation for personally salient OCD events might not be a central factor in threat perception and anxiety, although anxiety was not directly assessed. Woods et al. suggested that in clinical OCD, severity overwhelms probability, and that the commonly observed intolerance of uncertainty among individuals with OCD renders the very possibility of the occurrence of a feared event sufficient to cause severe distress. In addition, the fact that a different pattern of results was found for the non-clinical sample indicates that threat perception might be qualitatively different among individuals with OCD compared to non-anxious individuals (Woods et al., 2002).

Several methodological concerns suggest that the results of Woods et al. (2002) must be interpreted cautiously. In particular, it is likely that the events reported by the OCD sample were more severe, more difficult to cope with, but less probable than the events reported by the student sample, and this is a flaw in the ideographic methodology used (Woods et al., 2002). The low power involved in this study (especially among the clinical sample) must be considered. Predictors other than perceived coping might have made significant contributions to OCD severity in a larger sample, or in a regression model with more overall predictive ability, although it should be noted that the magnitude of the relationship between perceived probability and OCD severity was small. Other limitations include the fact that no formal diagnoses were conducted, and there was no inter-rater reliability check for diagnoses. In addition, the scale used showed poor internal consistency in both studies and its validity and reliability are untested.

Overall, the findings of Woods et al. (2002) suggest that, in clinical OCD, "cognitive misappraisals other than probability overestimation (i.e., severity overestimation and coping underestimation) are likely to be important in the treatment of OCD" (p. 109). This is consistent with the body of literature reviewed above, which suggests that probability overestimation is unlikely to be central to OCD risk/threat overestimation. However, Woods et al. suggested that better methods of assessing perceived probability, severity, and coping ability (i.e., ones which have ecological validity and internal consistency) are required. Indeed, that is the primary aim of the current research. However, unlike Woods et al., this study will focus on general risk perceptions because they are likely to be more important in long-term treatment gains (Maner & Schmidt, 2006; Rees, 2001).

Conclusions Regarding Perceived Probability, Cost, and Coping Ability Biases in OCD

Overall, it appears likely that individuals with OCD primarily overestimate OCD-relevant threat because of overestimation of the cost of potential negative events, and underestimation of their ability to cope with those events. Results regarding overestimation of the probability of harm in threatening situations have been equivocal (e.g., Moritz & Jelinek, 2009; Overton & Menzies, 2005; Thorpe et al., 2011), but overall suggest that individuals with OCD do not perceive unusually high probability of negative consequences associated with feared events (or that if they do, this bias is not uniquely predictive of OCD symptomatology or anxiety).

It is difficult to predict whether the results from studies using OCD-specific risks/negative events will generalise to general risk scenarios. There is currently no

theoretical reason to suspect that a different pattern of results will be obtained for general threat scenarios than for OCD-specific threat scenarios.

In terms of perceived probability of negative general events, research has suggested that anxious individuals do not usually overestimate probability for events that are not relevant to their particular disorder (Foa et al., 1996; Klumpp & Amir, 2010; Nelson et al., 2010; Uren et al., 2004; Woods et al., 2002). There is no evidence that individuals with OCD will depart from this trend, particularly given that they do not seem to overestimate the probability of events that directly relate to their OCD fears. In addition, research (Menzies et al., 2000) has demonstrated that increased levels of perceived responsibility do not result in increased probability estimates. Therefore, even if individuals with OCD assume temporary responsibility for general negative events, this is unlikely to result in inflated perceptions of the probability of harm. It can, therefore, tentatively be hypothesised that individuals with OCD will not overestimate the probability of general negative events.

Individuals with OCD do appear to overestimate the cost of potential negative events related to their OCD fears (e.g., Menzies et al., 2000; Moritz & Jelinek, 2009; Overton and Menzies, 2002, 2005; Salkovskis, Forrester, & Richards, 1998; Thorpe et al., 2011). In addition, it appears that individuals with OCD will overestimate the cost of negative events for which they feel responsible (Menzies et al., 2000; Salkovskis, Forrester, & Richards, 1998). Given their apparent skill in recognising causal pathways leading to harm, and their tendency to perceive responsibility for failing to act to prevent harm (Siev et al., 2010), it is possible that they will temporarily assume responsibility for any situation in which they foresee the possibility of harm occurring. Therefore, from this perspective, it is likely that individuals with OCD will overestimate the cost of negative events relating to general threat scenarios.

In terms of perceived coping, studies have suggested that individuals with OCD are likely to have low coping self-efficacy in situations relevant to their OCD fears and in more general situations (Moulding & Kyrios, 2006; Rector et al., 2002; Rees et al., 2006; Woods et al., 2002). In addition, findings of low self-esteem and low self-confidence in multiple domains (Ehntholt et al., 1999; Wu et al., 2006) suggest that individuals with OCD are likely to underestimate their ability to cope with a wide range of negative events, even those not relevant to their OCD. It appears likely, therefore, that individuals with OCD will underestimate their ability to cope with general negative events.

Aims of the Current Research

This research aims to examine the cognitive distortions that result in overestimation of threat, and consequent anxiety and avoidance, in general situations (located both in daily life and in the more distant future) among individuals with OCD. If it can be determined that individuals with OCD perceive high levels of subjective probability and/or cost of general risks, or if they demonstrate low coping self-efficacy for potential negative outcomes, these biases could be targeted in therapy. Potentially, this could help to reduce the rates of relapse, and improve long-term treatment outcomes for individuals with OCD.

Overall, this literature review has presented evidence that individuals with OCD are risk-aversive even in situations that are not related to their OCD symptoms. It has also been demonstrated that this is likely to be related to overestimation of threat in these situations, but that the cognitive mechanisms driving threat overestimation in general events are poorly understood. Tentative evidence that individuals with OCD are likely to overestimate the cost of negative events, and underestimate their ability to cope with those events, was presented. However, given that this evidence is largely indirect and almost always relates to OCD-specific fears, examination of threat perception biases in general risk scenarios is required. This is particularly important given the potential therapeutic benefits of uncovering mechanisms to reduce general risk-aversion among individuals with OCD and other anxious individuals.

A significant problem, however, is that there currently are no suitable measures that assess the various elements of threat perceptions in general situations. Therefore, an important step towards uncovering the nature of threat perception biases that drive general risk-aversion in individuals with OCD and individuals with other anxiety disorders is the creation and validation of a theoretically driven scale that simultaneously assesses perceived probability, cost, and coping ability related to general risk events. Such a scale has the potential to be used to study general risk-aversion among various anxious and other clinical groups, and could facilitate the enhancement of treatments for a multitude of clinical problems. Therefore, the first two studies to be reported focused on the creation and validation of the MDRAS, which was designed to achieve this purpose.

CHAPTER 6

STUDY 1 – CONSTRUCTION AND FACTOR ANALYSIS OF THE MULTI-DIMENSIONAL RISK ASSESSMENT SCALE

Measuring Risk Perceptions

Avoidance of general risks appears to be important in symptom maintenance and symptom relapse among individuals with OCD, and probably among other anxious individuals. Therefore it is important to assess the cognitive basis underlying avoidance of these risks using Beck et al.'s (1985) model of threat perception. However, despite previous calls for the development of measures to achieve this (e.g., Woods et al., 2002), none exist. Therefore, the aim of the current study was to create a measure that could be used to assess Beck et al.'s (1985) model of threat perception in relation to general unpleasant events, and to begin the process of validation through factor analysis. This required the construction of a questionnaire that assesses perceived probability, perceived cost, and perceived ability to cope with various general negative events that do not relate to typical OCD symptom dimensions or OCD fears (to avoid tapping into OCD symptomatology rather than general risk-aversion).

It has been suggested that a significant difficulty encountered when attempting to use cognitive techniques to reduce risk-aversion and OCD symptoms among individuals with OCD is that many of the events that they fear are located in the distant future, rendering disconfirmation of feared consequences impossible (Rees, 2001; Salkovskis, Forrester, Richards, & Morrison, 1998; Woods et al., 2004). It was therefore considered important that the new scale assessed risk estimations for non-OCD specific events that could occur at unspecified times in the future, as well as risk estimates for everyday events. Therefore, the Multi-Dimensional Risk Assessment Scale (MDRAS, see Appendix A) was designed to assess perceived probability, perceived cost, and perceived coping ability for various general everyday and potential future scenarios.

MDRAS Item Generation

Given that new scales should, when possible, consist of items based on theoretical considerations (Simms, 2008), it was important to use existing measures to generate items for the MDRAS. It was also important that the items were not strongly related to typical OCD symptoms. Given that two types of items (everyday and future) were required, two separate measures were used for item generation.

MDRAS Everyday Items

Given the importance of using theoretically driven items that did not tap into OCD symptoms, the ERI-AUS was used as the basis for item generation for MDRAS Everyday

items. Current understanding of general risk-aversion among individuals with OCD was largely derived from studies using the ERI-AUS and its predecessor, the ERI, both of which assess avoidance of non-pleasurable activities involving minor levels of risk that are encountered in everyday life. ERI-AUS items contain various everyday unpleasant events that are often avoided by individuals with OCD, but are not related to OCD symptoms (Steketee & Frost, 1994). These items are conceptually congruent with the items required in the MDRAS Everyday Scales (Cicolini & Rees, 2003; Steketee & Frost, 1994). Cicolini and Rees (2003) adapted the original ERI for use with Australian samples. The ERI and ERI-AUS can differentiate risk-taking attitudes between clinical OCD samples and non-clinical samples (Cicolini & Rees, 2003; Steketee & Frost, 1994) and between sub-clinical OCD samples and non-clinical samples (Frost et al., 1994), with scores decreasing as OCD severity increases. The ERI-AUS and the ERI are validated among individuals with OCD and non-clinical individuals (Cicolini & Rees, 2003; Frost et al., 1994; Steketee & Frost, 1994).

Steketee and Frost (1994) demonstrated that the ERI has good convergent validity, correlating significantly with the Risk Taking scale of the JPI (r = .52) and with all four subscales of the Sensation Seeking Scale (Zuckerman, Colin, Price, & Zoob, 1964), with rs ranging from.41 to .72. Discriminant validity was demonstrated through a smaller correlation with the JPI responsibility scale (r = -.28). Men scored significantly higher than women on the ERI, which is consistent with those gender effects observed using other risk-taking inventories (Steketee & Frost, 1994). The internal consistencies of the ERI and ERI-AUS are good, with Cronbach's alphas of .91 and .87, respectively (Cicolini & Rees, 2003; Steketee & Frost, 1994). Test-retest reliability of the ERI (r = .93 over a 14 day period) and ERI-AUS (r = .86 over a 10 week period) has also been demonstrated to be good (Garratt-Reed, 2004; Steketee & Frost, 1994). Many items on the ERI-AUS do not tap into OCD fears (Cicolini & Rees, 2003) and these items were considered for inclusion into the MDRAS.

MDRAS Future Items

The items for the MDRAS Future scales were derived from items on the Social Readjustment Rating Scale (SRRS, Holmes & Rahe, 1967). This scale contains items that involve typical negative events that many people will face at an undetermined point in the future. These items were included in the MDRAS to assess the typical cognitive style of individuals with OCD (concern with possible future negative events), without using OCD-specific fears. The SRRS appears to be a valid measure of stressful symptoms (Hobson & Delunas, 2001; Scully, Tosi, & Banning, 2000) and is the most widely used scale of life stress

in various cultures (Sandoval & Acuna, 2008; Scully et al., 2000). It contains 43 items considered to be stressful, based on the amount of life change that each event entails. Although the original stress levels (out of 100) assigned to each event are likely to require revision given changes in society since the scale was created, Scully et al. (2000) argued that the SRRS is a good measure of stress-related outcomes. The MDRAS items are included in Table 6.1.

Format of the MDRAS

Initially, 19 items were selected for inclusion in the MDRAS scales. The first eight items were adapted from ERI-AUS items and comprised the MDRAS Everyday scales, assessing risk perceptions of potential everyday events that represent non-pleasurable risks which are unrelated to typical obsessive-compulsive concerns. These items are worded in the present tense. The remaining 11 items were adapted from SRRS items and comprised the MDRAS future scales, assessing perceptions relating to risks that many people will face at an undetermined time in the future, but that are not likely to be everyday occurrences for most individuals. These items are worded in the future tense. Items were chosen that represented different types of risk, such as physical risk, social risk, and occupational risk (e.g., Horvath & Zuckerman, 1993). In addition, future risks of differing severity levels (as determined by the SRRS ratings) were selected to provide ecological validity.

For all MDRAS items, participants are asked to rate the probability of the occurrence of the specified unpleasant event within a scenario. They are also asked to rate the cost of that event, were it to occur, as well as how easily they believe they could cope with the event. Specified negative events were chosen, rather than allowing participants to imagine potential negative outcomes, because anxious individuals are likely to imagine negative events that are more costly and difficult to cope with, but also less probable, than the events imagined by non-clinical individuals (e.g., Woods et al., 2002). This would have rendered future between group comparisons on the MDRAS scales difficult to interpret. A Likert-type scale was used to score all MDRAS items, given that this type of scoring scale is typically used in risk research (e.g., Berenbaum, Thompson, & Bredemeier, 2007; Cicolini & Rees, 2003; Maner & Schmidt, 2006; Steketee & Frost, 1994). An example of the layout of the MDRAS can be seen in Table 6.2. All items contained the same response options.

Table 6.1

Item Content: The Multi-Dimensional Risk Assessment Scale (MDRAS)

1	You are driving at 20km/h above the speed limit on a major road. There is a risk that you will receive a speeding fine.
2	You are driving at 20km/h above the speed limit on a major road. There is a risk that you will be involved in an accident, causing you to break your leg.
3	You are outside for several hours without a coat on a cold, wet day. There is a risk that you will catch the flu.
4	You borrow something from a friend without asking because he/she is unavailable. There is a risk that he/she will be very angry, placing strain on your friendship.
5	You drive to a friend's house without looking up directions or taking a map, even though you have only been there once before and it is a long drive. There is a risk that you will get lost, with no means of checking the correct route.
6	You are forced to drive in a severe storm to do an errand you cannot postpone. There is a risk that this will be an unpleasant experience for you.
7	You allow a stranger into your house to use the telephone. There is a risk that he/she will try to harm you.
8	*You are in an expensive restaurant with some friends. There is a risk that you will accidentally trip and drop your plate, which smashes and spills food all over you, causing everyone in the restaurant to stare at you and to giggle, making you feel very embarrassed.*
9	*In the future there is a risk that your spouse or partner will die while you are still alive.*
10	In the future there is a risk that you will suffer serious injury or illness.
11	*In the future there is a risk that you will be fired from your job.*
12	*In the future there is a risk that you will be forced to serve time in jail.*
13	In the future there is a risk that you will experience chronic insomnia.
14	In the future there is a risk that you will experience a divorce.
15	In the future there is a risk that you will experience sexual difficulties.
16	In the future there is a risk that you will be required to completely stop eating your favourite food.
17	In the future there is a risk that you will be forced to permanently use a walking stick.
18	In the future there is a risk that you will be forced to begin a new line of work.
19	*In the future there is a risk that you will experience conflict with your new boss at work.*

Note. Items 1-8 = Everyday Risk items. Items 9-19 = Future Risk items. Italics = item deleted during scale modification process.

Table 6.2

Example of the Format of MDRAS Items

4. You borrow something from a friend without asking because he/she is unavailable. There is a risk that he/she will be very angry, placing strain on your friendship.

a) What is the probability that he/she will be very angry, placing strain on your friendship?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If he/she were very angry, placing strain on your friendship, how bad would that be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if he/she were very angry, placing strain on your friendship?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

The MDRAS contains three distinct scales: The MDRAS Probability Scale; the MDRAS Cost Scale; and the MDRAS Coping Scale. Each was designed to contain two lower-order scales, corresponding to perceptions of risk in potential everyday situations and perceptions of risk in potential future situations. It was anticipated that the Everyday and Future MDRAS scales would be significantly positively correlated and that their scores could be combined into total MDRAS Probability, MDRAS Cost, and MDRAS Coping scores, although this was examined through factor analysis. Therefore, the MDRAS was designed to provide nine different scores: Total Probability; Everyday Probability; Future Probability; Total Cost; Everyday Cost; Future Cost; Total Coping; Everyday Coping; and Future Coping. The initial step towards validating the MDRAS was to determine whether the proposed factor structure was indeed present in the scales and this was achieved through principal components analyses and confirmatory factor analyses.

Method

Participants

There was a total of 223 non-clinical participants including 66 men (29.6%) and 151 women (67.7%), with 6 participants (2.7%) not reporting gender. The mean age of participants was 32 years (*SD* = 13.1, range = 17.25 – 68.50), with men being somewhat older on average than women (35.3 and 30.6 respectively). One participant, who did not report gender, was excluded from the study after failing to complete the majority of items in the questionnaire package, resulting in a final data set of 222.

Measures

Participants completed the MDRAS and a demographics page requesting age and gender (see Appendix B) as part of a larger battery of questionnaires that will be reported in Study 2.

Procedure

This research was approved by the Curtin University Human Research Ethics Committee. This approval covered all studies reported in this thesis. Participants were recruited from lectures and tutorial classes within the Faculty of Health Sciences at Curtin University. In addition, snowball sampling was used to obtain further participants from within the researcher's social networks. Participants were given an information sheet, with slightly different versions for students and non-students (see Appendices C and D, respectively) and asked to complete the questionnaire package. In excess of 1000 questionnaire packages were distributed (the exact number cannot be ascertained because several individuals distributed questionnaire packages within their places of work, but discarded remaining questionnaires without recording the number distributed), with a response rate below 22%. Questionnaires were returned anonymously to a survey collection box located in the School of Psychology at Curtin University, or were mailed to the researcher at Curtin University.

Results

Data were analysed using the Statistical Package for Social Sciences (SPSS), versions 15 and 17. LISREL 8.51 was used to perform the confirmatory factor analyses (CFA). Prior to analysing the MDRAS data, the MDRAS Coping items were recoded so that higher scores represented higher estimates of coping ability. This was done primarily to facilitate

interpretation in the subsequent analyses – higher scores on all three subscales represented higher levels of perceived probability, perceived cost, and perceived ability to cope with the various scenarios.

Data Screening

Univariate descriptive statistics were generated in order to assess the accuracy of data input. Data were checked to ensure that all values were within the eligible range for the MDRAS items (i.e., 1-7) (Tabachnick & Fidell, 2001). No data entry errors were detected. The pattern of missing data on the MDRAS was analysed. Out of 12711 observations, 33 (less than 0.3%) were missing data. No variable was found to be missing more than 5% of the data. Given the small amount of missing data, the randomness of the missing data was not assessed (Tabachnick & Fidell, 2001). Five participants had missing data on the MDRAS. In one case, the participant appeared to have simply missed several pages of the MDRAS (as well as not including demographic information) and was excluded from the analysis. Means substitution was used to replace the remaining missing data because any procedure for dealing with missing data will yield similar results when such a small amount of data are missing from a large data set (Raaijmakers, 1999; Tabachnick & Fidell, 2001) and means substitution is the most commonly used method for replacing missing data in such scenarios (Buhi, Goodson, & Neilands, 2008; Raaijmakers).

Among continuous variables, cases with *z* scores in excess of 3.29 are considered to be potential univariate outliers (Tabachnick & Fidell, 2001). Twenty such cases were identified. Tabachnick and Fidell (2001) suggested that a good option for dealing with univariate outliers is to reduce the extremeness of their score. Although they suggested that this could be achieved by assigning outliers a score one unit larger (or smaller) than the next most deviant score, this was not practical in the current analysis because in most cases this would have resulted in no change in the outlying score (there was a maximum score of 7 on any item so if a score of 7 was an outlier, modifying it to be one score higher than the next most extreme score of 6 would have resulted in no change). Therefore scores were modified so that they fell as close as possible to 3.29 standard deviations of the mean for the respective variable. This approach was chosen largely to avoid the deletion of cases and consequent reduction of power for the planned analyses. Distributions were examined with outliers and after the outlying scores were modified. In some instances there was a substantially reduced skew after removing outliers, and it was decided to use the modified data for the remainder of the analyses.

Normality of distributions for the MDRAS items was assessed graphically because statistical methods are overly sensitive to even slight departures from normality among large samples (Tabachnick & Fidell, 2001). Histograms revealed that the distributions of several items were not perfectly normal, although in most cases they appeared to be satisfactory, given that PCA is relatively robust to violations of univariate normality (Allen & Bennett, 2008; Coakes & Steed, 1999; Tabachnick & Fidell, 2001). However, the distribution for Item 12a demonstrated a marked positive skew and leptokurtosis and the distribution for Item 12b demonstrated severe negative skew. Inspection of the data revealed that these items – which refer to the perceived (a) probability and (b) cost of being forced to spend time in jail, were unlikely to be appropriate as a means of assessing differences between populations because of the likelihood of floor and ceiling effects in the data, given that the mean perceived probability (1.47) was the lowest of any item on the MDRAS, and that the mean perceived cost (5.84) was the highest of any item. Item 12, which also demonstrated the lowest mean perceived coping score of any item (2.66), was subsequently deleted from the MDRAS. The remaining items were retained without transformation.

In order to screen for multivariate outliers, a standard regression analysis was run with age as the dummy dependent variable. Mahalanobis distance ($p < .001$) was used to screen for multivariate outliers (Tabachnick & Fidell, 2001) and, on this basis, seven cases were potentially multivariate outliers. However, a maximum Cook's distance of .08 suggested that none were overly influential. In addition, Tabachnick and Fidell (2001) suggest that multivariate outliers should only be removed from a data set if there is clear evidence that they fall outside of the intended population of study. Given that the MDRAS has not been used previously, this could not be ascertained. Upon examination of the raw data, there was no evidence of random response patterns in any of the potential outlying cases and, consequently, all cases were retained.

Principal Components Analysis of the MDRAS – Part One

As was previously explained, the MDRAS was designed to incorporate three higher order factors – Total Probability, Total Cost, and Total Coping. Each of these was designed to contain two subordinate factors corresponding to Everyday and Future risk perceptions. Therefore, the expected factor structure for each scale of the MDRAS was a higher-order factor and two lower-order factors. However, it was considered to be overly presumptuous to expect a clear everyday/future risk dichotomy, given the possibility that factors relating to risk constructs such as physical risk, social risk, financial risk, manmade versus natural risk,

or other specific types of risk (e.g., Brun, 1992; Horvath & Zuckerman, 1993; Uren et al., 2004) were also contained in the scale. Immediately conducting a CFA would result in the possibility of ignoring other potential risk-related factors in the MDRAS scales. Similarly, exploratory factor analysis (EFA) was considered to be inappropriate because the initial goal of this analysis was to generate hypotheses about the factor structure of the MDRAS scales, whereas EFA is concerned with revealing latent constructs (Park, Dailey, & Lemus, 2002). Therefore, for the purposes of reducing the data to a manageable number of constructs, prinicipal components analysis (PCA) was conducted (Norris & Lecavalier, 2010; Tabachnick & Fidell, 2001). PCA "is the solution of choice for the researcher who is primarily interested in reducing a large number of variables down to a smaller number of components" (Tabachnick & Fidell, 2001, p. 612) and is particularly useful as a means of deriving hypotheses about the potential structure of the MDRAS scales which can then be tested via CFA (Smith, 1998). PCA is often a useful initial step in factor analytic procedures, given that it reveals information about the nature of the factors involved (Tabachnick & Fidell). PCA with promax rotation, which permits correlations between extracted components, was chosen because it was expected that any extracted components would be correlated, given that all items in each MDRAS scale were designed to assess the same construct, albeit with respect to different types of events. This type of analysis is commonly used when creating a new scale or modifying existing scales (Foa et al., 2002). Tabachnick and Fidell (2001) indicate that a sample size in excess of 200 is "fair" (p. 588) for PCA.

The Kaiser criterion, whereby components with eigenvalues in excess of 1 are retained, is typically used in PCA. However, it tends to result in the retention of too many components (Hayton, Allen, & Scarpello, 2004). Therefore, the more reliable (Hayton et al., 2004) parallel analysis was used to determine the number of components to be retained. Hayton et al. (2004) suggested that parallel analysis is "one of the most accurate methods for determining the number of factors to retain" (p. 192). This procedure involves the generation of 1000 random data sets with the same dimensions as the main PCA (222 cases by 18 items for each of the three MDRAS Total scales). Each of these data sets is then subjected to a PCA, generating 1000 eigenvalues for each of the 18 components in the initial solution. These eigenvalues are rank-ordered and the eigenvalue at the 95^{th} percentile for each component is specified. Comparison of eigenvalues from the PCA on the actual data with those at the 95^{th} percentile in the parallel analysis indicates how many components to retain. In the case of the MDRAS Total Probability, MDRAS Total Cost, and MDRAS Total Coping scales, the first component is retained if its eigenvalue exceeds 1.63, the second component is

retained if its eigenvalue exceeds 1.50, and the third component is retained if its eigenvalue exceeds 1.40. Extraction of components ceases as soon as the eigenvalue from the main analysis does not exceed the corresponding eigenvalue from the parallel analysis. Once parallel analysis has indicated how many components should be retained, the PCA on the observed data is rerun, forcing the data into this number of components.

No PCA was conducted on a combination of the three MDRAS scales to test for the probability-cost-coping structure. This was because the three scales had face validity, with the wording of items clearly indicating whether perceived probability, perceived cost, or perceived coping ability were being assessed. Therefore, PCAs were conducted on each scale separately.

MDRAS Probability scale PCA.

Factorability of the data was assessed prior to commencing the PCA. In general, a dataset is suitable for PCA if it contains numerous correlations in excess of .3, demonstrates a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy greater than .6, and has a significant Bartlett's test of sphericity (Allen & Bennett, 2008; Coakes & Steed, 1999). There were numerous correlations in excess of .3, the KMO measure of sampling adequacy was .84, and Bartlett's test of sphericity was large and significant, suggesting that the MDRAS Probability data were suitable for PCA. Coakes and Steed (1999) suggested that "pure variables have loadings of .3 or greater on only one factor" (p. 161). Therefore, items that demonstrated a loading of .3 or igher on only one factor were considered to be appropriate for inclusion in that factor. Subsequently, "split loading" will refer to an item with a loading of .3 or higher on more than one component.

The MDRAS Probability scale was submitted to a PCA with promax rotation. Communalities for all variables were above the acceptable minimum of .2 for factor analytic procedures (Tabachnick & Fidell, 2001). The internal consistency was high, with a Cronbach's alpha of .85 that would not have been improved with the removal of any items.

Using parallel analysis, two components, accounting for 40.62% of the variance, were extracted. The first component, with an eigenvalue of 5.18, accounted for 28.77% of the variance. The second component, with an eigenvalue of 2.13, accounted for 11.85% of the variance. The third component was excluded because its eigenvalue (1.30) was below the 1.40 cut-off for inclusion.

In accordance with standard procedures for parallel analysis, the MDRAS Probability scale was then submitted to a second PCA, whereby the data were forced into two

components. All communalities were above the acceptable minimum of .2 (Tabachnick & Fidell, 2001). The pattern matrix indicated that the last nine items loaded positively on Component 1 and the first nine items loaded positively on Component 2, with no split-loadings (see Table 6.3). There was a positive correlation (r = .40, p < .001) between the extracted components.

