# Metacognition & Health Anxiety.

**A thesis submitted to the University of Manchester for the degree of Doctor of Philosophy in the Faculty of Biology, Medicine and Health.**

**2016**

**Robin Bailey**

**School of Health Sciences.**

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**Word Count: 66,067**

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**The University of Manchester: For the Degree of Doctor of Philosophy: December 2016**

**Abstract**

The development, maintenance, and treatment of health anxiety remains an important area in psychological research. The cognitive behavioural therapy (CBT) model has gained popularity, as an evidence-based approach for explaining and treating health anxiety (Barsky & Ahern, 2004; Clark, et al., 1998; Warwick, et al., 1996). However, significant limitations exist, not least because treating illness-related cognitions appears not to confer much advantage over other treatment approaches. An emerging psychological approach, Metacognitive Therapy (Wells & Matthews, 1994), may offer an alternative approach for understanding and treating this disorder. In this thesis the predictions made by the metacognitive model and applied to health anxiety were tested using data from cross sectional, longitudinal and treatment designs.

In Chapter 2 a cross sectional study investigated whether metacognition was associated with health anxiety when controlling for other factors (i.e., neuroticism, somatosensory amplification, and illness cognition). Results indicated a strong positive association between metacognition and health anxiety, and demonstrated the predictive potential of specific metacognitions over and above other established correlates of symptoms.

In Chapter 3exploratory and confirmatory factor analysis was used to develop a specific metacognitive measure. This resulted in a 14 item, three factor measure, with further analysis suggesting good internal-consistency, incremental, convergent and discriminant validity. Preliminary findings from this study support the assessment of health-anxiety specific metacognitions with this new tool.

Chapter 4 expanded the findings of chapter 2 and directly compared key aspects of the metacognitive model (metacognition) with the cognitive model (dysfunctional beliefs). Metacognitive beliefs were found to explain almost half of the variance in health anxiety when controlling for dysfunctional illness beliefs, and emerged as the strongest independent predictors. These data support a key component of the metacognitive model, that metacognition may be more important in health anxiety than symptom/illness-related beliefs.

In Chapter 5 & 6 both cross-sectional and longitudinal designs explored the relationship between cognition (catastrophic misinterpretation), and metacognition. Consistent with the metacognitive model the effect of cognition on health anxiety was explained by an interaction with metacognition. The results of these findings add further weight to the idea that metacognition may be more important in both the development and maintenance of health anxiety than cognition.

Finally, in Chapter 7 an A-B single case series treatment design (N=4) was used to investigate the effects associated with metacognitive therapy (MCT) applied to health anxiety. The results showed that all four patients treated with MCT demonstrated large and clinically meaningful improvements in health anxiety both at post treatment and follow up. These improvements also corresponded with substantial changes in patients metacognitive beliefs. Overall this case series provides preliminary evidence that MCT can be applied to health anxiety.

Collectively the results of this thesis provide new insights into the role played by metacognition in health anxiety. It provides evidence for a role of metacognition in both the development and maintenance of health anxiety, and indicates that targeting metacognition can be applied in treatment of these patients and may bring about a reduction in health anxiety symptoms.

## Declaration.

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification at this or any other institute of learning.

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## Acknowledgements.

I would like to acknowledge and thank my supervisor Professor Adrian Wells, for taking me on as a student in the first place and for all the teachings he has given me over the past six years. He has helped me develop in ways I never believed I could, both academically and personally. It is without a doubt that my life has been changed for the better through this PhD experience and Adrian has been instrumental in that process.

I would also like to thank my wife Lorraine for all her support and encouragement. Of course my amazing children Ciara and Izabella who have tolerated my absence on those rare occasions!

Lastly I would like to dedicate this PhD to all those kids from council estates, who struggled in education systems with undiagnosed learning difficulties, who everyone gave up on, but who never gave up on themselves: kids like me!


## The Author.

I graduated from Manchester Metropolitan University (MMU) in 1995 with a BA (Hons) in Humanities. I then went on to study for a PgDip in Counselling and then an MSc in Cognitive Behavioural Therapy. My Masters research investigated the role of thought suppression in health anxiety. I have worked as a cognitive behavioural therapist for the past 12 years in a variety of settings. I am now working at the University of Lancashire as a Lecturer in Counselling & Psychotherapy.

## Rationale for Submitting the Thesis in an Alternative Format.

The work in this thesis forms the basis of a systematic evaluation of metacognition and its role in health anxiety and it contains 6 journal articles that were prepared and have since been published in a variety of scientific journals. These articles form chapters 2-7 and have each been written to include a review of the literature that is relevant to the data presented. Chapter 1 will provide a broad yet detailed introduction to previous research that has been completed in this field and outline the key research questions and aims for the thesis. A final chapter, Chapter 8, synthesises the research findings and discusses their limitations and implications for the theory and treatment of health anxiety, as well as suggestions for future work.

The author was the primary investigator for all work presented in this thesis, performing the majority of conceptualisation, design, data collection, analysis, interpretation and writing. Contributions from co-author (Adrian Wells) who acted as supervisor on all parts of the studies including project design, analysis, interpretation, writing and publishing.

# Chapter 1: Introduction

## The Nature, Diagnosis and Categorisation of Health Anxiety

Health anxiety is a psychological disorder that is characterized by specific fears and convictions about having or developing a serious illness, despite medical reassurance and being in good health (Abramowitz & Braddock, 2008; Rode, Salkovskis, & Jack, 2001). The onset of the disorder has been attributed to a variety of causes such as personal experience of illness, having close relatives who have been ill (Barsky, Wool, Barnett, & Cleary, 1994; Kellner, 1986; Sandin, Chorot, Santed, & Valiente, 2004; Warwick and Salkovskis, 1990), or biological correlates such as serotonin dysfunction (Brondino, et al., 2008). Health anxiety is marked by a number of key cognitive, behavioural and somatic features that maintain a person's preoccupation regarding the status of their health (Asmundson, Abramowitz, Richter, & Whedon, 2010). Research has identified two distinct cognitive dimensions these include disease conviction "the idea that one has a serious disease", and disease phobia "the fear of having a serious disease" (Barsky, 1992; Bianchi, 1973; Ferguson & Daniel, 1995; Mayou, 1976; Pilowsky, 1967). Behaviours in health anxiety are used as a means to reduce an individual's anxiety about the perceived illness and perceived likelihood of occurrence; these include reassurance seeking, bodily checking, and internet searching (Asmundson, et al., 2010; Taylor & Asmundson, 2004). Somatic symptoms in health anxiety are generally characterized by persistent bodily symptoms or concerns which cannot be accounted for by a diagnosable disease (Novy, et al., 2005).

Contemporary theories have conceptualized the condition of health anxiety as a dimensional as opposed to a psychiatric construct, existing on a continuum from mild to

severe (Barsky, Wyshak, & Aklerman, 1986; Ferguson, 2009; Hitchcock & Mathews, 1992; Longley et al, 2010; Salkovskis & Bass, 1997; Taylor & Asmudson, 2004; Williams, 2004; Warwick & Salkovskis, 1990). At the mild end a certain level of health anxiety has been considered adaptive in motivating individuals to access health services as a means to check existing physical anomalies (Abramowitz, Olatjunji & Deacon, 2007). Additionally individuals who have recently been diagnosed or have an existing genuine illness may rightly experience a certain level of anxiety about their health throughout the duration of their illness (Baune, Adrian, & Jacobi, 2007; Tedstone & Tarrier, 2003).

Along this particular continuum individuals will experience health anxiety at differing levels of severity. Traditionally health anxiety at the severe end has been labelled hypochondriasis (American Psychiatric Association (APA), 1994). Historically hypochondriasis has been subsumed under the somatoform disorders and defined as 'the preoccupation with the fear of having, or the idea that one has, a serious disease based on the person's misinterpretation of bodily symptoms or bodily functions' (American Psychiatric Association (APA), 1994, p.445). The recent advances in DSM 5 (APA, 2013) has aimed to avoid the term hypochondriasis by introducing two new and distinct categories. Partly because the term hypochondriasis is considered an outdated and pejorative term (Reuman & Abramowitz, 2015), and overall it is considered too narrow and restrictive in its definition and scope (Creed & Barsky, 2004; Fink et al., 2004). Illness Anxiety Disorder (IAD) is the new category which is supposed to represent the presentation of health anxiety and Somatic Symptom Disorder (SSD); it subsumes the previous diagnosis of hypochondriasis alongside somatization disorder and pain disorder (APA, 2013). Much like health anxiety the main feature of illness anxiety disorder is the fear and preoccupation that one has or is in danger of developing a serious medical condition. However, unlike health anxiety this should be in the absence of somatic symptoms or if they are present they are only mild. For example, an

individual may be preoccupied with the belief they are developing Multiple Sclerosis without any of the perceived neurological symptoms associated with this condition. In contrast somatic symptom disorder (SSD) follows similar criteria to illness anxiety disorder only with the presence of somatic symptoms. A number of the other key cognitive, behavioural and affective characteristics that are associated with health anxiety are also subsumed under the diagnostic category of illness anxiety disorder and somatic symptom disorder (Bailer et al., 2016). These include reassurance seeking from medical experts, checking one's body for signs of symptoms, researching feared illness on the internet and high levels of anxiety (APA, 2013). However, some criticism has been levied at the new diagnosis of illness anxiety disorder. In a recent study (Bailer et al., 2016) that aimed to test the validity of these two new diagnoses it was found that individuals previously diagnosed with DSM IV hypochondriasis and reclassified under the new DSM 5 diagnosis in the main fitted the somatic symptom diagnosis but not the illness anxiety disorder diagnosis. These findings were also the same for individuals suffering from both mild and severe health anxiety. This would appear to suggest that those lying anywhere on the health anxiety continuum i.e. from mild to severe, will more than likely receive a diagnosis of somatic symptom disorder (Bailer, et al., 2016). This then raises questions regarding how much has actually changed from DSM –IV to DSM 5, in particular as somatic symptom disorder is really a replacement for hypochondriasis. However, more importantly it appears the new diagnostic criteria of Illness anxiety disorder do not present a valid diagnostic assessment of health anxiety, something that it was developed to capture. In fact Bailer et al's (2016) study indicates and concurs with previous findings by Rief and Martin (2014) that individuals suffering from health anxiety should be treated as belonging to one diagnostic entity. In addition this diagnostic entity should exist in a category that is also representative of the disorder's key symptoms, i.e. anxiety, (Scarella, et al., 2015).

**Health Anxiety and Other Anxiety Disorders**

It would also appear that the criticisms that are now being levied at DSM-5 mis-categorisation of illness anxiety disorder, have also been levied at hypochondriasis as defined by DSM IV and its inclusion in somatoform disorders. Studies and researchers have indicated that hypochondriasis would also be better categorized as an anxiety disorder, i.e. health anxiety, rather than a somatoform disorder (Abramowitz & Moore, 2006; Asmundson & Taylor, 2004; Creed & Barsky, 2004; Olatunji, Deacon & Abramowitz, 2009; Noyes, 1999). Part of the reason for this conceptual shift in categorization is borne out of the similarity in the characteristics and processes in hypochondriasis and various anxiety disorders. It has been proposed that various anxiety disorders are similar to and closely relate to hypochondriasis/health anxiety, in particular obsessive compulsive disorder (OCD) (Barsky, 1992; Rasmussen & Eisen, 1992); generalized anxiety disorder (GAD) (Lee, Ma & Tsang, 2010), and panic disorder (Abramowitz, et al., 2007; Hiller, Leibbrand, Rief, & Fichter, 2005; Salkovskis & Clark, 1993). Of these disorders there appear to be important links between health anxiety and panic disorder (Rachman, 2012). In both panic disorder (Clark, 1986) and hypochondriasis/health anxiety (Barsky & Klerman, 1983) the cardinal component of their categorization and clinical presentation relates to an individual's tendency to misinterpret bodily symptoms as the sign of illness threat, (e.g. "I am having a heart attack" & "I am developing heart disease"). They are also characterized by an individual's propensity to overly attend to bodily symptoms and respond with disproportionate levels of fear (Deacon & Abramowitz, 2008). Equally individuals with both conditions have a tendency to over utilize health care services as a means of explaining the symptoms and gaining medical reassurance (Olatunji, Deacon, Abramowitz, & Valentiner, 2007). Behaviourally, similarities exist whereby both disorders are characterized by safety behaviours, which serve the purpose of protecting oneself from the perceived illness/disease

(Abramowitz & Moore, 2006; Taylor & Asmudson, 2004).

As there maybe similarities between health anxiety and other anxiety disorders, it can potentially raise the question whether health anxiety is an independent entity at all or just a secondary feature of other anxiety disorders. To address this a number of studies have found many differences between specific anxiety disorders, such as OCD (Neziroglu, McKay, & Yaryura-Tobias, 2000), GAD (Haenan, de jong, Schmidt, Stevens, & Visser, 2000; Noyes, 1999) and health anxiety. With respect to panic disorder one of the main distinctions between panic disorder and hypochondriasis involves the chronicity of the perceived illness. In panic disorder the catastrophic misinterpretation is considered imminent, i.e. having a heart attack in the moment of experiencing panic whereas with hypochondriasis the illness is much more protracted and existing in the future, with more concern being placed on the significance of symptoms (Salkovskis & Clark, 1993; Noyes, Reich, Clancy, & O'Gorman, 1986). Equally studies have found that individuals with health anxiety rate their symptoms as more distressing and had poorer relations with their GP's (Barsky, Barnett, & Cleary, 1994; Deacon & Abromowitz, 2008; Hiller et al., 2005) than patients with panic disorder. Furthermore, with hypochondriasis/health anxiety perceived symptoms may not be the direct response of anxiety, for example, someone finding a lump, unlike panic disorder where symptoms directly arise from autonomic arousal (Williams, 2004).

**Health anxiety as an independent entity.** Overall it has been found that although health anxious individuals experience symptoms related to other anxiety disorders, these symptoms are less prominent compared to those with a primary diagnosis of an anxiety disorder (Deacon & Abramowitz, 2008). Additionally although individuals with anxiety disorders and health anxiety do not differ on measures of implicit and explicit anxiety, they are clearly distinguishable on measures of health anxiety (Weck, Bleichardt, Witthof, & Hiller, 2011).

To further distinguish health anxiety from other disorders a number of studies have

aimed to evaluate and explore comorbidity as a means to separate out independent presentations and closely related disorders. In a recent evaluation of co-morbdity in health anxiety the authors (Starcevic, 2013) identified that panic disorder and depression where more likely to be comorbid presentations with health anxiety than OCD and GAD, which indicated a distinction in symptom boundary and that health anxiety was a separate presentation from the other co-morbid anxiety states.

A more recent study also evaluated the relationship health anxiety has with other anxiety disorders and depression (Scarcella et al, 2016). The authors concluded that although there was evidence of comorbidity, a large proportion (, i.e. one third of the sample,) did not present with any axis one disorder, indicating that health anxiety is a distinct presentation that can exist in the absence of other disorders. Again like other reviews and analysis the authors further conclude that health anxiety should indeed be categorized as an independent anxiety disorder, with health anxiety now being the main term used in the majority of scientific literature (Veddegjærde, Sivertsen, Wilhelmsen, & Skogen, 2014).

**Prevalence rates and impact of health anxiety.** The prevalence rates of hypochondriasis based on diagnostic criteria have been shown to range from 0.8 -8.5% in clinical samples (Asmundson et al., 2001; Greeven et al., 2007). In a more recent epidemiological study (Weck, Richtberg, & Neng, 2014) investigating prevalence rates for health anxiety in a range of studies (N=55), the authors identified prevalence rates in the general population ranged from 2.1 to 13.1%. The consequences of health anxiety have been shown to negatively impinge upon daily living, employment and psychosocial functioning (Lucock & Morley, 1996; Noyes, et al., 1993; Robbins & Kirmayer, 1996; Sunderland, Newby, & Andrews, 2013) and are linked to overutilization of health care services, mental health services and associated financial costs (Lee, Creed, Ma, & Leung, 2015; Williams, 2004). Equally studies have indicated that although high health care utilization is common in this condition, people

with health anxiety have high levels of dissatisfaction with medical explanations and doctor's communications of symptoms (Creed, 2011). Further to this it has been found that individuals with health anxiety are not as frequent attenders to mental health services as individuals with other psychological disorders, where they could be better treated. However, they attended GP practises and specialist medical facilities much more than individuals with other mental health disorders, where they are less likely to be effectively treated (Bobevski, Clarke, & Meadows, 2016).