Table 6.3

Pattern Matrix Loadings on MDRAS Probability Components Following PCA with Promax Rotation and Parallel Analysis (N = 222)

MDRAS item	Component 1	Component 2
1	-.09	**.58**
2	-.14	**.79**
3	-.08	**.66**
4	-.04	**.62**
5	.13	**.42**
6	.14	**.54**
7	.02	**.71**
8	.09	**.60**
9	.21	**.33**
10	**.60**	.09
11	**.55**	.21
13	**.48**	.23
14	**.73**	-.04
15	**.69**	.003
16	**.51**	.11
17	**.61**	.14
18	**.70**	-.25
19	**.80**	-.20

Note. Loadings of .3 or higher are emboldened

MDRAS Cost scale PCA.

Factorability of the correlation matrix was assessed prior to commencing the PCA. There were numerous correlations in excess of .3, the KMO measure of sampling adequacy was .88, and Bartlett's test of sphericity was large and significant, suggesting that the data were suitable for PCA (Allen & Bennett, 2008; Coakes & Steed, 1999).

The MDRAS Cost scale was submitted to a PCA with promax rotation. All communalities were above the acceptable minimum of .2 (Tabachnick & Fidell, 2001) and the internal consistency was high, as indicated by a Cronbach's alpha of .88 which would not have been improved with the removal of any items.

Using parallel analysis, two components were extracted, accounting for 41.47% of the variance in the data. The first component, with an eigenvalue of 5.93, accounted for 32.94% of the variance. The second component, with an eigenvalue of 1.54, accounted for 8.53% of the variance. The third component was excluded because its eigenvalue (1.32) was below the 1.40 cut-off for inclusion.

In accordance with standard procedures for parallel analysis, the MDRAS Cost scale was submitted to a second PCA, whereby the data were forced into two components. All communalities were above the acceptable minimum of .2 (Tabachnick & Fidell, 2001). The item loadings from the pattern matrix can be seen in Table 6.4. Items 1-7 and Item 11 loaded unambiguously onto Component 1. Items 10, 13-15, and 17 loaded unambiguously onto Component 2. The two components were strongly positively correlated ($r = .55$, $p < .001$). However Items 8, 9, and 16 loaded onto both components and Item 18 did not demonstrate a loading of above .3 on either.

Table 6.4

Pattern Matrix Loadings on MDRAS Cost Components Following PCA with Promax Rotation and Parallel Analysis (N = 222)

MDRAS item	Component 1	Component 2
1	**.76**	-.25
2	**.64**	-.01
3	**.63**	.03
4	**.46**	.25
5	**.75**	-.09
6	**.76**	-.12
7	**.56**	19
8	**.38**	**.39**
9	**-.31**	**.82**
10	.17	**.61**
11	**.46**	**.17**
13	.20	**.54**
14	.03	**.59**
15	-.13	**.74**
16	**.30**	**.34**
17	.04	**.73**
18	.16	.29
19	**.36**	.28

Note. Loadings of .3 or higher are emboldened

MDRAS Coping scale PCA.

Factorability of the correlation matrix was assessed prior to commencing the PCA. There were numerous correlations in excess of .3, the KMO measure of sampling adequacy was .89, and Bartlett's test of sphericity was large and significant, suggesting that the data were suitable for PCA (Allen & Bennett, 2008; Coakes & Steed, 1999).

The MDRAS Coping scale was submitted to a PCA with promax rotation. All communalities were above the acceptable minimum of .2 (Tabachnick & Fidell, 2001) and internal consistency was high, as indicated by a Cronbach's alpha of .90 which would not have been improved with the removal of any items.

Using parallel analysis, two components, accounting for 45.49% of the variance, were extracted. The first component, with an eigenvalue of 6.58, accounted for 36.56% of the variance. The second component, with an eigenvalue of 1.61, accounted for 8.93% of the variance. The third component was excluded because its eigenvalue (1.19) was below the 1.40 cut-off for inclusion.

In accordance with standard procedures for parallel analysis, the MDRAS Coping scale was submitted to a second PCA, whereby the data were forced into two components. All communalities were above the acceptable minimum of .2 (Tabachnick & Fidell, 2001). The pattern matrix demonstrated a clean pattern of loadings whereby all items loaded positively onto one component and did not load onto the other (see Table 6.5). Items 1-8 loaded positively onto Component 1. There were also smaller positive loadings from Items 19, 11, and 18, which were job-related potential future items. Items 9, 10, and 13-17 loaded positively onto Component 2. The two extracted components were strongly positively correlated ($r = .56$, $p < .001$).

Table 6.5

Pattern Matrix Loadings on MDRAS Coping Components Following PCA with Promax Rotation and Parallel Analysis (N = 222)

MDRAS item	Component 1	Component 2
1	**.73**	-.15
2	**.63**	.10
3	**.71**	-.06
4	**.78**	-.10
5	**.79**	-.11
6	**.73**	-.04
7	**.70**	.13
8	**.62**	.13
9	.03	**.68**
10	.19	**.59**
11	**.48**	.16
13	.15	**.49**
14	-.02	**.71**
15	-.17	**.77**
16	.16	**.37**
17	-.12	**.82**
18	**.37**	.25
19	**.53**	.18

Note. Loadings of .3 or higher are emboldened

Discussion – PCA part one.

The aim of Study 1 was to assess the potential structure of the newly created MDRAS Probability, MDRAS Cost, and MDRAS Coping scales. Although each was designed to incorporate factors of everyday risk perceptions (assessed through the initial eight items) and future risk perceptions (assessed through the remaining eleven items), it was considered presumptuous to ignore the possibility of other factors, such as physical risk or social risk (Horvath & Zuckerman, 1993; Uren et al., 2004) within the scales. Therefore, PCA was initially conducted on each scale with the intention of suggesting potential factor structures to be tested via subsequent CFA.

MDRAS Probability scale.

The initial PCA using parallel analysis on the 18-item MDRAS Probability scale (following the removal of Item 12) indicated the presence of two components. Item loadings generally supported the proposed structure of the MDRAS, with the first nine items loading positively onto Component 2, which was labelled *MDRAS Everyday Probability* and the final

nine items loading positively onto Component 1, which was labelled *MDRAS Future Probability*. Item 9, which was designed to assess future probability judgements, loaded onto MDRAS Everyday Probability rather than onto MDRAS Future Probability. However, the remaining items all loaded as expected on the respective components. No items loaded onto both components after ignoring loadings lower than .3 (Allen & Bennett, 2008), indicating that MDRAS Everyday Probability and MDRAS Future Probability, although positively correlated (r = .40), were distinct constructs. However the positive correlation between the components raised the possibility of a higher-order factor (*MDRAS Total Probability*), as had been intended.

MDRAS Cost scale.

The initial PCA using parallel analysis on the 18-item MDRAS Cost scale indicated a two-component structure. In addition, these components appeared to largely correspond to everyday and future cost judgements. The pattern matrix demonstrated that the first 8 items all loaded as planned, onto Component 1, which was labelled *MDRAS Everyday Cost*. However, there were unplanned positive loadings onto MDRAS Everyday Cost from items 11, 16, and 19. In addition, Item 8 demonstrated unplanned split-loadings onto the second component. Of the 11 items designed to assess future cost, seven demonstrated the expected positive loadings on Component 2, which was labelled *MDRAS Future Cost*. However, Items 9 and 16 also spilt-loaded onto MDRAS Everyday Cost and Items 11, 18, and 19 did not demonstrate loadings in excess of .3 on MDRAS Future Cost. Overall the results supported the existence of the everyday and future cost components, although the pattern of item loadings was less clear than that observed in the MDRAS Probability scale, with several items loading onto both components. MDRAS Everyday Cost and MDRAS Future Cost were strongly positively correlated (r = .55) indicating the possible existence of a higher-order component (*MDRAS Total Cost*), as had been planned.

MDRAS Coping scale.

The initial PCA using parallel analysis on the 18-item MDRAS Coping scale generally supported the presence of the proposed everyday and future components. The first eight items loaded unambiguously onto Component 1 as was intended. This component appears to represent coping ability estimates for everyday events and was labelled *MDRAS Everyday Coping*. However Items 11, 18, and 19 also loaded onto this component, rather than onto the future coping component as had been intended. The remaining items all loaded

unambiguously onto the second component as was intended, with this component labelled *MDRAS Future Coping*. The large positive correlation (r = .56) between the components indicated the possibility of a higher-order component (*MDRAS Total Coping*), as had been intended.

Changes to the MDRAS.

Overall the results of the initial PCA on each scale suggested that the scales conformed to the intended component structure. However, there were several problematic items that did not load in the expected manner on one or more of the scales. Item 9, which assessed judgements related to the potential death of a spouse, was problematic because it demonstrated inconsistent loading across the three MDRAS scales. Although it loaded in the expected manner on the Coping scale, it did not load as expected on the Probability or Cost scales. This item was rated as the most costly and difficult to cope with of all of the MDRAS items (after deleting Item 12) and it is possible that the extreme nature of the item resulted in the ambiguous loading pattern. In addition, some participants might have already experienced this event and this could have influenced their responses, especially in terms of the probability of this event occurring again. Item 9 was consequently deleted from the MDRAS scales. Item 8 was problematic because it loaded on both components on the MDRAS Cost scale, but in neither case was the loading strong. The fact that this loading pattern was not evident in the MDRAS Probability or the MDRAS Coping scales rendered this item difficult to interpret (Tabachnick & Fidell, 2001). The wording of Item 8 was somewhat ambiguous and this could account for the inconsistent loading pattern (e.g., Foa et al., 2002) across MDRAS scales. Given that this Item 8 was also likely to be tapping into social phobia fears (and would therefore reduce its utility among individuals with social phobia), it was subsequently deleted from the MDRAS scales. Items 11 and 19 were problematic because, although they loaded as expected onto the MDRAS Future Probability component, they loaded onto the MDRAS Everyday Cost and MDRAS Everyday Coping components. Both of these items dealt with potential problems at work (being fired and experiencing conflict with the boss) and it is possible that some participants in the current study were already experiencing such problems, resulting in these items being reflective of ongoing/everyday problems rather than potential future problems for these people. Both items were deleted from all MDRAS scales. Items 16 demonstrated a small split-loading on the MDRAS Cost scale but was retained because it performed as expected in the MDRAS Probability and MDRAS Coping scales. Item 18 loaded inconsistently across the scales. However, there was

no obvious reason for this ambiguity (although Item 18 relates to occupational risks, it refers to the possibility of having to begin a new line of work rather than an ongoing problem such as conflict with a boss) and it was decided to retain this item in the belief that it was likely to load as planned after the removal of Items 11 and 19, which also related to occupational risks.

Shortened version of the MDRAS.

The resultant MDRAS scales consisted of 14 items, seven of which were intended to comprise the MDRAS Everyday scales and seven of which were designed to comprise the MDRAS Future Scales. This shorter version of the scale was more parsimonious than the original, which had been somewhat cumbersome and time consuming to complete. In addition, the MDRAS Everyday and MDRAS Future scales were now of equal length. Given the exploratory nature of the current study, it was decided to repeat the PCAs on the MDRAS Probability, MDRAS Cost, and MDRAS Coping scales using the shortened version of the MDRAS.

PCA on the 14-item MDRAS

In order to assess the structure of the shortened MDRAS scales, PCAs with promax rotation were again run on each scale. Parallel analysis was again utilised and, with the current data (222 x 14), this resulted in the first component being retained if its eigenvalue exceeded 1.55, the second component being retained if its eigenvalue exceeded 1.41, and the third component being retained if its eigenvalue exceeded 1.31.

PCA on the shortened MDRAS Probability scale.

For the 14-item MDRAS Probability scale, communalities for all items were above the acceptable minimum of .2 (Tabachnick & Fidell, 2001). The KMO measure of sampling adequacy (0.82) and a significant Bartlett's test of sphericity indicated that the data were suitable for PCA (Tabachnick & Fidell, 2001). Using parallel analysis two components were extracted, accounting for 42.89% of the variance in the data. The first component, with an eigenvalue of 4.14, accounted for 29.59% of the variance and the second component, with an eigenvalue of 1.86, accounted for 13.31% of the variance. The third component was excluded because its eigenvalue (1.20) was below the 1.31 cut-off for inclusion. Internal consistency was acceptable, with a Cronbach's alpha of .81, which would not have been improved to a substantial degree with the removal of any items from the analysis.

In accordance with parallel analysis procedures, the PCA with promax rotation was repeated, forcing the data into two components. Communalities were all above the acceptable minimum of .2 (Tabachnick & Fidell, 2001). The pattern matrix demonstrated that the first seven items loaded positively onto the MDRAS Everyday Probability component, while the last seven items loaded positively onto the MDRAS Future Probability component, with no split-loadings (see Table 6.6). There was a moderate positive correlation ($r = .38$, $p < .001$) between the components. The internal consistencies of the MDRAS Everyday Probability and the MDRAS Future Probability components were acceptable, with Cronbach's alphas of .75 and .78, respectively. These would not have been substantially improved with the removal of any items.

Table 6.6

Pattern Matrix Loadings on Shortened MDRAS Probability Components Following PCA with Promax Rotation and Parallel Analysis (N = 222)

MDRAS item	Component 1	Component 2
1	.07	**.59**
2	-.11	**.80**
3	-.07	**.68**
4	-.01	**.61**
5	.16	**.41**
6	.17	**.54**
7	.04	**.72**
10	**.69**	.02
13	**.54**	.16
14	**.68**	.01
15	**.78**	-.07
16	**.58**	.04
17	**.70**	.08
18	**.61**	-.19

Note. Loadings of .3 or higher are emboldened

PCA on the shortened MDRAS Cost scale.

For the 14-item MDRAS Cost scale, communalities for all items were above the acceptable minimum of .2 (Tabachnick & Fidell, 2001). The KMO measure of sampling adequacy (0.87) and a significant Bartlett's test of sphericity indicated that the data were suitable for PCA. Using parallel analysis, the first component, with an eigenvalue of 4.82, accounted for 34.44% of the variance. However, the second component, which accounted for

10.06% of the variance, demonstrated an eigenvalue of 1.41, which is identical to the parallel analysis cut-off eigenvalue. This component was retained pending the results of CFA comparing one-factor and two-factor models. The third component was excluded because its eigenvalue (1.08) was below the 1.31 cut-off for inclusion. Internal consistency was high, with a Cronbach's alpha of .85, which would not have been improved substantially with the removal of any items.

In accordance with parallel analysis procedures, the PCA with promax rotation was repeated, forcing the data into two components. Communalities were all above the acceptable minimum of .2 (Tabachnick & Fidell, 2001). The pattern matrix demonstrated that the first seven items loaded positively on the MDRAS Everyday Cost component and the last seven items loaded positively on the MDRAS Future Cost component, with no split loadings (see Table 6.7). There was a strong positive correlation (r = .53, p < .001) between the two components. The internal consistencies of the MDRAS Everyday Cost and MDRAS Future Cost components were acceptable, with Cronbach's alphas of .76 and .80, respectively, which would not have been improved with the removal of any items.

Table 6.7

Pattern Matrix Loadings on Shortened MDRAS Cost Components Following PCA with Promax Rotation and Parallel Analysis (N = 222)

MDRAS item	Component 1	Component 2
1	**.65**	-.11
2	**.72**	-.05
3	**.51**	.18
4	**.53**	.16
5	**.71**	-.03
6	**.78**	-.10
7	**.74**	.001
10	.26	**.52**
13	.10	**.66**
14	.14	**.48**
15	-.13	**.73**
16	.19	**.49**
17	-.13	**.83**
18	-.14	**.61**

Note. Loadings of .3 or higher are emboldened

PCA on the shortened MDRAS Coping scale.

For the 14-item MDRAS Coping scale, communalities for all items were all above the acceptable minimum of .2 (Tabachnick & Fidell, 2001). The KMO measure of sampling adequacy (0.88) and a significant Bartlett's test of sphericity indicated that the data were suitable for PCA. Using parallel analysis, two components were retained, accounting for 47.82% of the variance in the data. The first component, with an eigenvalue of 5.17, accounted for 36.96% of the variance and the second component, with an eigenvalue of 1.52, accounted for 10.86% of the variance. The third component was excluded because its eigenvalue (1.00) was below the 1.31 cut-off for inclusion. Internal consistency was high, with a Cronbach's alpha of .86 that would not have been improved with the removal of any items.

In accordance with parallel analysis procedures, the PCA with promax rotation was repeated, forcing the data into two components. Communalities were all above the acceptable minimum of .2 (Tabachnick & Fidell). The pattern matrix demonstrated that the first seven items loaded positively onto the MDRAS Everyday Coping component and the final seven items loaded positively onto the MDRAS Future Coping component, with no split-loadings, (see Table 6.8). There was a strong positive correlation ($r = .50$, $p < .001$) between the two components. The internal consistency of the MDRAS Everyday Coping component was high, with a Cronbach's alpha of .85. The internal consistency of the MDRAS Future Coping component was acceptable, with a Cronbach's alpha of .75. In neither case would improvements have resulted from the removal of any items.

Table 6.8

Pattern Matrix Loadings on Shortened MDRAS Coping Components Following PCA with Promax Rotation and Parallel Analysis (N = 222)

MDRAS item	Component 1	Component 2
1	**.69**	-.09
2	**.69**	.07
3	**.69**	.01
4	**.79**	-.11
5	**.73**	.00
6	**.73**	.02
7	**.73**	.10
10	.29	**.50**
13	.14	**.50**
14	.09	**.60**
15	-.20	**.83**
16	.09	**.47**
17	-.14	**.87**
18	.29	**.33**

Note. Loadings of .3 or higher are emboldened

Discussion – PCA part two.

Clearly, the procedure used to test the item loadings on the 14-item MDRAS is suboptimal, given that the same data were used in the analyses that had been used to initially refine the scales. It would, therefore, be expected that the pattern of item loadings would closely conform to expectations. Nevertheless, this exploratory analysis confirmed that, in this data set at least, deletion of four items has improved the factor structure of the MDRAS scales, with parallel analysis demonstrating that each of the MDRAS scales (with the possible exception of the Cost scale) could be separated, as intended, into two components corresponding to everyday risk judgements and future risk judgements. Items loaded as planned on each component with no unplanned loadings or split-loadings, although item 18 remained somewhat problematic, given that it loaded with similar magnitude onto the two Coping components. The PCA results suggest that the structure of the MDRAS is based around the distinction between everyday risk and future risk, with little interference from other potential risk domains.

However, the observed components were positively correlated in all cases, indicating the possibility that a higher-order factor (Total Probability, Cost, or Coping) could be present in each MDRAS scale. This was not surprising because the MDRAS scales were each designed to be used as a unitary construct in addition to providing subscale scores. It makes

sense, therefore, to hypothesise the presence of a higher-order construct that drives the lower-order risk scales. PCA - being an exploratory technique rather than a confirmatory technique - cannot be used to test the higher-order hypothesis. The higher-order hypothesis must be tested using a confirmatory technique such as CFA. CFA was therefore used to resolve the issue of whether each MDRAS scale contained a higher-order factor pertaining to total perceived probability, cost, or coping ability. It should be emphasised that the purpose of the CFAs was not to merely confirm the two-factor structure suggested by the previous PCAs, which would be a rather circulatory exercise involving confirming a factor solution with the same data from which the solution was derived. Rather, it was to expand on the PCA results and to clarify remaining questions about the structure of the MDRAS scales. Another important question pertained to the component structure of the MDRAS Cost scale, which was somewhat ambiguous because the second component had an identical eigenvalue to the cut-off for component retention suggested by parallel analysis procedures. It was unclear whether a one-factor or two-factor solution was preferable for the MDRAS Cost scale and CFA comparing the fit of the one-factor and two-factor models was required to determine whether to retain the two component structure for this scale.

CFA on the MDRAS

PCA results suggested that the shortened MDRAS could be meaningfully divided into Everyday and Future scales. However, several questions regarding the structure of the MDRAS scales remained. In order to answer these questions, CFA, using LISREL version 8.51, was performed on each of the MDRAS scales.

For the MDRAS Probability and MDRAS Coping scales, two models were tested. Initially, the fit of a two-factor model, whereby the first seven items loaded onto an *Everyday* factor and the remaining seven items loaded onto a *Future* factor, and the two factors were allowed to correlate, was tested. A second model was tested, whereby a higher-order factor was added to the two-factor model, so that the Everyday and Future factors both loaded onto a *Total* factor. This was to determine whether adding a higher-order factor improved the fit of the two-factor model. For the MDRAS Cost scale, the fit of three models was tested. In addition to the two models discussed above, a one-factor model where each MDRAS item loaded onto a single cost factor was examined, to determine the utility of retaining Component 2 following the equivocal results of the PCA.

Fit indices.

Because different fit indices evaluate model fit from slightly different perspectives, more than one fit index is generally reported. The present study used the following fit statistics: The Satorra-Bentler chi-square divided by its degrees of freedom (χ^2/df), the comparative fit index (CFI), the non-normed fit index (NNFI), the standardised root mean square residual (SRMR), and the root mean square error of approximation (RMSEA). The Satorra-Bentler chi-square was used because it is less likely to be inflated by multivariate non-normality than is the standard chi-square statistic, while being equally reliable in the presence of multivariate normality (Yang-Wallentin & Joreskog, 2001). The cut-off criterion for the χ^2/df statistic has been set between 2 and 5 (Hooper, Coughlan, & Mullen, 2008). More specifically, Kline (1998) proposed that a value less than or equal to 3 indicates an acceptable fit. The CFI compares the null model, in which all latent variables are assumed to be uncorrelated, to the hypothesised model. The suggested criterion for a good fit is a CFI value greater than or equal to .95 (Benet-Martnez & Karakitapoglu-Aygun, 2003; Tabachnick & Fidell, 2001). The NNFI compares the chi-square values of the null and the hypothesised model, a value greater than or equal to .95 indicates a good fit, although some reserchers have suggested as low as .85 is acceptable (Benet-Martnez & Karakitapoglu-Aygun, 2003; Tabachnick & Fidell, 2001). The SRMR is considered to be one of the more meaningful fit indices to report in a CFA analysis (Hooper et al., 2008). It measures the square root difference between the residuals of the null model and the hypothesised model. An SRMR of less than or equal to .08 is required for the SRMR to be considered a good fit (Hooper et al.; Marsh, Hau, & Wen, 2004). The RMSEA is considered an important fit index as it takes into account the number of parameters in the hypothesised models and selects the most parsimonious model to analyse (Hooper et al., 2008). A cut-off value value of between .06 and .08 has been suggested as indicative of a good fit on this index (Diamantopoulos & Siguaw, 2000; Hooper et al.; Hu & Bentler, 1999).

CFA on the MDRAS Probability scale.

Results of the CFA on the MDRAS Probability scale are presented in Table 6.9. The NNFI (.91), CFI (.92), SRMR (.07), and χ^2/df (2.60) all indicated that the two-factor model was a reasonably good fit for the data. Although the RMSEA (.09) indicated a moderate fit, this statistic tends to underestimate model fit among relatively small samples such as this (Tabachnick & Fidell, 2001). The higher-order factor model demonstrated fit indices that

were virtually identical to the two-factor model but did not exceed the fit of the two-factor model.

CFA on the MDRAS Cost scale.

Results of the CFA on the MDRAS Cost scale are presented in Table 6.9. The NNFI (.89), CFI (.91), SRMR (.08) and χ^2/df (3.47) suggested that the one-factor solution was a moderate fit for the data, although the RMSEA (.11) indicated a poor fit. The two-factor solution was a superior fit, with the NNFI (.93), CFI (.94), RMSEA (.08), SRMR (.06) and χ2/df (2.57) all indicating a reasonably good fit. The higher-order factor model demonstrated fit indices that were similar to, but did not exceed, those of the two-factor model.

Table 6.9

Comparative Fit Indices for One Factor (Cost only), Two Factor, and Higher-Order Factor Models for MDRAS Probability, MDRAS Cost, and MDRAS Coping (N = 222)

Model		RMSEA	NNFI	CFI	SRMR	χ^2/df
Probability						
	Two factor	.09	.91	.92	.07	2.60
	Higher order factor	.09	.90	.92	.07	2.64
Cost						
	One factor	.11	.89	.91	.07	3.47
	Two factor	.08	.93	.94	.06	2.57
	Higher order factor	.09	.93	.94	.06	2.61
Coping						
	Two factor	.10	.93	.94	.07	3.12
	Higher order factor	.10	.92	.94	.07	3.16

Note: RMSEA = root mean square error of approximation; NNFI = non-normed fit index; CFI = comparative fit index; SRMR = standardised root mean square residual.

CFA on the MDRAS Coping scale.

Results of the CFA on the MDRAS Coping scale are presented in Table 6.9. The NNFI (.93), CFI (.94) and SRMR (.07) all indicated that the two-factor model was a reasonably good fit. The RMSEA (.10) and χ^2/df (3.12) indicated a moderate fit. The higher-order factor model demonstrated fit indices that were very similar to the two-factor model but did not exceed the fit of the two-factor model.

CFA Discussion.

For all three MDRAS scales, a solution containing two correlated factors corresponding to everyday risk judgements (items 1-7) and future risk judgements (items 10 and 13-18) provided a good fit. In the case of the MDRAS Cost scale the fit of this model was superior to the one-factor solution whereby all items loaded onto a single factor. This finding was important because of the uncertainty regarding the retention of the second component in the prior PCA. It therefore appears that Everyday and Future scales can be interpreted for the MDRAS Probability, Cost, and Coping scales.

For each MDRAS scale, a higher-order solution provided a good fit (although not improving the fit of the two-factor model), suggesting that total MDRAS Probability, Cost, and Coping scores can be meaningfully interpreted. This is supported by the fact that the internal consistencies of each MDRAS Total scales were high. Therefore, it appears that each MDRAS scale contains an overall factor consisting of all items, along with two correlated subordinate factors consisting of 1) Everyday risk items and 2) Future risk items. This supports the hypothesised (and intended) factor structure of the MDRAS.

Discussion and Conclusions

The results of Study 1 suggest that the MDRAS scales can be used to measure perceptions of the probability and cost of two types of general risks (everyday and future), as well as perceived ability to cope with those events. In addition, it appears that the Everyday and Future subscales can be usefully combined into an overall scale score. Consequently, the MDRAS appears to provide nine meaningful scale scores: MDRAS Total Probability; MDRAS Everyday Probability; MDRAS Future Probability; MDRAS Total Cost; MDRAS Everyday Cost; MDRAS Future Cost; MDRAS Total Coping; MDRAS Everyday Coping; and MDRAS Future Coping. Given that PCA and CFA were conducted on the same sample, these factors will require replication among separate samples of clinical and non-clinical individuals. However the fact that the scale appears to be structured as planned reflects the

theoretical basis of the items selected. The MDRAS Total scales are likely to provide important information regarding the differences in risk perceptions between various clinical groups. However, the Everyday/Future distinction in the MDRAS scales could be equally important. The MDRAS Everyday scales could be particularly related to general risk-aversion that appears to be common among individuals with OCD and among other anxious groups (Cicolini & Rees, 2003; Lorian & Grisham, 2010, 2011, Steketee & Frost, 1994) and could help to understand the cognitive mechanisms that drive this risk-aversion. However, it is unclear to what extent the MDRAS Future scales will relate to general risk-aversion. It is uncertain whether threat overestimation among individuals with OCD and other anxious individuals will extend possible future life events such as those in the MDRAS Future scales. Given their fear of potential future events (Grayson, 2010; Rees, 2001; Salkovskis, Forrester, Richards, & Morrison, 1998), it is likely that individuals with OCD will evidence cognitive distortions in their judgements of probability, cost, or coping ability related to these future events. However it is less certain that other anxious groups will evidence threat perception biases relevant to these events. It is possible that differential ratings of probability, cost, and coping ability for everyday and future events will distinguish between various clinical groups. It is also, however, possible that heightened levels of perceived probability and cost, and lowered perceived coping ability, will be ubiquitous among anxious individuals and mediated largely by anxiety and negative affect.