**Measuring health anxiety.** As health anxiety is considered a dimensional rather than a categorical construct (i.e. presence or absence of a diagnosis), a dimensional assessment is needed to accurately capture the occurrence and severity of this presentation. Self-report measures have been commonly used clinically and within research settings as a means to assess and screen health anxiety. Over the years there have been a range of different self-report measures developed to capture all aspects of health anxiety such as the Health Anxiety Inventory (HAI) (Salkovskis, Rimes, Warwick, & Clark, 2002), the Illness Attitude Scales (IAS) (Kellner, Abbott, Winslow, & Pathak, 1987) and the Whiteley Index (WI) (Pilowsky, 1967). A good measure of health anxiety is considered to be one that differentiates clinical from non-clinical participants (Noyes, Holt, Happel, Kathol, & Yagla, 1997), and is not contaminated by demographic factors associated with this disorder (Ferguson, 2000). One such measure is the Whiteley Index (Pilowsky, 1967), an internationally established health anxiety scale, and one of the most frequently used measures. The original version (Pilowsky, 1967) was developed from 20 dichotomous (yes/no) items given to 100 patients diagnosed as health anxious and non-health anxious patients. Analysis revealed 14 health anxious attitudes and concerns which substantially discriminated the two groups, and through exploratory principal component analysis three specific factors emerged: disease fear, disease conviction, and bodily preoccupation. A number of studies have replicated this with either two or three of

the subscales being extracted through factor analysis and all yielding acceptable to good levels of reliability (Asmundson, Carlton, Bovell, & Taylor, 2008; Hiller et al., 2002; Welch, Carleton, Asmundson, 2009). Further studies by Speckens et al. (1996) found that the Whiteley Index was effective in discriminating between hypochondriacal and non-hypochondriacal patients. A newer version of the Whiteley Index uses a five-point-response format (1 = "not at all" to 5 = "extremely"); it is considered to be a more appropriate measure of severity (Barsky, 1992; Welch, Carleton, & Asmundson, 2009) and is more relevant and empirically supports the idea of health anxiety being a continuum construct (Asmundson, Carleton, Bovell, & Taylor, 2008, Ferguson, 2009). Various studies have identified that scores of 40 or over on this instrument are indicative of clinical hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993); however, the means used to establish this lack definitive and robust criteria. The measure has shown good internal consistency in medical outpatients $\alpha$ =.80, general practice $\alpha$ =.78, and general population $\alpha$ =.76 (Speckens, et al., 1996). Equally test–retest reliability, convergent validity, and concurrent validity of the WI have all been good or excellent (Fink et al., 1999; Speckens, 2001; Stewart & Watt, 2000).

**Psychotherapeutic Models of Health Anxiety**

In line with the debate regarding dimensions and continuum constructs, a number of important psychotherapeutic models have been developed to conceptualise and treat health anxiety, such as the interpersonal model (Noyes, 1999), the somatosensory amplification model (Barsky, 1992; Barsky, Goodson, Lane, & Cleary, 1988; Barsky & Klerman, 1983), and the cognitive behavioural model (Salkovskis, 1996; Salkovskis & Warwick, 1986; Warwick & Salkovskis, 1990). Although differences exist in these models, there are many overlapping features; for example health anxious individuals display a selective bias and hypervigilance towards bodily sensations. They are preoccupied with somatic symptoms

which increases emotional arousal with its own set of somatic symptoms and there is a reciprocal relationship between cognitive, affective and behavioural characteristics. However, specific individual constructs and processes are given differential emphasis in each model to account for the development and maintenance of this disorder.

**Interpersonal Model and Neuroticism**

The personality trait of neuroticism or negative affectivity has been clinically and theoretically associated with hypochondriasis (e.g., Cox, Borger, Asmundson, & Taylor, 2000; Ferguson et al., 2000; Noyes et al., 1994; Vassend, Roysamb, & Nielsen, 2012) and is considered the strongest trait for predicting health anxiety symptoms (Noyes et al., 2003). According to interpersonal models of health anxiety (Noyes et al., 2003; Stuart & Noyes, 1999), insecure attachment styles are considered to be instrumental in the formation and maintenance of hypochondriasis, developed through poor parental care and childhood sickness (Craig et al., 1993). As a result of insecure attachment styles individuals overly focus on somatic symptoms and as a result seek out care from others. Unfortunately due to this attachment style the lack of appropriate reassurance or care can lead the individual to become withdrawn, alienated and worried, and thus in more need for reassurance (MacSwain et al., 2009; Noyes et al., 2003). A number of studies on health anxiety and attachment have found that these specific insecure attachment styles are positively associated with neuroticism and negative affectivity (Feeney & Ryan, 1994; Noyes et al 2003; Wearden, Lamberton, Crook, & Walsh, 2005; Wearden, Perryman, & Ward, 2006). Thus, highlighting the central role of neuroticism or negative affectivity in the experience of somatisation and health related anxiety (Costa & McCrae, 1985a; Vassend & Skrondal, 1999).

**Cognitive perceptual model and somatosensory amplification.**

Cognitive-perceptual theories (Barsky, 1992; Barsky, Goodson, Lane & Cleary, 1988; Barsky & Klerman, 1983; Barsky & Wyshak, 1990) conceptualise that individuals with health

anxiety have a tendency to enhance somatic feelings and sensations, and perceive these as powerful, toxic and disturbing, a construct described as "somatosensory amplification". The idea that individuals with health anxiety amplify physical sensations due to having a heightened sensitivity to bodily sensations means they are more able to detect bodily sensations than others. Alongside this hypervigilance and selective attention towards bodily symptoms, somatosensory amplification is characterised by a misinterpretation of symptoms and sensations being dangerous or indicative of serious illness (Barsky, 1992). Out of these components of somatosensory amplification studies have found that the catastrophic misinterpretation tends to be the process that is most significant in somatosensory amplification (Marcus et al., 2007). The construct of somatosensory amplification has been considered a mediator between perceived health concerns and health anxiety (Ferguson et al., 2000). In addition individuals with health anxiety tend to have higher levels of somatosensory amplification than healthy controls (Haenen, Schmidt, Schoenmakers, & van der Hout, 1997), but similar levels to individuals with panic disorder (Martinez, Belloch, & Botella, 1999).

**Cognitive behavioural model.** Similar to the somatosensory amplification model one of the most studied and supported theories regarding health anxiety stems from cognitive behavioural theories. Generally based on Beck's (1976) schema theory and specifically on established models of panic disorder (Clark, 1986), the main tenet of the CBT model of health anxiety posits that individuals have a tendency to catastrophically misinterpret bodily symptoms as a sign of untreated pathology (Salkovskis, 1989; Warwick & Salkovskis, 1990). When an individual experiences a critical incident (e.g., exposure to illness related information, change in bodily experiences), this can result in the activation of latent dysfunctional health related schemata based on past experiences (Warwick & Salkovskis, 1990). These specific beliefs tend to relate to themes regarding the likeliness and awfulness of illness, inadequacy of medical services and perceived inability to cope with illness

(Hadjistavropoulos et al., 2012; Salkovskis & Warwick, 2001). Once activated this leads to catastrophic misinterpretation of bodily symptoms as an indicator of the presence of illness (Marcus & Church, 2003); for example, “My headache must be a brain tumour”. Consequently health anxious individuals tend to experience high levels of anxiety and then selectively attend to bodily processes and negative illness related information (Barsky, Coeytaux, Sarnie, & Cleary, 1993; Lecci & Cohen, 2002; Owens, Asmundson, Hadjistavropoulos, & Owens, 2004) and engage in further catastrophising of minor bodily symptoms (Hadjistavropoulos, Hadjistavropoulos, & Quine, 2000; Rief, Hiller, & Margraf, 1998). This tendency to misinterpret information and symptoms in a personally threatening way can be further maintained by the employment of a confirmatory bias which leads the individual to continue to attend to cues that maintain these beliefs and thus increase anxiety (Salkovskis, 1996; Salkovskis & Clark, 1993).

The main behavioural factors which are conceptualised in the CBT model of health anxiety are phobic avoidance of situational cues (Taylor & Asmundson, 2004) excessive health related reassurance seeking and repetitive checking in the form of internet checking (Baumgartner & Hartmann, 2011); they are all employed as means of reducing anxiety. Those individuals who engage in excessive reassurance seeking often end up with conflicting information, and a disbelief in medical advice, which further maintains beliefs in illness being present. For example this may involve more frequent medical visits (Barsky, Ettner, Horsky, & Bates, 2001; Kellner, Abbot, Winslow, & Pathak, 1987) and beliefs that they warrant specialist medical attention (Conroy Smyth, Siriwardena, & Fernandes, 1999).

Although the CBT and somatosensory amplification models appear to propose the same cognitive appraisals as having a dominant role in the maintenance of health anxiety (i.e. the tendency to catastrophically misinterpret bodily symptoms), at present the CBT model is considered as having the most robust evidence for conceptualising and treating this disorder

(Clark et al., 1998; Nakao, Shinozaki, Ahern, & Barsky, 2011; Sorensen, et al., 2011; Warwick, et al., 1996; Taylor & Asmundson, 2004).

## Empirical Support for the Main Tenets of the CBT Model

### Catastrophic misinterpretations.

The idea that illness related information is catastrophically misinterpreted due to dysfunctional cognitions regarding illness and health (Salkovskis & Bass, 1997) is considered "the most important aspect of health anxiety" (Salkovskis, 1996; p69). A number of different studies have provided some level of evidence to suggest that individuals with high levels of health anxiety tend to catastrophically misinterpret symptoms more compared to those with low health anxiety, anxiety disorders, and healthy controls. Studies that have evaluated catastrophic misinterpretations have tended to do so through the use of ambiguous scenarios whereby individuals indicate an illness that the symptoms may relate to if they had them, or involve rating the likelihood of serious illness based on a set of symptoms. In an early study Hitchcock and Matthews (1992) using a specific symptom scenario measure, found that those individuals who scored higher on measures of health anxiety tended to misinterpret scenarios in a more catastrophic way than those low in health anxiety. In a similar study using a specific symptom scenario measure called Symptoms and Outcomes Scale (SOS), Marcus (1999) identified that individuals with higher levels of health anxiety tended to misinterpret negative scenarios in a more catastrophic way. Rief et al. (1998) identified that individuals with health anxiety made more catastrophic misinterpretations of bodily symptoms compared to a control condition. In another study by Haenan et al. (2000) the authors developed a measure called the Estimation of Negative Outcome Questionnaire (ENOQ), which provided both health and non-health related ambiguous scenarios for participants to evaluate. Individuals with elevated health anxiety tended to evaluate health

related scenarios as more likely to occur than those in a healthy control condition.

One major limitation in all these studies relates to the potential conceptual overlap of items on the measures of health anxiety and measures of catastrophic misinterpretation (Marcus, Gurley, Marchi, & Bauer, 2007). In addition, the majority of the measures used in these studies have tended to frame the scenarios as if they were happening to someone else , "If someone you know woke with symptoms of …." rather, than the individual themselves "If you woke up with symptoms of…..".

A number of studies have investigated whether individuals with health anxiety are more prone to catastrophically misinterpret bodily symptoms compared to individuals with other anxiety disorders. As catastrophic thinking is considered a transdiagnostic process across a range of psychiatric disorders (Gellatly & Beck, 2016), it could be assumed that both individuals with anxiety disorders or health anxiety would misinterpret symptoms. Weck, Neng, Richtberg and Strangier (2012) identified that individuals with health anxiety tended to catastrophically misinterpret bodily symptoms more than individuals with a range of anxiety disorders. In a further replication of this study Neng and Weck (2015) found that individuals with health anxiety tended to attribute somatic symptoms to severe and moderate diseases as opposed to mild diseases. In this study the health anxiety group also had a tendency to dismiss normalising explanations for diseases, compared to both anxiety disorder groups and health controls. One of the major limitations in both these studies was the high rate of comorbidity in the health anxiety sample with other anxiety disorders. Equally some of the individuals in the anxiety disorder group had panic disorder which shares some of the key features of health anxiety, in particular catastrophic misinterpretations of bodily symptoms.

As the majority of these studies are cross sectional in nature two studies have recently been carried out which explore whether catastrophic misinterpretations were in any way prospective predictors of health anxiety. One study identified that catastrophic

misinterpretations of bodily symptoms were shown to predict health anxiety symptoms over the period of a month (Gautreau, et al., 2014). A more extended study has established that catastrophic misinterpretations were significant prospective predictors of health anxiety (Woud et al., 2016). However, in this study other factors also emerged as equally significant predictors of health anxiety, such as general non-health related misinterpretations, thus questioning the specific role of general threat versus health related misinterpretations in prospectively predicting health anxiety.

**Triggers.** According to standard cognitive behavioural models of health anxiety, in particular Salkovskis and Warwick's (1986, 2001) model, illness related dysfunctional beliefs or schema are triggered by a variety of external events (e.g., news items, friend's illness) and internal bodily sensations (e.g., headaches, mouth ulcers). Evidence regarding the role of these triggers in health anxiety appears scant and inconclusive. In one experimental study individuals who were primed with illness related information displayed more interference on a modified Stroop for illness related words (Lecci & Cohen, 2002); however, the same effect was not observed in a similar previous study (Marcus, 1999). In a systematic review looking at cognitive variables in health anxiety and hypochondriasis little evidence was found for this component of the model (Marcus, et al., 2007), with not enough studies present to warrant its inclusion in the review.

**Dysfunctional assumptions.** According to the CBT model, catastrophic misinterpretations of bodily symptoms occur when dysfunctional assumptions are activated by internal or external health related material. Health anxiety related dysfunctional beliefs have been the subject of a range of studies that have accrued a strong evidence base for their presence. The thematic content of these beliefs varies across studies and includes the severity and occurrence of perceived illness (Marcus & Church, 2003), and all or nothing thinking (Marcus, et al., 2007), fatalistic and cynical beliefs about the ability to prevent illness,

treatment compliance, and believability of medical reassurance (Fulton, Marcus & Merkey, 2011). Salkovskis and Warwick's (1986) cognitive model has implicated four different dysfunctional beliefs as being pivotal to the maintenance of health anxiety. These particular beliefs have been labelled "the likelihood of contracting or having an illness," "the awfulness of illness," "the inability to cope with illness," and "the inadequacy of medical services for treating illness" (Salkovskis & Warwick, 2001). According to the cognitive theory, it is these particular dysfunctional assumptions that are responsible for leading the health anxious individual to catastrophise bodily symptoms. A few recent studies have identified that these specific dysfunctional assumptions are implicated in health anxiety. Hadjistavropoulos et al. (2012) studied whether these specific beliefs significantly predicted health anxiety in a sample of non-medical and medical patients. Regression analysis revealed that in the non-medical sample two dysfunctional assumptions predicted health anxiety, i.e. "Difficulty Coping" and "Likelihood of Illness". In the self-reported medical sample three of the four assumptions predicted health anxiety, the only exclusion being "Difficulty Coping with Illness". In a further cross sectional study Fergus (2014) identified that these four dysfunctional beliefs were more strongly associated with health anxiety than OCD.

Although these studies indicate that these specific dysfunctional beliefs have an association with health anxiety, there have been no prospective studies aimed at investigating their casual role in the development of health anxiety. So to date, although theoretically posited as a developmental variable little is empirically known about these particular beliefs.

**Attentional bias.** Another variable present in cognitive behavioural models of health anxiety and hypochondriasis is when individuals continue to selectively attend to bodily processes (internal) and negative illness related information (external) (e.g., Barsky et al., 1993; Lecci & Cohen, 2002; Marcus et al., 2007; Owens et al., 2004). Based on the theoretical underpinnings of schema therapy for anxiety disorders (Beck & Clark, 1997),

once an individual's health or illness related beliefs are activated by an internal or external trigger, a confirmatory bias leads them to selectively attend to information that supports the illness related beliefs and disregard information that contradicts the information (Barsky et al., 2001). Although the concept of dysfunctional illness beliefs guiding attention has been supported by evidence theoretically, experimentally the evidence has been mixed and inconclusive.

In one study where individual's schemas had been activated, participants did not show any attentional bias towards threat related words (Williams, et al., 2003). In experiments in which schemata activation did not occur, attentional biases to health related threats were observed (Karademas et al., 2008). In a study using a visual dot probe paradigm authors found no evidence of attentional threat bias to health threat cues in individuals with high levels of health anxiety compared to those with low levels of health anxiety (Lees, Mogg, & Bradley, 2004). In another study utilising the dot probe, cognitive symptoms as espoused by CT models of health anxiety did not predict attentional bias towards personally relevant threat related words (Lee, Ma, & Tsang, 2012). In a recent study Shields and Murphy (2011) found no difference in information processing of health illness related words and healthy related words on a dot probe test between high and low health anxious individuals, even after priming had occurred. Furthermore, this study identified that health concerns are applicable to all participants regardless of health anxiety levels. Other experimental studies have identified that selectively attending to threat related material was transient rather than stable and therefore at odds with a key construct of CBT theory (Whitthoft, Rist, & Bailer, 2008).

**Efficacy of CBT Treatment for Health Anxiety.**

Many studies have shown promise regarding the effectiveness of cognitive behavioural therapy for treating health anxiety ( e.g. Barsky & Ahern, 2004; Clark et al., 1998; Greeven et al., 2007; Hedman et al., 2011; Rief, Hiller, & Magraf, 1998; Thomson &

Page, 2007; Visser & Bouman, 2001; Warwick, Clark, Cobb, & Salkovskis, 1996; Warwick & Salkovskis, 1990). In a number of these trials different therapies were used although all fall under the umbrella of cognitive and behavioural therapies, i.e. CBT (Barsky, 2004; Greeven, et al., 2004; Warwick, 1996), Cognitive therapy (Clark et al., 1998;Visser & Bouman, 2001), Psychoeducation/internet CBT (Bouman & Visser 1998; Buwalda et al., 2008; Hedman, et al., 2011), Behaviour therapy (Visser & Bouman, 2001), CBT with mindfulness (Sørensen et al., 2011), and Mindfulness Based CBT ( McManus, Surawy, Muse, Vazques-Montes, & Williams, 2012 ). Although this looks promising, a recent systematic review revealed that recovery rates from hypochondriasis were between 30% and 50% (olde Hartman et al., 2009). Some authors have concluded that CBT has failed to demonstrate the same levels of treatment superiority seen in other anxiety disorders (McManus, Grey, & Shafran, 2008) and superior efficacy over non-specific therapies (Thomson & Page, 2007). In the latter, a Cochrane review (Thompson & Page, 2007) the authors found non-specific treatments not aimed at treating hypochondriasis, yielded better results than waiting lists and similar results to CBT treatments at 12-month-follow up (e.g., Clark et al., 1998). In addition, studies comparing two different CBT based treatments produced no real difference in outcome (Bouman & Visser, 1998; CT vs. ERP; Buwalda, et al., 2008: CBT vs. Problem Solving). Although change was measured using validated tools, the variety of those used made it difficult to compare effect sizes between the different therapies and interventions (Thomson & Page, 2007).

In a more recent meta-analysis there was substantial evidence to suggest that CBT was superior to all waitlist control conditions (Olatunji, et al., 2014). However, one notable finding in the study was that overall effects sizes of the pooled samples showed that CBT resulted in a high effect size post treatment (hedges g=.95) but this reduced to a much smaller effect size at follow up (hedges g=.35). This finding on its own appears to indicate that CBT

(e.g., CBT, CT, Exposure Therapy) may not have long lasting effects on health anxiety. Further in this study and consistent with Thomson and Page, (2007), the actual effect sizes between CBT and wait list control was stronger (hedges g=1.12) compared to CBT vs treatment as usual, i.e. non-specific therapies (hedges g= 0.46). The modest effect sizes between treatment as usual and CBT could be due to non-specific factors that cross both these interventions. Within this meta-analysis a dose-response effect was found in that the more sessions the patients had the higher the effect sizes, with the top range being 17 sessions. In fact this appears to be a trend in other studies which show that CBT for health anxiety tends to be associated with a high number of sessions. For example, in a recent treatment study patients received an initial 19 sessions, with 73.8% receiving a mean total of 17.97 additional sessions post treatment (range 2-62) (Weck, Gropalis, Hiller, & Bleichhardt, 2015)

Furthermore it is unclear in CBT trials which specific elements are responsible for treatment effects, raising questions about the content validity of the CBT interventions used. Across all CBT studies for health anxiety a range of cognitive and behavioural interventions have been used as part of the treatment protocol, such as relaxation training, exposure, exposure and response prevention, mindfulness, cognitive restructuring, etc. (Bouman, 2014). Not only does this limit conclusions being drawn concerning which specific intervention is effective, it can create theoretical confusion when two interventions are applied in the same protocol. For example, cognitive restructuring has been considered an effective intervention in reducing health anxious symptoms (Barksy & Ahern, 2004; Warwick et al, 1998), and in a recent study CBT, incorporating mindfulness has demonstrated equally positive findings (Sørensen et al., 2011). By including an additional element such as mindfulness to standard CBT it obscures which ingredient is active in bringing about therapeutic change, particularly when schema based approaches actively challenge thoughts and mindfulness approaches

actively discourage this (Segal, Teasdale & Williams, 2002; Teasdale et al., 2000; Lovas & Barsky, 2010). Overall it appears that CBT may have some effect in reducing health anxiety symptoms in some patients who suffer with this disorder (Bouman, 2014). However, all other comparative interventions seem to have beneficial effects, raising the question whether CBT actually has a specific active ingredient over and above non-specific treatment effects, as no active treatment ingredients have been reliably demonstrated (Bouman, 2014).

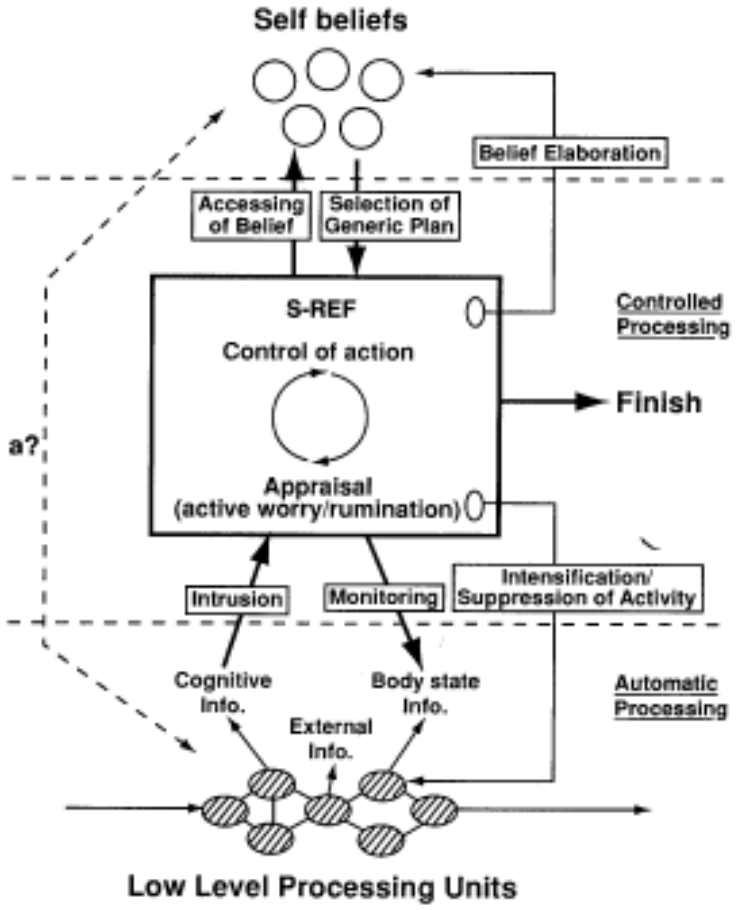
In particular, both the personality trait of neuroticism (Ormel, Rosmalen, & Farmer, 2004) and the content of cognition, i.e. cognitive appraisals (e.g., Beck 1976; Beck, Emery & Greenberg, 1985), have been given a central role for conceptualising and treating psychopathology in general and hypochondriasis specifically. Within psychological therapy there has been an explanatory paradigm shift towards attributing the development and persistence of disorder to the very cognitions that control and modify such content, i.e. metacognitions (Wells, 2002), and a call for this construct to be explored specifically in relation to health anxiety (Bouman, 2014).

**The Self-Regulatory Executive Function (S-REF) Model of Psychological Disorder: Theory and Practice.**

The paradigm shift towards exploring the factors that control cognition in psychopathology can be traced to the work of Wells and Matthews (1994), and their Self-Regulatory Executive Function (S-REF) model. The S-REF model of emotional disorder offers an alternative model in explaining and treating psychological disorder to traditional schema theories. The S-REF model (Wells & Mathews, 1994) is a “multi layered” cognitive architecture based upon three differentiated but interrelated processing levels, i.e. low level processing, on-line controlled processing and a level of stored knowledge and beliefs. Processing at the lower level relates to a more reflexive and unconscious activity that tends to be activated by specific internal (i.e. cognitive and body state), and external stimuli; however,

it can also be influenced by top down executive control. The 'on-line' strategic level is considered the important configuration in psychological disorder and it performs a self-regulatory executive function (S-REF). This processing aims at evaluating lower level inputs such as bodily states and external stimuli, as well as operating as a metacognitive process in appraising the significance of cognition, as a means of guiding cognition towards self-regulatory threat reduction (Wells & Mathews, 1994). This level is capacity limited and relies upon volitional attentional allocation for execution. At this level appraisals are aimed at evaluating discrepancies between current state and desired state and subsequent coping strategies are evaluated and selected. The processing at the S-REF level is guided by higher level self-relevant knowledge, this knowledge base consists of two types self-beliefs: declarative beliefs that influence the S-REF appraisals and procedural beliefs which guide the allocation of S-REF strategies. However, it has been argued that knowledge may be purely procedural in nature and these specific declarative beliefs are either a trigger for or output of this proceduralised processing (Wells & Mathews, 1994, 1996). Wells and Matthews argue that much of the knowledge on which processing draws is metacognitive in nature and involves procedures or plans for guiding cognition. Overall information processing is marked by a continuous and dynamic interplay between these three levels. For example, in the case of reducing self-discrepancies dynamic interplay exists between biasing lower level processing and S-REF activity so that these discrepancies can be rectified and the interplay can cease.

**Figure1: The S-REF Model (Reproduced with permission from Author; Wells 2000).**




**The Cognitive Attentional Syndrome (CAS)**

In the S-REF model it is proposed that psychological distress is linked to a particular style of processing that is activated and maintained in on-line processing. This style is called the cognitive attentional syndrome (CAS). The syndrome consists of perseverative thinking in the form of worry and rumination, maladaptive coping behaviours (e.g., avoidance), a heightened attentional focus on threat and counterproductive thought control strategies (Wells, 2009). The theory states that the CAS is driven and guided by metacognitive beliefs

which are both positive and negative in nature (Wells, 2002).

**Worry/Rumination.** Maladaptive processes, such as worry and/or rumination, serve the purpose of avoiding/dealing with danger or finding answers to one's problems, and usually take the form of "what if " or "why" type questions. Unfortunately this style of thinking can become problematic for the individual because it maintains preoccupation with threat or processes that reinforce and strengthen dysfunctional knowledge. It also maintains and reinforces emotional states and reduces cognitive flexibility for attentional control to be passed to lower level processing when habituation and emotional processing can occur (Wells & Mathews, 1994; 1996). Due to their habitual nature these processes operate outside of awareness and often become unregulated, which heightens a sense of uncontrollability and hopelessness (Wells, 2009). Strong evidence exists for both worry and rumination playing a role in a variety of emotional disorders (Mathews & Wells, 2004; Mellings & Alden, 2000; Nolen Hoeksama, 2000, 2004; Wells & Papageorgiou, 1995).

**Attentional Threat Monitoring.** Attentional threat monitoring involves the direction of attention towards sources of internal/ external threat or negative information as a voluntary strategy to eliminate threat or increase control (Wells & Mathews, 1994). This process is counterproductive because it keeps the individual in a hypersensitive state of threat detection, which increases awareness and reinforces negative thinking, and magnifies perception of subjective danger (Wells & Mathews, 1994), thus increasing intrusive thoughts. The focus of threat will differ depending upon disorder for example, with PTSD being more associated with external threat and panic disorder more associated with internal threat.

**Thought Control and Maladaptive Behaviours.** Maladaptive metacognitive coping strategies, such as thought suppression, has been implicated in various anxiety disorders (see Arbramowitz et al., 2001, for a review) as a means of controlling unwanted negative thoughts and intrusions. Of the various strategies employed to achieve suppression the two categories

worry and punishment have been found to be closely associated with vulnerability to psychopathology (Amir, Cashman, & Foa, 1997; Borkovec & Inz, 1990; Holeva, Tarrier, & Wells, 2001; Roussis & Wells, 2006 & Wells & Davies, 1994; Wells 1997**)**.

Maladaptive behaviours in particular avoidance and reassurance seeking, also form part of the CAS which are purported to prevent disconfirmation that thinking is controllable, emotions are not dangerous and that the individual can cope in real situation (Wells, 2009).

**Metacognition.** The S-REF model proposes that the strategic processing that occurs as part of the CAS is guided by metacognitions that are stored in long term memory. Metacognitive knowledge (Wells, 2000) refers to specific knowledge that individuals hold about their own thinking; for example, how it works, what they perceive their thoughts to mean, etc. Metacognitive knowledge can exist in an explicit verbally expressible form, such as in depression when individuals believe that ruminatory thinking is uncontrollable or in generalised anxiety disorder when individuals believe that worry is dangerous. Other forms of metacognitive knowledge exist in a more implicit form that is less verbally accessible and can relate to attentional allocation and memory retrieval. These tactical plans can be marked by particular metacognitive beliefs that influence thinking styles, such as "If I worry I will not be caught off guard" or "If I think about all the bad things that might happen I will be prepared" (Wells, 2005).

The metacognitive beliefs considered most important in metacognitive therapy are conceptualised as positive and negative in nature. Although content may differ in relation to disorder, they can explain almost all psychopathology (Wells, 2000). Positive metacognitive beliefs concern the usefulness of perseverative thinking, threat monitoring and coping behaviours; for example, "worry will help me prepare" or "rumination will help me find an answer to why I am depressed"(Wells, 2000). Negative metacognitive beliefs lead to a perceived over significance of negative and threat related interpretations of mental

phenomenon and/or emotional states. Two main themes in negative metacognitive beliefs include danger and uncontrollability; for example “Worry is dangerous and will send me mad” or “I cannot control my depressive thoughts” (Wells, 1999).

**Measurement of Metacognition.** At present there is substantial evidence of the role of metacognition in psychological disorders, such as OCD (e.g., Gwilliam et al., 2004), GAD (e.g., Khawaja & McMahon, 2011; Wells & Carter, 1999, 2001), PTSD (Bennett & Wells, 2010) and depression (e.g., Papageorgiou & Wells, 2009). In the majority of studies where metacognitions were measured as predictor of psychological disorders the Metacognitions Questionnaire (MCQ: Cartwright-Hatton & Wells, 1997) or the shortened more popular Metacognitions Questionnaire-30 (MCQ-30: Wells & Cartwright-Hatton, 2004), have been used. The MCQ was developed as a measure of generic metacognitive beliefs. The measure consists of five distinct subscales which measure cognitive confidence (evaluates confidence in memory and attention), e.g., (“I have little confidence in my memory for words and names), positive beliefs about worry (,e.g., “Worrying helps me cope”), cognitive self-consciousness (the propensity to focus on thought processes; e.g., “I am constantly aware of my thinking”), negative beliefs about uncontrollability of thoughts and danger (, e.g. “My worrying could make me go mad”), and beliefs about the need to control thoughts, (e.g. “I will be punished for not controlling certain thoughts”). Items are rated on a 4-point Likert scale from 1 (“do not agree”) to 4 (“agree very much”). For each subscale, six items are scored 1–4, with a minimum score of 6 and a maximum score of 24. The MCQ-30 is a well validated measure and has demonstrated good internal consistency, convergent and divergent validity (e.g., Cook et al., 2015; Myers & Wells, 2005; Wells & Cartwright-Hatton, 2004).

## Evidence for Metacognitive Beliefs

There has been a substantial body of evidence developed over the past 20 years to

support the notion that metacognitive beliefs play a significant role in the development and maintenance of psychological disorder (e.g., Ruscio & Borkovec, 2004; Sarisoy et al., 2014; Spada, Georgiou, & Wells, 2010; Wells & Carter, 2001;Wells & Cartwright-Hatton, 2004). In addition metacognition has been shown to predict symptoms more strongly than cognition across a range of psychological disorders.