One caution that must be noted is that the sample size utilised in Study 1 (N = 222) was somewhat smaller than ideal. Tabachnick and Fidell (2001) suggested that sample sizes larger than 200 are "fair" (p. 588) for PCA and CFA. However, ideally the results of the CFA should be replicated on a larger, independent sample. Future studies using the MDRAS should examine the possibility of reducing the scale further through eliminating items in order to reduce the amount of time required to complete the scale. In particular, item 18 still appears to be somewhat problematic. This item demonstrated inconsistent loadings in the initial version of the MDRAS and, although it loaded as planned in each scale of the shortened MDRAS, its removal would have fractionally improved the internal consistency of the MDRAS Total Probability and MDRAS Total Cost scales, as well as the MDRAS Future Probability scale. In addition, the observed factor structure among the non-clinical sample utilised in Study 1 might not be replicated among clinical samples, so the use of the MDRAS on such samples will initially require caution.

These cautions notwithstanding, Study 1 appears to have provided sufficient evidence that the MDRAS, which is a theoretically derived scale, is structured as planned and is

therefore likely to be a useful clinical tool. However, before attempting to perform comparisons between groups, further validation of the MDRAS is necessary, particularly in terms of assessing the construct validity of the scales. In particular, it is important to ensure that the scales are performing as expected in relation to negative affect, because this is a strongly established correlate of threat perceptions and risk-aversion (Butler & Mathews, 1983, 1987; Eisenberg et al., 1998; Maner & Schmidt, 2006). In addition, it is necessary to explore the discriminant validity of the MDRAS scales in relation to obsessive cognitions – although the MDRAS was designed to measure general risk-aversion that is common among individuals with OCD, it was not designed to tap into OCD-specific cognitive styles and if it does, its utility in other anxious groups will be reduced. Finally, it is important to establish that the primary appraisal (probability and cost) scales of the MDRAS are assessing a separate construct to the secondary appraisal (coping) scales. Therefore, Study 2 will aim to continue the exploration of the MDRAS Scales through examining the pattern of relationships between the MDRAS scales, a measure of NA, a measure of OCD cognitions, and a measure of perceived control over anxiety (which should be closely related to the MDRAS Coping scales). This is an important step in the validation of the MDRAS and is necessary before attempting to examine differences between clinical groups on perceptions of the probability, cost, and coping of negative everyday and future events.

CHAPTER 7

STUDY 2 – INITIAL VALIDATION OF THE MDRAS

Aim of Study 2

Study 1 established that each of the MDRAS scales contains two separate, although related, constructs corresponding to everyday risk perceptions and future risk perceptions, which can be combined into overall risk perceptions. It is now important to assess how these risk constructs correlate with other measures in order to ascertain the validity of the MDRAS. Study 2 aimed to achieve this through investigating the relationship between the MDRAS scales and a measure of negative affect (NA), a measure of perceived control over threat, and a measure of obsessive thinking. Negative affect is closely related to anxiety and depression (Dyck, Jolly, & Kramer, 1994) and is known to have a significant impact on risk perceptions, especially for self-referent events (e.g., Butler & Matthews, 1987; Gasper & Clore, 1998). Therefore, it was necessary to determine that the MDRAS scales related to NA. It was also important to determine how the MDRAS relates to other measures after controlling for NA. A measure of perceived control was used primarily as a means of demonstrating convergent validity for the MDRAS Coping scales, but also as a means of demonstrating discriminant validity of the MDRAS Probability and MDRAS Cost scales. The measure of obsessive beliefs was used in an attempt to provide discriminant validity for the MDRAS scales. Given that the MDRAS was designed to consist of events that are not specific to OCD, the relationships between the MDRAS scales and the OBQ scales are expected to be small and largely accounted for by NA.

Method

Participants and Procedure

The data for Study 2 were collected simultaneously with the data used in Study 1. Therefore, participant details are identical to Study 1. In addition to the MDRAS and demographics page, participants completed the Anxiety Control Questionnaire (ACQ; Rapee, Craske, Brown, & Barlow, 1996), the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), and the Obsessive Beliefs Questionnaire (OBQ; OCCWG, 2005). The order of the scales was random to eliminate the possibility of order effects in the data, with the only exception being that the demographics page was first in each questionnaire package. A correlational design was used to test the relationships between the various measures. T tests were used to examine the difference between men and women on the MDRAS scales.

Measures

The Multi-Dimensional Risk Assessment Scale (MDRAS).

The shortened, 14-item version of the MDRAS was utilised, with data from deleted items being excluded. Details of this questionnaire were reported in Study 1. MDRAS Everyday scale scores (Probability, Cost, and Coping) for each participant were computed by summing the scores on the first seven items of the MDRAS and dividing the result by 7. The same procedure was used to obtain MDRAS Future scores, using the last seven items. The MDRAS Total scale scores were obtained by summing all items and dividing by 14. As explained in Study 1, Coping items were reverse-scored so that higher scores reflected higher perceived coping ability.

The Positive and Negative Affect Schedule (PANAS).

The PANAS (see Appendix E) is a 20-item self-report measure that assesses positive affect and negative affect. Only the NA scale was used in the current study, although participants completed the entire scale. NA indicates general subjective distress which includes anger, contempt, anxiety, fear, guilt, and disgust, with low NA being a state of calmness. NA broadly encapsulates the personality factor of neuroticism, and is closely linked to anxiety and risk-aversion (Crawford & Henry, 2004; Watson et al., 1988).

The PANAS contains 10 items that assess PA, and 10 items that assess NA. Items were designed to be "relatively pure markers of either PA or NA" (Watson et al., 1988, p. 1064) that did not exhibit high split-loadings on the other factor. Participants are asked to rate the extent to which they have experienced a range of emotions over a specified time period. The researcher has the option of choosing several time frames, ranging from *right now* to *generally* – the *general* timeframe was used in the current study. Ratings are made on a 5-point scale, where 1 represents *very slightly or not at all* and 5 represents *extremely*. Scores on each NA item are summed to provide a total NA score. The emotion items that comprise the NA scale are distressed, upset, hostile, irritable, scared, afraid, ashamed, guilty, nervous, and jittery (Watson et al., 1988).

In their initial validation of the PANAS, Watson et al. (1988) used a large student sample, along with 267 non-students. There were no systematic differences on the PANAS between the two groups. Cronbach's alphas for the NA scale ranged from .84 to .87, depending on the time frame used in the scale. In a small (N = 61) clinical sample, good internal consistency was demonstrated (Cronbach's alpha = .91) for the NA scale using the timeframe of *during the past few weeks*. Eight-week test-retest reliability was acceptable: r =

.71 for the 'general' timeframe (r = .81 in the clinical sample) (Watson et al., 1988). Factor analyses provided support for the two-factor structure of the PANAS, and suggested that each scale (PA and NA) accurately assessed the intended construct (Watson et al., 1988).

The NA scale of the PANAS showed the expected positive correlations with the State scale of the State-Trait Anxiety Inventory (r = .51), the Hopkins Symptom Checklist (r = .65 to .74), and the Beck Depression Inventory (r = .56 to .58) (Watson et al., 1988). In separate studies (Clark & Watson, 1986, as cited in Watson et al., 1988; Leeka, 1987, as cited in Watson et al., 1988) NA was responsive to changes in stress levels, when the PANAS was administered in the form how do *you feel… at the present moment* or in the form *have you felt this way today*. Watson et al. (1988) concluded that the PANAS is an internally consistent, reliable, and valid measure of the largely separate constructs of negative affect and positive affect.

Crawford and Henry (2004) conducted a CFA on the PANAS in a sample of 1003 adults who were generally representative of the British population. After comparing various models, it was concluded that a two-factor solution provided the best fit for the data. The items loaded onto the factors in the manner suggested by Watson et al. (1988). Cronbach's alpha for the NA scale was .85, providing further support for the internal consistency of this scale (Crawford & Henry, 2004). NA correlated significantly more highly with measures of anxiety than with measures of depression, providing further evidence for the construct validity of the NA scale. In addition, Crawford and Henry reported that demographic variables do not exert a significant influence over PANAS scores. They concluded that the PANAS demonstrated adequate psychometric properties in a large sample, and that the measure appears to possess good construct validity. Previous studies had also supported the factor structure of the PANAS and had successfully utilised the scale in diverse cultures and across the age range (e.g., Crocker, 1997; Dyck et al., 1994).

Among a sample of 223 club athletes, CFA suggested that a two-factor model was the best fit for the data (Tuccitto, Giacobbi, & Leite, 2010), although this model deviated slightly from the original model proposed by Watson et al. (1988). Gaudreau, Sanchez, and Blondin (2006) conducted CFAs of the PANAS on two separate French samples (N = 305 and N = 217) using a short-term time frame. They suggested that the NA factor could be divided into two separate, although highly correlated factors, which they labelled "Afraid" and "Upset", but that this finding did not compromise the utility of the NA scale. Recently, Leue and Beauducel (2011) suggested that an overarching factor termed *affective polarity* might also be

assessed by the PANAS, although the PA-NA distinction remained, with both factors demonstrating good construct validity.

The Anxiety Control Questionnaire (ACQ).

The ACQ (see Appendix F) was used as an additional measure of perceived coping/control in an attempt to add validity to the results of the MDRAS. It is a 30-item self-report questionnaire designed to assess the individual's perception of control over both internal reactions and external events. Items are scored on a 6-point scale (0 representing *Strongly Disagree* and 5 representing *Strongly Agree*) and item scores are summed to provide a total control score (some items must be reverse-scored). Although the ACQ was designed to assess the lower order factors of control over emotional reactions and control over external events (Rapee et al., 1996), some subsequent studies have suggested that the ACQ assesses three lower-order factors, along with an overarching 'perceived control' factor (Brown, White, Forsyth, & Barlow, 2004; Zebb & Moore, 1999). However Shujuan, Meihua, & Jianxin (2009) suggested that the lower order factors are likely to be method artefacts, and found only one factor among 212 Chinese adolescents. Only the overarching factor will be interpreted in the current study, given the ambiguity regarding the lower-order factor structure of the scale.

The ACQ has demonstrated good psychometric properties. High levels of internal consistency have been reported across studies, with Cronbach's alphas for the total scale ranging from .81 to .89 among clinical and non-clinical samples (Lang & McNiel, 2006; Rapee et al., 1996; Shujuan et al., 2009; Zebb & Moore, 1999). Rapee et al. (1996) reported high test-retest correlations over 1 week and 1 month (r = .88 and r = .82 respectively).

The ACQ has demonstrated good validity. Rapee et al. (1996) reported good convergent and discriminant validity, with scores on the ACQ correlating significantly with scores on the Anxiety and Stress subscales of the Depression Anxiety Stress Scales. It also correlated more strongly with measures of anxiety and stress than did more global measures of control (such as the Rotter Internal/External Locus of Control Scale). Although the ACQ correlated with other measures of anxiety and distress, these correlations were "far from unity" (Rapee et al., 1996, p. 288). Lang and McNiel (2006) reported that the ACQ was significantly negatively related to measures of depression and anxiety, with correlations of approximately -.5. Shujuan et al. (2009) reported negative correlations in the order of -.4 with the anxiety, depression, and body symptoms scales of the Chinese version of the SCL-90. In addition, Rapee et al. demonstrated that the ACQ is sensitive to change with therapy among

individuals with panic disorder. Zvolensky et al. (2001) found that the ACQ subscale scores were predictive of interpretive biases for threat. Zebb and Moore (1999) concluded that, although the underlying factor structure of the ACQ required further study, the measure is useful as an overall scale.

In what represents the most thorough attempt to validate the ACQ, Brown et al. (2004) used a sample of 1550 clinically anxious individuals and 360 non-clinical individuals. Brown et al. concluded that the measure appears to be a useful indicator of the overall level of control that individuals perceive they have over their lives. Convergent and discriminant validity of the ACQ were demonstrated through the pattern of intercorrelations with measures of anxiety (the Beck Anxiety Inventory and the Anxiety scale of the Depression Anxiety Stress Scales) and depression (the Beck Depression Inventory and the Depression scale of the Depression Anxiety Stress Scale).

The Obsessive Beliefs Questionnaire (OBQ).

The OBQ (see Appendix G) is a 44-item measure designed to assess cognitive patterns that are relevant to current cognitive behavioural models of OCD. It was initially designed to assess six cognitive domains (responsibility; overimportance of thoughts; control of thoughts; estimation of threat; tolerance of uncertainty; and perfectionism), and items were selected that were relevant to these specific domains, but did not represent an OCD symptom or an emotional reaction (OCCWG, 2001).

Participants completing the OBQ are asked to indicate the extent to which they agree or disagree with each statement, based on what they think they are like *most of the time*. Hence, the OBQ is designed to assess beliefs that are held across contexts, rather than state-like symptoms (OCCWG, 2001, 2005). Ratings are made on a 7-point scale, ranging from 1 (*disagree very much*) to 7 (*agree very much*), and scores are summed to reach a total OBQ score, as well as separate factor scores.

In two initial validation studies (OCCWG, 2001, 2003), an 87-item version of the OBQ demonstrated good internal consistency (Cronbach's alphas ranging from .80 to .96 for the various subscales in different samples) and promising test-retest reliability (*r* ranged between .75 and .90 over a 12 day period). OCD participants obtained higher scores than the anxious control group and both groups of non-clinical individuals on all six subscales, although this difference did not reach significance for the perfectionism subscale between the OCD and anxious control groups. This provided evidence for the criterion validity of the OBQ (OCCWG, 2001). In addition, scores on each subscale were moderately correlated with

scores on measures of general distress and of obsessive-compulsive symptomatology, with partial correlations suggesting that the OBQ assesses OCD symptoms after controlling for negative affect. However, there was evidence that the discriminant validity of the OBQ was problematic because the scale related strongly to general emotional disturbance (OCCWG, 2003). In addition, the six subscales were highly intercorrelated, and it was argued that factor analysis was required to reduce the number of dimensions in the OBQ (OCCWG, 2003).

In a further study, the OBQ was submitted to factor analysis using a sample of 410 individuals with OCD, 105 anxious control participants, 87 community controls, and 291 students (OCCWG, 2005). Three factors emerged in both the OCD and student samples (the community and anxious control samples were too small to undergo factor analysis), and were labelled RT (which deals with preventing harm, the consequences of inaction, and responsibility for negative outcomes); PC (reflecting high and absolute standards of completion, rigidity, concern over mistakes, and feelings of uncertainty); and ICT (reflecting concern over the consequences of having intrusive thoughts, TAF, and the need to rid oneself of intrusive thoughts). Items that demonstrated loadings of .5 or higher on one of these three factors were retained in the measure, resulting in a new 44-item version of the OBQ (OCCWG, 2005).

The internal consistency of the newly derived subscales was good, with Cronbach's alphas of .93 for RT, .93 for PC, .89 for ICT, and .95 for the total score (OCCWG, 2005). The criterion validity of the 44-item OBQ was good, with OCD participants scoring significantly higher on the RT and the ICT subscales (but not on the PC subscale) than anxious controls. Anxious control participants scored higher than non-anxious participants on all subscales. In addition, the convergent validity of the 44-item OBQ was good, with the expected correlations between OBQ scores and scores on the Padua Inventory – Revised **(**PI-R; Burns, Keortge, Formea, & Sternberger, 1996) subscales, which assess different aspects of OCD symptomatology (OCCWG, 2005). There was also support for the discriminant validity of the 44-item OBQ, with OBQ subscales predicting specific OCD symptoms, after controlling for general distress (OCCWG, 2005). In addition, the intercorrelations among the three new subscales (r = .42 – .57) were lower than those between the six originally proposed subscales.

Although results of factor analyses have been inconsistent regarding the lower-order factor structure of the OBQ (e.g., Taylor et al., 2005; Woods et al., 2004; Wu & Carter, 2008), the overall OBQ score accounts for the majority of variance in the scale and can be confidently interpreted. Taylor et al. (2005) suggested that their results indicate that, while

specific belief domains are likely important to OCD, the general OCD belief factor is more important and that various domains of OCD-related beliefs might overlap more than was previously believed.

Wu and Carter (2008) found that the OBQ scales showed substantial partial correlations to OCD symptoms but not to depression or panic, supporting the convergent and discriminant validity of the OBQ. However the OBQ scales demonstrated moderate relationships with multiple OCD symptoms. Although not stated by Wu and Carter, this would again appear to support the argument (e.g., Taylor et al., 2005; Woods et al., 2004) that the overall OBQ score is the most relevant and that subscale scores must be treated with more caution. Although the subscales proposed by the OCCWG (2003, 2005) will be interpreted in the current study, the primary focus will be on the overall OBQ score. The OBQ scales can be used to predict OCD symptoms and the OBQ has been widely demonstrated to be a useful clinical tool (e.g., Belloch et al., 2010; Kaiser et al., 2010; Taylor et al., 2010; Tolin et al., 2008; Wheaton et al., 2010).

Hypotheses

Hypothesis 1

Given that the MDRAS scales are designed to assess cognitive processes involved in risk perception, it was hypothesised that they would correlate with negative affect as assessed via the PANAS (positively for the MDRAS Probability and Cost scales and negatively for the MDRAS Coping scales). This hypothesis was made to test the convergent validity of the MDRAS scales because there is consistent evidence that anxiety and negative affect are highly positively correlated with threat perception and avoidance of risks (e.g., Butler & Matthews, 1987; Constans & Matthews, 1993; Lorian & Grisham, 2010; Maner et al., 2007; Maner & Schmidt, 2006; Uren et al., 2004).

Hypotheses 2a and 2b

Individuals with OCD are risk-aversive and overestimate threat (Cicolini & Rees, 2003; Moritz & Jelinek, 2009; Moritz & Pohl, 2009; Overton & Menzies, 2005; Rachman, 1998; Steketee & Frost, 1994). Therefore, it would be expected that, even among a non-clinical sample, cognitive processes involved in risk/threat perception should be correlated with levels of obsessive beliefs. Consequently, it was hypothesised that the MDRAS Probability and MDRAS Cost scales would be significantly positively correlated with obsessive thinking (total OBQ scores) and that the MDRAS Coping Scales would be

significantly negatively correlated with obsessive thinking. This hypothesis was a further test of the convergent validity of the MDRAS scales.

However, the MDRAS was designed to be a measure of risk attitudes in non-OCD situations so should not explain a high proportion of unique variance in obsessive beliefs after controlling for negative affect in a non-clinical sample. It was therefore hypothesised that the magnitude of the relationship between the MDRAS scales and the OBQ would be relatively small after accounting for PANAS NA scores. This hypothesis was designed to test the discriminant validity of the MDRAS scales. However, the MDRAS might explain some unique variance in OCD symptoms because some previous evidence (Abed & de Pauw, 1999; Cicolini & Rees, 2003; Feygin et al., 2006) has suggested that OCD might be a risk-taking disorder over-and-above the risk-aversion expected among non-OCD anxious individuals.

Hypotheses 3a and 3b

It was hypothesised that MDRAS Coping scores would be significantly positively correlated with ACQ scores, given that MDRAS Coping is designed to assess a conceptually similar construct to the ACQ. This hypothesis was designed to provide further evidence for the convergent validity of the MDRAS Coping scales.

It was further hypothesised that the magnitude of the relationships between the MDRAS Coping scales and the ACQ would be higher than the magnitude of corresponding relationships between the ACQ and the MDRAS Probability scales or MDRAS Cost scales. This is because MDRAS Probability and MDRAS Cost are assessing primary appraisal processes and are likely to be less closely related to a measure of perceived control (the ACQ) than is MDRAS Coping, which assesses secondary appraisal processes (e.g., Zvolensky et al., 2001). This hypothesis was designed to further test the discriminant validity of the MDRAS Probability and Cost scales.

Hypothesis 4

It was hypothesised that the relationship between the MDRAS Coping scales and the ACQ would be stronger than the respective relationships between MDRAS Coping scales and the OBQ total scale. This hypothesis was designed to test the discriminant validity of the MDRAS Coping scales because perceived coping ability should be more closely related to perceived control than to levels of obsessive beliefs.

Hypothesis 5

It was hypothesised that the MDRAS scale scores would be more closely related to OBQ RT than to OBQ ICT. This hypothesis was designed to test both the convergent and discriminant validity of the MDRAS scales because the OBQ RT scale assesses threat estimation, which is congruent with the MDRAS scales' assessment of the variable underlying threat overestimation. The OBQ ICT scale assesses the importance assigned to thoughts and their control, and is conceptually less closely related to threat perceptions.

Hypothesis 6

It was hypothesised that women would rate MDRAS events as significantly more probable and costly than men, and that men would rate themselves as being more able to cope with the MDRAS events than women. This hypothesis was designed to further examine the validity of the MDRAS scales because the majority of evidence has suggested that men are more willing to take risks than women in various types of situations, suggesting that they perceive less threat and/or have better coping self-efficacy (Cicolini & Rees, 2003; Conley & Peplau, 2010; Pawlowski, Atwal, & Dunbar, 2008; Steiner, 1972; Steketee & Frost, 1994).

Results

Data were analysed using SPSS version 17. As in Study 1, a conservative alpha level of .01 was used to judge statistical significance, given the large number of statistical tests performed. In addition, a Microsoft Excel program was used to compute Z scores to test the significance of differences between related correlations (see Appendix H for the formula used).

Data Screening

Prior to analysing the data obtained from the remaining scales, the ACQ reverse scored items were recoded. Univariate descriptives were generated for the OBQ, PANAS, ACQ, age, and gender in order to assess the accuracy of data input. Data were checked to ensure that all points were within the eligible range for the respective scales (Tabachnick & Fidell, 2001). No data entry errors were detected. However, eight cases were deleted at this time because they contained large sections of missing data. In two cases the participant had failed to complete the second page of the OBQ (containing 27 of the 44 items) and in the remaining cases the participants had failed to respond to at least one of the questionnaires. Tabachnick and Fidell (2001) suggest that deleting cases with missing data is appropriate

when they are relatively few in number. This resulted in a sample of 214 participants (145 women, 64 men, 5 gender unreported) for the remainder of the analyses. MDRAS data were not screened because the same data used in Study 1 were utilised, with outlying scores remaining modified.

SPSS Missing Values Analysis was used to analyse missing data from the PANAS, the OBQ, the ACQ, age, and gender for the remaining 214 participants. No variable was missing more than 5% of the data so the pattern of missing data was not assessed (Tabachnick & Fidell, 2001). Given that the amount of missing data was relatively small, means substitution was used to estimate missing values (Tabachnick & Fidell, 2001), with the exception of missing values on gender.

Histograms and boxplots were examined to screen variables for normality and for the presence of univariate outliers. None of the MDRAS scales demonstrated obvious deviations from normality and there were few univariate outliers on any of these scales. The OBQ total scale, RT scale, and the PC scale showed no obvious deviations from normality. OBQ ICT demonstrated a moderate amount of positive skew. However, there were few univariate outliers on any of the OBQ scales. Scores on the ACQ showed no obvious deviations from normality and boxplots revealed no potential outliers. Scores on the PANAS demonstrated strong positive skew and boxplots revealed six potential outliers with very high scores.

No transformations were applied to the skewed variables because Tabachnick and Fidell (2001) suggest that "If a scale is meaningful or widely used, transformation often hinders interpretation" (p. 81). The OBQ ICT scale and the PANAS are both widely used clinical measures and transformation would have resulted in variables that were no longer assessing obsessive thinking or negative affect, but a logarithm of each. It is likely to reduce the theoretical utility of comparing MDRAS scores with transformed data from these scales. It would also rendered comparisons to previous studies impossible. It is also worth noting that, given that these scales are all designed to assess clinical symptoms, their usage in non-clinical samples is likely to result in skewed distributions (e.g., Zebb & Moore, 1999) and it is better to work with skewed distributions that are representative of the underlying population rather than to distort the distribution simply to meet the parametric assumption of normality (Norman & Streiner, 2008). Correlations between variables were examined using Spearman's *Rho*, and the pattern was not markedly different to that observed using Pearson's *r*, again suggesting that transformations were not required.

It was recognised that outliers could potentially inflate the magnitude of correlations in the data. However the number of univariate outliers was relatively small and some outliers

are to be expected when dealing with such a large sample (Tabachnick & Fidell, 2001). Examination of raw data on outlying cases did not provide evidence for unusual response patterns. The pattern of correlations was examined for the entire data set and the data set after deletion of cases with outlying scores. Although correlations were higher when outlying scores were retained, the magnitude of this difference was relatively small. For example, the correlation between MDRAS Total Probability and MDRAS Total Coping was reduced from -.52 to -.48 with the removal of outliers. It was decided to retain outlying scores for the remainder of the analyses.

The data were screened for multivariate outliers using regression with case number as the dummy dependent variable. Two separate regression analyses were conducted. The first involved scores for the complete scales of the MDRAS, the OBQ total score, the ACQ, PANAS NA, and age. The second analysis contained the scores for the everyday and future scales within each of the MDRAS scales, the separate OBQ subscales, the ACQ, PANAS NA, and age. Mahalanobis distance ($p < .001$) revealed one multivariate outlier in each analysis, accounted for by the same case. This case was not particularly influential, as indicated by a Cook's distance of .08 and .07 in the respective analyses. In addition it was not detected as a univariate outlier on any of the variables. Examination of raw data did not reveal unusual response patterns and examination of the correlation matrix with the case deleted revealed that it had negligible impact upon results. Consequently the case was retained.

Descriptive Statistics

The mean scores for variables in the study are shown in Table 7.1.

MDRAS descriptive statistics.

Results indicated that the mean level of everyday perceived probability (3.57) was higher than future perceived probability (3.28), t (213) = 4.53, $p < .001$, although this was a small effect. The mean everyday cost score (4.06) was not significantly different to the future cost score (4.12), t (213) = 1.25, $p = .21$. Despite the lack of difference in perceived cost between the scales, mean perceived ability to cope with everyday events (4.48) was significantly higher than mean perceived ability to cope with future events (4.12), t (213) = 7.50, $p < .001$. The magnitude of this difference was small. Correlations between the MDRAS scales are shown in Table 7.2.