In one study (Gwilliam, Wells, & Cartwright-Hatton, 2004) the authors identified that the relationship between the cognitive variable "inflated responsibility" and OCD is dependent upon metacognitive beliefs. Equally when metacognitive beliefs were controlled in the study, inflated responsibility did not emerge as a significant predictor of OCD symptoms. In a clinical study investigating which construct was important in OCD symptom change after treatment with exposure and response prevention, Solem et al. (2009) found that metacognition was a significant predictor of OCD symptom change. Interestingly, when the overlap between predictors such as cognition ("inflated responsibility"), perfectionism, and metacognitive beliefs were controlled, only metacognitive beliefs emerged as a significant predictor of post treatment change in OCD symptoms. Further to this a study conducted by Sassaroli et al. (2015) aimed to evaluate the relationship between the cognitive construct of "inflated responsibility", metacognitive beliefs and OCD. Using a mediation model the authors found that the relationship between inflated responsibility and OCD was fully mediated by the metacognitive belief "need to control thinking". In essence the relationship between inflated responsibility and OCD is non-significant when metacognitive beliefs are included in the model, a finding that challenges the dominance of cognitive content as espoused by cognitive theories of OCD (Salkovskis, 1985).

In the case of generalised anxiety Wells and Carter (1999) identified that metacognitive beliefs were stronger predictors of generalised anxiety disorder and independent of cognitions in the ordinary domain, i.e. the content of worry, and trait anxiety.

In a study identifying whether metacognitive beliefs or the cognitive construct of "intolerance of uncertainty" predicted generalised anxiety disorder, Khawaja and McMahon (2011) found that metacognitive beliefs were the stronger predictor of this disorder. They also found that metacognitive beliefs were stronger significant predictors of OCD and depression symptoms than intolerance of uncertainty.

In PTSD, Bennett and Wells (2010) identified that metacognitive beliefs predicted PTSD symptoms over and above associated cognitive variables, such as memory disorganization. In this study when metacognitions were controlled, memory disorganisation did not emerge as a significant predictor of PTSD. In the case of depression, Yilmaz, Gencoz and Wells (2015) found that metacognitive beliefs explained additional variance in depression when controlling for dysfunctional schemata. Additionally metacognitive beliefs significantly predicted depressive symptoms, whereas dysfunctional schemata did not.

Thus, metacognitive beliefs as predicted by the Wells and Matthews's model may play a role, but all these particular studies were cross sectional in nature. A number of studies have also identified that metacognitive beliefs are predictive of disorder prospectively. In the case of anxiety, Hjemdal, Stiles and Wells (2013) predicted future symptoms of anxiety when compared to negative automatic thoughts, indicating metacognitive beliefs are stronger prospective predictors of anxiety than ordinary cognition. In the case of OCD, Myers, Fisher and Wells (2009) completed a longitudinal study examining prospective predictors of OCD, including cognitive beliefs, such as perfectionism, responsibility, over-estimation of threat and metacognitive beliefs, in particular fusion-based metabeliefs. They found that the only significant predictor of OCD symptoms were metacognitive beliefs, with all cognitive variables failing to emerge as significant predictors of OCD symptoms.

Overall it appears that at both a cross-sectional and longitudinal level metacognitive beliefs may be important variables in psychological disorder and appear to explain variance

and emerge as independent significant predictors of disorder above cognition. Theoretically, these findings correspond with the main tenet of S-REF model which postulates that what is important in psychological disorder is not the content of cognition but the beliefs that control cognition, i.e. metacognitive beliefs.

**Evidence for Metacognitive Therapy.**

Metacognitive therapy which aims to target metacognitive beliefs and processes has been applied to a range of psychological disorders with promising results when compared to waitlist control groups and other forms of therapy. However, there are few studies of this approach applied to treating health anxiety. A brief review of wider studies follows.

In the case of generalised anxiety disorder a number of studies have indicated effectiveness. In a small open trial consisting of ten consecutive patients, Wells and King (2006) found that MCT was effective at reducing GAD symptoms at post treatment and at 6 and 12 month follow. In a small randomised control trial comparing MCT with applied relaxation (AR) in the treatment of GAD, Wells et al. (2010) found that MCT was superior to applied relaxation. This was found to be the case at post treatment, 6 month and 12 month follow up, with post treatment effects on the Penn State Worry Questionnaire (PSWQ) (Cohens d = MCT 3.41 vs AR 0.95). Equally 80% of patients in the MCT arm of the trial met recovery status, whereas only 10% in the AR condition recovered. In a larger trial, independent of the therapy's developers (van der Heiden, Muris, & van der Molen, 2012), MCT was compared to a CBT based treatment for GAD which specifically targets the construct intolerance of uncertainty. In this trial patients (N=126) diagnosed with GAD were randomly allocated to MCT, CBT or a delayed treatment. Results indicated that MCT produced significantly higher effect sizes than CBT on measures of GAD, trait anxiety, general psychopathology and depression. Equally 91% of participants made clinically significant changes compared to 80% in the CBT group. In a separate 30 month follow up

study (van der Heiden, et al., 2012**),** the authors found that MCT still maintained better statistical and clinical changes than the CBT group.

A multiple base-line systematic case series examined the effectiveness of MCT in the treatment of depression (Wells et al., 2009). In this study four participants with recurring major depressive disorder received 6-8 sessions of MCT. All participants at the end of therapy met recovery status and three out of the four (75%) met recovery status at 6-month-follow up. In a replication of this study in a Danish sample, Callesen, Jensen and Wells (2013) found similar results with 75% meeting recovery at post-treatment and 100% at six month follow up. In a randomised controlled trial conducted independently of the developers, MCT was compared to CBT in the treatment of major depressive disorder (Jordan et al., 2014). In this study both treatments were effective in the treatment of depression with no significant differences in effects sizes (both groups d=1.03). However, in the MCT arm of the trial there was a disproportionately higher percentage of co-morbidity compared to the CBT group (e.g., Social anxiety, MCT 48% vs. CBT 28%), which may have had an impact on overall results. In a further study (Groves et al., 2015), based upon this trial the authors explored changes in neuropsychological functioning after both treatments. At four weeks there was no group differences in aspects of executive functioning, in particular working memory and attention. However, at post treatment MCT was superior to CBT in neuropsychological functioning, indicating a change in the constructs that MCT purports to target, i.e. attentional flexibility.

In OCD, an initial systematic case series demonstrated promise in treatment of this disorder (Fisher & Wells, 2008). After treatment four patients met recovery criteria (Jacobson & Truax, 1991), at six month follow up one patient's details were not available, but two out of the remaining three still met recovery criteria. In a recent pilot study (van der Heiden et al, 2016), 25 consecutively referred patients received up to 15 sessions of MCT. At post

treatment 74% of patients met recovery criteria and 80% at follow up, with very large effect sizes on measures of OCD, d= 2.54 & d=2.69, respectively. The recovery rates reported in this study are at least comparable to those found in studies using what is considered the "bona fide" treatment for OCD, Exposure and Response Prevention (ERP) (Fisher & Wells, 2005). However, in this study more patients were deemed to be asymptomatic than in previous studies (van der Heiden, 2016).

Studies in the treatment of PTSD have demonstrated MCT as an effective treatment. In an initial systematic case series, Wells and Sembi (2004) treated six consecutive patients, and followed up at 3, 6, 18 and 41 months. All patients demonstrated significant reductions on all measures of PTSD, and maintained these at follow up points. Although a small sample, the effect sizes in this study were extremely high, ranging from d= 3.0 to 5.0. In an open trial MCT demonstrated effectiveness in the treatment of PTSD. Eleven patients completed treatment and at the end of therapy 90 % met Jacobson and Truax's (1991) recovery criteria. At post treatment 89% also met either met recovery or were reliably improved. The mean number of sessions completed was 8.5, which is considerably brief considering the seriousness of the psychological disorder. In a preliminary controlled trial MCT was compared to a waitlist control group. At post treatment the MCT group showed statistically significant reductions in measures of PTSD, depression and anxiety, whereas the control group did not. At post treatment 70% of patients in the MCT group met recovery criteria at post treatment and 80% at follow up. The between post treatment effect sizes between the two groups, ranged from d=1.2 to d=2.4. Replicating but improving on the previous study, the average number of sessions was 6.4. In a comparative randomised control trial MCT was tested against prolonged exposure (PPE), a standard treatment for PTSD, and a waitlist control (Wells, et al. 2015). MCT showed superiority to prolonged exposure (PE) in magnitude of effect sizes on measures of PTSD (MCT d= 4.52 vs d= PE 1.34), depression

(MCT d= 1.73 vs d= PE 1.01), anxiety (MCT d= 2.18 vs PE d = 1.19) and heart rate (MCT d= 2.37 vs PE d= .69). Again average number of sessions in this study mirrors those in previous studies, (i.e. 8.)

A recent meta-analysis has evaluated how effective MCT is in treating anxiety and depression (Normann, Emmerik, & Morina, 2014). Evaluating 16 published and unpublished studies the authors found aggregated within group effect sizes from pre to post treatment were, g = 2.00, 95% CI (1.61–2.38), P < .001. Additionally the effect sizes from post treatment to follow up were largely maintained with an aggregated effect size of *g* = 1.68, 95% CI (1.37–1.94), *P* <.001. In the between group analysis which compared MCT with a waitlist control and MCT with CBT, large and significant differences favouring MCT were found. In the waitlist comparison the effect size was g= 1.81, 95% CI (1.26–2.36) and compared to CBT the effect size was *g*= 0.97, 95% CI (0.59–1.35), overall indicating MCT to be superior to both waitlist control and CBT. Mechanisms of change were also evaluated in this analysis and in line with metacognitive theory, there were changes in metacognition with large effect sizes at post treatment (g = 1.18) and follow-up (g = 1.31). Within the analysis the overall session length was 10.71 (SD = 2.06).

## The Metacognitive Model in Health Anxiety

The S-REF model of vulnerability to emotional dysfunction has been implicated in a variety of psychological disorders, and there is some emerging evidence of its applicability to health anxiety. However, so far there has not been a systematic test of the model in this respect. In the next section the data that currently exist will be reviewed

**Metacognition and health anxiety.** In relation to health anxiety preliminary studies have shown that specific metacognitive beliefs appear to be positively associated and predictive of this disorder. Bouman and Meijer (1999) identified a positive association between hypochondriasis (as measured by the Whiteley Index: WI (Pilowsky 1967), and

metacognition (as measured by the Metacognition Questionnaire: MCQ (Cartwright-Hatton & Wells, 1997) i.e. MCQ total score and two MCQ dimensions: “negative metacognitive beliefs about uncontrollability and danger” (r=0.42), and “beliefs about thought control incorporating themes of superstition punishment and responsibility” (r=0.52). Additionally exploratory analysis revealed the MCQ subscale of “cognitive self-consciousness” to be a significant predictor of hypochondriasis. This was alongside ‘uncontrollability and interference of illness thoughts', a subscale from a metacognitive measure: The Meta-Cognitions about Health Anxiety: MCHA (Bouman & Meijer, 1999). Although the MCHA claims to measure all aspects of metacognitive beliefs related to health anxiety, no specific evaluation of this particular measure has been completed, as a result the psychometric properties have not been established.

In another study (Kaur, Butow, & Thewes, 2011) the authors discovered that the MCHA total correlated positively with the Whitley index (r =0.32). Additionally all subscales of the MCQ-30 had positive associations with the same measure of health anxiety; positive beliefs about worry (r=0.45), negative beliefs about worry concerning uncontrollability and danger, (r=0.61), cognitive confidence, (r=0.35), beliefs about the need to control thoughts, (r=0.40) and cognitive self-consciousness, (r=0.34).

Only one study has used a specific aspect of metacognitive therapy to treat health anxiety through targeting metacognitions. Using the attention training technique (ATT) as a standalone intervention, Papageoriou and Wells (1998) used this procedure to treat three patients diagnosed with DSM- IV (APA, 1994) hypochondriasis. ATT is proposed to work by strengthening an individual’s attentional flexibility as a means of interrupting the CAS and thus strengthening metacognitive plans for cognitive control (Wells, 2009). In this A-B-A case series all patients reached clinical significant changes on measures of cognition, behavioural responses (e.g., reassurance seeking), affect and bodily focused attention, at post

treatment and six month follow up. Additionally none of the patients met the diagnostic criteria for hypochondriasis post treatment and at follow up.

## Aims of Current Thesis

Given the paucity of research applying the metacognitive model to health anxiety, and the limitations in the CBT model, the present thesis reports a series of studies that aimed to test the model in this context. By researching the role of metacognition in health anxiety and its application clinically it may have important implications for both the understanding and treatment of this disorder. The first aim was to build upon preliminary research (Bouman & Meijer, 1999; Kaur, et., 2011) and evaluate the association between health anxiety and metacognition. Additionally, we aimed to establish if there was a significant positive correlation with health anxiety, whether this remained significant after controlling for variables normally associated with health anxiety (i.e., neuroticism, somatosensory amplification, and illness cognition).

To further develop the measurement of health anxiety related metacognitions the second aim of the thesis was to develop a specific psychometric measure that captures all aspects of metacognitive beliefs proposed by the metacognitive model. This measure was developed and evaluated using a systematic approach that involves screening items using principal components analysis, scrutinising items using exploratory components analysis, and a detailed examination of the factor structure using confirmatory factor analysis. Evaluation of both reliability and validity was also undertaken.

As a third aim, the role of metacognition in health anxiety was investigated further by evaluating key tenets of the metacognitive model versus the cognitive model. In particular we aimed to explore whether metacognitive beliefs emerged as more important predictors of health anxiety than dysfunctional beliefs (schemas) as espoused by cognitive models.

A fourth aim of the thesis was to examine whether the relationship between

catastrophic misinterpretation and health anxiety is dependent upon metacognitive beliefs. Additionally we aimed explore whether the interaction between catastrophic misinterpretation and metacognition might determine levels of health anxiety.

Our fifth aim was to build upon all the previous aims in the thesis but this time employ a longitudinal design to explore the potential causal relationship between metacognition and health anxiety.

If metacognitive beliefs are important in the development and maintenance of health anxiety, the final aim of the thesis was to investigate whether targeting these beliefs clinically would help reduce the symptoms of health anxiety. This study would be the first of its kind to show that specifically targeting metacognitions via a full MCT treatment protocol associated with reduction in health anxiety.

Overall the studies in this thesis will aim to evaluate only one component of the S-REF model, that is, metacognitive beliefs. As these beliefs are considered relevant to all psychological disorders, this aspect of the model may be important in health anxiety.

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# Chapter 2:

# Does Metacognition Make a Unique Contribution to Health Anxiety When Controlling for Neuroticism, Illness Cognition, and Somatosensory Amplification?

**Robin Bailey**

**Adrian Wells**

**Published in the Journal of Cognitive Psychotherapy.**

**Does Metacognition Make a Unique Contribution to Health Anxiety When Controlling for Neuroticism, Illness Cognition, and Somatosensory Amplification?**


Abstract

Somatosensory amplification (e.g., Barsky, 1992), illness cognition (e.g., Salkovskis & Warwick, 1986), and neuroticism (e.g., Noyes et al., 2003) have all been linked to health anxiety. The first two factors are disorder specific; however, neuroticism is a general vulnerability connected to a range of disorders. In the metacognitive model (Wells, 2009), beliefs about thinking have been implicated in the development of psychopathologies, but little is known about the contribution of individual differences in metacognition to health anxiety, specifically. A cross-sectional design was employed with convenience sampling used for participant selection. Participants (N 5 351) completed a questionnaire battery and the following hypotheses were tested: (a) metacognition would show a significant positive correlation with health anxiety and (b) the relationship between metacognition and health anxiety will remain significant after controlling for variables normally associated with health anxiety (i.e., neuroticism, somatosensory amplification, and illness cognition). Hierarchical multiple regression analyses were run to test hypotheses and determine the best independent metacognitive predictors. The results supported each of the hypotheses and revealed three independent metacognitive predictors of health anxiety: “negative metacognitive beliefs about uncontrollability and danger,” “beliefs about the need for thought control,” and “cognitive confidence.” Overall, this study indicates that metacognition may have an important role in health anxiety, and the clinical implications are discussed.

Keywords: health anxiety; metacognition; illness cognition; neuroticism; somatosensory amplification

## Introduction

Hypochondriasis has historically been categorized as a somatoform disorder in the Diagnostic and Statistical Manual of Mental Disorder (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association [APA], 2000). It is defined as "the preoccupation with the fear of having, or the idea that one has, a serious disease based on the person's misinterpretation of bodily symptoms or bodily functions" (p. 445). However, various studies Cognitive-perceptual theories (e.g., Barsky, 1992; Barsky & Wyshak, 1990) propose that individuals with health anxiety have a tendency to enhance somatic feelings and sensations and perceive these as powerful, toxic, and disturbing, a construct described as "somatosensory amplification." Alongside hypervigilance and selective attention toward bodily symptoms, somatosensory amplification is characterized by a misinterpretation of symptoms and sensations as being dangerous or indicative of serious illness (Barsky, 1992). The construct of somatosensory amplification has been considered a mediator between perceived health concerns and health anxiety (Ferguson et al., 2000).

Cognitive models of health anxiety propose that cognitive appraisal is significantly involved in the development and maintenance of this condition (Salkovskis & Warwick, 1986; Warwick & Salkovskis, 1990). The idea that illness-related information is catastrophically misinterpreted because of dysfunctional cognitions regarding illness and health is considered "the most important aspect of health anxiety" (Salkovskis, 1996, p. 69). Empirical evidence exists that individuals with health anxiety hold dysfunctional illness related beliefs, with much of the research focusing on the cognitive content that distinguishes health anxious

individuals from the non-health anxious (e.g., Marcus, 1999; Marcus & Church, 2003; Rief, Hiller, & Margraf, 1998; Salkovskis & Warwick, 1986).

Although both the personality trait of neuroticism (Ormel, Rosmalen, & Farmer, 2004) and the content of cognition that is, cognitive appraisals (e.g., Beck, 1976; Beck, Emery, & Greenberg, 1985) have been given a central role for conceptualizing and treating psychopathology in general and health anxiety specifically, there has been a recent paradigm shift. This has consisted of attributing the development and persistence of disorder to the cognitions that control and modify such content that is, metacognition (Wells, 2000, 2009). This metacognitive approach is grounded in the self-regulatory executive function (S-REF) model (Wells & Matthews, 1994, 1996) of emotional disorder. This model proposes that psychological distress is linked to and maintained by a cognitive attentional syndrome (CAS). This consists of perseverative thinking in the form of worry and rumination, maladaptive coping behaviors (e.g., avoidance), a heightened attentional focus on threat, and counterproductive thought control strategies (Wells & Mathews, 1994, 1996). The theory states that the CAS is driven and guided by metacognitive beliefs which are both positive and negative in nature (Wells, 2000). The content of cognition, namely a specific appraisal, "I might have cancer," is seen as either a trigger for or the situational output of the CAS. To date, several studies have demonstrated that metacognition makes a substantial contribution to specific disorders independently of cognitive content and appraisals, both cross-sectionally (Gwilliam, Wells, & Cartwright-Hatton, 2004; Khawaja & McMahon, 2011; Myers & Wells, 2005; Ruscio & Borkovec, 2004; Wells & Carter, 1999, 2001) and longitudinally (Myers, Fisher, & Wells, 2009; Papageorgiou & Wells, 2009). In particular, negative beliefs about the uncontrollability and dangerousness of thoughts have been implicated across a range of psychological disorders (e.g., Spada, Georgiou, & Wells, 2010; Wells & Cartwright-Hatton, 2004).

Although cognitive models focus on the health anxious person's preoccupation with their bodies and the tendency to misinterpret bodily sensations, the metacognitive theory provides a different perspective. According to this model, health anxious patients do not effectively regulate their worries about health, indeed bodily preoccupation and health-related worries may be maintained by positive beliefs about this thinking process and/or negative beliefs about the uncontrollability of the process that allow it to persist leading to chronic illness cognition.

To date, two preliminary studies have shown that specific metacognitive beliefs appear to be positively associated and predictive of this disorder (Bouman & Meijer, 1999; Kaur, Butow, & Thewes, 2011). Both studies found specific metacognitive beliefs: "negative beliefs about the uncontrollability of thoughts and danger" and "beliefs about need for control" to be positively associated with hypochondriasis. However, these studies did not control for additional variables that could account for this association and the substantive nature of this relationship remains to be explored. The metacognitive model predicts that metacognition should account for variation in health anxiety because it is a transdiagnostic factor involved in all psychopathologies. Moreover, its contribution should be independent of individual differences in cognitive content, somatosensory amplification, and neuroticism, if as the metacognitive model predicts, a central putative mechanism concerns beliefs about worry and its control rather than beliefs about bodily illness.

## Aims

In accordance with this assertion, this study predicts that (a) metacognition would show a significant positive correlation with health anxiety, and (b) if metacognitive theory is correct, the relationship between metacognition and health anxiety would remain significant after controlling for other associated variables (i.e., neuroticism, somatosensory amplification, and

illness cognition). We also aimed to explore the best set of independent metacognitive predictors of health anxiety among the metacognitions assessed hypothesizing that "negative beliefs about the uncontrollability of thoughts and danger" would be present in the final equation.

## Methods

### Participants and Procedure

A cross-sectional design was employed with convenience sampling used for participant selection. There were 351 first- and second-year student nurses who completed a questionnaire battery between August 2011 and August 2012. The study received full ethical approval from the University of Manchester's ethics committee (project reference, 11150) . Students were approached about the study via University e-mail and full details were provided about the study and its aims, with the option of consenting or not. Students were then given questionnaires in their lectures and asked to fill these in if they chose to take part in the study. Student nurses were selected because there is a higher potential to identify health anxiety in this group of participants (Azuri, Ackshota, & Vinker, 2010; Hunter, Lohrenz, & Schwartzman, 1964). Information about gender was obtained from all participants, both these demographic variables have been considered important in health anxiety (MacSwain, Sherry, Stewart, Watt, Hadjistavropoulos, & Graham, 2009; Bleichhardt & Hiller, 2007). Other variables such as marital status were not included as this has no effect on health anxiety (Bleichhardt & Hiller, 2007), and it was not necessary to include information on educational status as they were all degree students.

### Measures

*The Whiteley Index (WI)***.** The WI (Pilowsky, 1967) is one of the most frequently used measures of hypochondriacal or health anxiety symptoms. For the purpose of this study, the

14 item newer version of the WI (Barsky, 1992; Welch, Carleton, & Asmundson, 2009) that uses a 5-point response format (1 = not at all to 5 = extremely) was used because it is more appropriate for measuring health anxiety severity. Scores range from 14 (minimum) to 70 (maximum), a number of studies have established that a cut off score of 40 or above indicates the presence of hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993). The measure has shown good internal consistency in medical outpatients alpha= .80, general practice alpha = .78, and the general population alpha= .76 (Speckens, Spinhoven, Sloekers, Bolk, & van Hemert, 1996).

*Cognition about Body and Health Questionnaire (CABAH).* The CABAH is a scale related to cognitive behavioral concepts of health anxiety (Rief et al., 1998) and has been widely used to assess cognitions regarding illness and health as well as attitudes associated with bodily complaints (Hiller, Leibbrand, Rief, & Fichter, 2005). The version used in this study consists of 28 statements that define the following four subscales: catastrophizing interpretation of bodily complaints, autonomic sensations, bodily weakness, and intolerance of bodily complaints. Scores range from 0 to 84, with higher scores denoting more negative cognitions about health, The overall internal consistency of the CABAH is excellent alpha= .90, and for the subscales it is moderate to good, ranging from .67 to .88 (Rief et al., 1998). Four of the subscales showed discrimination between somatoform disorders and hypochondriasis (Rief et al., 1998). An original fifth subscale was excluded (health habits) because it has failed to reveal significant group differences between patients with hypochondriasis and a clinical control group (Rief et al., 1998). The CABAH has been shown to positively correlate with the WI (Leibbrand, Hiller, & Fichter, 2000). In the current study it possessed excellent internal consistency $\alpha = .90$.

*The Metacognitions Questionnaire-30 (MCQ-30).* The MCQ-30 (Wells & Cartwright-Hatton, 2004). The MCQ-30 is a well-established thirty item questionnaire measuring

metacognitive beliefs and processes implicated in the metacognitive model. It consists of five subscales: cognitive confidence (evaluates confidence in memory and attention) (MCQCC), positive beliefs about worry (MCQPOS), cognitive self- consciousness (the propensity to focus on thought processes) (MCQCSC), negative beliefs about uncontrollability of thoughts and danger (MCQNEG), and beliefs about the need to control thoughts (MCQNC). Items are rated on a 4-point Likert scale from 1 ("do not agree") to 4 ("agree very much"). For each subscale, six items are scored 1–4, with a minimum score of 6 and a maximum score of 24. Higher scores correspond with the existence of greater maladaptive metacognitive beliefs. The MCQ has been found to be a reliable measure and demonstrates good convergent and divergent validity (Cartwright-Hatton & Wells, 1997; Wells & Cartwright-Hatton, 2004). The internal consistency for the total MCQ-30 is (α= .93), with associated subscales having Cronbach alphas ranging from .72 to .93 (Wells & Cartwright-Hatton, 2004). In the current study internal consistency for the total MCQ-30 was (α = .94), with associated subscales having Cronbach alphas ranging from α= .80 to α = .88.

*Personality Questionnaire-Revised: Neuroticism Scale of the Eysenck Short Form (EPQ- R-N).* EPQR-S (Eysenck, Eysenck, & Barrett, 1985) The EPQR-S is an internationally established personality test, which is used extensively in research to predict the occurrence and characteristics of psychological distress and emotional instability (e.g., Gershuny & Sher, 1998; Kendler, Gardner, & Prescott, 2002). It includes 48 items and 4 subscales: extraversion (12 items), neuroticism (12 items), psychoticism (12 items), and lie (12 items). For the purpose of this study, only the neuroticism subscale was used because hypochondriasis has been linked to this personality trait (Hollifield, 2001). Each question on the subscale has a binary response, "yes" or "no" and items scored 1 or 0, with a maximum potential score of 12 and a minimum of 0. In a cross cultural study covering four countries the neuroticism

subscale had good internal consistency with Cronbach alphas ranging from .79 to .83 (Francis, Brown & Philipchalk, 1992). In the current sample, the alpha was.79.

*Somatosensory Amplification Scale (SSAS).* The SSAS (Barsky, Wyshak, & Klerman, 1990) is a ten item self-rated questionnaire consisting of a 5-point Likert scale, with responses ranging from 1= "not at all" to 5="extremely". A higher total score means that the respondent is more somatized (maximum = 50). The SSAS measures three theoretical aspects of somatosensory amplification; heightened sensitivity towards unpleasant bodily symptoms; selective attention towards bodily sensations and catastrophic misinterpretations of bodily symptoms/sensations (Barsky, Goodson, Lane, & Cleary, 1988). Somatosensory amplification has been shown to be positively associated with hypochondriasis (Barsky et al., 1990; Marcus et al., 2007) and has construct validity with measures of health anxiety such as the Whiteley Index (Barsky et al., 1990). The SSAS has demonstrated satisfactory internal consistency, α. = 83 (Barsky et al., 1990). In the current sample the alpha was .70.

## Data Analysis

Initially we ran Pearson inter-correlations between measures of health anxiety (WI) and cognition total (CABAH), CABAH subscale Catastrophizing Interpretation of Bodily Complaints (CABAHIN), neuroticism (EPQ-R-N), somatosensory amplification (SSAS), metacognition total (MCQ-30), and the five MCQ-30 subscales. A hierarchical regression analysis was then conducted to test whether metacognition explained additional variance in health anxiety when simultaneously controlling for other established variables: age/gender, neuroticism (EPQ-R-N), illness cognition (CABAHIN), and somatosensory amplification (SSAS).

# Results

## Sample Characteristics

Three hundred and fourteen of these participants were female (89.5% of the sample) and 37 were male (10.5% of the sample). All participants provided details about their age. The age range was 19–59 years, with a mean age of 27 years (SD 5 7.48 years). Fourteen percent of the study passed the cut off score of 40 or above which can indicate the presence of health anxiety/hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993).

## Correlations

Pearson correlations were computed between measures of health anxiety (WI) and cognition total (CABAH), CABAH subscale Catastrophizing Interpretation of Bodily Complaints (CABAHIN), neuroticism (EPQ-R-N), somatosensory amplification (SSAS), metacognition total (MCQ-30), and the five MCQ-30 subscales as reported in Table 2.1. As a large number of correlations, the level of statistical significance was set at .01 rather .05 to reduce the risk of Type I error. In line with previous studies on neuroticism, illness cognition, and somatosensory amplification, all correlations were significant, indicating that high scores on all total measures relate to high scores on the health anxiety measure.

In relation to metacognition as predicted, the MCQ-30 was positively associated with health anxiety and among all the variables had the strongest individual correlation ($r = .72$, $p < .001$). As cognition (CABAH) was also strongly associated with health anxiety ($r = .65$, $p < .001$), Steiger's Z test (Steiger, 1980) was applied and revealed the difference between these correlations was statistically significant ($Z = 2.33667$, $p < .05$). This indicates that the relationship between the metacognition measure and health anxiety was significantly stronger than that between cognition and health anxiety.

The strength of the MCQ-30 correlation is an interesting finding because this is a generic measure that was not designed to measure health-anxiety-related metacognitions specifically. The relationship between the five individual subscales of metacognition and health anxiety revealed moderate to strong positive correlations in all cases. Overall, these analyses reveal a positive and significant correlation between health anxiety and the different domains of metacognition measured.

**Testing the Independent Contribution of Metacognition**

A hierarchical regression analysis was run to test whether metacognition explained additional variance in health anxiety when simultaneously controlling for other established variables: age/gender, neuroticism (EPQ-R-N), illness cognition (CABAHIN), and somatosensory amplification (SSAS).

Multicollinearity was tested by examination of variance inflation factor (VIF) and tolerance statistics. After all predictors were entered, none appeared problematic, all tolerance values were well greater than the recommended .2 (range .46 –.97; Menard, 1995) and all VIF values well less than 10 (Myers, 1990).

A predetermined level of entry of the predictor variables was based on logical and methodological priority to examine the unique additional contribution of each metacognitive variable. The results of this analysis are summarized in Table 2.2.

On Step 1, age and gender were forced into the equation to control for demographic factors that may be associated with health anxiety, this block contributed to 0.1% of the variance and was not significant. To control for personality factors, neuroticism (EPQ-R-N) was force-entered at Step 2, which explained a further 10% of the variance. Somatosensory amplification (SSAS) and cognitive interpretation (CABAHIN) measures were then entered to control for cognition and they accounted for a further 27% of the variance. Finally, the five

metacognitive predictors were entered into the final step (Step 4) using stepwise selection to determine the best independent predictors. Three metacognitive variables were entered that together accounted for a further 18% of the variance negative beliefs about uncontrollability of thoughts and danger (MCQNEG), beliefs about the need to control thoughts (MCQNC), and cognitive confidence (MCQCC). Summary statistics for the final step of the equation were as follows: the multiple R was .74 and significant ($F = 52.40$, $df = 350$, $p < .001$), and the overall adjusted $R^2$ was .54.

In the final step of the equation, five predictors made a unique and statistically significant contribution to health anxiety, three of these were metacognitive dimensions. As replication failure is a well-known problem for stepwise regression, the data set was split into two subsets (A and B) and regression equations carried out on both to test whether the regression findings for the first subsample were replicated in the second subsample and how well the original model generalizes. In the first subset (A), four predictors made a unique and statistically significant contribution to health anxiety: CABAHIN ($b = .28$, $p < .001$), MCQNEG ($b = .25$, $p < .01$), MCQNC ($b = .19$, $p < .05$), and EQQTOT ($b = .15$, $p < .05$). In the second subset (B), four predictors made a unique and statistically significant contribution to health anxiety: MCQNEG ($b = .38$, $p < .001$), MCQNC ($b = .27$, $p < .001$), CABAHIN ($b = .17$, $p < .005$), and SSAS ($b = .12$, $p < .05$). These results demonstrated that two metacognitive variables were reliable predictors in the two subsets.