Table 7.1

Descriptive Statistics (N = 214)

Scale	*M* (*SD*)	Minimum	Maximum
MDRAS Total Prob	3.43 (.71)	1.71	5.93
MDRAS Everyday Prob	3.57 (.81)	1.43	5.71
MDRAS Future Prob	3.28 (.88)	1.00	6.57
MDRAS Total Cost	4.09 (.69)	2.36	5.86
MDRAS Everyday Cost	4.06 (.78)	2.29	6.00
MDRAS Future Cost	4.12 (.78)	2.34	6.29
MDRAS Total Coping	4.30 (.67)	2.30	5.98
MDRAS Everyday Cope	4.48 (.81)	2.03	6.71
MDRAS Future Coping	4.12 (.70)	2.29	5.95
PANAS NA	19.35 (6.50)	10	41
ACQ	99.19 (19.71)	47	147
OBQ	126.64 (37.19)	49	239
OBQ RT	48.36 (16.32)	16	105
OBQ ICT	25.45 (9.76)	12	58
OBQ PC	52.83 (16.94)	18	96

Table 7.2

Correlations Between MDRAS Scales (N = 214)

	Total Prob	Ev Prob	Fut Prob	Total Cost	Ev Cost	Fut Cost	Total Coping	Ev Coping	Fut Coping
Total Prob	1								
Ev Prob	.82	1							
Fut Prob	.85	.40	1						
Total Cost	.52	.58	.30	1					
Ev Cost	.55	.66	.28	.89	1				
Fut Cost	.37	.37	.25	.89	.57	1			
Total Coping	-.52	-.56	-.32	-.86	-.75	-.77	1		
Ev Coping	-.56	-.62	-.32	-.76	-.82	-.53	.91	1	
Fut Coping	-.35	-.35	-.24	-.77	-.50	-.86	.87	.57	1

Note. All correlations were significant ($p < .001$).

Descriptive statistics for the ACQ, the PANAS, and the OBQ.

Correlations between the MDRAS and the other measures in the study are shown in Table 7.3

The mean score on the ACQ was 99.18, similar to the 95.42 reported by Zebb and Moore (1999) and the 96.1 reported by Rapee et al. (1996) among their non-clinical population. It was higher than the 75.63 (Lang & McNiel, 2006) and the 73.8 (Rapee et al., 1996) reported among psychiatric samples. In the current study, the ACQ demonstrated excellent internal consistency, with a Cronbach's alpha of .91.

The mean PANAS NA score in the current study was 19.35. This is similar to the results of Watson et al. (1988) who reported a mean score of 18.1 among a non-clinical sample using the "in general" timeframe. In the current study, the PANAS NA scale demonstrated good internal consistency, with a Cronbach's alpha of .88.

The mean OBQ total scale score in the current study was 126.64, which is comparable to the overall mean score of 130.8 reported by Wu and Carter (2008) in a non-clinical sample (2008). The mean subscale scores of the OBQ in the current study were 48.36 for RT, 25.45 for ICT, and 52.83 for PC. The corresponding means obtained by Wu and Carter were 47.9,

28.5, and 54.4, respectively. In the current study the OBQ total scale demonstrated excellent internal consistency, with a Cronbach's alpha of .94. The internal consistency of the OBQ subscales was also good, with Cronbach's alphas of .89, .90, and .84 for the RT subscale, the PC subscale, and the ICT subscale, respectively. The OBQ subscales were all significantly positively correlated, (*r*s ranging from .48 to .67). These correlations are somewhat higher than those reported by the OCCWG (2005) among the OBQ subscales, although the reason for this is unclear.

Table 7.3

Correlations Between The MDRAS and Other Scales (N = 214)

	MDRAS Scale								
Scale	Total Prob	Ev Prob	Fut Prob	Total Cost	Ev Cost	Fut Cost	Total Coping	Ev Coping	Fut Coping
ACQ	-.52**	-.45**	-.42**	-.50**	-.47**	-.42**	.61**	.59**	.47**
PANAS NA	.50**	.40**	.44**	.47**	.46**	.37**	-.51**	-.49**	-.41**
OBQ Total	.37**	.36**	.26**	.48**	.44**	.40**	-.46**	-.45**	-.37**
OBQ RT	.38**	.36**	.28**	.44**	.43**	.36**	-.43**	-.42**	-.33**
OBQ ICT	.30**	.26**	.24**	.32**	.32**	.25**	-.38**	-.38**	-.29**
OBQ PC	.27**	.28**	.17	.44**	.38**	.40**	-.39**	-.36**	-.32**
Age	-.25**	-.21*	-.20*	-.20*	-.14	-.22**	.14	.05	.21*

* $p < .01$. ** $p < .001$.

Hypothesis 1

As can be seen from the correlations in Table 7.3, Hypothesis 1, that the MDRAS scales would be significantly related to NA, was supported for the MDRAS Total scales as well as the MDRAS Everyday and Future scales. In all cases the MDRAS Probability and MDRAS Cost scales were significantly positively correlated with PANAS NA scores, and MDRAS Coping scales were significantly negatively correlated with PANAS NA scores. The magnitude of these correlations was large in all cases (Cohen, 1988).

Hypothesis 2

Hypothesis 2a, that the MDRAS scales would be related to obsessive thinking, was supported, with significant moderate correlations (r = .26 to r = .48) between the total OBQ score and each of the MDRAS scales (see Table 7.3). In general, correlations between the OBQ total score and the MDRAS Cost and Coping scales were of greater magnitude than the correlations between the OBQ total scale and the MDRAS Probability scale.

In order to test Hypothesis 2b, that the relationship between the MDRAS and the OBQ would largely be accounted for by NA, it was necessary to run multiple regression analyses to determine whether MDRAS scores significantly predicted OBQ total scores after controlling for NA. Separate hierarchical multiple regression analyses were conducted with OBQ scores as the criterion, with PANAS NA and the MDRAS scales as the predictors. In the first analysis, MDRAS Total scores were used, whereas in the second analysis, MDRAS Everyday and MDRAS Future scores were used. In each case, PANAS NA scores were entered in the first step of the analysis and the MDRAS scale scores were entered in the second step, in order to determine how much variance in the OBQ scores were accounted for by MDRAS scales after controlling for NA.

Analysis using the MDRAS Total scales.

In Step 1, PANAS NA scores accounted for a significant 21.6% of the variance in OBQ scores, R^2 = .216, $F(1, 212) = 58.25$, $p < .001$. In Step 2, MDRAS Total Probability, Total Cost, and Total Coping were entered simultaneously and accounted for a further 9.1% of the variance in OBQ scores, ΔR^2 = .091, $\Delta F(3, 209) = 9.08$, $p < .001$. This is a small effect, according to Cohen's (1988) conventions (f^2 = .10). Regression coefficients (see Table 7.4) revealed that none of the MDRAS Total scales contributed significant unique variance to OBQ scores, although MDRAS Total Cost approached significance (p = .02). This supports Hypothesis 2b, that the MDRAS scales would not account for a large amount of variance in obsessive thinking after controlling for NA.

Table 7.4

Unstandardised (B) and Standardised (β) Regression Coefficients, and Part Correlations (sr^2), For Each Predictor in Step 2 of a Regression Model Predicting OBQ Total Scores using MDRAS Total scores

Variable	*B*	95% CI for *B*	β	sr^2
NA	1.606*	[.807, 2.405]	.281	.228
Total Probability	2.996	[-4.464, 10.456]	.057	.046
Total Cost	14.125	[1.994, 26.255]	.262	.132
Total Coping	-3.579	[-16.307, 9.150]	-.064	-.032

*$p < .01$.

Analysis using the MDRAS Everyday and the MDRAS Future scales.

In Step 1, PANAS NA scores accounted for a significant 21.6% of the variance in OBQ scores, $R^2 = .216$, $F(1, 212) = 58.25$, $p < .001$. In Step 2, MDRAS Everyday Probability, MDRAS Future Probability, MDRAS Everyday Cost, MDRAS Future Cost, MDRAS Everyday Coping, and Future Coping were entered simultaneously and accounted for a further 9.5% of the variance in OBQ scores, $\Delta R^2 = .095$, $\Delta F(6, 206) = 4.76$, $p < .001$. This is a small effect, according to Cohen's (1988) conventions ($f^2 = .10$). Regression coefficients (see Table 7.5) revealed that none of the MDRAS scales contributed significant unique variance to OBQ scores. This supports Hypothesis 2b.

Table 7.5

Unstandardised (B) and Standardised (β) Regression Coefficients, and Part Correlations (sr^2), For Each Predictor in Step 2 of a Regression Model Predicting OBQ Total Scores using MDRAS Everyday and Future scores

Variable	*B*	95% CI for *B*	β	sr^2
NA	1.648*	[.832, 2.463]	.288	.230
Everyday Probability	1.951	[-5.371, 9.273]	.043	.030
Future Probability	.689	[-4.895, 6.274]	.016	.014
Everyday Cost	3.480	[-7.319, 14.280]	.073	.037
Future Cost	11.712	[-.015, 23.439]	.245	.114
Everyday Coping	-6.385	[-16.534, 3.765]	-.140	-.072
Future Coping	5.114	[-8.053, 18.281]	.096	.044

*$p < .01$.

Hypothesis 3

As can be seen in Table 7.3, Hypothesis 3a, that the MDRAS Coping scales would be positively correlated with the ACQ, was supported, with large or moderate correlations in each case (Cohen, 1988).

In order to test Hypothesis 3b, that the MDRAS Coping scales would be more closely related to the ACQ than would the MDRAS Probability and Cost scales, the correlations between the MDRAS Coping Scales and the ACQ were compared to correlations between the MDRAS Probability Scales and the ACQ and the MDRAS Cost Scales and the ACQ. Hypothesis 3b was supported for the comparison with the MDRAS Total Cost scale, with the correlation between MDRAS Total Coping and the ACQ (.61) being significantly higher than the correlation between MDRAS Total Cost and the ACQ (-.50, $Z = 3.51$, $p < .001$). Hypothesis 3b was also supported for the comparison with the MDRAS Everyday Probability and Everyday Cost scales, with the correlation between MDRAS Everyday Coping and the ACQ (.59) being significantly higher than the correlation between MDRAS Everyday Probability and the ACQ (-.45, $Z = 2.96$, $p < .001$) or between MDRAS Everyday Cost and the ACQ (-.47, $Z = 3.60$, $p < .001$). However Hypothesis 3b was not supported for the

comparisons with the MDRAS Total Probability Scale or the MDRAS Future Probability or Future Cost scales. The correlation between the MDRAS Total Coping scale and the ACQ (.61) was not significantly higher than the correlation between MDRAS Total Probability and the ACQ (-.52, $Z = 1.69$, $p = .09$). The correlation between MDRAS Future Coping and the ACQ (.47) was not significantly higher than the corresponding correlations between MDRAS Future Probability and the ACQ (-.42, $Z = .44$, $p = .44$) or between MDRAS Future Cost and the ACQ (-.42, $Z = 1.71$, $p = .09$).

A possible explanation for the lack of significant differences in some of the observed correlations lies in the fact that all MDRAS scales and the ACQ were closely correlated with NA. These relationships have been reported in previous studies (Berenbaum, Thompson, & Pomerantz, 2007; Maner et al., 2007; Stapinski, Abbott, & Rapee, 2010; Szabo, 2009) and it is possible that they masked potential differences in the strength of relationships between the ACQ and each of the MDRAS scales. In order to determine whether this explanation had merit, hierarchical multiple regression analyses were conducted, with ACQ scores as the criterion and PANAS NA and MDRAS scores as predictors. In each analysis, PANAS NA scores were entered in the first step of the equation, and MDRAS scores were entered in the second step in order to examine the proportion of variance in ACQ scores that could be accounted for by the various MDRAS scales after removing the variance accounted for by negative affect.

Multiple regression – MDRAS Total scales.

In Step 1, PANAS NA scores accounted for a significant proportion of the variance in ACQ scores, $R^2 = .42$, $F(1, 212) = 156.01$, $p < .001$. In Step 2, MDRAS Total Probability, Total Cost, and Total Coping scores were entered into the regression equation and accounted for an additional 12.1% of the variance in ACQ scores, $\Delta R^2 = .121$, $\Delta F (3, 209) = 18.45$, $p < .001$. This is a small to medium effect ($f^2 = .14$). Regression coefficients (see Table 7.6) revealed that MDRAS Total Coping accounted for a significant 4.97% of unique variance in ACQ scores, MDRAS Total Probability accounted for a smaller 1.56% of unique variance in ACQ scores and MDRAS Total Cost accounted for a non-significant .67% of unique variance in ACQ scores. This supports Hypothesis 3b for the MDRAS Total Scores, with MDRAS Total Coping accounting for more variance in ACQ scores than did the MDRAS Total Probability or Total Cost scales.

Table 7.6

Unstandardised (B) and Standardised (β) Regression Coefficients, and Part Correlations (sr^2), For Each Predictor in Step 2 of a Regression Model Predicting ACQ Scores using PANAS NA and MDRAS Total Scores

Variable	*B*	95% CI for *B*	β	sr^2
NA	-1.269**	[-1.612, -.926]	-.419	-.341
Total Probability	-4.338*	[-7.541, -1.135]	-.156	-.125
Total Cost	4.667	[-.542, 9.876]	.163	.082
Total Coping	13.265**	[7.799, 18.730]	.451	.223

*$p < .01$. **$p < .001$.

Multiple regression – MDRAS Everyday and Future scales.

In Step 1, PANAS NA scores accounted for a significant proportion of the variance in ACQ scores, $R^2 = .42$, $F(1, 212) = 156.01$, $p < .001$. In Step 2, MDRAS Everyday Probability, MDRAS Future Probability, MDRAS Everyday Cost, MDRAS Future Cost, MDRAS Everyday Coping, and MDRAS Future Coping scores were entered into the regression equation and accounted for a an additional 12.7% of the variance in ACQ scores, $\Delta R^2 = .127$, $\Delta F(6, 206) = 9.71$, $p < .001$. This was a small to medium effect ($f^2 = .14$). Regression coefficients (see Table 7.7) revealed that MDRAS Everyday Coping contributed a significant 4.04% of unique variance in ACQ scores. None of the remaining MDRAS scales contributed significant unique variance to ACQ scores. This largely supports Hypothesis 3b for the MDRAS Everyday and Future scales.

Table 7.7

Unstandardised (B) and Standardised (β) Regression Coefficients, and Part Correlations (sr^2), For Each Predictor in Step 2 of a Regression Model Predicting ACQ Scores using PANAS NA and MDRAS Everyday and Future Scores

Variable	*B*	95% CI for *B*	β	sr^2
NA	-1.283**	[-1.632, -.934]	-.423	-.338
Everyday Probability	-1.838	[-4.971, 1.295]	-.076	-.054
Future Probability	-2.183	[-4.573, .206]	-.098	-.084
Everyday Cost	4.701	[.080, 9.323]	.186	.094
Future Cost	-.925	[-5.943,4.093]	-.037	-.017
Everyday Coping	9.487**	[5.144, 13.831]	.392	.201
Future Coping	2.405	[-3.229, 8.040]	.085	.039

*$p < .01$. **$p < .001$.

Hypothesis 4

Hypothesis 4, that the MDRAS Coping scales would be more closely related to a measure of perceived control (the ACQ) than to a measure of obsessive beliefs (the OBQ), was supported for the MDRAS Total Coping Scale: The correlation between the MDRAS Total Coping scale and the ACQ ($r = .61$) was significantly larger in magnitude than the correlation between the MDRAS Total Coping scale and the OBQ total scale ($r = -.46$, $Z = 2.62$, $p = .004$). Hypothesis 4 was also supported for the MDRAS Everyday Coping Scale: The correlation between the MDRAS Everyday Coping scale and the ACQ ($r = .59$), was significantly higher in magnitude than the correlation between the MDRAS Everyday Coping scale and the OBQ total scale ($r = -.45$, $Z = 2.66$, $p = .006$). However, Hypothesis 4 was not supported for the MDRAS Future Coping scale: The correlation between MDRAS Future Coping and the ACQ ($r = .47$) was not significantly higher in magnitude than the correlation between MDRAS Future Coping and the OBQ total score ($r = -.37$, $Z = 1.73$, $p = .08$). These results were possibly confounded by the high correlation between the OBQ and the ACQ scores ($r = -.51$). As a result, standard multiple regression analyses were conducted utilising the MDRAS Coping scales as the criterion, and ACQ and OBQ total scores, along with

PANAS NA scores, as predictors in order to determine the proportion of unique variance in MDRAS Coping scores accounted for by the ACQ and the OBQ.

With MDRAS Total Coping as the criterion, the combination of PANAS NA, ACQ, and OBQ total scores accounted for a significant 41.3% of variance, $R^2 = .413$, $F(3, 210) = 49.16$, $p < .001$. This was a large effect ($f^2 = .70$). Regression coefficients (see Table 7.8) revealed that ACQ scores predicted a significant 8.76% of unique variance in MDRAS Total Coping. OBQ total scores only predicted 2.25% of unique variance in MDRAS Total Coping.

Table 7.8

Unstandardised (B) and Standardised (β) Regression Coefficients, and Part Correlations (sr^2), For Each Predictor in a Regression Model Predicting MDRAS Total Coping Scores using PANAS NA, OBQ, and ACQ Scores

Variable	*B*	95% CI for *B*	β	sr^2
NA	-.017*	[-.031, -.002]	-.160	-.119
ACQ	.014**	[.009, .019]	.410	.296
OBQ	-.003*	[-.005, -.001]	-.179	-.150

*$p < .01$. **$p < .001$.

With MDRAS Everyday Coping as the criterion, the combination of PANAS NA, ACQ, and OBQ total scores accounted for a significant 39.1% of variance, $R^2 = .391$, $F(3, 210) = 44.92$, $p < .001$. This was a large effect ($f^2 = .64$). Regression coefficients (see Table 7.9) revealed that ACQ scores predicted a significant 9% of unique variance whereas OBQ total scores only predicted 2.02% of unique variance in MDRAS Everyday Coping.

Table 7.9

Unstandardised (B) and Standardised (β) Regression Coefficients, and Part Correlations (sr^2), For Each Predictor in a Regression Model Predicting MDRAS Everyday Coping Scores using PANAS NA, OBQ, and ACQ Scores

Variable	*B*	95% CI for *B*	β	sr^2
NA	-.018	[-.036, .000]	-.141	-.105
ACQ	.017**	[.011, .023]	.416	.300
OBQ	-.004*	[-.006, -.001]	-.168	-.142

*p < .01. **p <.001.

With MDRAS Future Coping as the criterion, the combination of PANAS NA, ACQ, and OBQ total score accounted for a significant 25.6% of variance, R^2 = .256, F(3, 210) = 24.08, p < .001. This was a medium to large effect (f^2 = .34). Regression coefficients (see Table 7.10) revealed that ACQ scores predicted a significant 4.80% of unique variance, whilst OBQ total scores did not predict significant unique variance.

Table 7.10

Unstandardised (B) and Standardised (β) Regression Coefficients, and Part Correlations (sr^2), For Each Predictor in a Regression Model Predicting MDRAS Future Coping Scores using PANAS NA, OBQ, and ACQ Scores

Variable	*B*	95% CI for *B*	β	sr^2
NA	-.015	[-.032, .002]	-.143	-.107
ACQ	.011**	[.005, .016]	.304	.219
OBQ	-.003	[-005, .000]	-.147	-.124

**p <.001.

Overall the results of the regression analyses suggest that the ACQ predicts more unique variance in the MDRAS Coping scales than does the OBQ, supporting Hypothesis 4.

Hypothesis 5

Hypothesis 5 was not directly supported – in no case did the MDRAS scores correlate more strongly with OBQ RT scores than with OBQ ICT scores at an alpha level of .01, although in some cases the differences approached significance. The results are presented in Table 7.11.

Table 7.11

Comparison of the Magnitude of Correlations Between MDRAS Scales and OBQ RT/OBQ ICT Scales

	Correlations		Difference Between Correlations	
MDRAS Scale	OBQ RT	OBQ ICT	*Z* Score	*p*
Total Probability	.38	.30	1.61	.11
Everyday Probability	.36	.26	1.84	.07
Future Probability	.28	.24	.84	.40
Total Cost	.44	.32	2.23	.03
Everyday Cost	.43	.32	1.96	.05
Future Cost	.36	.25	1.93	.05
Total Coping	-.43	-.38	.86	.39
Everyday Coping	-.42	-.38	.82	.41
Future Coping	-.33	-.29	.66	.51

Although none of the differences were significant at an alpha level of .01, the correlations between the MDRAS scales and the OBQ RT scale were, in all cases, higher than the correlations between the MDRAS scales and the OBQ ICT scale. Given that OBQ RT correlated highly with OBQ ICT (r = .64) the lack of significant findings is not surprising. To further examine the relationship between the MDRAS scales and the OBQ RT and OBQ ICT scales, regression analyses were run using each of the MDRAS scales as the criterion, entering PANAS NA, OBQ RT, and OBT ICT simultaneously as predictors. Part-correlations were examined to determine the proportion of unique variance in MDRAS scale

scores accounted for by the two OBQ scales after removing the variance accounted for by negative affect. As can be seen in Table 7.12, OBQ RT accounted for unique variance in most MDRAS scales, whereas OBQ ICT did not account for unique variance in any MDRAS scale. This provides tentative support for Hypothesis 5.

Table 7.12

Percentage of Unique Variance in MDRAS Scales Accounted for by OBQ RT and OBQ ICT Scales After Controlling for NA

MDRAS Scale	OBQ RT		OBQ ICT	
	% Variance	*p*	% Variance	*p*
Total Probability	1.80	.02	.02	.83
Everyday Probability	2.78	< .01	.0001	.99
Future Probability	.38	.32	.04	.75
Total Cost	4.28	< .001	.01	.87
Everyday Cost	3.53	< .01	.05	.71
Future Cost	3.17	< .001	.003	.94
Total Coping	1.59	.03	.83	.11
Everyday Coping	1.61	.03	.85	.11
Future Coping	.88	.13	.44	.28

Hypothesis 6

Independent samples t tests were conducted to assess gender differences in MDRAS scale scores among the 209 participants who had reported gender (145 women and 64 men). Descriptive statistics split by gender can be found in Table 7.13. The hypothesised gender differences were present for the MDRAS Total scales. Women's mean MDRAS Total Probability and Total Cost scores were significantly higher than men's, with small to medium effect sizes: MDRAS Total Probability, t (207) = -2.85, p = .005, d = .43; MDRAS Total Cost, t (207) = -2.85, p = .005, d = .43. Women's mean MDRAS Total Coping score was significantly lower than men's and this was a medium sized effect, t (207) = 3.46, p = .001, d

= .52. Hypothesis 6 was also supported for the MDRAS Everyday Scales. Women's mean Everyday Probability and Everyday Cost ratings were significantly higher than men's: MDRAS Everyday Probability, t (207) = -4.40, $p < .001$, $d = .66$; MDRAS Everyday Cost, t (207) = -3.27, $p = .001$, $d = .49$. Men's mean MDRAS Everyday Coping score was significantly higher than women's, t (207) = 3.78, $p < .001$, $d = .57$. However, Hypothesis 6 was not supported for the MDRAS Future Scales. Although for each scale the gender differences were in the expected direction, none of these differences reached statistical significance at an alpha level of .01. Mean scores for women on MDRAS Future Probability and MDRAS Future Cost were not significantly higher than men's: MDRAS Future Probability, t (207) = -.62, $p = .54$, $d = .09$; MDRAS Future Cost, t (207) = -1.78, $p = .08$, $d = .27$. For MDRAS Future Coping, women's mean score was not significantly lower than the corresponding mean for men, t (207) = 2.24, $p = .03$, $d = .34$.

Table 7.13

Descriptive Statistics Split According to Gender

Variable	Women		Men	
	Mean	*SD*	*Mean*	*SD*
Total Probability*	3.53	.71	3.23	.67
Everyday Probability*	3.74	.78	3.22	.79
Future Probability	3.31	.86	3.23	.94
Total Cost*	4.19	.71	3.89	.61
Everyday Cost*	4.18	.80	3.80	.68
Future Cost	4.19	.80	3.98	.73
Total Coping*	4.19	.68	4.53	.59
Everyday Coping*	4.34	.80	4.79	.76
Future Coping	4.05	.72	4.28	.63
PANAS NA	19.75	6.79	18.86	5.84
ACQ	96.96	19.90	103.75	18.84
OBQ Total	125.02	37.66	130.21	37.18
OBQ R/T	47.81	16.35	49.74	16.89
OBQ ICT	25.48	10.08	25.62	9.31
OBQ P/C	51.73	17.04	54.85	16.63

* $p < .01$.

Discussion

In order to further investigate the psychometric properties of the newly created MDRAS, this study set out to explore the pattern of relationships between the MDRAS and other related and well established clinical measures. Importantly, major predictions regarding the relationships between MDRAS scales and other measures were supported.

There is a wide body of literature endorsing the link between threat perception and NA/anxiety (e.g., Butler & Mathews, 1983, 1987; Cisler & Koster, 2010; Gasper & Clore, 1998; Maner et al., 2007; Maner & Schmidt, 2006; Roy et al., 2008; Verkuil et al., 2009; Waters, Wharton, et al., 2008). In general, the perceived probability and perceived cost of negative events are positively related to anxiety and NA (e.g., Berenbaum, Thompson, & Pomerantz, 2007; Nelson et al., 2010; Poulton & Andrews, 1996; Uren et al., 2004; Voncken et al., 2007; Wells, 1995) and perceived ability to cope with negative events is negatively related to anxiety and NA (e.g., Bouchard et al., 2007; Casey, Oei, Newcombe, & Kenardy, 2004; Cieslak et al., 2008; Waters, Mogg, et al., 2008; White et al., 2006; Zvolensky et al., 2001). It was important that the MDRAS scales related to NA (assessed by the PANAS) in a manner consistent with this. Results suggested that this was the case – as assessed on the MDRAS, individuals with higher levels of NA perceived unpleasant general risks as more probable and more costly than did individuals with lower levels of NA. They also perceived themselves as less able to cope with these risks. The fact that the MDRAS scales related to NA in a manner consistent with previous risk/threat measures (and that these relationships are of clinically significant magnitude) provides important evidence for the convergent validity of the MDRAS scales, indicating that they assess cognitive processes that are relevant to threat perception.

Further evidence for the convergent validity of the MDRAS is that it successfully captured the well-established positive relationships between obsessive thinking (assessed by the OBQ total score) and probability/cost estimates for negative events, as well as the negative relationship between obsessive thinking and perceived coping ability for negative events. This is consistent with the literature demonstrating that individuals with OCD perceive heightened levels of threat because of heightened perceptions of the probability (in some instances) and cost of negative events, or because of low subjective coping ability (e.g., Amir et al., 2009; Cisler & Olatunji, 2010; Endrass et al., 2011; Irak & Flament, 2009; Menzies et al., 2000; Moritz & Jelinek, 2009; Najmi et al., 2010; Overton & Menzies, 2005; Steketee et al., 1998; Thorpe et al., 2011; Woods et al., 2002). The correlations were of medium strength, indicating clinically relevant relationships between the MDRAS scales and

obsessive-compulsive thinking. Interestingly, and consistent with the suggestion that probability overestimation might not be central to overestimation of threat among individuals with OCD, the correlations between probability ratings on the MDRAS and level of obsessive beliefs appeared to be somewhat lower than the correlations between cost and coping ratings on the MDRAS and level of obsessive beliefs, although significance tests were not conducted.

When examined more closely, the pattern of relationships between the MDRAS scales and the OBQ also provided evidence for the discriminant validity of the MDRAS. Regression analyses indicated that, although the MDRAS scales were related to OBQ scores, this was eliminated when controlling for NA, suggesting that the MDRAS scales are not tapping into obsessive thinking and are likely to be measuring risk perceptions that are largely uncontaminated by OCD cognitive processes. This is important because the MDRAS was designed to measure general threat perceptions that are not related to obsessive concerns. It appears that the MDRAS may be suitable for use to assess risk perceptions in a variety of clinical groups without needing to control for the impact of obsessive beliefs. However, some previous research (Cicolini & Rees, 2003; Frost et al., 1994; Steiner, 1972; Lyoo, et al., 2001; Lyoo et al., 2003; Rees et al., 2006; Steketee & Frost, 1994) has suggested that risk-aversion might be related to a primary diagnosis of OCD and that risk-aversion among individuals with OCD is not merely a product of the high levels of negative affect that accompany the disorder. Therefore, the fact that the MDRAS scales in combination accounted for a small proportion of unique variance in obsessive beliefs is not problematic. It should be noted that the magnitude of the relationship between the MDRAS scales and obsessive thinking might be higher in a clinical sample, and this will require investigation in future studies.

Interestingly, although regressions revealed that none of the individual MDRAS scales predicted significant unique variance in OCD symptoms, there was a trend for the Cost scales to do so, particularly when the MDRAS Total scales were used in the analysis. Although it is unwise to draw conclusions from non-significant (at the reduced alpha-level used in this study) trends, this is consistent with the clinically and empirically derived belief that threat biases other than probability estimation drive overestimation of threat, and consequent risk-aversion, among individuals with OCD (e.g., Cicolini & Rees, 2003; Grayson, 2010; Menzies et al., 2000; Moritz & Jelinek, 2009; Rees, 2001; Salkovskis, Forrester, & Richards, 1998; Thorpe et al., 2011; Woods et al., 2002). This provides further tentative evidence for the construct validity of the MDRAS scales.

Further evidence of the convergent validity of the MDRAS Coping scales is that they correlated positively with the ACQ – a conceptually similar measure assessing perceived control over anxiety and external events. In addition, the discriminant validity of the MDRAS Coping scales was demonstrated by the fact that the relationships between these scales and the ACQ were stronger than the relationships between these scales and a conceptually dissimilar measure of obsessive beliefs (the OBQ). This suggests that, as intended, the MDRAS Coping scales are assessing coping/control-related beliefs and are not assessing OCD-related cognitive processes.

Further evidence for the divergent validity of the MDRAS Probability and Cost scales is that they related less strongly to perceived control over anxiety and external events (ACQ scores) than did the MDRAS Coping scales. Given the high (r = -.65) correlation between NA and ACQ scores (consistent with previous research, e.g., Stapinski et al., 2010), regression analysis controlling for NA were conducted to examine the relationship between the ACQ and the MDRAS scales. Results demonstrated that, when the MDRAS Total scales were used, perceived ability to cope with MDRAS negative events predicted more unique variance in ACQ scores than did the perceived probability or cost of those events after controlling for NA. When the MDRAS Everyday and Future scales were used, only the perceived ability to cope with everyday negative MDRAS events predicted significant variance in ACQ scores after controlling for NA. These results suggest that the perceived ability to cope with negative events as assessed on the MDRAS is more closely related to the ACQ than are the perceived probability or cost of those events. This provides further evidence for the convergent validity of the MDRAS Coping scales. These results also indicate that, despite being closely correlated, the MDRAS Cost and MDRAS Coping scales are assessing different constructs and are likely to be providing separate clinically relevant information about risk perceptions.

It is important to note that perceived ability to cope with future events on the MDRAS was not predictive of significant unique variance in perceived control scores. However, this result is not problematic in terms of the validity of the MDRAS. It is possible that the perceived ability to control anxiety (as assessed by numerous ACQ items) is less important when assessing ability to cope with potential negative events in the future than it is when assessing immediately salient negative events. Conceptually, it is likely that individuals would not consider their level of control over anxiety to be important when assessing the threat involved in distant future events. However, perceived control over anxiety is likely to factor into the considerations of individuals assessing their ability to cope with immediately

relevant risks. This also indicates the possibility that risk perception for immediately significant events might involve different processes than risk perception for events at an unspecified future time.

Although no other direct measures of threat perception were included in the current study, it was important to determine whether the MDRAS scales were more closely related to obsessive beliefs concerning threat (the OBQ RT subscale) than to obsessive beliefs concerning the importance/control of thoughts (the OBQ ICT subscale). Overall the results of the regression analyses suggested that this was the case, with obsessive beliefs about threat generally accounting for more unique variance in the MDRAS scales than did obsessive beliefs about the importance/control of thoughts, although in some cases neither type of belief accounted for significant variance after controlling for NA. Of particular importance is that obsessive beliefs about the importance/control of thoughts did not account for significant unique variance in any of the MDRAS scales. This provides support for the discriminant validity of the MDRAS scales, which were not designed to be related to beliefs about thinking. However, the relatively small amount of unique variance in MDRAS scores accounted for by either of the OBQ scales renders the results of these regression analyses difficult to interpret and of questionable clinical utility. It would be interesting to conduct similar analyses among a sample of clinical individuals with OCD to determine whether the amount of unique variance in MDRAS scores accounted for by the OBQ scales was higher. It can be concluded that the results provide partial support for Hypothesis 5 - the OBQ RT accounted for more unique variance in MDRAS scores than did the OBQ ICT, although the clinical significance of these differences is unclear.

Another noteworthy finding is that the OBQ RT scales appeared to be more closely related to the MDRAS Cost scales than to the MDRAS Probability or the MDRAS Coping scales. OBQ RT accounted for significant unique variance in all of the MDRAS Cost scales, whereas among the remaining MDRAS scales it only accounted for significant unique variance in MDRAS Everyday Probability. Although this result, among a non-clinical sample and when dealing with such low proportions of variance, cannot be assigned too much importance, it suggests that perceived cost of negative events might be more central to OCD pathology than is the perceived probability of those events or perceived ability to cope with them. This supports research suggesting that probability overestimation is not central to OCD pathology (e.g., Overton & Menzies, 2005; Menzies et al., 2000; Salkovskis, Forrester, & Richards, 1998; Thorpe et al., 2011) although it does not support research suggesting that low perceived self-competence/coping ability is crucial (e.g., Boekaerts; 1991; Grayson, 2010;

Woods et al., 2002). However, Woods et al. (2002) did not find perceived coping ability to be important to OCD symptomatology among a non-clinical sample. A more thorough investigation of this issue will be undertaken in Study 3, among a sample of clinical individuals with OCD.

It should be noted that research (e.g., Taylor et al., 2005; Woods et al., 2004; Wu & Carter, 2008) has suggested that the subscales scores of the OBQ are somewhat ambiguous and are less important than the overall OBQ score so the results using OBQ subscales must be interpreted with caution. This is consistent with the high correlations observed among the OBQ subscales in the current study. Therefore, it is not surprising that the MDRAS scales did not demonstrate large differences in their strength of relationships to separate OBQ subscales.

The expected gender differences in the MDRAS scales were demonstrated. Previous research (Cicolini & Rees, 2003; Conley & Peplau, 2010; Pawlowski et al., 2008; Steiner, 1972; Steketee & Frost, 1994) has suggested that women estimate higher levels of risk in various situations than do men. Consistent with this, women rated negative general events as more probable and costly on the MDRAS Total and Everyday scales than did men. Women also rated themselves as less able to cope with those events. This is encouraging for the construct validity of the MDRAS, which appears to be behaving in a similar manner to other measures of risk perceptions. The expected gender differences were not observed for the MDRAS Future scales, although for the Future Coping scales there was a trend for men to rate themselves as being more able to cope than did women. The majority of research into risk-taking differences across gender has focused on risk behaviours that are located in the present or imminent future (often the timeframe is not specified), rather than risks than are specified as being located in the future. Therefore, this result is not necessarily problematic for the validity of the MDRAS Future scales, although this matter certainly warrants further investigation. This result appears to demonstrate that the MDRAS Everyday and Future scales, although correlated, are measuring distinct constructs and that risk assessment for everyday events is likely to involve somewhat different cognitive processes to risk assessment for potential future events.

It is also important to note that, in the current study, ratings of the probability and cost of negative events were positively correlated. This is counter-intuitive because, in general, more severe/costly negative events are less likely to occur. However, the observed positive correlation between these MDRAS ratings is frequently reported in risk studies (e.g., Berenbaum, Thompson & Bredemeier, 2007; Foa et al., 1996; Uren et al., 2004). This suggests that the MDRAS measures perceived probability and perceived cost of negative

events in a manner that is consistent with other risk/threat measures. It appears likely that although probability and cost are separate parts of a risk appraisal construct, these appraisals do not operate in isolation and individuals make overall risk appraisals as well as evaluating probability and cost (e.g., Uren et al., 2004).

Interestingly, age demonstrated negative correlations with the MDRAS Probability and MDRAS Cost scales, as well as positive correlations with the MDRAS Coping scales. Although these correlations were small (and in one case non-significant), they are in the opposite direction to what might be expected, based on previous research into sensation-seeking risks. Typically, sensation seeking is negatively correlated with age (Zuckerman, 1984). However it appears likely that older individuals perceive slightly lower levels of threat in general situations than do younger individuals. Alternatively, it is possible that some MDRAS items are more likely to occur, or more costly, for younger individuals than older individuals. This will require further investigation.

The scores obtained on the PANAS NA scale, the OBQ (and its subscales), and the ACQ were similar to scores obtained on these measures in other studies on non-clinical participants (Watson et al., 1988; Wu & Carter, 2008; Zebb & Moore, 1999). This indicates that participants in the current study are likely to be reasonably representative of the general population, at least in terms of their levels of negative affect, obsessive beliefs, and perceived control over anxiety. This suggests that the current findings are likely to generalise well.

The current study was limited by the fact that non-clinical participants were used. It is certainly possible that a different pattern of relationships between variables would be observed among clinical samples. However, non-clinical samples are frequently used in risk research (e.g., Jones & Menzies, 1998b; Lorian & Grisham, 2010; Menzies et al., 2000; Thorpe et al., 2011) and evidence suggests that non-clinical samples provide good analogues for research into OCD because most individuals have some level of obsessive beliefs (Warren, Gershuny, & Sher, 2002). Nevertheless, the pattern of relationships between the MDRAS scales and other measures requires examination among a sample of individuals with OCD and individuals with other anxiety disorders, particularly given that some evidence indicates that risk perceptions might be qualitatively different among clinical individuals than among non-clinical individuals (Woods et al., 2002). Another limitation is that the test-retest reliability of the MDRAS could not be ascertained because of the inability to identify participants to repeat the scale. This issue will require investigation in future studies.

Conclusions

Overall the results of Study 2 are promising in terms of the validity of the MDRAS scales. The MDRAS scales related in the expected manner with measures of NA and obsessive beliefs. In addition, they were not closely related to obsessive thinking after controlling for NA, indicating that, as planned, the MDRAS scales assess cognitive processes relating to 'normal' threat/risk perception that is separate from typical OCD cognitive patterns. Importantly the MDRAS Coping scales appear to relate more strongly to another measure of perceived control than do the MDRAS Probability and MDRAS Cost scales. This indicates that the MDRAS is assessing the separate constructs of primary and secondary threat appraisal. It also indicates that the MDRAS Cost and MDRAS Coping scales, although closely correlated, are assessing separate constructs. In addition, the MDRAS Everyday scales and the MDRAS Future scales appear to behave separately, suggesting that they are assessing different elements of risk perception. In particular, the MDRAS Everyday Coping scale accounts for significant unique variance in ACQ scores whereas the MDRAS Future Coping Scale does not. The precise reason for this is unclear, however it demonstrates that the two MDRAS Coping scales are assessing different dimensions of the perceived coping construct.

The evidence presented here indicates that the MDRAS performs as would be expected of a measure of risk/threat perceptions. This is true for its relationships with other measures, as well as the correlations between MDRAS scales. It is also true in terms of observed gender differences. Overall, the preliminary evidence presented here indicates that the MDRAS is likely to be assessing elements of threat perception. Although many questions regarding the scale remain, a trial using the MDRAS on clinical samples was warranted. Such a trial would potentially serve two functions – to provide further evidence for the validity of the MDRAS and to test for differences in threat perceptions among clinical and non-clinical groups. This, along with comparing the risk perceptions of individuals with OCD and individuals with other anxiety disorders, was the aim of Study 3.

CHAPTER 8

STUDY 3 – EXAMINING PERCEPTIONS OF THREAT AMONG INDIVIDUALS WITH OCD, OTHER ANXIOUS INDIVIDUALS, AND NON-ANXIOUS INDIVIDUALS

Aims of Study 3

The aim of Study 3 was to examine MDRAS scores in individuals with OCD compared to other anxious and non-anxious individuals. In particular, the study was designed to investigate which cognitive distortions (inflated estimates of perceived probability and/or cost, or reduced estimates of coping ability) distinguish threat perceptions of individuals with OCD from those of non-clinical individuals and are therefore likely to be involved in inflated general risk perceptions and risk-aversion among individuals with OCD. Through the use of an anxious control group this study also aimed to investigate whether these distortions are specific to OCD, or are more closely related to NA.

Hypotheses

It was hypothesised that individuals in the anxious groups (OCD and anxious control) would report higher levels of perceived cost and lower levels of perceived ability to cope with general negative events than the non-clinical group as assessed by the MDRAS. It was also hypothesised that the anxious control group, but not the OCD group would report higher probabilities of negative events on the MDRAS compared to the non-clinical group. Given the paucity of research into differences between clinical groups in terms of general threat perceptions, and evidence that general risk-aversion might be prevalent among anxious individuals, no hypotheses regarding differences between the two clinical groups were made. However, it was planned to compare these groups on each MDRAS scale.

Method

Participants

There were three groups of participants, a non-clinical (NC) group, an OCD group, and an anxious control (AC) group. The NC group consisted of 42 individuals, 15 men and 27 women (mean age = 23.07 years, *SD* = 7.40, range = 18 – 51.75) recruited from undergraduate psychology classes at Curtin University. The OCD group consisted of 21 individuals, 8 men and 13 women (mean age = 39.10 years, *SD* = 13.13, range = 22.5 – 63.75) recruited from the Curtin University Psychology Clinic. All clinical participants were currently receiving treatment. Inclusion into the OCD group required a primary diagnosis of OCD, as assessed by trainee clinical psychologists in a face-to-face structured diagnostic interview - the Structured Clinical Interview for DSM-IV, Version 2.0/Patient Form (SCID-I/P; First, Spitzer, Gibbon, & Williams, 1996). In order to protect participant confidentiality, access to other diagnostic information was not available. Although clinicians were asked to

provide a complete diagnostic profile for all clients, in many cases this did not occur and as such the presence of comorbid diagnoses among many members of the OCD group cannot be ascertained. However, as stated, in all cases OCD was the primary diagnosis. The AC group consisted of 17 individuals, 8 men and 9 women (mean age = 41.78 years, *SD* = 13.75, range = 21.25 – 65) recruited from the same clinic as the OCD group. AC participants also underwent diagnosis using the SCID, and criteria for inclusion in the AC group were a primary diagnosis of an anxiety disorder other than OCD, and no comorbid diagnosis of OCD. The AC group consisted of eight individuals with a primary diagnosis of panic disorder (six with agoraphobia, two without agoraphobia), four individuals with a primary diagnosis of GAD, three individuals with a primary diagnosis of social phobia, and two individuals with a primary diagnosis of PTSD. Once again, in most cases information regarding comorbid diagnoses (other than OCD) was unavailable.

Measures

The 14-item MDRAS and the PANAS have been described previously. As in Study 2, only PANAS NA scores were utilised, although participants completed the entire scale.

The Obsessive-Compulsive Inventory-Revised (OCI-R)

The OCI-R (Appendix I) is an 18-item self-report inventory designed to measure the severity of obsessive-compulsive symptoms. Participants are asked to report how much the experience related to each statement has bothered them in the past month. Responses are made on a 5-point Likert scale, with 0 representing *Not at all* and 4 representing *Extremely*.

The OCI-R consists of six subscales, each of three items, relating to the OCD symptom subtypes checking, ordering, washing, obsessing, hoarding, and neutralising (Foa et al., 2002). Summing the factor scores provides an overall measure of OCD severity. Evidence has indicated that the proposed factor structure of the scales is valid in clinical and non-clinical samples, with six lower-order factors driven by a single higher-order factor (Abramowitz & Deacon, 2006; Hajcak, Huppert, Simons, & Foa, 2004; Huppert et al., 2007; Roberts & Wilson, 2008).

The internal consistency of the OCI-R is good. Foa et al. (2002) reported Cronbach's alphas for the total score ranging from .81 for individuals with OCD to .93 for individuals with social phobia. Hajcak et al. (2004) also reported high levels of internal consistency for the total score (Cronbach's alpha = .88) and a good level of internal consistency for the subscale scores (washing = .76, checking = .76, ordering = .84, obsessing = .77, hoarding =

.68, and neutralising = .61) in a sample of 395 non-clinical individuals. Similar results were also reported for a second sample of non-clinical individuals (Hajcak et al., 2004). Roberts and Wilson (2008) reported an internal consistency of .88 for the total scale and good to moderate internal consistency for the subscales. Huppert et al. (2007) reported good internal consistency for the total score (Cronbach's alpha = .84) and most of the subscales (with the exception of neutralizing) among a large sample of individuals with OCD.

Foa et al. (2002) reported a test-retest reliability of .82 over 1 to 2-week intervals for the total OCI-R score among individuals with OCD, and .84 among non-clinical individuals. Using a 4-week interval, Hajcak et al. (2004) reported test-retest correlations of .70 for the total scale, and between .54 and .77 for the subscales.

The OCI-R has good convergent validity with scores correlating strongly and positively with scores on various measures of OCD symptoms including the Yale-Brown Obsessive-Compulsive Scale (Goodman et al., 1989), the Maudsley Obsessive-Compulsive Inventory (Hodgson & Rachman, 1977), and the PI-R (Foa et al., 2002; Hajcak et al., 2004). The divergent validity of the OCI-R is also adequate, demonstrating lower correlations with measures of worry, anxiety, depression, and perfectionism than with measures of OCD symptoms (Gonner, Leonhart, & Ecker, 2008; Hajcak et al., 2004).

The OCI-R can be used to discriminate between individuals with OCD and non-clinical individuals and between individuals with OCD and individuals with GAD. In addition, the OCI-R subscales differentiate individuals with different types of OCD symptoms (Huppert et al., 2007). The OCI-R is also sensitive to changes in symptoms with treatment (Abramowitz, Tolin, & Diefenbach, 2005) and has been successfully adapted for use in various languages and cultures, demonstrating good psychometric properties in each case (e.g., Fullana et al., 2005; Gonner, Hahn, Leonhart, Ecker, & Limbacher, 2009; Gonner et al., 2008; Malpica, Ruiz, Godoy, & Gavino, 2009; Woo, Kwon, Lim, & Shin, 2010). Overall, the OCI-R is a useful diagnostic tool (Foa et al., 2002). Abramowitz et al. (2005) calculated that a score of 22 or above on the OCI-R total scale could be considered a clinically significant level of symptoms, based on statistical analysis of average OCI-R scores from several studies.

Procedure

Participants were given an information sheet, with slightly different versions for clinical and non-clinical participants (see Appendices J and K, respectively). They completed a questionnaire package consisting of the MDRAS, the PANAS, and the OCI-R, along with

the same demographics page used in studies 1 and 2. Non-clinical participants returned their questionnaires anonymously to a box at the psychology reception at the School of Psychology and Speech Pathology at Curtin University. Clinical participants returned their completed questionnaires to their clinician at the Curtin University Psychology Clinic. Clinicians then recorded diagnostic information for each client before placing the questionnaire into a box at the clinic reception. It was not possible to identify any of the participants from the information given.

Although multiple comparisons were performed in this study, the exploratory nature of the research suggests that it is important to avoid missing significant between group effects and it was therefore deemed appropriate to retain an alpha level of .05 throughout. In addition, the fact that the comparisons in the study were theory-driven suggests that retaining an uncorrected alpha level is acceptable because the possibility of failing to detect significant effects is as clinically problematic as falsely detecting non-existent effects (Perneger, 1998).

Results

Data Screening

Data were analysed using SPSS version 18. As in studies 1 and 2, MDRAS Coping items were recoded so that higher scores reflected higher subjective coping estimates.

Univariate descriptive statistics were generated in order to assess the accuracy of data input. Data were checked to ensure that all values were within the eligible range for each scale. No data entry errors were detected. Missing values analysis revealed that no variable was missing more than 5% of its data, so the randomness of missing data was not assessed (Tabachnick & Fidell, 2001). No data were missing for age, gender, or any of the MDRAS items. Three participants failed to complete the entire PANAS, with this being the only missing data from this scale. Given the small number of clinical participants in the current study, deletion of cases was not considered to be the most appropriate method of dealing with the missing data on the PANAS. Instead, total PANAS NA scores for these three individuals (2 OCD and 1 AC) were calculated using means substitution based on each participant's clinical group (Tabachnick & Fidell, 2001). However these cases will not be used when examining internal consistency data for the PANAS. One participant failed to respond to OCI-R Item 1 and another participant failed to respond to OCI-R Item 16. Given that only two data points were missing on the OCI-R, these were replaced through means substitution by clinical group (Tabachnick & Fidell, 2001).

Non-clinical participants were not screened prior to completing the questionnaire package and consequently it is possible that some individuals in this group would have met diagnostic criteria for OCD. Therefore, based on the recommendations of Abramowitz et al. (2005), any non-clinical participant with a score of 22 or higher on the total scale of the OCI-R was excluded from the study. This led to the deletion of 11 cases. Although several individuals in the AC group demonstrated a high level of OCD symptoms on the OCI-R, it was not considered appropriate to remove these cases because these individuals did not meet OCD diagnostic criteria on the SCID, despite the presence of significant levels of OCD symptoms.

Outliers and normality in the MDRAS scales.

Data were screened for the presence of univariate outliers. Although there were several univariate outliers across the various MDRAS scales, only one case, in the AC group, accounted for univariate outliers in multiple scales. Tests of normality were conducted with this case excluded and Shapiro-Wilk statistics suggested that removing this case significantly improved the normality of the distributions of the MDRAS Total Cost scale and the MDRAS Future Cost Scale in the AC group. This case was consequently excluded from the remainder of the analyses. The remaining outliers were not modified. Examination of histograms for each MDRAS scale (in each clinical group) revealed that none of the scales demonstrated a distribution that differed significantly from normality.

Outliers and normality in the PANAS and the OCI-R.

Data were screened for the presence of univariate outliers in each clinical group. For PANAS NA, two outliers with high scores were detected in the NC group. These two cases were deleted from the analyses because of the possibility that these participants would have met diagnostic criteria for an anxiety or depressive disorder. For the OCI-R total score, one outlier with a high score was detected in both the OCD and AC group. This score was not modified for the OCD group because it is not surprising that someone with OCD would demonstrate elevated scores on a measure of OCD symptoms. However, the outlying case in the AC group was also an outlier on the OCI-R neutralising, checking, and washing scales. Examination of OCI-R total scores revealed that this participant's score of 67 was second highest among all participants (including those with OCD). This raises the possibility that a diagnosis of OCD had been overlooked for this individual and it was deemed necessary to exclude this case from further analyses. Although there were outlying scores on several of the

OCI-R subscales, different cases accounted for these and it was not considered necessary to modify these data.

Normality of the distributions of the PANAS NA and the OCI-R total and subscales was assessed for each group. Histograms suggested that the distribution of the PANAS NA scale did not significantly deviate from normality in any of the groups. However, the OCI-R total scale demonstrated a positively skewed distribution among the OCD group and each of the OCI-R subscales demonstrated a positively skewed distribution in at least one of the groups. Despite this, it was not considered to be appropriate to transform the OCI-R scales because doing so would alter the meaning of the scores (which indicate level of OCD symptoms) and render the interpretation of the meaning of these scores difficult (Tabachnick & Fidell, 2001). In addition, given that OCI-R scale scores did not depart from normality in all clinical groups, it was not considered appropriate to transform some OCI-R scale scores and not others. Correlations were examined using Spearman's *Rho* and the pattern was not markedly different to that observed using Pearson's *r*, again suggesting no transformations were necessary.

Descriptive Statistics

The final sample consisted of 29 non-clinical participants (8 men and 21 women), 21 individuals with OCD (8 men and 13 women), and 15 anxious control participants (6 men and 9 women). Descriptive statistics for all of the variables used in this study can be found in Table 8.1. The internal consistency of the MDRAS scales was assessed on the entire sample. The MDRAS Total Probability scale and MDRAS Everyday Probability scale demonstrated good internal consistency (Tabachnick & Fidell, 2001), with Cronbach's alphas of .81. The MDRAS Future Probability scale demonstrated acceptable internal consistency (Allen & Bennett, 2008), with a Cronbach's alpha of .70. Slight improvements in internal consistency for the Total Probability scale and the Future Probability scale would have resulted from the removal of Items 10 and 14.

The MDRAS Total Cost scale and MDRAS Everyday Cost scale demonstrated good internal consistency (Tabachnick & Fidell, 2001), with Cronbach's alphas of .85 and .81, respectively. The MDRAS Future Cost scale demonstrated acceptable internal consistency (Allen & Bennett, 2008), with a Cronbach's alpha of .69. This would have been slightly improved with the removal of Item 12.

The MDRAS Total Coping scale, the MDRAS Everyday Coping, and the MDRAS Future Coping scale demonstrated good internal consistency (Tabachnick & Fidell, 2001),

with Cronbach's alphas of .89, .86, and .78, respectively. A slight increase in internal consistency for the Future Coping scale would have resulted from the removal of Item 12.

Table 8.1

Descriptive Statistics: Mean Scores (and Standard Deviations) on Study Variables for Non-clinical, OCD, and Anxious Control Groups

Variable	NC (n = 29)	OCD (n = 21)	AC (n = 15)
Age	22.89 (7.33)	39.10 (13.13)	41.25 (12.67)
PANAS NA	17.97 (3.87)	26.11 (6.82)	26.67 (6.92)
OCI-R total	9.07 (4.57)	22.27 (14.56)	20.40 (11.51)
OCI-R washing	.66 (.94)	2.81 (3.61)	1.80 (2.11)
OCI-R obsessing	1.93 (1.60)	4.95 (3.63)	4.87 (11.55)
OCI-R hoarding	2.34 (1.61)	4.48 (3.76)	3.40 (3.09)
OCI-R ordering	2.38 (2.27)	3.48 (4.04)	4.86 (3.04)
OCI-R checking	1.17 (1.00)	3.95 (3.88)	3.20 (2.11)
OCI-R neutralising	.59 (.82)	2.60 (3.46)	2.27 (2.31)
MDRAS Total Probability	3.42 (.67)	3.72 (.80)	3.82 (.65)
MDRAS Everyday Probability	3.58 (.75)	3.91 (1.05)	4.06 (.86)
MDRAS Future Probability	3.27 (.85)	3.53 (.86)	3.58 (.69)
MDRAS Total Cost	3.83 (.71)	4.50 (.74)	4.39 (.35)
MDRAS Everyday Cost	3.77 (.73)	4.59 (.87)	4.60 (.47)
MDRAS Future Cost	3.90 (.83)	4.42 (.69)	4.18 (.52)
MDRAS Total Cope	4.57 (.59)	3.64 (.72)	3.76 (.49)
MDRAS Everyday Cope	4.73 (.58)	3.69 (.91)	3.76 (.59)
MDRAS Future Cope	4.40 (.76)	3.59 (.62)	3.76 (.55)

In terms of overall level of OCD symptoms, OCI-R total scores for the OCD group in the current study (M = 22.27) were somewhat lower than those reported in other studies. For example, Foa et al. (2002), Abramowitz and Deacon (2006), and Huppert et al. (2007) all reported mean OCI-R total scores of between 26.30 and 28.01 among individuals with OCD. Among the AC group in the current study, mean level of OCD symptoms, as assessed by the OCI-R, (M = 20.4) was higher than those reported among a GAD sample (10.6) by Huppert et al. or an anxiety disorders sample (12.43) by Abramowitz and Deacon. The NC OCI-R mean in the current study (9.07) was lower than the 18.82 reported by Foa et al., the 19.91 reported by Hajcak et al. (2004), or the 20.20 reported by Roberts and Watson (2008). It should be noted, however, that the NC mean in the current study was 15.65 prior to removal of cases considered to be in the clinical range. The internal consistency of the OCI-R total scale was excellent, with a Cronbach's alpha of .90.