**Table 2.1:Inter-correlations of Health Anxiety, Neuroticism, Illness Cognition, Somatosensory Amplification, and Metacognition**

| Variable | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | M | SD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. WITOT | .719** | .416** | .646** | .317** | 508** | 671** | .468** | .599** | .598** | .549** | 26.37 | 10.14 |
| 2. MCQTOT | | .434** | .646** | .388** | .766** | .850** | .685** | .840** | .840** | .547** | 53.83 | 16.50 |
| 3. SSAS | | | .552** | .254** | .254** | .423** | .291** | .295** | .412** | .379** | 10.34 | 4.57 |
| 4. CABAHTOT | | | | .211** | .460** | .586** | .444** | .569** | .522** | .902** | 22.48 | 9.81 |
| 5. EPQ-R-N | | | | | .285** | .403** | .235** | .201** | .353** | .139** | 5.74 | 3.37 |
| 6. MCQPOS | | | | | | .576** | .356** | .644** | .553** | .422** | 10.16 | 3.69 |
| 7. MCQNEG | | | | | | | .444** | .618** | .687** | .465** | 11.28 | 4.76 |
| 8. MCQCC | | | | | | | | .519** | .442** | .356** | 10.23 | 4.00 |
| 9. MCQNC | | | | | | | | | .617** | .538** | 9.56 | 3.68 |
| 10. MCQSC | | | | | | | | | | .422** | 12.58 | 4.44 |
| 11. CABAHIN | | | | | | | | | | | 9.20 | 5.41 |

**Correlation is significant at the .001 level (2-tailed).

WITOT, Whiteley Index Total; MCQTOT, Metacognition Questionnaire Total; SSAS, Somatosensory Amplification Scale; CABAHTOT, Cognitions About Body and Health Questionnaire Total; EPQ-R-N, Eysenck Personality Questionnaire-Revised (Neuroticism Scale); MCQPOS, Positive Beliefs About Worry; MCQNEG, Negative Beliefs about Uncontrollability of Thoughts and Danger; MCQCC, Cognitive Confidence; MCQNC, Beliefs About Need to Control Thoughts; MCQCSC, Cognitive Self-Consciousness; CABAHIN, Cognitions About Body and Health Questionnaire Interpretation Scale.

**Table 2.2: Summary of hierarchical analysis predicting health anxiety.**

| STEPWISE STATISTICS | | | | FINAL STATISTICS | | |
|---|---|---|---|---|---|---|
| **Step** | **Variable** | **$\Delta r^2$** | ***p*** | **β** | **t** | ***p*** |
| **1 (Enter)** | Age | .001 | .878 | -.003 | -.072 | .943 |
| | Sex | | | .032 | .886 | .376 |
| **2 (Enter)** | EPQ-R-N | .100 | .000 | .058 | 1.452 | .147 |
| **3 (Enter)** | SSAS | .270 | .000 | .095 | 2.289 | .023 |
| | CABAHIN | | | .187 | 4.162 | .000 |
| **4(Stepwise)** | MCQNEG | .146 | .000 | .361 | 6.951 | .000 |
| | MCQNC | .026 | .000 | .177 | 3.405 | .001 |
| | MCQCC | .008 | .012 | .111 | 2.527 | .012 |

EPQ-R-N (Eysenck Personality Questionnaire-Revised-Neuroticism); SSAS (Somatosensory Amplification Scale); CABAHIN (Catastrophising Interpretation of Bodily Complaints); MCQNEG (Negative Beliefs about Uncontrollability of Thoughts and Danger) ; MCQNC (Beliefs About the Need to Control thoughts); MCQCC (Cognitive Confidence).

## Discussion

This study tested hypotheses arising from the metacognitive model of psychopathology in relation to health anxiety. Consistent with the theory and our first hypothesis metacognition correlated significantly and positively with health anxiety. This is similar to a recent study which found significant and positive correlations between all MCQ-30 subscales and the WI (Kaur et al., 2011). Our findings differed slightly from Bouman and Meijer's (1999) study who found a slightly weaker relationship between MCQ total and WI (r = .40). In addition, the relationship between the WI and the subscales of "positive beliefs about worry," "cognitive confidence," and "cognitive self- consciousness" were nonsignificant. The difference may be caused by the version of the MCQ used. In this study and Kaur et al.'s

(2011) study, the MCQ-30 was used, whereas Bouman and Meijer (1999) used the longer version of the scale that is less refined.

The relationship we observed between health anxiety and metacognition are similar in magnitude to those observed in studies of relationships between metacognition and depressive symptoms (e.g., Papageorgiou & Wells, 2003) and worry (e.g., Cartwright-Hatton & Wells, 1997; Wells & Cartwright-Hatton, 2004; Wells & Papageorgiou, 1998). Suggesting that metacognitions may be as important to health anxiety as they are to other disorders, such as depression and generalized anxiety.

Results pertaining to the second hypothesis showed that three metacognitive dimensions accounted for an additional 18% of the variance over and above the control variables. These findings provide preliminary evidence that metacognitive beliefs about thoughts make a contribution to health anxiety independently of general anxiety vulnerability (neuroticism) and cognition (illness cognition and somatosensory amplification). Again, this is in line with findings in other studies, where metacognition has been associated with health anxiety (Bouman & Meijer, 1999) and other psychological symptoms (e.g., depression; Papageorgiou & Wells, 2001), stress associated with medical conditions (Allott, Wells, Morrison, & Walker, 2005), and generalized anxiety disorder (Wells, 2005).

Further analysis revealed that these metacognitive dimensions explained a substantial 41.3% of the variance in health anxiety after controlling age/gender and neuroticism. Cognition contributed a relatively small but significant additional 3.7% to this. These results suggest that con- trolling for metacognition had a large effect on the strength of the relationship between cognition and health anxiety. This is in line with the S-REF model, which emphasizes that metacognition should have a role that is independent of cognition and may

account for a large part of the relationship normally observed between cognition and psychological symptoms (Wells, 2000).

After splitting the sample, two metacognitive factors remained as reliable predictors in both subsets and generalized to the overall final equation (i.e., “negative beliefs about uncontrollability of thoughts and danger” and “beliefs about the need to control thoughts”). The predictor variable, cognitive confidence, appeared in the final equation but did not appear in any subset. Cognitive confidence may be a weaker predictor and/or may not be reliable and its contribution should be established in subsequent studies.

Two of the three independent metacognitive predictors in this study negative beliefs about uncontrollability of thoughts and danger and beliefs about the need to control thoughts were similar to the two predictors of health anxiety found by Bouman and Meijer (1999). Furthermore, this corresponds with other studies that demonstrate that uncontrollability metacognitions are a common factor in psychopathology (e.g., Spada et al., 2010; Wells & Cartwright-Hatton, 2004). If cognitive confidence also proved to be a reliable metacognitive predictor, this would resonate with findings in other disorders that have conceptual and clinical similarities to health anxiety such as obsessive-compulsive disorder (Hermans, Martens, De Cort, Pieters, & Eelen, 2003) and chronic fatigue syndrome (Maher-Edwards, Fernie, Murphy, Wells, & Spada, 2011).

Overall, some interesting questions and hypotheses emerge from these findings. From a treatment perspective, they suggest that clinicians could focus on modifying client’s metacognitions, as is the case in metacognitive therapy (Wells, 2009), rather than focusing on challenging the content of illness cognition. This may be a more effective way of bringing health worries under control.

There are several limitations to this study and the findings should be interpreted with caution. The study is cross-sectional in nature and therefore it cannot address causality in the relationships observed. The causal status of metacognition in health anxiety remains to be examined. A further limitation concerns the participants. As most were self-selecting female between the ages of 20 and 30 years, this restricts generalizability and applicability to other samples. Equally, as the participants were students, it is unclear whether the present findings can be generalized to the DSM-5 categories: somatic symptom disorder and illness anxiety disorder. Conversely, as the metacognitive model proposes that metacognitions are a general feature of most psychopathologies, they may be important in both illness anxiety and somatic symptom disorder; however, this needs to be addressed in future research.

A third limitation was the use of self-report measures (i.e., the WI) as a means of assessing health anxiety in a nonclinical sample. One of the disadvantages of using this measure is that it does not measure all facets of health anxiety, and we cannot rule out the possibility that a different pattern of results would have emerged if we had measured a wider range of health anxiety features. In addition, the measure of illness cognition used (i.e., CABAH) may not fully measure the primary thoughts that the cognitive behavioral model predicts are related to health anxiety; however, using the CABAH reduced conceptual overlap with processes such as worry.

In conclusion, the results are consistent with the proposal that metacognition may have a role in health anxiety, and it demonstrates the predictive potential of specific metacognitions over and above other established correlates of symptoms. As a result, future research would be helpful to better clarify the role of metacognition in the development and maintenance of health anxiety

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# Chapter 3:

# Development and Initial Validation of a Measure of Metacognitive Beliefs in Health Anxiety: The MCQ-HA

**Robin Bailey**

**Adrian Wells**

**Published in Psychiatry Research**

**Development and Initial Validation of a Measure of Metacognitive Beliefs in Health Anxiety: The MCQ-HA.**

Abstract

Metacognitive beliefs have been shown to correlate with emotional disorders and more recently have been implicated in health anxiety. Research exploring these beliefs have tended to use the Metacognition Questionnaire (MCQ), which is a general measure. To facilitate research on the metacognitive model applied to health anxiety the present study reports on the development and initial evaluation of a new specific metacognitive measure of health anxiety, the Metacognitions Questionnaire-Health Anxiety (MCQ-HA). Principal components analysis identified 14 suitable items to be explored. Subsequent exploratory factor analysis of the MCQ-HA identified three factors: "Beliefs that Thoughts can cause Illness", "Beliefs about Biased thinking", and "Beliefs that Thoughts are Uncontrollable". Confirmatory factor analysis supported the three-factor-model with all selected goodness-of-fit statistics equivalent to or better than recommended values. Preliminary evidence suggests good internal consistency, incremental, convergent and discriminant validity in relation to associated measures. The MCQ-HA appears to be a potentially useful predictor of health anxiety.

## Introduction

Health anxiety (HA) is prevalent in both community samples (3.5%) (Sunderland et al., 2013) and in medical care services (20%) (Tyrer et al., 2011). Disorders of HA exist on a continuum from mild to severe (Ferguson, 2009; Taylor and Asmundson, 2004) and have a major functional impact on the sufferer and health care services (Barsky et al., 2001; Fink et al., 2010). Cognitive-behavioural therapy (CBT) models have been used to conceptualise and

treat health anxiety. It is a condition normally associated with beliefs regarding the presence of illness and a preoccupation about being ill (Salkovskis et al., 2002). These approaches specify several dysfunctional cognitions as important in both the development and maintenance of the disorder (Abramowitz and Braddock, 2008; Fergus, 2013; Marcus and Church, 2003). CBT treatments tend to target specific beliefs (e.g. "Unexplained symptoms are a sign of serious illness") as a means of reducing health anxiety symptoms and such approaches have demonstrated efficacy (see Olatunji et al. (2014) for a review). More recently, Wells and Matthews (1994, 1996) have suggested that the beliefs emphasised in CBT models may not be so central to psychological disorder after all. Instead, they propose that the regulation of thinking and beliefs about thoughts are more important. In their Self-Regulatory Executive Function model (S-REF), psychological disorders such as health anxiety result from excessive thinking (e.g. about illness) that is difficult to bring under control. This thinking style is dominated by worry and rumination and is the consequence of metacognitive beliefs. These specific beliefs which individuals hold about particular types of thoughts tend to be both positive and negative in nature, for example "worry will help me cope" and "worry is dangerous".

Metacognition is a far reaching term that incorporates knowledge and regulation of various aspects of cognitive activity (Moses and Baird, 1999). The Wells and Matthews (1994, 1996) model is supported by data demonstrating that metacognitive knowledge in the form of specific beliefs individuals hold about their own cognition is reliably correlated with emotional disorder and symptoms, such as OCD (e.g. Gwilliam et al., 2004), generalised anxiety (e.g. Khawaja and McMahon, 2011; Wells and Carter, 1999, 2001), PTSD (Bennett and Wells, 2010) and depression (e.g. Papageorgiou and Wells, 2009). Studies that have tested the role of metacognition in psychological disorders have used the Metacognitions

Questionnaire (MCQ: Cartwright-Hatton and Wells, 1997) or the shortened version Metacognitions Questionnaire-30 (MCQ-30: Wells and Cartwright-Hatton, 2004).

In the domain of health anxiety a number of studies have begun to explore the relationship between metacognition and this presentation. Bouman and Meijer (1999) identified that metacognition was a positive predictor of extreme health anxiety, using a metacognitive measure of health anxiety used specifically for the study, The Metacognitions about Health Anxiety questionnaire (MCHA). Barenbrügge et al. (2013) identified that both negative and positive metacognitive beliefs were strongly and positively associated with all aspects of health anxiety. Bailey and Wells (2013) also identified that metacognitive beliefs were strongly associated with health anxiety and had predictive power over and above other correlates associated with this disorder, such as illness cognition and somatosensory amplification. A more recent study also indicated that metacognitive beliefs moderate the relationship between health anxiety and catastrophic misinterpretation (Bailey and Wells, 2015).

Although the MCQ-30 was used in these studies it is limited as it does not directly capture health-anxiety specific metacognitive beliefs and therefore may have reduced sensitivity and specificity in this context. None of the items on the MCQ-30 specifically relate to health anxious beliefs which impacts the face validity of the measure and clinical utility when applied to a health anxious population. Equally, although a metacognitive measure of health anxiety (MCHA) has been developed, little is known about its psychometric properties nor has it been subjected to any detailed exploratory or confirmatory factor analysis. Additionally the current proposed measure differs from the MCHA in several important respects: (1) the current measure (MCQ-HA) is based on expert opinion of one of the originators of the MCQ30, which is not the case for the MCHA; and (2) the MCQ-HA included additional items based on metacognitive therapy with health anxious patients, leading to a wider item

pool than evident in the MCHA and MCQ-30 (specifically tapping new areas around beliefs concerning biased thinking).

To facilitate research on the Wells and Matthews model applied to health anxiety the present study reports on the development and initial evaluation of a new metacognitive measure of health anxiety, the Metacognitions Questionnaire-Health Anxiety (MCQ- HA). When developing and evaluating a new measure Matsunaga (2010) reinforces Thompson's (2004) recommendations of a three-stage-approach, which was used to guide the present study; (1) screening items on the MCQ-HA using principal components analysis; (2) scrutinising the remaining items on the MCQ-HA using exploratory factor analysis; and (3) detailed examination of the factor structure of the MCQ-HA using confirmatory factor analysis. We also report preliminary data on the internal consistency and convergent and divergent validity of the measure

## Study 1

### Methods

*Participants*

The sample used in this study was the same used in Chapter 2. A cross-sectional study was undertaken with convenience sampling used for participant selection. Students were approached about the study via University e-mail and full details were provided about the study and its aims, with the option of consenting or not. Students were then given questionnaires in their lectures and asked to fill these in if they chose to take part in the study Three hundred and fifty one students undertaking a nursing degree completed the questionnaire. This particular student demographic was chosen as previous research has revealed that health anxiety is normally distributed in student populations (Marcus et al., 2008) and in nursing student's specifically (Zhang et al., 2014). Information about gender

was obtained from all participants, both these demographic variables have been considered important in health anxiety (MacSwain, Sherry, Stewart, Watt, Hadjistavropoulos, & Graham, 2009; Bleichhardt & Hiller, 2007). Other variables such as marital status were not included as this has no effect on health anxiety (Bleichhardt & Hiller, 2007), and it was not necessary to include information on educational status as they were all degree students. Ethical approval was granted from the University of Manchester's ethical committee, (Project reference 11150).

**Measures**

*The Meta-Cognitions about Health Questionnaire (MCQ-HA)*

Two sources of information were used to generate initial categories of items for the new MCQ-HA; (1) the items and subscales on the existing MCQ-30; and (2) patient reports of metacognitions recorded by the second author during treatment of health anxiety cases. Using the MCQ-30 enabled us to have a structure of particular belief domains to guide the generation of items. On this basis the following categories of items were generated: (1) negative beliefs about optimistic thinking (e.g. “I will be punished for thinking I am in good health”); (2) positive beliefs about worry (e.g. “Anticipating illness means I won't be taken by surprise”); (3) beliefs about uncontrollability of worry (e.g. “Only if I have a diagnosis will I be able to stop worrying”; (4) beliefs about the danger of worrying (e.g. “I could lose my mind through health worry”; and (5) fusion/need for control beliefs (e.g. “Thinking I am ill means I am ill”). Twenty items were initially generated to capture these domains. Unlike the MCQ-30 we did not include metacognitive beliefs relating to self-consciousness or cognitive confidence because we aimed to specifically measure beliefs about thoughts rather than monitoring (self-consciousness), and beliefs about effectiveness of cognitive functioning. We

were concerned that the latter may overlap conceptually with disease convictions focusing on mental decline and therefore reflect symptoms of health anxiety.

In addition to the above, Worthington and Whittaker (2006) recommend that item quality should be subjected to expert re- view, as the second author is a leading expert on metacognition and developer of the MCQ, we relied on this and the source of items to enhance content validity. We retained the 1–4 response scale and labels used in the MCQ-30: 1 (Do not agree); 2 (Slightly agree); 3 (Agree moderately), and 4 (Agree very much). A potential improvement on generating items could have involved using a focus group of health anxious individuals to pilot the measure on. This could have maybe enabled us to generate a wider pool of items which maybe more clinically accurate.