Levels of NA in the NC group in the current study (M = 17.97) were consistent with the 16.00 reported by Crawford and Henry (2004), the 17.35 reported by Merz and Roesch (2011), and the 19.35 in Study 2 of the current research in large non-clinical samples. NA scores among the clinical groups (M = 26.11 for the OCD group and M = 26.67 for the AC group) are very similar to the 26.35 reported by Beck et al. (2003) among a clinical sample. This suggests that the current sample is comparable, in terms of NA, to samples used in other studies. The internal consistency of the PANAS NA scale was good, with a Cronbach's alpha of .86.

A one-way between groups analysis of variance (ANOVA) revealed a significant main effect for Group on age, F (2, 62) = 20.41, p < .001. Post-hoc analyses with Tukey's HSD revealed that the OCD group was significantly older than the NC group, p < .001, 95% CI of difference [8.79, 23.62]. The AC group was also significantly older than the NC group, p < .001, 95% CI of difference [10.13, 26.59]. The OCD group did not differ in age from the AC group, p = .83, 95% CI of difference [-10.90, 6.59].

A one-way between groups ANOVA revealed a significant main effect for Group on PANAS NA, F (2, 62) = 17.35, p < .001. Post-hoc analyses with Tukey's HSD revealed that the OCD group scored significantly higher than the NC, p < .001, 95% CI of difference [4.21, 12.07]. The AC group also scored higher than the NC group, p < .001, 95% CI of difference [4.35, 13.06]. The OCD group did not differ from the AC group on levels of NA, p = .95, 95% CI of difference [-5.20, 4.07].

A one-way between groups ANOVA revealed a significant main effect for Group on OCI-R total scores, F (2, 62) = 11.65, p < .001. Post-hoc analyses with Tukey's HSD

revealed that the OCD group scored significantly higher than the NC group, $p < .001$, 95% CI of difference [6.06, 20.34]. The AC group also scored higher than the NC group, $p < .001$, 95% CI of difference [3.40, 19.26]. However, unexpectedly, the OCD group did not score significantly higher than the AC group on overall OCD symptom levels, $p = .86$, 95% CI of difference [-6.55, 10.30].

ANOVAs revealed a significant main effect for Group on each of the OCI-R subscales. Post-hoc analyses using Tukey's HSD revealed that the OCD group scored higher than the NC group on all OCI-R subscales with the exception of ordering. The AC group scored higher than the NC group on OCI-R obsessing, checking, and ordering subscales, but not on the washing, hoarding, or neutralising subscales. There were no differences between the OCD and AC groups on any OCI-R subscales.

Between-Group Comparisons on the MDRAS

In order to test for between-group differences in perceptions of the probability and cost of negative events, as well as perceived ability to cope with those events, separate one-way between groups ANOVAs were conducted on each of the MDRAS scales. The homogeneity of variance assumption was violated for the comparisons on the MDRAS Total Cost scale and the MDRAS Future Cost scale. Consequently, in addition to post-hoc comparisons using Tukey's HSD (which assumes equal variances), post-hoc comparisons using Tahmane's T2 test (which does not assume equal variances) were examined for these variables. The pattern of results was the same using either statistic and only Tukey's HSD will be reported. Between group comparisons were repeated after controlling for age, however the pattern of results was identical so these analyses will not be reported.

MDRAS Probability.

Total Probability Scale.

ANOVA results demonstrated a non-significant main effect for Group on the MDRAS Total Probability Scale, F (2,62) = 1.95, $p = .15$, $\eta^2 = .06$.

Everyday Probability Scale.

ANOVA results demonstrated a non-significant main effect for Group on the MDRAS Everyday Probability Scale, F (2,62) = 1.72, $p = .19$, $\eta^2 = .05$.

Future Probability Scale.

ANOVA results demonstrated a non-significant main effect for Group on the MDRAS Future Probability Scale, F (2,62) = .99, p = .38, η^2 = .03.

Analyses on Combined Clinical Groups.

Analyses on the MDRAS Probability scales were repeated after combining the two clinical groups to increase power. However, in no case did the combined OCD and AC group score higher on MDRAS Probability estimates than did the NC group. For the MDRAS Total Probability scale, F (1, 63) = 3.77, p = .06, η^2 = .06. For the MDRAS Everyday Probability Scale, F (1, 63) = 3.25, p = .08, η^2 = .05. For the MDRAS Future Probability Scale, F (1, 63) = 1.98, p = .16, η^2 = .03. It should be noted that, although the comparison for the Total Probability scale approached significance, this was a small effect according to Cohen's (1988) conventions. Effect sizes were also small for the MDRAS Everyday and MDRAS Future scales, indicating that the failure to find significant between group differences on MDRAS Probability scales was unlikely to be because of insufficient sample size.

MDRAS Cost.

Total Cost Scale.

ANOVA results indicated that there was a significant main effect for Group on the MDRAS Total Cost scale, F (2, 62) = 7.26, p = .001, η^2 = .19. Post-hoc comparisons with Tukey's HSD revealed that the OCD group scored significantly higher than the NC group, p = .002, 95% CI of difference [.21, 1.12]. The AC group also scored significantly higher than the NC group, p = .03, 95% CI of difference [.05, 1.06]. However the OCD group did not score significantly differently to the AC group, p = .88, 95% CI of difference [-.42, .64].

It was decided to re-run this analysis after controlling for NA. Therefore, a one-way analysis of covariance (ANCOVA) was used to compare MDRAS Total Cost scores among the three groups after controlling for the influence of PANAS NA. The assumptions of homoscedasticity and homogeneity of regression and were not violated. After controlling for NA, there were no longer significant between group differences on the MDRAS Total Cost scale, F (2, 59) = 1.38, p = .26, η^2 = .04.

Everyday Cost Scale.

ANOVA results indicated that there was a significant main effect for Group on the MDRAS Everyday Cost scale, F (2, 62) = 10.10, p < .001, η^2 = .25. Post-hoc comparisons

with Tukey's HSD revealed that the OCD group scored significantly higher than the NC group, p = .001, 95% CI of difference [.31, 1.32]. The AC group also scored significantly higher than the NC group, p = .002, 95% CI of difference [.27, 1.39]. The OCD group did not score significantly differently to the AC group, p = .998, 95% CI of difference [-.61, .58].

A one-way ANCOVA (assumptions of homoscedasticity and homogeneity of regression were met) showed that, after controlling for NA, there were no longer significant between groups differences on the MDRAS Everyday Cost scale, F (2, 59) = 1.21, p = .31, η^2 = .04.

Future Cost Scale.

ANOVA results indicated that there was a marginally significant main effect for Group on the MDRAS Future Cost scale, F (2, 62) = 3.07, p = .05, η^2 = .09. Post-hoc comparisons with Tukey's HSD revealed that the OCD group scored significantly higher than the NC group, p = .04, 95% CI of difference [.01, 1.01]. The AC group did not score significantly differently to the NC group, p = .45, 95% CI of difference [-.28, .84]. The OCD group did not score significantly differently to the AC group, p = .61, 95% CI of difference [-.36, .83].

A one-way ANCOVA (assumptions of homoscedasticity and homogeneity of regression were met) indicated that, after controlling for NA, there were no longer significant between groups differences on the MDRAS Future Cost scale, F (2, 59) = .96, p = .39, η^2 = .03.

MDRAS Coping.

Total Coping Scale.

ANOVA results indicated that there was a significant main effect for Group on the MDRAS Total Coping scale, F (2, 62) = 16.49, p < .001, η^2 = .35. Post-hoc comparisons with Tukey's HSD revealed that the OCD group scored significantly lower than the NC group, p < .001, 95% CI of difference [-1.35, -.50]. The AC group also scored significantly lower than the NC group, p < .001, 95% CI of difference [-1.27, -.34]. The OCD group did not score significantly differently to the AC group, p = .83, 95% CI of difference [-.62, .38].

A one-way ANCOVA (assumptions of homoscedasticity and homogeneity of regression were met) demonstrated that, after controlling for NA, there were no longer significant between groups differences on the MDRAS Total Coping Scale, F (2, 59) = 1.35, p = .27, η^2 = .04.

Everyday Coping Scale.

ANOVA results indicated that there was a significant main effect for Group on the MDRAS Everyday Coping scale, F (2, 62) = 16.50, $p < .001$, $\eta^2 = .35$. Post-hoc comparisons with Tukey's HSD revealed that the OCD group scored significantly lower than the NC group, $p < .001$, 95% CI of difference [-1.52, -.55]. The AC group also scored significantly lower than the NC group $p < .001$, 95% CI of difference [-1.50, -.43]. The OCD group did not score significantly differently to the AC group, $p = .96$, 95% CI of difference [-.64, .50].

A one-way ANCOVA (assumptions of homoscedasticity and homogeneity of regression were met) indicated that, after controlling for NA, there were no longer significant between groups differences on the MDRAS Everyday Coping Scale, F (2, 59) = .88, $p = .42$, $\eta^2 = .03$.

Future Coping Scale.

ANOVA results indicated that there was a significant main effect for Group on the MDRAS Future Coping scale, F (2, 62) = 10.10, $p < .001$, $\eta^2 = .25$. Post-hoc comparisons with Tukey's HSD revealed that the OCD group scored significantly lower than the NC group, $p < .001$, 95% CI of difference [-1.28, -.35]. The AC group also scored significantly lower than the NC group, $p = .01$, 95% CI of difference [-1.16, -.13]. The OCD group did not score significantly differently to the AC group, $p = .72$, 95% CI of difference [-.72, .37].

A one-way ANCOVA (assumptions of homoscedasticity and homogeneity of regression were met) showed that, after controlling for NA, there were no longer significant between groups differences on the MDRAS Future Coping Scale, F (2, 59) = 1.21, $p = .31$, $\eta^2 = .04$.

Correlations Between Measures

It was of theoretical interest to examine the pattern of relationships between the MDRAS scores, NA, and OCD symptom dimensions (OCI-R scores). Bivariate correlations between measures were computed separately for the clinical and non-clinical groups. Given that ANOVAs had failed to differentiate the OCD and the AC group, these were combined in order to increase power. Despite this, the small group sizes render the correlational analyses somewhat unreliable and results must be treated as exploratory.

As demonstrated in Table 8.2, NA did not correlate significantly with any of the MDRAS scales among the non-clinical participants. It should be noted that in most cases, the relationship was in the expected direction (i.e., higher MDRAS probability and cost ratings

were related to higher levels of negative affect) but failed to reach significance, possibly because of the small sample size. Interestingly, the relationships between the OCI-R total scales and the MDRAS total scales were significant and in the expected direction – higher levels of OCD symptoms were associated with higher perceived probability and cost, and lower coping self-efficacy. There were not consistent relationships between the MDRAS scales and the OCI-R subscales.

Table 8.2

Correlations Between Variables in Study 3 Among Non-Clinical Participants (N = 29)

	Total Prob	Ev Prob	Fut Prob	Total Cost	Ev Cost	Fut Cost	Total Coping	Ev Coping	Fut Coping
NA	.05	.16	-.05	.19	.18	.17	-.18	-.17	-.15
OCI-R total	.38*	.35	.29	.39*	.30	.40*	-.46*	-.39*	-.41*
OCI-R wash	.11	.05	.13	-.02	-.12	.08	-.03	-.03	-.02
OCI-R obsess	.50**	.31	.51**	.30	.20	.34	-.33	-.32	-.27
OCI-R hoard	.19	.22	.10	.27	.07	.41*	-.30	-.15	-.36
OCI-R order	.04	.13	-.06	.15	.24	.05	-.25	-.25	-.20
OCI-R check	.20	.26	.09	.29	.30	.23	-.25	-.18	-.25
OCI-R neutral	.29	.18	.29	.29	.27	.26	-.31	-.35	-.21
Age	.20	.16	.18	-.23	-.21	-.21	.06	-.04	.13

Note. ** $p < .01$. * $p < .05$.

As can be seen in Table 8.3, the pattern of correlations among the clinical group was somewhat different to that observed in the non-clinical group. Among clinical individuals, levels of negative affect were correlated significantly with every MDRAS scale except Everyday Probability. Correlations were in the expected direction, with higher levels of negative affect being related to higher perceived probability and cost, and lower coping self-efficacy. The OCI-R total score only correlated with MDRAS Total Cost and MDRAS Everyday Cost, although non-significant correlations with other MDRAS scales again appear to be due to the small sample size. As with the non-clinical group, there were not consistent relationships between the MDRAS scales and the OCI-R subscales.

Table 8.3

Correlations Between Variables in Study 3 Among Clinical Participants (N = 36)

	Total Prob	Ev Prob	Fut Prob	Total Cost	Ev Cost	Fut Cost	Total Coping	Ev Coping	Fut Coping
NA	.38*	.25	.41*	..47**	.47**	.35*	-.42*	-.37*	-.41*
OCI-R total	.21	.14	.21	.34*	.34*	.26	-.27	-.23	-.27
OCI-R wash	.10	.05	.12	.18	.16	.17	-.10	-.06	-.13
OCI-R obsess	.23	.18	.19	.34*	.30	.30	-.23	-.21	-.21
OCI-R hoard	.20	.02	.36*	.24	.27	.14	-.38*	-.37*	-.32
OCI-R order	.15	.14	.10	.24	.30	.11	-.14	-.17	-.08
OCI-R check	.03	.06	-.01	.19	.12	.23	-.08	.02	-.20
OCI-R neutral	.10	.09	.06	.16	.18	.09	-.13	-.10	-.15
Age	.20	.11	.23	-.06	.10	-.24	-.16	-.25	-.01

Note. ** $p < .01$. * $p < .05$.

PANAS NA and OCI-R total scores were both correlated with MDRAS Total Cost and MDRAS Everyday Cost scores among the clinical group. Therefore, it was of interest to examine, through regression analysis, whether negative affect or OCD symptom levels were more closely related to MDRAS Cost scores. Tabachnick and Fidell (2001) suggested that, for regression analyses, a sample size of 104 + *m* is required to test individual predictors. This would require a sample size of 106 in this study. Clearly the current sample size of 36 did not approach this figure so the analysis must be treated as exploratory and interpreted with extreme caution. For this reason, only the MDRAS Total Cost scale was subject to regression analysis. A standard multiple regression analysis was conducted, with MDRAS Total Cost as the DV and PANAS NA and OCI-R total as the DVs. The combination of PANAS NA and OCI-R total scores accounted for a significant amount of variance in MDRAS Total Cost scores, $R^2 = .26$, F (2, 33) = 5.66, $p = .008$. This was a medium to large-sized effect ($f^2 = .34$). Regression coefficients (see Table 8.4) indicated that NA accounted for significant unique variance in MDRAS Total Cost scores, but level of OCD symptoms did not.

Table 8.4

Unstandardised (B) and Standardised (β) Regression Coefficients, and Part Correlations (sr^2), For Each Predictor in a Regression Model Predicting MDRAS Total Cost

Variable	*B*	95% CI for *B*	β	sr^2
NA*	.035	[.006, .065]	.398	.371
OCI-R	.009	[-.006, .024]	.197	.184

Note. * $p < .05$.

Discussion

This study investigated differences between individuals with OCD, anxious controls, and non-clinical individuals in the perception of probability and cost of general unpleasant events, along with perceived ability to cope with those events. As was hypothesised, the clinical groups rated potential negative events as more costly than did non-clinical individuals (with the exception of the cost of potential future events among the AC group), and rated their ability to cope with those events as lower. Also as hypothesised, individuals with OCD did not rate the probability of those events occurring as being higher than non-clinical individuals. However, contrary to hypotheses, individuals with other anxiety disorders also did not estimate the probability of everyday or future general negative events as higher than did non-anxious individuals. There were no differences between individuals with OCD and other anxious individuals in terms of perceived probability, cost, or ability to cope with negative general everyday or potential future events. Importantly, after controlling for negative affect, there were no differences between any of the groups on any MDRAS scale, suggesting that negative affect, rather than specific symptoms, is related to heightened cost and lowered coping ability estimates among anxious individuals. It is important to note that the Everyday and Future scales of the MDRAS did not typically produce different results to the Total MDRAS scale. Consequently, unless otherwise stated, this discussion will be referring to the results of the Total, Everyday, and Future scales simultaneously when mentioning MDRAS results.

Among the OCD group, the results are consistent with the literature suggesting that overestimation of threat and consequent risk-aversion among individuals with OCD are likely to be largely related to inflated perceptions of the cost of negative events, and/or reduced coping self-efficacy for those events (Aelterman et al., 2011; Ehntholt et al., 1999; Grayson, 2010; Mancini et al., 2004; Menzies et al., 2000; Moritz & Jelinek, 2009; Overton and

Menzies, 2002, 2005; Rector et al., 2002; Rees et al., 2006; Salkovskis 1985, 1989; Salkovskis, Forrester, & Richards, 1998; Steketee et al., 1998; Thorpe et al., 2011; Woods et al., 2002). The results are also consistent with evidence that overestimation of the probability of negative events is not central to OCD anxiety (Grayson, 2010; Rees, 2001; Thorpe et al., 2011; Woods et al., 2002). Given the small effect sizes observed in the MDRAS Probability ANOVAs, this does not appear to be simply the result of insufficient sample size. It does indeed appear that the risk/threat judgements of individuals with OCD can be differentiated from those of non-clinical individuals based on inflated perceptions of the cost/awfulness of negative events, along with perceived inability to cope with the potential negative consequences of threatening scenarios. It also appears likely that these processes are important in threat perception among individuals with OCD regardless of the type of event that is feared, be it general (everyday or future) threat, or OCD-specific threat (e.g., Moritz & Jelinek, 2009; Steketee et al., 1998; Thorpe et al., 2011). What remains to be determined, however, is the extent to which one or other of these biases is more important to threat overestimation in various situations.

The observed elevated cost and reduced coping estimates among the AC group are consistent with the literature suggesting that anxious individuals are likely to be generally risk-aversive (Lorian & Grisham, 2010, 2011; Maner & Schmidt, 2006, Maner et al., 2007). Previous research has consistently demonstrated that anxious individuals overestimate the cost of negative events related to their disorder (e.g., Berenbaum, Thompson, & Pomerantz, 2007; de Jong & Peters, 2005; McManus et al., 2000; Poulton & Andrews, 1996; Rheingold et al., 2003; Smari et al., 2001; Stopa & Clark, 2000; Uren et al., 2004; Voncken et al., 2003; Voncken et al., 2007). However, little previous research has investigated whether anxious individuals overestimate the cost of negative events that do not relate to their anxiety disorder, although Uren et al. (2004) found that this was true for individuals with panic disorder, but not for individuals with social phobia. However, Uren et al.'s findings were based on anxious individuals' perceptions of threat in scenarios relevant to other anxiety disorders, rather than general threats. The current results indicate that anxious individuals estimate the potential cost of general risks as being higher than do non-anxious individuals. This is consistent with them being generally risk-aversive (e.g., Lorian & Grisham, 2011) and is also consistent with Beck et al.'s (1985) general model linking anxiety to risk-aversion. However, a high percentage of the AC group had a primary diagnosis of panic disorder (with or without agoraphobia) or GAD. Given previous evidence that individuals with panic disorder overestimate the cost of a range of events (Uren et al., 2004) and that individuals

with GAD are likely to perceive elevated threat in a variety of scenarios (Cicolini & Rees, 2003; Lorian & Grisham, 2011), this result will require replication among various other anxious groups. It remains possible that some anxiety disorders might be characterised by cost overestimation for disorder-specific events only, and not for general risks of the type assessed by the MDRAS (Uren et al., 2004).

The finding of low perceived ability to cope with general negative events among the AC group is consistent with evidence that low coping self-efficacy is pervasive among anxious individuals and is central to threat overestimation and consequent anxiety among various clinically anxious groups (e.g., Bouchard et al., 2007; Casey, Oei, & Newcombe, 2004; Casey, Oei, Newcombe, & Kenardy, 2004; Cloitre et al., 1992; Hoffart, 1995b; Smari et al., 2001; Stopa & Clark, 1993; Waters, Mogg, et al., 2008; White et al., 2006). However this is the first time that this has been demonstrated with respect to negative events that are not specifically related to the anxiety disorder in question. This suggests that low perceived ability to cope with the potential consequences of negative events is involved in high levels of threat perception, and consequent risk-avoidance, among anxious individuals in a range of situations. Once again, this result requires replication among other anxious samples.

The AC group did not estimate higher probability of general negative events than did non-clinical individuals on the MDRAS. This is somewhat surprising, given the wide body of literature demonstrating that probability overestimation is prevalent among anxious individuals (e.g., Berenbaum, Thompson, & Pomerantz, 2007; Butler & Mathews, 1987; Gasper & Clore, 1998; Maner et al., 2007; Maner & Schmidt, 2006; Macleod et al., 1991; Suarez & Bell-Dolan, 2001; Stober, 1997; Uren et al., 2004; Voncken et al., 2007; Warren et al., 1989; Weinstein, 2000). However, the majority of this research has focused on disorder-specific threats and negative events and studies have consistently demonstrated that anxious individuals tend to overestimate probability for disorder-specific scenarios but not for scenarios relevant to other anxiety disorders (Foa et al., 1996; Klumpp & Amir, 2010; Nelson et al., 2010; Uren et al., 2004; Woods et al., 2002). Additionally, evidence has indicated that perceived probability does not predict risk-aversion in general situations among non-clinical individuals, although perceived cost does (Maner & Schmidt, 2006; Mitte, 2007). Indeed, it is likely that overestimation of the probability of negative events among anxious individuals largely results from ease of memory access to previous similar scenarios that have involved negative outcomes – i.e., highly developed threat schemata (Butler & Mathews, 1983,1987; Gasper & Clore, 1998; Kverno, 2000; MacNamara & Hajcak, 2010). Presumably, however, most anxious individuals will not have particularly elaborate threat schemata for general

risks. This could explain why they do not appear to estimate a high probability of the occurrence of negative outcomes that do not relate to their anxiety disorder. This hypothesis, however, awaits empirical validation.

Crucially, the current results do not provide evidence that general threat overestimation is unique to OCD, or even that it is elevated among individuals with OCD compared to other anxious groups. This indicates that general risk-aversion is unlikely to be specifically related to OCD. Although this is contrary to some previous suggestions (e.g., Cicolini & Rees, 2003), prior research into general risk-aversion among individuals with OCD has only compared OCD groups to non-clinical groups (Cicolini & Rees, 2003; Frost et al., 1994; Steketee & Frost, 1994). Therefore, the lack of significant differences between individuals with OCD and other anxious individuals in terms of threat perceptions for general events is not a surprising finding. Indeed, it is consistent with the transdiagnostic model where risk-aversion is a core feature of anxiety in general (e.g., Lorian, 2011; Lorian & Grisham, 2010, 2011; Maner et al., 2007; Maner & Schmidt, 2006). Also consistent with the transdiagnostic model is the fact that, after controlling for NA, neither anxious group scored higher than the NC group on any of MDRAS scales. This suggests that threat overestimation (as assessed by the subjective probability and cost of negative events, and subjective ability to cope with them) and consequent risk-aversion is primarily related to NA and anxiety, rather than to specific symptom patterns or beliefs. This assertion is further supported by the fact that, among the clinical groups in this study, correlations and regressions indicated that OCD symptoms do not appear to be uniquely related to risk perceptions. However, given the lack of difference between the OCD and the AC groups in terms of OCD symptoms, these results will require replication. In addition, although the OCD group scored higher than the NC group on perceived cost of potential future threats, the same was not true for the AC group. This suggests the possibility that individuals with OCD might overestimate the cost of potential future events compared to other anxious individuals (Rees, 2001; Salkovskis, 1985) but that larger sample sizes are required to detect this difference. If this is the case, it is likely to be related to inflated responsibility beliefs among individuals with OCD (Salkovskis, Forrester & Richards, 1998).

The observed patterns of correlations in the clinical and non-clinical groups are interesting because they suggest that perceptions of the probability and cost of potential negative events, along with perceived ability to cope with those events, are related to different factors among anxious individuals compared to non-anxious individuals. Non-clinical individuals' perceptions of probability, cost, and coping ability were not closely

related to NA. Conversely, clinical individuals' perceptions of probability, cost, and coping ability appear to be closely related to NA, but not to level of OCD symptoms. It should be noted, however, that these results could be unreliable because of the small sample size and restricted range of scores. This is particularly likely given that the MDRAS scales correlated strongly with NA in the larger non-clinical sample in Study 2, in contrast to the results obtained in this study.

Limitations

Several cautions are warranted when interpreting the results of the current study. First, the size of the clinical groups, although fairly typical for this type of research, was relatively small. This suggests that some of the analyses lacked the statistical power to detect small effect sizes in the between group comparisons. However, given that the study was designed to detect large, clinically significant between group differences in risk perceptions, this is not particularly problematic. Nevertheless, it would be theoretically interesting to replicate the current study with a larger clinical sample in order to test for the presence of small effects. Additional regression analyses on each clinical group, exploring the impact of probability, cost, and coping perceptions on NA and clinical symptomatology will require larger sample sizes.

Conversely, some of the observed between groups differences on the MDRAS might be relatively trivial from a clinical point of view. In particular, the 95% confidence intervals for the differences between the clinical groups and the non-clinical group on the MDRAS Total Cost and Future Cost scales suggest that, although clinical individuals estimate higher cost of negative events than do non-clinical individuals (with the exception of future cost for the anxious control participants), the magnitude of this difference might not be large. If this is the case, attempting to reduce perceived cost estimates among anxious individuals might not be particularly effective in reducing anxiety levels. The between groups differences on perceived coping ability appear to be larger, and might represent a more important therapeutic target.

It is possible that the failure to find elevated probability estimates among the clinical groups compared to the non-clinical group in this study could be an artefact of therapy. Both anxious groups were involved in therapy at the time of participation in the study and, given that cognitive therapy tends to emphasise probability re-estimation, it is possible that initial overestimates of the probability of negative events had been corrected, whereas estimates of the cost of those events, or of one's ability to cope with the events, remained unchanged. This

explanation is unlikely, especially given the evidence that individuals with OCD appear not to overestimate the probability even of OCD-specific events compared to non-clinical individuals (e.g., Grayson, 2010; Rees, 2001; Thorpe et al., 2011). In addition, from a clinical perspective, if estimates of the probability of negative general events are reduced through standard therapy, no further specific focus on probability estimation is needed in order to reduce general risk perceptions. However, this will require further investigation, perhaps through longitudinal treatment studies that assess perceived probability, cost, and coping ability prior to treatment and at various times throughout the treatment process.

It is also important to consider the possibility that risk-aversive cognitions might be partially state-dependent among individuals with OCD. In particular, if perceived probability, perceived cost, or perceived coping ability are uniquely related to OCD (e.g., Rees, 2001), then the therapy received by individuals with OCD participating in the current study (if it has reduced their OCD symptom levels) could have suppressed, to some extent, elevations in these biases compared to other clinical individuals, explaining the lack of differences between the OCD and the AC groups in risk perceptions. This appears somewhat unlikely, given that the cognitive biases studied appear to be more closely related to NA than to OCD symptoms and given previous tentative evidence that reduction in OCD symptoms is not necessarily accompanied by reduced risk-aversion (Garratt-Reed, 2004). However, studies utilising the MDRAS to assess changes in risk perceptions with therapy among individuals with OCD are required to definitively answer this question.

Another potential caution stems from the OCD sample used. OCI-R scores indicate that several individuals in the OCD group had significant hoarding behaviours. Although this is not necessarily problematic, it has been suggested that hoarding is somewhat separate to other OCD symptom dimensions and involves somewhat different cognitive processes (e.g., Abramowitz, Lackey, & Wheaton, 2009). Therefore, it is possible that the current results have been influenced by the presence of a high proportion of OCD hoarders. Future studies should examine the differences, if any, in risk perceptions between individuals with OCD hoarding and other OCD symptom dimensions. In addition, examination of patterns of risk perception on the MDRAS among individuals with different OCD symptom types would be theoretically interesting, and could suggest different therapeutic avenues for addressing risk-aversion in individuals with various OCD symptoms. Finally, the fact that additional diagnostic information was not available for most individuals in this study should be remedied in future studies, so that the impact of various comorbid conditions on risk perceptions can be delineated.

Another limitation of the current study is that the OCD and AC groups were not differentiated in terms of level of OCD symptoms. This appears to have stemmed from the relatively low level of OCD symptoms in the OCD group combined with a relatively high level of OCD symptoms in the AC group. The relatively low scores on the OCI-R among the OCD group compared to OCD groups in other studies (e.g., Foa et al., 2002; Huppert et al., 2007) is likely to reflect the fact that the majority of these individuals were undergoing treatment, which is likely to have reduced their level of OCD symptoms. It should be noted, however, that mean levels of OCD symptomatology were still in the clinically significant range (Abramowitz et al., 2005) in the current study. The high level of OCD symptomatology in the AC group, however, is more difficult to explain. Overall the mean level of symptoms fell marginally below the clinically significant cut-off (Abramowitz et al., 2005), but was not significantly different to the level of symptoms displayed by the OCD group. Given that none of the AC participants met diagnostic criteria for OCD, this is surprising. It is difficult to predict how this is likely to have impacted the current results, given the paucity of research assessing risk perceptions among individuals with OCD and a consequent lack of understanding on the impact of OCD symptoms on these perceptions. However, if level of OCD symptoms is important in perceptions of probability, cost, and coping ability for negative events, it could be argued that two clinical groups with similar levels of OCD symptoms (regardless of diagnostic status) would be unlikely to differ in these perceptions. From that perspective it is unclear whether the current results can be generalised to suggest that there are no differences between individuals with OCD and other anxious individuals (without elevated OCD symptom levels) in terms of perceptions of the probability and cost of general negative events, or of their ability to cope with those events. It would be equally plausible that the lack of observed differences in the current study could be attributed to similar levels of OCD symptoms in both groups.

However, it has previously been argued that risk-aversion among individuals with OCD and other anxious individuals is largely independent of symptom experience and might be a premorbid risk factor for the development of anxiety symptoms (Cicolini & Rees, 2003; Rees, 2001). In addition, results from the current study suggested that, among the clinical groups, levels of OCD symptoms were not related to any of the MDRAS scales after controlling for NA. Along with the previous finding that reduction of OCD symptomatology did not influence general risk-aversion among individuals with OCD (Garratt-Reed, 2004), this indicates that levels of OCD symptomatology are not central to cognitions involving risk estimation among anxious individuals. This suggests that the finding that individuals with

OCD cannot be distinguished from other equally anxious individuals in terms of their general risk perceptions (probability, cost, or coping ability) is likely to be robust. However, this will require further investigation among other anxious samples without high levels of OCD symptomatology and until this time, the lack of differences between the OCD and AC groups on the MDRAS must be interpreted cautiously.

Another limitation is that the MDRAS is a new scale and has not previously been used to examine differences in risk perceptions among anxious individuals. It is possible that the failure to find differences between the OCD and AC groups in this study is due to insensitivity in the MDRAS scales. This seems unlikely, however, given that the MDRAS Cost and MDRAS Coping scales successfully differentiated anxious and non-anxious individuals, and given that the pattern of results largely conformed to theory-driven hypotheses. Further investigation into the utility of interpreting separate Everyday and Future scales in the MDRAS is warranted, however, given that they generally did not produce different patterns of results to the MDRAS Total scale.

Clinical Implications

It has been argued that targeting general risk-aversion among individuals with OCD is likely to be important in terms of maintaining treatment gains (e.g., Lyoo et al., 2001; Rees, 2001; Rees et al., 2006). Maner and Schmidt (2006) made a similar suggestion pertaining to anxiety disorders in general. These results indicate that the suggestion is valid for OCD and for other anxious individuals. Indeed, for all anxious individuals, it appears likely that therapeutic components targeting elevated levels of perceived cost of general negative events, and/or low perceived ability to cope with those events, are likely to be required to reduce general risk-aversion (e.g., Grayson, 2010; Rees et al., 2006). Given the clinical importance of general risk-aversion among anxious individuals, treatments focusing on reducing these biases need to be investigated. It is important to note that this is a separate process to targeting cognitive biases surrounding disorder-specific concerns. If biased estimates regarding the cost of general negative events, and subjective ability to cope with them, can be reduced among anxious individuals, so will levels of general risk-aversion. Presumably, this will break the cycle of inflated perceptions of threat and anxiety, and consequent risk-aversion, among anxious individuals, leading to long-term treatment benefits (Maner & Schmidt, 2006).

Conclusions

Overall, the results of Study 3 indicate that anxious individuals, regardless of their diagnostic status, appear to estimate a higher cost of potential negative events and to evaluate themselves as less able to cope with the occurrence of these events, compared to non-anxious individuals. It is likely that these biases are driving general risk-aversion among anxious individuals (e.g., Lorian & Grisham, 2010; 2011). However, anxious individuals appear to estimate a similar level of the probability of the occurrence of general negative events as do non-clinical individuals.

The lack of differences on the MDRAS between the OCD and AC groups, and the fact that MDRAS scores were largely related to NA rather than OCD symptoms among the clinical groups, suggest that there is not disorder-based specificity in the cognitive biases driving general threat overestimation and risk-aversion among anxious individuals. Although this result requires replication among samples of individuals with different anxiety disorders, it is consistent with the argument that general risk-aversion is present across anxious individuals and is likely to represent a risk factor for the development of anxiety disorders (Maner & Schmidt, 2006). It is also consistent with Beck et al.'s (1985) assertion that anxiety in general is linked to higher levels of perceived threat. This strongly suggests the potential efficacy of developing treatments targeting perceived cost and perceived coping ability for **general** threats among anxious individuals.

The results of Study 3 are also promising in terms of the validity and clinical utility of the MDRAS, with the scales performing as predicted by theory and demonstrating high levels of internal consistency. Nevertheless, further validation of the MDRAS is required on a diverse range of clinical and non-clinical individuals.

CHAPTER 9

GENERAL DISCUSSION

General Discussion

The overarching aim of the current research was to examine the cognitive basis of general risk-aversion among individuals with OCD in order to inform potential treatments to reduce this problematic cognitive and behavioural pattern. This aim was achieved and therefore this research has the potential to improve treatments for individuals with OCD and anxious individuals in general.

This discussion will begin discussing the utility of the MDRAS, including its potential as a clinical and research instrument and future directions for the scale. Implications of this research for theories of risk-aversion will be discussed, followed by clinical implications of the current research in terms of threat perceptions and risk-aversion. Potential therapeutic avenues for addressing biased estimates of the cost of negative events, and of subjective ability to cope with those events among anxious individuals will also be reviewed, given that these biases appear to be related to general risk-aversion. Future directions for research and clinical practice will be discussed, before outlining some general limitations of the current research and making concluding statements.

Utility of the MDRAS

It appears that the MDRAS is accurately assessing cognitive variables that drive threat/risk estimation for potential general everyday and future non-pleasurable risks. In addition, it can differentiate individuals with OCD from non-anxious individuals in a manner that is consistent with existing theory on threat perception biases among individuals with OCD (e.g., Moritz & Jelinek, 2009; Moritz & Pohl, 2009; Salkovskis, Forrester, & Richards, 1998; Thorpe et al., 2011). Although the MDRAS is still in its infancy, its potential importance for clinical practice and future research is extensive. The MDRAS is a theory-driven measure that can assist in the exploration and understanding of broad risk attitudes in a diverse array of clinical and non-clinical populations. This is important given the likely negative impact of these cognitive biases upon anxiety and treatment outcomes (Maner & Schmidt, 2006). The MDRAS extends on previous risk measures because of its focus on events that are not symptom-specific and because of evidence of its validity among clinical and non-clinical individuals. This represents a major contribution of the current body of research to the field of OCD in particular and anxiety disorder research in general.

Indeed, a potential clinical use for the MDRAS is as an assessment tool for all individuals with OCD (and perhaps for other anxious individuals) upon entry into therapy. Examining which cognitive bias or biases are driving general risk-aversion in each individual

client is likely to provide clinicians with insight into how to address this problem in therapy. It is certainly possible that some individuals with OCD will be characterised by low coping estimates but not high cost estimates, or vice-versa. If this is the case, cognitive approaches addressing the wrong bias are unlikely to be effective. Hence, the MDRAS could be used to inform treatment choices in each individual client.

Future directions for the MDRAS.

As was mentioned in Study 3, future studies using the MDRAS among individuals with OCD should further examine how various OCD symptom types relate to threat perception biases. This is particularly important given that OCD symptom dimensions appear to be related to specific cognitive distortions (e.g., Taylor et al., 2010; Tolin et al., 2008). It is possible that some OCD symptom types are characterised by strong biases in one or more of the components of threat perception but that other symptom types are not. Based on current findings, however, it would appear that NA, rather than OCD symptoms, is primarily related to threat perception biases. This issue requires further investigation.

It is likely that the MDRAS can be used to further understanding of the cognitive biases driving threat overestimation and consequent general risk-aversion among various groups of anxious individuals (e.g., Lorian & Grisham, 2010, 2011). Again, this will provide insight into potential therapeutic methods to address these biases (e.g., Maner & Schmidt, 2006). One caution is that the MDRAS items were selected to avoid tapping into OCD-specific fears and symptoms, but not to avoid fears or symptoms that might be related to other anxiety disorders. Therefore, future studies examining the relations between the MDRAS scales and various anxiety disorder symptom patterns are required. Indeed, modification of the MDRAS to avoid tapping into specific anxiety symptoms might be necessary. Nevertheless, the MDRAS appears to be a useful tool for furthering understanding of the cognitive biases that drive the complex phenomenon (e.g., Lorian & Grisham, 2010) of general risk-aversion among various groups of anxious individuals.

The current finding that individuals with OCD were not differentiated from other anxious individuals on any MDRAS scale does not diminish the importance of examining the cognitive basis of general risk-aversion among various groups of anxious individuals, especially given previous evidence that different anxious groups exhibit different cognitive biases surrounding inflated risk perceptions (Uren et al., 2004). The anxious control group in Study 3 was limited by its small size, high level of OCD symptoms, and concentration of individuals with panic disorder or GAD. Therefore, it is unclear to what extent the biased

estimates of cost and coping ability for general events among this group will be present among various other anxious groups. Ideally, future studies should examine samples of individuals with various specific anxiety diagnoses in order to determine how biased estimates of probability, cost, and coping ability are related to specific symptomatologies as well as to general anxiety. In addition, studies are required to investigate how these biases are related to symptom changes during therapy.

Research Findings Regarding Threat Perception and Risk-Aversion

Despite the need for further investigation, Study 3 demonstrated that threat perception biases are largely related to negative affect rather than specific symptoms. Importantly, there was little evidence of disorder-specificity in patterns of risk perception, with individuals with OCD and other anxious individuals exhibiting similar perceptions of the probability and cost of negative events, and of their ability to cope with those events. This requires further investigation given the likely complexity of general risk-aversion among clinical individuals (Lorian & Grisham, 2010, 2011). However, it suggests that anxious individuals are generally risk-aversive as a function of anxiety/NA, rather than specific symptomatology. This is consistent with the transdiagnostic model of risk-aversion (e.g., Maner et al., 2007; Maner & Schmidt, 2006), which suggests that general risk-aversion is implicated in the development of anxiety pathology in general. Results are not consistent with suggestions that OCD is specifically a risk-aversive disorder (e.g., Cicolini & Rees, 2003; Rees et al., 2006; Steiner, 1972; Steketee & Frost, 1994), although this is not particularly surprising because few studies have compared risk-aversion in individuals with OCD to that in other anxious individuals. The clinical implications of the current research would therefore appear to extend beyond OCD and apply to anxiety disorders in general.

Clinical Implications of the Current Research

This body of research has achieved its primary objective of informing potential therapeutic methods of reducing general risk-aversion among individuals with OCD. The evidence gathered in Study 3 suggests that, among individuals with OCD, targeting estimates of the probability of the occurrence of everyday negative events is unlikely to be effective, given that they do not appraise these events as being more likely than do other individuals. This is in line with expectations based on previous research findings (e.g., Moritz & Jelinek, 2009; Moritz & Pohl, 2009; Thorpe et al., 2011). Probability re-estimation has previously proven ineffective among individuals with OCD (e.g., Moritz & Pohl, 2009), so other

cognitive methods of reducing general threat perception are likely to be required. It also appears likely that general risk-aversion among other anxious individuals is not mediated by inflated estimates of the probability of negative outcomes. However, given evidence that disorder-specific risk-aversion is related to probability overestimation among anxious individuals (e.g., Nelson et al., 2010; Uren et al., 2004), it is possible that what determines the emergence of clinical symptoms in some disorders is the belief that negative outcomes are not only costly and difficult to cope with, but are also probable. However, this is unlikely to be the case in OCD (Salkovskis, Forrester, & Richards, 1998; Thorpe et al., 2011) and this hypothesis awaits validation.

It appears that individuals with OCD, along with other anxious individuals, are generally risk-aversive because they perceive a high cost of potential negative events, and/or have low coping self-efficacy for those events. This suggests that interventions attempting to reduce general risk-aversion among anxious individuals (e.g., Maner & Schmidt, 2006) should focus on reducing catastrophic thinking (i.e., perceived cost of negative events) and/or on improving coping self-efficacy. Potential methods for achieving this will now be briefly reviewed.

Therapeutic strategies to target inflated cost estimations.

Strategies to specifically target catastrophic thinking (i.e., assuming the worst possible outcomes within a scenario) are potential avenues for reducing the perceived cost of general risks. Although traditional cognitive-behavioural approaches sometimes include elements focused on reducing catastrophising, a targeted approach specifically aimed at reducing this cognitive style is likely to be required in order to achieve long-term change (Thorn, Boothby, & Sullivan, 2002).

Thorn et al. (2002) proposed a CBT approach for chronic pain that directly targeted catastrophising through raising awareness of catastrophic thinking and promoting awareness that catastrophic thoughts are not necessarily accurate. Subsequently, catastrophic thoughts are restructured by promoting awareness of alternative (less severe) outcomes associated with pain. In addition, coping mechanisms other than catastrophising are taught. Thorn et al. (2002) acknowledged that this type of treatment does occur in many treatment programs, but that it is rarely afforded the priority required to create enduring reductions in catastrophising.

In a subsequent trial of this treatment approach, Thorn et al. (2007) demonstrated that a specific clinical focus on catastrophising was effective in reducing headache pain and distress, as well as overall anxiety levels, among chronic migraine sufferers. In addition,

reductions in catastrophising were associated with improved self-efficacy for managing headaches. Changes in catastrophising have been demonstrated to predict significant variance in treatment outcomes among individuals with chronic pain (Rodero, Campayo, Fernandez, & Sobradiel, 2008; Smeets, Vlaeyen, Kester, & Knottnerus, 2006; Spinhoven et al., 2004; Vowles, McCracken, & Eccleston 2007, 2008).

It is certainly possible that a cognitive strategy similar to that suggested by Thorn et al. (2002) could be efficacious for reducing the cost estimates associated with general risks among individuals with OCD and other anxious individuals (potentially, inflated probability estimates, if present, could be addressed in a similar manner). In particular, if individuals can learn to recognise that their feared consequences are not the only possible outcomes of taking various general risks, their perceptions of the potential cost of negative outcomes could be reduced, resulting in lower perceived threat and consequently less anxiety. As individuals learn to recognise their catastrophic thinking in various situations, this approach has the potential to generalise into other general risk situations and result in enduring reductions in anxiety.

Along these lines, Rees (2001) argued that, among individuals with OCD, it might be possible to reduce the salience and perceived cost of possible negative consequences through cognitive techniques to raise the salience of the positive or neutral consequences that can result from risks. Although risk-aversive individuals are preoccupied with the possible negative outcomes of risk (Mann, 1992), they do not underestimate the value of positive outcomes, nor do they view these outcomes as particularly unlikely (Eisenberg et al., 1998). Using this rationale, Rees developed a cognitive strategy that focused on encouraging the client to consciously consider the utility of risk-taking by focusing on potential positive or neutral outcomes of various forms of risk-taking, and to use these images to replace images of places and activities as dangerous. The incidence of risk-taking behaviour increased as a consequence of this intervention. It should be noted that the cognitive mechanism/s of this change was not assessed and it cannot be asserted that it was definitely related to reduced cost estimates. In addition, Rees' study involved a case study of a single individual with OCD, and requires replication among larger diverse clinical samples of risk-avoidant individuals. Nevertheless, this cognitive strategy, possibly in combination with Thorn et al.'s (2007) approach to reducing catastrophising, might prove useful in reducing the avoidance of general risks among anxious individuals. Indeed, this is consistent with Najmi and Amir's (2010) finding that directing attention away from threat was effective in reducing disorder-specific risk-aversion among individuals with OCD.

It should be noted, however, that self-efficacy for coping with pain appears to partially mediate the relationship between catastrophising and physical functioning (McKnight, Afram, Kashdan, Kasle, & Zautra, 2010). If this result extends to anxiety and risk-aversion, it might be more important to target self-efficacy and perceived coping ability in order to reduce general risk-aversion among individuals with OCD and other anxious individuals.

Therapeutic strategies to improve actual and perceived coping ability.

Therapy specifically aimed at enhancing perceived coping ability would appear to be important in efforts to reduce threat perception, anxiety, and general risk-aversion among individuals with OCD and among other anxious individuals. Strangely, coping has received little interest in the treatment literature, either among individuals with OCD or individuals with other clinical disorders (Sandahl, Gerge, & Herlitz, 2004). However, in order to target perceived coping ability it would seem pertinent to take a positive approach to cognitive therapy. In particular, enhancing problem-solving skills (e.g., Arean, 2009) and using strategies to build self-efficacy could engender a cognitive set whereby the individual, upon encountering a general risk scenario, thinks in terms of "what can I do in this situation", rather than in terms dangers and uncontrollability.

As was discussed in Chapter 4, self-efficacy is crucial to perceptions of coping ability, and is therefore central to risk-taking and risk-avoidant behaviour patterns (Nicholls et al., 2010; Sandahl et al., 2004; Wyatt, 1992). Individuals who exhibit low self-efficacy in a given situation are unlikely to take risks associated with that situation because they doubt their ability to control the consequences of risky behaviour, or to cope with any negative outcomes (Wyatt, 1992). Given previous evidence that individuals with OCD have unrealistically low perceptions of their own competence in general life situations (i.e., pervasive low levels of self-efficacy), and low levels of self-esteem (Boekaerts, 1991; Dar et al., 2000; Hoffart, 1995a; McNally & Kohlbeck, 1993; Rector et al., 2002; Rees et al., 2006; Samuels et al., 2000; van den Hout & Kindt, 2003; Williams & Zane, 1989), it is likely that low self-efficacy is a major contributor to their low perceived ability to cope with general risk scenarios.

Raising levels of self-efficacy and self-esteem in individuals with OCD should result in them gaining enhanced perceptions of their own ability to cope with aversive events that could result from general risk-taking. This should cause a decline in the levels of anxiety that are elicited by these situations (Beck et al., 1985), resulting in a reduction of general risk-aversion and consequently improved overall therapeutic outcomes (Maner & Schmidt, 2006).

The finding that other anxious individuals also underestimate their coping ability suggests that raising self-efficacy is a treatment goal that should be included in therapy for a range of anxiety disorders.

Traditional CBT has a minimal impact on self-efficacy (Williams, Turner, & Peer, 1985). However, guided mastery therapy is a technique that directly aims to improve individuals' self-efficacy (Hoffart, 1995a, 1998; Williams et al., 1985). Guided mastery therapy is based on self-efficacy theory (Bandura, 1977, 1997), and emphasises building a sense of mastery by promoting rapid proficient performance accomplishments in feared/avoided situations (Hoffart, 1995a; Williams & Zane, 1989).

Guided mastery treatment was initially conceived as a means of improving treatment outcomes for individuals with agoraphobia (Williams, 1990). These individuals tend to have a variety of phobic fears and avoidance and consequently cannot be exposed to the full range of their fears. Therefore, Williams (1990) argued that treatment requires a specific focus on improving performance in feared situations while simultaneously helping clients to appraise their performance in a manner that results in "an enduring generalized sense of mastery" (p. 90). Fostering a sense of enduring mastery across situations would be ideal when addressing general risk-aversion among individuals with OCD and other anxious individuals, given that the range of events judged as threatening is likely to be too diverse for exposure therapy to cover entirely.

Guided mastery therapy is a performance-based technique that relies on behavioural mechanisms to create change. The therapist actively encourages and guides the client to perform progressively more difficult tasks as rapidly as possible. The goal is initially to raise the level of performance and self-efficacy by assisting clients to perform tasks that they would otherwise find too difficult (i.e., anxiety provoking). Therapists often employ modelling to demonstrate effective coping behaviours and task performance. In general, clients are encouraged to master subtasks leading to an overall behavioural goal, although the objective is always to help the client to progress as quickly as possible (Williams, 1990). The sense of mastery experienced by the client is critical to therapeutic progress, but the level of anxiety experienced is not considered important (Williams, 1990).

Once the client can perform adequately within the feared situation, the therapist then assists him/her to reduce coping rituals and defensive behaviours (such as always sitting near an exit or muscular rigidity when within a feared situation) within the feared situation because they prevent a sense of mastery and maintain a sense of low self-efficacy. Finally, the therapist fosters independent performance of tasks by intervening only when it is essential

to promote progress and by training clients to be their own therapists. Treatment engenders a sense of self-influence among clients that is likely to generalise to new fears and situations, even after treatment has ceased (Williams, 1990). It is the quality of performance that is emphasised in guided mastery therapy, and it is assumed that as individuals become more proficient at performing various tasks, their self-efficacy related to those tasks will be enhanced. These increases in self-efficacy should generalise to other tasks and situations, reducing levels of anxiety in those situations (Hoffart, 1995a, 1998; Williams, 1990; Williams et al., 1985).

Guided mastery therapy has proven effective in enhancing self-efficacy and perceived coping ability among individuals with phobias (especially agoraphobia) of various severity (Hoffart, 1995a, 1998; Williams, Dooseman, & Kleifield, 1984; Williams et al., 1985; Williams & Zane, 1989; Zane & Williams, 1993). It has also proven effective in reducing symptoms of agoraphobia, with improved self-efficacy in feared situations being an important mediator of this change (e.g., Hoffart, Sexton, Hedley, & Martinsen, 2008; Reilly, Gill, Dattilio, & McCormick, 2005; Williams & Zane, 1989). Some evidence has suggested that guided mastery is more effective than standard CBT for reducing symptoms of agoraphobia (e.g., Williams et al., 1985; Williams & Zane, 1989). However, other studies have obtained opposite results (e.g., Hoffart, 1995a, 1998).

There is reason to believe that guided mastery therapy might be effective as a method to increase self-efficacy for coping with general risk activities among individuals with OCD and among other anxious individuals. This should reduce perceived threat and, consequently, anxiety and risk-aversion in general risk situations. Treatments that specifically focus on effective behavioural performance, both in disorder-specific and general situations, could easily be incorporated into standard CBT regimens – essentially conducting exposure exercises but with a focus on behaviour rather than anxiety. Heightened self-efficacy should generalise from these situations into other situations that are avoided and, once defensive behaviours are eliminated, facilitate a reduction in risk-aversion across a range of situations (Williams, 1990). However, guided mastery therapy has not previously been used to target general risk-aversion and consequently its effectiveness for such a task is unclear. Future clinical studies should investigate the utility of guided mastery therapy for enhancing self-efficacy and reducing general risk-aversion among individuals with OCD or other anxiety disorders. In addition, the manner in which this treatment should be incorporated into existing therapy programs for various disorders requires investigation. It should be noted, however, that guided mastery has not always proved effective for treating some types of anxiety

symptoms (e.g., Zinta, 2008). Therefore, other means of improving coping ability among anxious individuals, particularly focusing on cognitive approaches, should also be investigated.

Little research has been conducted into devising individual treatments to improve self-esteem (Hall & Tarrier, 2003). However, cognitive techniques that involve working with clients to elicit positive self-attributes, and then identify specific examples that provide evidence of those attributes, appear to produce sustained increases in self-esteem among most clinical individuals (Hall & Tarrier, 2003; Warren, McLellarn, & Ponzoha, 1988). It is possible that cognitive techniques designed to make anxious individuals more aware of their ability to cope (for example, by increasing the salience of previous similar instances in which they have successfully coped) could enhance perceived coping ability and consequently reduce general risk-aversion. These cognitive approaches should be clinically trialled among individuals with OCD and other anxious individuals in order to examine this hypothesis.

In addition to building self-efficacy, it is likely that the adoption of adaptive behaviour in everyday risk scenarios will require specific skills training. Arean (2009) suggested that adequate problem solving occurs when an individual possesses both positive self-efficacy and effective problem-oriented behaviours. Therefore, interventions that focus specifically on teaching problem-solving skills are likely to be effective in increasing perceived coping ability among individuals with OCD and other anxious individuals. Individuals could be assessed to determine specific types of daily situations that they avoid, then work on each separately to improve problem-solving skills. The problem is defined and analysed, defining behavioural goals. Potential solutions are generated and discussed before selecting the best option to trial. This option is then divided into a series of steps to be implemented outside of therapy, with successes and failures reviewed in subsequent therapy sessions (Arean, 2009). The focus is not only on specific problems, but also on the process used to solve those problems. This type of approach has proved successful in increasing problem-solving skills and reducing symptomatology among a wide range of clinical populations, including individuals with self-harming behaviours (Bannan, 2010), individuals with GAD (Khodarahimi & Pole, 2010), and depressed individuals (Arean, 2009; Klein et al., 2011). Problem-solving therapy is designed to enhance positive behavioural functioning and improve general quality of life, as well as to reduce rates of relapse among clinical individuals (D'Zurilla & Nezu, 2010). It could be implemented as part of treatment regimens for various anxious individuals, in combination with guided mastery therapy, to improve

actual and perceived coping ability and consequently reduce perceived threat and general risk-aversion.