**Overview of data analysis**

To investigate the initial pool of items generated and prepare for exploratory factor analysis principal components analysis (PCA) was conducted on the initial 20 item measure. Using SPSS version 22 the default principal components method of factor extraction was performed on the data, because it has been shown as an acceptable data reduction technique (Costello and Osborne, 2005). Eigenvalues above 1 was selected because this is considered appropriate when running a primary analysis of data screening (Field, 2013; Matsunaga, 2010). As there was a potential for the items in this measure to be correlated, as has been shown in other metacognitive measures, i.e. the MCQ (Cartwright-Hatton and Wells, 1997), oblique rotation (promax) was used. Oblique rotation has been shown to generate solutions with correlated components (Costello and Osborne, 2005; Henson and Roberts, 2006). Both the structure matrix and pattern matrix were inspected and items screened to identify the strength of loadings on the generated components. When screening the items on the pattern matrix, those

that had a primary factor loading lower than .32 (Tabachnick and Fidell, 2007) were deemed problematic.

## Results

### Sample Characteristics

Three hundred and fourteen of these participants were female (89.5% of the sample) and thirty seven were male (10.5% of the sample). All participants provided details about their age. The age range was 19–59 years, with a mean age of 27 years (SD= 7.48). Fourteen percent of the study passed the cut off score of 40 or above which can indicate the presence of health anxiety/hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993)

### Exploratory Factor Analysis

Three components emerged and of the 20 items five did not meet criteria and were not retained: (1) “I could lose my mind through health worry”; (2) “Worrying about health will make me more vulnerable to illness”; (3) “Thinking I am ill means I am ill”; (4) “Being optimistic about my health will help me detect problems before it is too late”; and (5) “Anticipating illness means I won't be taken by surprise”. One item on component three “Worrying about my health will help me detect problems before it is too late” was also removed as it could not be interpreted in a meaningful way in relation to the other items.

The remaining 14 items were analysed further using a principal components method, with the default factor extraction method “Eigenvalues above 1 retained” and rotated using the oblique method (promax). All items had primary loadings above .32 and were therefore retained (Table3.1). Cronbach alpha for the total 14 items was .86, for component 1.82, component 2.78, and component 3.70. Cronbach alpha's if-item-deleted were below the overall alpha total of .86. To test the homogeneity of the scale corrected item-total correlations were examined and were all above the recommended cut off of .3, (Nunnally and Bernstein, 1994),

indicating each item was related to the overall scale (range .42–.62). Based on Kline's (2005) recommendations that the skew and kurtosis indices should not exceed values of 3 and 10 respectively, the majority of items fell within this range (skew range .44–3.0; kurtosis range -.65 to 9.1). The range of inter-correlations between the three components ranged from .37 to .53.

**Table 3.1: Principle components analysis pattern matrix rotated to the promax criterion using principal components method, with item mean and standard deviations.**

| | Component | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | M | SD |
| 3. I will be punished for thinking I am in good health. | .840 | .019 | -.088 | 1.18 | .514 |
| 20. Thinking positively about my health will tempt fate and I will become ill. | .797 | -.088 | .121 | 1.23 | .611 |
| 13. Thinking the worse about symptoms will keep me safe. | .742 | -.003 | .012 | 1.25 | .564 |
| 16. Worrying about my health will help me cope. | .729 | .037 | -.077 | 1.29 | .572 |
| 15. If I think positively about physical symptoms I will be caught off guard. | .625 | .063 | .095 | 1.30 | .600 |
| 7. Worrying about illness is likely to make it happen. | .067 | .809 | -.043 | 1.70 | .885 |
| 5. Thinking negatively can increase my chances of disease. | .074 | .790 | -.067 | 1.76 | .956 |
| 14. Worrying about my health will damage my body. | -0.13 | .685 | -.086 | 1.60 | .786 |
| 11.Some thoughts have the power to make me ill | .109 | .668 | .037 | 1.64 | .918 |
| 1. Thinking of illness could change my health. | -.162 | .645 | .155 | 2.05 | .984 |
| 17. I have no control over thinking about my health. | -.009 | -.097 | .841 | 1.63 | .831 |
| 12. Dwelling on thoughts of illness is uncontrollable. | -.048 | .017 | .841 | 1.62 | .781 |
| 19. Only if I have a diagnosis will I be able to stop worrying. | .269 | -.011 | .558 | 1.77 | .937 |
| 2. I cannot have peace of mind so long as I have physical symptoms. | -.078 | .339 | .444 | 2.02 | .836 |

## Study 2

PCA is an extraction method utilised to reduce the number of items, exploratory factor analysis (EFA) aims to identify latent variables that make up the shared variance amongst these items (Worthington and Whittaker, 2006). The specific goal of EFA is to determine the number of underlying factors, identifying which items load on which factors and identifying those that do not load sufficiently (Thompson, 2004). For these purposes EFA is considered superior to PCA (Snook and Gorsuch, 1989; Widaman, 1993) and a more useful approach when constructing new measures and more generalisable to confirmatory factor analysis (for a review see Worthington and Whittaker (2006).

### Overview of data analysis

Exploratory and confirmatory factor analysis was carried out using a new data set. The sample was split into two equal sub- groups, using the SPSS version 22 "Random sample of cases". EFA using data from one sub-group CFA using data from the second sub-group. Principal axis factoring method of factor extraction was performed on the 14 items in group 1, this method is considered more appropriate for exploratory factor analysis as it is better at defining the latent variables underlying the data (Fabrigar et al., 1999). Oblique rotation was employed with the method set again to "promax". To support the validity of the scale confirmatory factor analysis (CFA) using Amos 20.0 was performed on the 14-item three factor solution to assess model fit, using the second subgroup.

## Method

*Participants*

As in study 1 a cross-sectional study was undertaken with convenience sampling used for participant selection. A new sample of five hundred and fifty three students undertaking a degree in nursing completed the questionnaire. As in study 1 these particular students were

targeted due to evidence suggesting they have elevated levels of health anxiety. Students were then given questionnaires in their lectures and asked to fill these in if they chose to take part in the study. Data collection in this study took place between 2012 and 2013. Information about gender was obtained from all participants. Ethical approval was granted from the University of Manchester's ethical committee (Project Reference 11150).

## Results

### Sample Characteristics

Four hundred and fifty of these participants were female (82% of the sample) and one hundred and three were male (18% of the sample). All participants provided details about their age. The age range was 19–56 years, with a mean age of 28 years (SD=7.32 years).

### Exploratory factor analysis

The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was .90 which is considered superb (Hutcheson and Sofroniou, 1999), and Bartlett's test of sphericity $X^2$ = 1716.226 was highly significant $p < .0001$, both indicating factor analysis was appropriate. After visually inspecting the scree plot there appeared to be three factors at the point of inflection. Although the scree plot is one of the most popular methods of determining factor retention, it has been considered not always the most reliable (Costello and Osborne, 2005). An alternative factor extraction method, Horn's (1965) parallel analysis, has been shown to be one of best ways to determine the correct number of underlying factors (Zwick and Velicer, 1986; Henson and Roberts, 2006; Patil et al., 2008), and computes whether eigenvalues observed from the real data are larger than the corresponding average eigenvalues from random data. Using O'Connor's (2000) syntax script applied to SPSS and set for "principal axis factoring" and "permutations of the raw data set", the first three factor

eigenvalues exceeded the 95th percentile criteria for random data eigenvalues and explained 61% of the variance. The first factor was well above the chance level (actual eigenvalue= 5.38; estimated average eigenvalue =.444; 95th per- centile eigenvalue = .543); as was the second factor (actual = 1.09; estimated = .339; 95th percentile eigenvalue = .406) and the third (actual = .584; estimated = .269; 95th percentile eigenvalue = .323). Actual eigenvalues for factor four (actual = .212; estimated = .219; 95th percentile eigenvalue = .260) and factors beyond were not larger and therefore did not meet this criterion. A three factor solution was deemed acceptable and subsequently examined.

Of the three factors extracted five items loaded highly on factor 1 and 2, and four items on factor 3, with none loading lower than .32 (Tabachnick and Fidell, 2007) and the solution was interpretable (Table 3.2). Factor 1 contained metacognitive beliefs relating to negative thinking causing illness, and was labelled “Beliefs that thoughts can cause illness”. Factor 2 contained metacognitive beliefs relating to beliefs about the usefulness of biased thinking (negative is helpful and positive is unhelpful) and was labelled “Beliefs about biased thinking”. Factor 3 contained items relating to metacognitive beliefs about the uncontrollability of thinking about illness and was labelled “Beliefs that thoughts are uncontrollable”). Inter-correlations between factors ranged from .45 to .65.

**Confirmatory factor analysis.**

Results of CFA showed that all standardised regression weights were above the acceptable cut off of .5 (Hair et al., 2006), range .57–.82. A lower Chi square value indicates a better fit, however, the $X^2$ value in this study was 137 with 74 degrees of freedom and was significant .001. For models with more than 200 cases, the chi square is almost always statistically significant (Schumacker and Lomax, 1996). For these reasons alternative fit indices were used to assess model fit. Goodness of fit index (GFI) was examined and was .95 meeting the

cut off criteria of .95 established by Miles and Shevlin (1998). Root mean squared error of approximation (RMSEA) was .051 suggesting a good fit based on Hu and Bentler's (1998, 1999), ≤ .06 cut-off criteria. The standardized root mean square residual (SRMR) was .041 which again is lower than .5 a threshold deemed to be indicative of a well-fitting model (Diamantopoulos and Siguaw, 2000). To assess incremental fit, i.e. the improvement of fit for our tested model compared with a more restricted baseline model, the Comparative Fit Index (CFI) was examined (.962) and exceeded the recommended ≤ .95 suggested by Hu and Bentler (1999) as a good fit. The Tucker–Lewis index (TLI) was also examined (.95) and met the recommended ≤ .95 suggested by Hu and Bentler (1999) as a good fit.

**Table 3.2: Exploratory factor analysis pattern matrix rotated to the promax criterion using principal axis factoring.**

| Items | Factor | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| 5. Thinking negatively can increase my chances of disease | | | |
| 14. Worrying about my health will damage my body. | .883 | .032 | -.191 |
| 7. Worrying about illness is likely to make it happen. | .731 | -.131 | .093 |
| 11. Some thoughts have the power to make me ill. | .718 | .079 | -.019 |
| 1. Thinking of illness could change my health. | .635 | -.028 | .203 |
| 3. I will be punished for thinking I am in good health. | .457 | .068 | .069 |
| 13. Thinking the worse about symptoms will keep me safe. | .051 | .848 | -.177 |
| 15. If I think positively about physical symptoms I will be caught off guard. | -.066 | .801 | -.059 |
| 16. Worrying about my health will help me cope. | .016 | .674 | .157 |
| 20. Thinking positively about my health will tempt fate and I will become ill. | -.024 | .511 | .212 |
| 12. Dwelling on thoughts of illness is uncontrollable. | .016 | .503 | .278 |
| 17. I have no control over thinking about my health. | -.036 | -.081 | .935 |
| 19. Only if I have a diagnosis will I be able to stop worrying. | .012 | -.026 | .754 |
| 2. I cannot have peace of mind so long as I have physical symptoms. | .040 | .211 | .417 |
| | .099 | .218 | .336 |

## Study 3

To assess the internal consistency of the factors (subscales), the 14 item questionnaire and accompanying measures were administered to a new sample. It was hypothesised the MCQ-HA would demonstrate convergent validity by correlating with measures of health anxiety. We also hypothesised that metacognition would have stronger correlations with health anxiety than general anxiety vulnerability, indicating divergent validity. Additionally we hypothesised the MCQ-HA would demonstrate incremental validity by explaining additional variance in health anxiety, over and above the MCQ-30.

### Participants

A new group of participants were used in this study and were also part of the sample used in Chapter 6. As with the previous study, students were approached about the study via University e-mail and full details were provided about the study and its aims, with the option of consenting or not. Students were then given questionnaires in their lectures and asked to fill these in if they chose to take part in the study Two hundred and fifty nine students undertaking a nursing degree completed the questionnaire. Data collection took place between 2013 and 2015. This particular student demographic was chosen as previous research has revealed that health anxiety is normally distributed in student populations (Marcus et al., 2008) and in nursing student's specifically (Zhang et al., 2014). Information about participant's age and gender was obtained. Ethical approval was granted from the University of Manchester's ethical committee (Project reference, 13175).

**Measures**

*The Whiteley index*: (WI; Pilowsky, 1967)

The WI (Pilowsky, 1967) is one of the most frequently used measures of hypochondriacal or health anxiety symptoms. For the purpose of this study, the 14 item newer version of the WI (Barsky, 1992; Welch, Carleton, & Asmundson, 2009) that uses a 5-point response format (1 = not at all to 5 = extremely) was used because it is more appropriate for measuring health anxiety severity. Scores range from 14 (minimum) to 70 (maximum), a number of studies have established that a cut off score of 40 or above indicates the presence of hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993). The measure has shown good internal consistency in medical outpatients alpha= .80, general practice alpha = .78, and the general population alpha= .76 (Speckens, Spinhoven, Sloekers, Bolk, & van Hemert, 1996).The Cronbach alpha in the present study was .90.

*Cognition about Body and Health Questionnaire:* (CABAH: Rief et al., 1998)

The CABAH is a scale related to cognitive behavioral concepts of health anxiety (Rief et al., 1998) and has been widely used to assess cognitions regarding illness and health as well as attitudes associated with bodily complaints (Hiller, Leibbrand, Rief, & Fichter, 2005). The version used in this study consists of 28 statements that define the following four subscales: catastrophizing interpretation of bodily complaints, autonomic sensations, bodily weakness, and intolerance of bodily complaints. Scores range from 0 to 84, with higher scores denoting more negative cognitions about health, The overall internal consistency of the CABAH is excellent alpha= .90, and for the subscales it is moderate to good, ranging from .67 to .88 (Rief et al., 1998). Four of the subscales showed discrimination between somatoform disorders and hypochondriasis (Rief et al., 1998). An original fifth subscale was excluded (health habits) because it has failed to reveal significant group differences between patients

with hypochondriasis and a clinical control group (Rief et al., 1998). The CABAH has been shown to positively correlate with the WI (Leibbrand, Hiller, & Fichter, 2000).The Cronbach alpha in the present study was .84.

*The Metacognitions Questionnaire-30* (MCQ-30; Wells and Cartwright-Hatton, 2004)

The MCQ-30 (Wells & Cartwright- Hatton, 2004) The MCQ-30 is a well-established thirty item questionnaire measuring metacognitive beliefs and processes implicated in the metacognitive model. It consists of five subscales: cognitive confidence (evaluates confidence in memory and attention) (MCQCC), positive beliefs about worry (MCQPOS), cognitive self- consciousness (the propensity to focus on thought processes) (MCQCSC), negative beliefs about uncontrollability of thoughts and danger (MCQNEG), and beliefs about the need to control thoughts (MCQNC). Items are rated on a 4-point Likert scale from 1 ("do not agree") to 4 ("agree very much"). For each subscale, six items are scored 1–4, with a minimum score of 6 and a maximum score of 24. Higher scores correspond with the existence of greater maladaptive metacognitive beliefs. The MCQ has been found to be a reliable measure and demonstrates good convergent and divergent validity (Cartwright-Hatton & Wells, 1997; Wells & Cartwright-Hatton, 2004). The internal consistency for the total MCQ-30 is ($\alpha$= .93), with associated subscales having Cronbach alphas ranging from .72 to .93 (Wells & Cartwright-Hatton, 2004). In the current study Cronbach's alphas for the total measure was .91 and subscales ranged from .66 to .86.

*Neuroticism scale of the Eysenck Personality Questionnaire-Revised: Short Form* (EPQ-R-N; Eysenck et al., 1985)

The EPQR-S is an internationally established personality test, which is used extensively in research to predict the occurrence and characteristics of psychological distress and emotional instability (e.g., Gershuny & Sher, 1998; Kendler, Gardner, & Prescott, 2002). It includes 48

items and 4 subscales: extraversion (12 items), neuroticism (12 items), psychoticism (12 items), and lie (12 items). For the purpose of this study, only the neuroticism subscale was used because hypochondriasis has been linked to this personality trait (Hollifield, 2001). Each question on the subscale has a binary response, “yes” or “no” and items scored 1 or 0, with a maximum potential score of 12 and a minimum of 0. In a cross cultural study covering four countries the neuroticism subscale had good internal consistency with Cronbach alphas ranging from .79 to .83 (Francis, Brown & Philipchalk, 1992).Cronbach's alpha in the present study was .75.