Targeting intolerance of uncertainty.

This research suggests that another potential therapeutic avenue for reducing general risk-aversion among individuals with OCD in particular is to target intolerance of uncertainty (e.g., Grayson, 2010). Given that they do not appear to overestimate the probability of general negative events, it appears that any possibility of those events is sufficient to allow for inflated threat estimation. Grayson (2010) suggested that, in order to help individuals with OCD cope with uncertainty, cognitive techniques highlighting the impossibility of achieving certainty, as well as highlighting other situations in which the individual successfully manages uncertainty are important. However, Grayson (2010) suggested that further research into treating intolerance of uncertainty is required. An examination of how non-anxious individuals deal with uncertainty surrounding general risks could be a useful basis for determining the best methods of reducing intolerance of uncertainty among individuals with OCD. If individuals with OCD learn to tolerate uncertainty more effectively, this could reduce general risk-aversion and improve overall treatment outcomes.

Future Clinical Directions

Research is required into effective methods for reducing the perceived cost of potential negative events, and for improving perceived ability to cope with those events among individuals with OCD. It is likely that this will also be applicable to individuals with other anxiety disorders, given that they appear to demonstrate similar threat perception biases in general situations. A clinical trial of guided mastery therapy is warranted, along with a trial of cognitive methods for reducing catastrophising. However, other methods might be required and it is likely that different techniques might be useful for different clients. If, as previously suggested, the MDRAS is used as part of assessment procedures, individualised treatments could be designed based on which threat perception distortion/s require modifying. Research into the processes involved in adaptive cognitions and behaviours surrounding risk could provide further insights into potential avenues through which these processes could be nurtured among clinically anxious individuals.

Importantly, future clinical trials should investigate not only whether treatments are effective in reducing cost estimates or improving perceived coping ability, but also whether changes in these cognitive variables influence actual behaviours surrounding general risks.

Treatments that effectively reduce general threat perception should, theoretically, reduce anxiety and consequently reduce general risk-aversion. This should begin to erode the cycle of heightened threat perception causing anxiety and risk-aversion, which generates further threat overestimation (e.g., Cano-Vindel et al., 2009; Klumpp & Amir, 2010; Maner & Schmidt, 2006). However, clinical trials into whether (and which) cognitive changes result in behaviour changes surrounding general risk (i.e., reduced risk-aversion) among individuals with OCD and other anxious individuals are required.

In addition, longitudinal treatment outcome studies are required to determine whether reduced general risk-aversion among individuals with OCD improves treatment outcomes and reduces relapse rates. Theoretically, this should be the case (e.g., Lyoo et al., 2001; Maner & Schmidt, 2006; Rees, 2001; Rees et al., 2006). However studies comparing standard cognitive-behavioural treatment with treatments incorporating methods for reducing general threat perception (likely through reducing perceived cost of harm or increasing coping self-efficacy) will be required. Such studies should measure OCD symptoms, risk perceptions, anxiety levels, and overall levels of functioning over time. Similar studies, with relevant outcome measures should also be conducted among other anxious groups.

Limitations

The limitations of each of the studies conducted as part of this research have been acknowledged. However, it should be recognised that cognitive conceptualisations of threat, although important in determining anxiety and situational behaviour, are not the only determinants of risk-related behavioural outcomes. Indeed, factors such as emotional reactions towards risky events, including state anxiety and how much the individual likes or dislikes activities involved in risk, can influence risky decision-making (Cheung & Mikels, 2011; Finucane, Alhakami, Slovic, & Johnson, 2000; Lerner & Keltner, 2001). The current research did not account for these factors. Therefore, changing threat perceptions among individuals with OCD will not necessarily translate into equivalently sized behavioural changes surrounding risk, although it certainly represents an important step towards achieving such changes (Maner & Schmidt, 2006).

A methodological limitation across this research is that all data were self-report. It has been observed that self-report data do not always correspond strongly to data collected through other means (e.g., Dell'Osso et al., 2002; Schwerdtfeger, 2004; Sohler et al., 2009), are open to the influence of social desirability (e.g., Huang, Liao, & Change, 1998) and can be differentially influenced by personality factors such as neuroticism (de Jong & Slaets,

2005). Consequently, it is possible that different results would have been obtained had other methods (such as interviewing) been used to collect the data. It is also possible that anxious individuals might have responded differently to non-anxious individuals because of personality differences between the groups, or that they might have underreported their actual perceived probability because they perceive this to be socially desirable (especially if they have likely been taught to re-estimate probability in therapy). In addition, it has been suggested that, among individuals with OCD, self-report data regarding probability estimation is somewhat flawed because, although they do not perceive negative events as being more likely *per se*, they do perceive themselves as more likely to experience those events *compared to other people* (Moritz & Jelinek, 2009). However, Moritz and Jelinek (2009) used OCD-specific negative events and it is likely that individuals with OCD would perceive these events as more likely to happen to them than others because of low perceived sense of control (e.g., Moulding & Kyrios, 2006) rather than skewed estimates of the probability of negative events.

Despite its inherent flaws, it is difficult to envisage a manner in which perceptions of threat could be assessed through means other than self-report data. Interviewing would have been prohibitively time consuming and is likely to be more prone to social desirability estimates than self-report data (Dell'Osso et al., 2002). Behavioural measures of risk taking can demonstrate how an individual reacts to potential threats, but they cannot determine the cognitive basis of this reaction, as was the goal in the current research. Therefore, self-report data was the only viable option for assessing the cognitive basis of threat overestimation among anxious individuals in general threat scenarios. Indeed, self-report data is widely used in research into risk/threat perception and anxiety, so the current methods are consistent with other studies (e.g., Cicolini & Rees, 2003; Steketee & Frost, 1994). In addition, the results of the current research are broadly consistent with those of Lorian and Grisham (2010), who found anxious individuals to be risk-aversive using a behavioural analogue task. However, in terms of the validity of the MDRAS scales, it would be useful to determine the extent to which the MDRAS scales correlate with behavioural measures of general risk taking in future studies. However, such measures do not currently exist, so this will represent a significant new area of research.

Another potential limitation relates to the non-clinical samples used in this research. It appears that risk preferences are involved in the decision to participate in research (Harrison, Lau, & Rutstrom, 2009). Therefore, the non-clinical individuals who chose to participate in this research might not be representative of the general population in terms of perceptions of

probability, cost, and coping ability regarding potential negative events. However, results from the other measures used in this research suggested that the non-clinical groups were similar to those used in previous studies.

A final limitation of the current research is that some recent evidence suggests that only some individuals with OCD are likely to be motivated by harm avoidance, whereas others are motivated more by the desire to get things "just right" (Pietrefesa & Coles, 2009). "Not just right" experiences appear to be primarily linked to perfectionism (Moretz & McKay, 2009) and it is possible that individuals who are motivated by these experiences might not overestimate threat in general situations. If the OCD sample in Study 3 contained individuals who are not harm-avoidant, this could have suppressed potential differences on the MDRAS scales between the OCD and the anxious control groups. In addition, therapeutic methods for targeting general risk-aversion are unlikely to result in treatment gains for individuals who are motivated by "not just right" experiences. However, this conceptualisation of OCD requires further investigation and cannot be assigned a high level of certainty at this stage. Nevertheless, future studies should ensure that OCD samples are motivated by harm avoidance rather than "not just right" experiences before inclusion into risk-related research.

Conclusions

The research reported in this thesis has potentially wide-ranging implications for the understanding and treatment of OCD and other anxiety disorders. It represents the first attempt to examine the cognitive underpinnings of general risk-aversion among individuals with OCD, based on Beck et al.'s (1985) well-established cognitive theory. From this perspective, it has provided insight into why individuals with OCD are risk-aversive in their daily lives and has begun the process of identifying potential cognitive methods to treat this unhealthy cognitive, behavioural, and emotional state. This has the potential to improve short-term treatment gains and long-term treatment maintenance among individuals with OCD.

The fact that cognitive biases relating to risk perceptions did not distinguish individuals with OCD from other anxious individuals does not diminish the clinical importance of the current findings for OCD. Conversely, it extends the importance of this research and suggests that similar therapeutic gains could be achieved by targeting these biases among a range of anxious individuals (e.g., Maner & Schmidt, 2006). Future studies should investigate the optimal methods for addressing cognitive biases related to risk

perception across anxiety disorders. However treatments targeted at specific clients are likely to be the most effective and the MDRAS could be used to determine which bias represents the most important therapeutic target for each client.

The MDRAS itself is also an important contribution provided by the current research. Indeed, this measure has the potential to be of substantial clinical and research utility across anxiety disorders. Its possible uses in broad-scale studies as well as on an individual client basis have been discussed. It can be used to further understand general risk-aversion in diverse populations, informing treatments and improving cognitive-behavioural conceptualisations of various anxiety disorders.

Overall, in order to reduce general risk-aversion among anxious individuals, this research has indicated that targeting faulty estimates of the cost of negative events, and of one's ability to cope with those events, is required. In order to achieve these goals, a positive approach to therapy should be adopted. A focus on building self-efficacy, increasing problem-solving skills and proficiency, and promoting awareness of potential positive outcomes associated with daily risk would appear to be promising avenues for reducing threat perception biases. This should result in increased willingness to engage in general risks, improving long-term anxiety reduction and treatment outcomes, and increasing quality of life among individuals with OCD specifically, and anxious individuals in general.

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Appendix A: Multi-Dimensional Risk Assessment Scale (MDRAS)

Consider the following situations:

1. You are driving at 20km/h above the speed limit on a major road. There is a risk that you will receive a speeding fine.

a) What is the probability that you will receive a speeding fine?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If you did receive a speeding fine, how bad would that be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if you did receive a speeding fine?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

2. You are driving at 20km/h above the speed limit on a major road. There is a risk that you will be involved in an accident, causing you to break your leg.

a) What is the probability that you will be involved in an accident, causing you to break your leg?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If you were involved in such an accident, how bad would that be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope with the consequences of being involved in such an accident?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

3. You are outside for several hours without a coat on a cold, wet day. There is a risk that you will catch the flu.

a) What is the probability that you will catch the flu?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If you did catch the flu, how bad would that be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if you did catch the flu?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

4. You borrow something from a friend without asking because he/she is unavailable. There is a risk that he/she will be very angry, placing strain on your friendship.

d) What is the probability that he/she will be very angry, placing strain on your friendship?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

e) If he/she were very angry, placing strain on your friendship, how bad would that be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

f) How easily could you cope if he/she were very angry, placing strain on your friendship?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

5. You drive to a friend's house without looking up directions or taking a map, even though you have only been there once before and it is a long drive. There is a risk that you will get lost, with no means of checking the correct route.

a) What is the probability that you will get lost along the way, with no means of checking the correct route?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If you did get lost with no means of checking the correct route, how bad would that be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if you did get lost with no means of checking the correct route?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

6. You are forced to drive in a severe storm to do an errand you cannot postpone. There is a risk that this will be an unpleasant experience for you.

a) What is the probability that this will be an unpleasant experience?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If the experience were distressing, how bad would that be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if the experience was distressing?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

7. You allow a stranger into your house to use the telephone. There is a risk that he/she will try to harm you.

d) What is the probability that he/she will try to harm you?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

e) If he/she did try to harm you, how bad would that be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

f) How easily could you cope if he/she tried to harm you?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

8. You are in an expensive restaurant with some friends. There is a risk that you will accidentally trip and drop your plate, which smashes and spills food all over you, causing everyone in the restaurant to stare at you and to giggle, and making you feel very embarrassed.

a) What is the probability that this embarrassing experience will happen to you?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If the experience did occur, how bad would that be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if the experience occurred?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

9. In the future there is a risk that your spouse or partner will die while you are still alive.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

10. In the future there is a risk that you will suffer serious injury or illness.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

11. In the future there is a risk that you will be fired from your job.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

12. In the future there is a risk that you will be forced to serve time in jail.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

13. In the future there is a risk that you will experience chronic insomnia.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

14. In the future there is a risk that you will experience a divorce.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

15. In the future there is a risk that you will experience sexual difficulties.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

16. In the future there is a risk that you will be required to completely stop eating your favourite food.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

17. In the future there is a risk that you will be forced to permanently use a walking stick.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

18. In the future there is a risk that you will be forced to begin a new line of work.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

19. In the future there is a risk that you will experience conflict with your new boss at work.

a) What is the probability that this will happen?

1	2	3	4	5	6	7
Almost None	Very Low	Quite Low	Moderate	Quite High	Very High	Almost Certain

b) If this happened, how bad would it be for you?

1	2	3	4	5	6	7
Not At All Bad	Minor Inconvenience	Inconvenience	Quite Bad	Bad	Extremely Bad	As Bad As I Can Imagine

c) How easily could you cope if this happened?

1	2	3	4	5	6	7
Cope Very Easily	Cope Easily	Cope Quite Easily	Cope, But With Some Difficulty	Difficult To Cope	Extremely Difficult To Cope	Could Not Cope

Appendix B – Demographics Page for Studies One, Two, and Three

Demographic Information

What is your age in years and months?

_____years and _____months.

What is your gender?

Male Female

(Please circle)

Appendix C - Participant Information for Student Participants in Studies One and Two

Participant Information

My name is David Garratt-Reed and I am a PhD (Clinical Psychology) student at Curtin University of Technology.

I am conducting research in the area of anxiety. Specifically, I am interested in determining why anxious individuals seem to avoid risky situations more frequently than other people do. In order to achieve this goal, it is necessary for me to assess the thoughts of anxious people in "risky" situations, and to compare them to the thoughts of other individuals in the same situations.

Please complete all of the questionnaires in the package and return them to the box that I have placed in the office at the School of Psychology.

Your participation in this research is completely voluntary and non-participation will have no influence on your academic rights or results. However, return of the completed questionnaires will be deemed as an indication of your consent to participate in the study. Because identifying information will not be collected (with the exception of age and gender) it will not be possible to withdraw consent after you have submitted the questionnaires. All of the information that you divulge will be completely anonymous, and the data will not be identifiable.

If you experience distress due to the completion of these questionnaires, please contact the counselling service at Curtin University on 9266 7850.

For further information please do not hesitate to contact me on 9266 2559 or 9266 3037. The supervisor of this project, Dr Clare Rees, can be contacted on 9266 3039.

This study has been approved by the Curtin University Human Research Ethics Committee. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.

Thank you for your time!

Appendix D - Participant Information for Community Participants in Studies One and Two

Participant Information

My name is David Garratt-Reed and I am a PhD (Clinical Psychology) student at Curtin University of Technology.

I am conducting research in the area of anxiety. Specifically, I am interested in determining why anxious individuals seem to avoid risky situations more frequently than other people do. In order to achieve this goal, it is necessary for me to assess the thoughts of anxious individuals in "risky" situations, and to compare them to the thoughts of other individuals in the same situations.

Please complete all of the questionnaires in the package and return them to me via mail, using the enclosed envelope.

Your participation in this research is completely voluntary. Return of the completed questionnaires will be deemed as an indication of your consent to participate in the study. Because identifying information will not be collected (with the exception of age and gender) it will not be possible to withdraw consent after you have submitted the questionnaires. All of the information that you divulge will be completely anonymous, and the data will not be identifiable.

If you experience distress due to the completion of these questionnaires, please contact the psychology clinic at Curtin University on 9266 3436.

For further information please do not hesitate to contact me on 9266 2559 or 9266 3037. The supervisor of this project, Dr Clare Rees, can be contacted on 9266 3039.

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Thank you for your time!

Appendix E – Positive and Negative Affect Schedule (PANAS)

PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to the word. Indicate to what extent you generally feel this way, that is, how you feel on the average. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ interested
_____ distressed
_____ excited
_____ upset
_____ strong
_____ guilty
_____ scared
_____ hostile
_____ enthusiastic
_____ proud

_____ irritable
_____ alert
_____ ashamed
_____ inspired
_____ nervous
_____ determined
_____ attentive
_____ jittery
_____ active
_____ afraid

Appendix F – Anxiety Control Questionnaire (ACQ)

Listed below are a number of statements describing a set of beliefs. Please read each statement carefully and, on the 0-5 scale given, indicate how much you think each statement is typical of you.

0	1	2	3	4	5
Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree

___1. I am usually able to avoid threat quite easily.
___2. How well I cope with difficult situations depends on whether I have outside help.
___3. When I am put under stress, I am likely to lose control.
___4. I can usually stop my anxiety from showing.
___5. When I am frightened by something, there is generally nothing I can do.
___6. My emotions seem to have a life of their own.
___7. There is little I can do to influence people's judgements of me.
___8. Whether I can successfully escape a frightening situation is always a matter of chance with me.
___9. I often shake uncontrollably.
___10. I can usually put worrisome thoughts out of my mind easily.
___11. When I am in a stressful situation, I am able to stop myself from breathing too hard.
___12. I can usually influence the degree to which a situation is potentially threatening to me.
___13. I am able to control my level of anxiety.
___14. There is little I can do to change frightening events.
___15. The extent to which a difficult situation resolves itself has nothing to do with my actions.
___16. If something is going to hurt me, it will happen no matter what I do.
___17. I can usually relax when I want.
___18. When I am under stress, I am not always sure how I will react.
___19. I can usually make sure people like me if I work at it.
___20. Most events that make me anxious are outside my control.
___21. I always know exactly how I will react to difficult situations.
___22. I am unconcerned if I become anxious in a difficult situation, because I am confident in my ability to cope with my symptoms.
___23. What people think of me is largely outside my control.
___24 I usually find it hard to deal with difficult problems.
___25. When I hear that someone has a serious illness, I worry that I am next.
___26. When I am anxious, I find it difficult to focus on anything other than my anxiety.
___27. I am able to cope as effectively with unexpected anxiety as I am with anxiety that I expect to occur.
___28. I sometimes think, "Why even bother to try to cope with my anxiety when nothing I do seems to affect how frequently or intensely I experience it?".
___29. I often have the ability to get along with "difficult" people.
___30. I will avoid conflict due to my inability to successfully resolve it.

Appendix G - Obsessive Beliefs Questionnaire (OBQ)

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	7
Disagree very much	Disagree moderately	Disagree a little	Neither agree nor disagree	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. I often think things around me are unsafe.	1	2	3	4	5	6	7
2. If I'm not absolutely sure of something, I'm bound to make a mistake.	1	2	3	4	5	6	7
3. Things should be perfect according to my own standards.	1	2	3	4	5	6	7
4. In order to be a worthwhile person, I must be perfect at everything I do.	1	2	3	4	5	6	7
5. When I see any opportunity to do so, I must act to prevent bad things from happening.	1	2	3	4	5	6	7
6. Even if harm is very unlikely, I should try to prevent it at any cost.	1	2	3	4	5	6	7
7. For me, having bad urges is as bad as actually carrying them out.	1	2	3	4	5	6	7
8. If I don't act when I foresee danger, then I am to blame for any consequences.	1	2	3	4	5	6	7
9. If I can't do something perfectly, I shouldn't do it at all.	1	2	3	4	5	6	7
10. I must work to fulfil my potential at all times.	1	2	3	4	5	6	7
11. It is essential for me to consider all possible outcomes of a situation.	1	2	3	4	5	6	7
12. Even minor mistakes mean a job is not complete.	1	2	3	4	5	6	7

13. If I have aggressive thoughts or impulses about my loved ones, this means I may secretly want to hurt them.	1	2	3	4	5	6	7
14. I must be certain of my decisions.	1	2	3	4	5	6	7
15. In all kinds of daily situations, failing to prevent harm is just as bad as deliberately causing harm.	1	2	3	4	5	6	7
16. Avoiding serious problems (for example, illness or accidents) requires constant effort on my part.	1	2	3	4	5	6	7
17. For me, not preventing harm is as bad as causing harm.	1	2	3	4	5	6	7
18. I should be upset if I make a mistake.	1	2	3	4	5	6	7
19. I should make sure others are protected from any negative consequences of my decisions or actions.	1	2	3	4	5	6	7
20. For me, things are not right if they are not perfect.	1	2	3	4	5	6	7
21. Having nasty thoughts means I am a terrible person.	1	2	3	4	5	6	7
22. If I do not take extra precautions, I am more likely than others to have or cause a serious disaster.	1	2	3	4	5	6	7
23. In order to feel safe, I have to be as prepared as possible for anything that could go wrong.	1	2	3	4	5	6	7
24. I should not have bizarre or disgusting thoughts.	1	2	3	4	5	6	7
25. For me, making a mistake is as bad as failing completely.	1	2	3	4	5	6	7
26. It is essential for everything to be clear cut, even in minor matters.	1	2	3	4	5	6	7
27. Having a blasphemous thought is as sinful as committing a sacrilegious act.	1	2	3	4	5	6	7
28. I should be able to rid my mind of unwanted thoughts.	1	2	3	4	5	6	7
29. I am more likely than other people to accidentally cause harm to myself or to others.	1	2	3	4	5	6	7
30. Having bad thoughts means I am weird or abnormal.	1	2	3	4	5	6	7
31. I must be the best at things that are important to me.	1	2	3	4	5	6	7
32. Having an unwanted sexual thought or image means I really want to do it.	1	2	3	4	5	6	7
33. If my actions could have even a small effect on a potential misfortune, I am responsible for the outcome.	1	2	3	4	5	6	7
34. Even when I am careful, I often think that bad things will happen.	1	2	3	4	5	6	7
35. Having intrusive thoughts means I'm out of control.	1	2	3	4	5	6	7
36. Harmful events will happen unless I am very careful.	1	2	3	4	5	6	7
37. I must keep working at something until it's done exactly right.	1	2	3	4	5	6	7
38. Having violent thoughts means I will lose control and become violent.	1	2	3	4	5	6	7
39. To me, failing to prevent a disaster is as bad as causing it.	1	2	3	4	5	6	7

40. If I don't do a job perfectly, people won't respect me.	1	2	3	4	5	6	7
41. Even ordinary experiences in my life are full of risk.	1	2	3	4	5	6	7
42. Having a bad thought is morally no different than doing a bad deed.	1	2	3	4	5	6	7
43. No matter what I do, it won't be good enough.	1	2	3	4	5	6	7
44. If I don't control my thoughts, I'll be punished.	1	2	3	4	5	6	7

Appendix H – Formla for Calculating the Significance of the Difference between Two Correlated Correlations

Whether two correlated predictors (same dependent variable) differ.

1. = r_{yx} 2. = r_{yz}

$$Z = (z_1' - z_2')[(N-3)/(2(1 - r_{xz})h)]^{0.5}$$

$$h = (1 - fr_m^2)/(1 - r_m^2)$$

$$f = (1 - r_{xz})/2(1 - r_m^2)$$

$$r_m^2 = (r_{yx}^2 + r_{yz}^2)/2$$

The 95% confidence limits are given by:

$$z_1' - z_2' \pm 1.96[(2(1 - r_{xz})h)/(N-3)]$$

Appendix I – Obsessive Compulsive Inventory-Revised (OCI-R)

The following statements refer to experiences that many people have in their everyday lives. Circle the number that best describes **HOW MUCH** that experience has **DISTRESSED or BOTHERED you during the PAST MONTH**. The numbers refer to the following verbal labels:

0	1	2	3	4
Not at all	A little	Moderately	A lot	Extremely

1. I have saved up so many things that they get in the way.	0	1	2	3	4
2. I check things more often than necessary.	0	1	2	3	4
3. I get upset if objects are not arranged properly.	0	1	2	3	4
4. I feel compelled to count while I am doing things.	0	1	2	3	4
5. I find it difficult to touch an object when I know it has been touched by strangers or certain people.	0	1	2	3	4
6. I find it difficult to control my own thoughts.	0	1	2	3	4
7. I collect things I don't need.	0	1	2	3	4
8. I repeatedly check doors, windows, drawers etc.	0	1	2	3	4
9. I get upset if others change the way I have arranged things.	0	1	2	3	4
10. I feel I have to repeat certain numbers.	0	1	2	3	4
11. I sometimes have to wash or clean myself simply because I feel contaminated.	0	1	2	3	4
12. I am upset by unpleasant thoughts that come into my mind against my will.	0	1	2	3	4
13. I avoid throwing things away because I am afraid I might need them later.	0	1	2	3	4
14. I repeatedly check gas and water taps and light switches after turning them off.	0	1	2	3	4
15. I need things to be arranged in a particular order.	0	1	2	3	4
16. I feel that there are good and bad numbers.	0	1	2	3	4
17. I wash my hands more often and longer than necessary.	0	1	2	3	4
18. I frequently get nasty thoughts and have difficulty getting rid of them.	0	1	2	3	4

Appendix J – Participant Information for Clinical Participants in Study Three

Participant Information

My name is David Garratt-Reed and I am a PhD (Clinical Psychology) student at Curtin University of Technology.

I am conducting research in the area of anxiety. Specifically, I am interested in determining why anxious individuals seem to avoid risky situations more frequently than other people do. In order to achieve this goal, it is necessary for me to assess the thoughts of anxious individuals in "risky" situations, and to compare them to the thoughts of other individuals in the same situation. In addition, I am collecting information about mood and clinical symptoms to use in my analysis of the thought patterns exhibited by various individuals in "risky" situations.

Please complete all of the questionnaires in the package and return them to your therapist at the clinic.

Your participation in this research is completely voluntary and non-participation will have no influence on your ongoing treatment. Return of the completed questionnaires will be deemed as an indication of your consent to participate in the study. Because identifying information will not be collected (with the exception of age and gender) it will not be possible to withdraw consent after you have submitted the questionnaires. All of the information that you divulge will be completely anonymous, and the data will not be identifiable.

If you experience distress due to the completion of these questionnaires, please contact the psychology clinic at Curtin University on 9266 3436.

For further information please do not hesitate to contact me on 9266 3037. The supervisor of this project, Dr Clare Rees, can be contacted on 9266 3442.

This study has been approved by the Curtin University Human Research Ethics Committee. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.

Thank you for your time!

Appendix K – Participant Information for Non-Clinical Participants in Study Three

Participant Information

My name is David Garratt-Reed and I am a PhD (Clinical Psychology) student at Curtin University of Technology.

I am conducting research in the area of anxiety. Specifically, I am interested in determining why anxious individuals seem to avoid risky situations more frequently than other people do. In order to achieve this goal, it is necessary for me to assess the thoughts of anxious individuals in "risky" situations, and to compare them to the thoughts of other individuals in the same situation. In addition, I am collecting information about mood and clinical symptoms to use in my analysis of the thought patterns exhibited by various individuals in "risky" situations.

Please complete all of the questionnaires in the package and return them to the box that I have placed in the office at the School of Psychology.

Your participation in this research is completely voluntary and non-participation will have no influence on your ongoing academic rights. Return of the completed questionnaires will be deemed as an indication of your consent to participate in the study. Because identifying information will not be collected (with the exception of age and gender) it will not be possible to withdraw consent after you have submitted the questionnaires. All of the information that you divulge will be completely anonymous, and the data will not be identifiable.

If you experience distress due to the completion of these questionnaires, please contact the counselling service at Curtin University on 9266 7850.

For further information please do not hesitate to contact me on or 9266 3037. The supervisor of this project, Dr Clare Rees, can be contacted on 9266 3442.

This study has been approved by the Curtin University Human Research Ethics Committee. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.

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