## Results

### Sample Characteristics

Two hundred and thirty five of the participants were female (91% of the sample) and twenty four were male (9% of the sample). All participants provided details about their age. The age range was 19–50 years, with a mean age of 26 years (SD = 6.9 years). Ten percent of the study passed the cut off score of 40 or above which can indicate the presence of health anxiety/hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993).

### Internal consistency

Using the “reliability analysis” procedure in SPSS, the internal consistency of the MCQ-HA was examined using corrected item- total correlations for the full-scale which ranged from (.39–.71). For the individual subscales these were as follows: “Beliefs about biased thinking” (.54–.75), “Beliefs that thoughts can cause illness” (.44–.60), and “Beliefs that thoughts are uncontrollable” (.54–.72). These coefficients show subscale items are correlated with their subscales and are higher than the acceptable standard of .30 (Nunnally and Bernstein, 1994). Internal consistency was examined using Cronbach's alpha computed for the total score and the five subscales. Alpha scores ranged from acceptable to good: MCQ-HA Total $\alpha$=.90;

"Beliefs about biased thinking" α=.83; "Beliefs that thoughts can cause illness" α=.78; and "Beliefs that thoughts are uncontrollable" α=.81.

**Convergent and divergent validity**

Supporting the convergent validity of the MCQ-HA, the results showed a significant positive correlation between total score and health anxiety symptoms as measured by the total score on the Whiteley Index and Cognitions about Body and Health Questionnaire. Equally, the three subscales also demonstrated convergent validity with measures of health anxiety. Overall, the correlations ranged from moderate to high in magnitude, with the strongest subscale correlations found between both measures of health anxiety and "beliefs that thoughts are uncontrollable" (Table 3.3).

To assess divergent validity Pearson correlations were run between the MCQ-HA subscales, the Whitley Index total and The EPQ-R-N. We predicted that the MCQ-HA would have a stronger correlation with the health anxiety measure than with the measure of general anxiety vulnerability, i.e. neuroticism. Correlations revealed a strong association between all MCQ-HA subscales and the Whiteley Index; however, significant correlations only existed between the EPQ-R-N, the MCQ-HA total and one MCQ-HA sub- scale (Table 3). Although the correlation between the WI and MCQ-HA total was relatively high (.69), at this level of association there is 48% shared variance which indicates that the measures are unlikely to be assessing the same construct.

To further explore whether there were significant differences between the magnitude of the metacognition and neuroticism correlations compared with metacognition with health anxiety, Steiger's Z test (Steiger, 1980) was applied. Results revealed the difference between these correlations was statistically significant ($Z = 9.51$, $p < .001$). This indicates that the

relationship between the metacognition measure and health anxiety was significantly stronger than that between metacognition and neuroticism.

**Incremental validity**

An important question concerns the incremental utility (validity) of the MCQ-HA beyond the MCQ-30. We examined if MCQ-HA could explain additional variance in the WI over and above the MCQ-30, thus establishing the potential utility of the new measure in subsequent research in the area of health anxiety. To examine this a hierarchical regression was run using SPSS "linear regression" command in which MCQ-30 subscales were entered as a block on step 1 and then the MCQ-HA subscales entered on a block on step 2. We were interested in the increment in R square on this second step and the final independent subscales in the equation. The MCQ-30 subscales accounted for 30% of the variance in health anxiety on step 1. The MCQ-HA subscales entered at step 2 explained an additional 26% of the variance in health anxiety. On the final step of the equation four of the subscales made a unique and statistically significant contribution to health anxiety: MCQ-30 – "Uncontrollability and Danger" ($\beta$= .18, P <.005); MCQ-HA – "Thoughts about illness are uncontrollable" ($\beta$ =.44, P < .001); MCQ-HA – "Beliefs about biased thinking" ($\beta$= .14, P < .05) and MCQ-HA – "Beliefs that thoughts can cause illness" ($\beta$ = .12, P < .05).

Two separate regression analyses were also run to determine the additional variance explained in health anxiety when con- trolling for neuroticism and cognition. Results indicated that the MCQ-HA explained an additional 30% of the variance in health anxiety, compared to 15% explained by the MCQ-30.

***Table 3.3: Inter-correlations between metacognition about health, health anxiety, cognitions about body and health, and neuroticism.***

| | 1 | 2 | 3 | 4. | 5. | 6. |
|---|---|---|---|---|---|---|
| 1.MCQHAT | | | | | | |
| 2.MCQHAC | .825** | | . | | | |
| 3.MCQHAP | .851** | .534** | | | | |
| 4.MCQHAU | .878** | .562** | .718** | | | |
| 5.WI | .693** | .486** | .596** | .711** | | |
| 6.CABAH | .540** | .424** | .450** | .483** | .447** | |
| 7.EPQ | .135* | .035 | .121 | .233** | .372** | .086 |

Note. MCQHAT= Metacognitions about Health Total; MCQHAC= Beliefs that Thoughts can Cause Illness; MCQHAB = Beliefs about Biased Thinking; MCQHAU = Beliefs that Thoughts are Uncontrollable; WI = Whiteley Index; CABAH = Cognitions about Body and Health Questionnaire; EPQ = Eysenck Personality Questionnaire.

**Correlation is significant at the .001 level (two-tailed). *Correlation is significant at the .001 level (one-tailed).

## Discussion

The metacognitive model (Wells, 2009; Wells and Matthews, 1994) implicates metacognitive beliefs about thoughts rather than other belief domains in the development of psychological disorder symptoms. Consistent with the model previous studies have demonstrated that metacognitions predict HA symptoms and explain a greater amount of variance than illness beliefs (Bailey and Wells, 2013). However, testing the model would be facilitated by developing more specific and sensitive measures of health anxiety related metacognitions. The purpose of the present study was to develop and psychometrically evaluate a

questionnaire measure designed to assess metacognitive beliefs that may be more specific to health anxiety.

PCA was used to identify and screen appropriate items for the measure. This process revealed 14 items which loaded independently and meaningfully across three components. The other six items did not pass the established criteria for retention and were dropped. Subsequent exploratory factor analysis on new data-sets also revealed a three-factor- solution. The three observed subscales were labelled: (1) Beliefs about biased thinking: this related to beliefs that thinking in certain ways can prevent or cause illness. (2) Beliefs that thoughts can cause illness: this was made up of beliefs that having illness related thoughts can lead to negative health outcomes. (3) Beliefs that thoughts are uncontrollable: this related to beliefs that thinking about illness is uncontrollable. Confirmatory factor analysis supported the structure of the measure with most indices confirming a good fit to a three-factor solution.

Assessment of internal consistency supported the homogeneity of subscales and the full measure. Correlations with measures of health anxiety demonstrated acceptable convergent validity of the scale and subscales. Preliminary evidence of divergent validity was obtained in demonstrating stronger relationships between MCQ- HA and health anxiety than between MCQ-HA and general anxiety proneness assessed with the EPQ-R-N.

To examine the potential utility of the MCQ-HA incremental validity was examined to determine if the MCQ-HA accounted for additional variance in health anxiety over and above that ac- counted for by the more generic measure of metacognitions the MCQ-30. Results indicated that the MCQ-HA variables explained an additional 26% of the variance over and above MCQ-30 sub- scales. Equally all three MCQ-HA subscales emerged as independent cross sectional predictors of health anxiety. Overall this would indicate in this sample the

MCQ-HA appears to be a valid and potentially useful cross sectional predictor of health anxiety.

The present findings support the metacognitive model and confirm that specific metacognitive beliefs are positively associated with health anxiety. Furthermore, there is demonstrable utility in measuring such metacognitions in attempting to statistically explain health anxiety symptoms. The MCQ-HA is likely to prove a useful addition in assessing the role of metacognitions in health anxiety and in continuing to test the relative contributions of different components of cognition. Equally if these specific beliefs are instrumental in health anxiety, then targeting them in therapy may be an effective means of reducing health anxiety symptoms. In a preliminary study this approach seemed feasible (Bailey and Wells, 2014).

However, there are limitations with this present study that future studies should aim to overcome. The initial items were not subjected to any external evaluation of readability and comprehensibility outside of the study's authors, further evaluation could improve any potential issues with item clarity. As participants in the current study were a specific non-health seeking sample, more diverse samples and including clinical samples would need to be used to establish the generalisability of the factor structure and reliability of the measure. However, as noted health anxiety is normally distributed in student groups generally (Marcus et al., 2008) and medical based student's specifically (Zhang et al., 2014). We have not established the stability of MCQ-HA subscale scores over time and therefore at present we do not have data on the re- test reliability of the scales.

The demographic was predominantly young, white and female and as a result limits the generalisability of the correlation analyses. In particular, as the samples predominantly consisted of females the latent structure of items in males needs to be determined and wider

generalisability of the results is unknown. Further research would benefit from having a more balanced gender ratio.

A limitation of the current analysis is that we did not include another measure of metacognition in health anxiety which could have enabled further evaluation of convergent validity. Since the only other measure available; the MCHA (Bouman & Meijer, 1999) is unpublished and has not been subject to detailed psychometric assessment, we decided not to include it in this study as a means of limiting the number of administered to participants.

In conclusion, the preliminary findings from this study support the assessment of health anxiety specific metacognitions and provide justification for future research work evaluating and using the MCQ-HA. In particular future studies should include participants from a clinical sample to determine if the same factor structure emerges in this population. Development of this tool provides a means of testing the metacognitive model against cognitive approaches to health anxiety and may subsequently support important conceptual and therapeutic developments in this area.

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# Chapter 4

# The Contribution of Metacognitive Beliefs and Dysfunctional Illness Beliefs in Predicting Health Anxiety: An Evaluation of the Metacognitive Versus the Cognitive Models

**Robin Bailey**

**Adrian Wells**

**Published in Clinical Psychologist.**

**The Contribution of Metacognitive Beliefs and Dysfunctional Illness Beliefs in Predicting Health Anxiety: An Evaluation of the Metacognitive versus the Cognitive Models.**


Abstract

Background: In the cognitive model dysfunctional beliefs about symptoms and illnesses are pivotal in the conceptualisation of health anxiety. The metacognitive model offers an alternative view in that health anxiety is linked more to beliefs about thinking that is metacognitive beliefs. This study sets out to test the relative contribution of each type of belief to health anxiety as a rigorous test of each of the respective models.

Method: In the present study, 377 participants completed measures of neuroticism, health anxiety-related dysfunctional beliefs and metacognitive beliefs.

Results: Metacognitive beliefs explained a significant and large proportion (49 %) of the variance in health anxiety, when controlling for dysfunctional beliefs and neuroticism. They were found to be the strongest independent cross sectional predictors of health anxiety.

Conclusions: Overall, the findings indicate that metacognitive beliefs have a role in predicting health anxiety and may be more important than the symptom-related beliefs emphasised in cognitive models. The clinical implications of these findings are briefly considered.


## Introduction

Health anxiety is characterised by the belief that one has a serious illness, or a preoccupation with serious illness based upon bodily sensations (Asmundson, Taylor, Carleton, Weeks, &

Hadjstavropoulos, 2011). Conceptualised by cognitive behavioural models as a dimensional construct existing on a continuum from mild to severe (Abramowitz, Schwartz, & Whiteside, 2002; Ferguson, 2009; Longley et al., 2010; Salkovskis & Warwick, 1986; Taylor & Asmundson, 2004), health anxiety is maintained by a reciprocal interplay between cognitive, behavioural and affective factors. To date Cognitive Behavioural Therapy (CBT) approaches have been dominant in both the conceptualisation of health anxiety and its treatment (see Olatunji et al., 2014 for a review).

Cognitive behavioural theories conceptualise dysfunctional beliefs as a cardinal component in the development and maintenance of health anxiety (Marcus, Gurley, Marchi, & Bauer, 2007; Norris & Marcus, 2014). A vast body of research posits that health anxious individuals hold that health anxious individuals hold specific dysfunctional illness-related beliefs (Hitchcock & Mathews, 1992; Marcus, 1999; Marcus & Church, 2003; Rief, Hiller, & Margraf, 1998) that differentiate health anxious individuals from non-health anxious individuals (Salkovskis & Warwick, 1986, 2001) and individuals with anxiety disorders (Weck, Neng, Richtberg, & Stangier, 2012). The content of these beliefs can vary, with themes associated with severity and occurrence of perceived illness (Marcus & Church, 2003) unknown symptomatology perceived as catastrophic, with detrimental outcomes (Barsky, Coeytaux, Sarnie, & Cleary, 1993) all or nothing thinking about symptoms (Marcus et al, 2007) and fatalistic and cynical beliefs about the ability to prevent illness, treatment compliance, and the believability of medical reassurance (Fulton, Marcus, & Merkey, 2011). To date numerous studies (see Marcus et al., 2007, Norris & Marcus, 2014, for a review) have identified positive relationships between dysfunctional beliefs and health anxiety.

Salkovskis and Warwick's (1986; 1990) cognitive behavioural approach is considered the most well established and supported model of health anxiety (Taylor & Asmundson, 2004). According to this model dysfunctional beliefs remain latent until they are activated by

internal and/or external health-relevant information. Once activated these beliefs contribute to the catastrophic misinterpretation of bodily sensations and events (Taylor & Asmundson, 2004), and thus lead to high levels of anxiety and associated physiological arousal. Consequently the individual will overly focus on their bodily symptoms and filter all information through a cognitive bias, which intensifies bodily preoccupation and illness conviction (Barsky et al., 1993; Owens, Asmundson, Hadjistavropoulos, & Owens, 2004; Salkovskis & Clark, 1993), leading to further catastrophising minor bodily symptoms (Hadjistavropoulos, Hadjistavropoulos, & Quine, 2000; Rief et al., 1998). Ultimately this leads the individual to engage in behaviours such as reassurance seeking and avoidance as a means of reducing distress (Warwick & Salkovskis, 1990). In this model, four specific dysfunctional beliefs are considered instrumental in the maintenance and severity of health anxiety and are thematically based around: "the likelihood of contracting or having an illness," "the awfulness of illness," "the inability to cope with illness," and "the inadequacy of medical services for treating illness" (Salkovskis & Warwick, 2001). These key cognitions have recently been subjected to empirical testing to evaluate their role in health anxiety. Hadjistavropoulos et al. (2012) explored whether these four beliefs were associated with and predicted health anxiety, using a self-report measure specifically created to capture these beliefs: the Health Cognition Questionnaire (HCQ). The study found that after controlling for depression and general anxiety these beliefs were uniquely associated with health anxiety in both a medical and a non-medical sample. Fergus (2014) also found associations between these four dysfunctional beliefs and health anxiety and that the beliefs were more strongly related to health anxiety than obsessive compulsive disorder.

In contrast to cognitive models, the metacognitive model (Wells, 2009; Wells & Matthews, 2015) proposes that psychological disorders, such as health anxiety, result primarily from metacognitive beliefs rather than the "schemas" concerning health and symptoms. According

to the metacognitive model individuals with health anxiety engage in a generic thinking style, labelled the cognitive attentional syndrome (CAS) (Wells, 2000), which is triggered by negative thoughts. The CAS in relation to health anxiety includes worry and rumination about illness and health, threat monitoring for thoughts of illness and physical signs of illness, and behavioural strategies such as reassurance seeking that aim to control repetitive negative thoughts. These responses are guided by metacognitive beliefs, which are positive and negative in nature. Individuals with health anxiety hold beliefs that worrying about illness is useful, for example: "thinking the worst about symptoms will keep me safe," or inversely, "thinking positively about my health will tempt fate and I will become ill." Additionally individuals can also hold negative metacognitive beliefs about the uncontrollability of illness-related thinking ("I have no control over thinking about my health") and the danger of illness-related thinking ("worrying about my health will damage my body"). Evidence supports the role of such metacognitive beliefs in health anxiety. In two separate experimental studies (Kaur, Butow, & Sharpe, 2013; Kaur, Butow, & Thewes, 2011) metacognitive beliefs were associated with an attentional bias towards health-related information. In a community sample Barenbrügge, Glöckner-Rist, and Rist (2013) found a strong association between both negative and positive metacognitive beliefs and several aspects of health anxiety. Bailey and Wells (2013) found that metacognitive beliefs predicted health anxiety over and above other established correlates, such as illness cognition "catastrophic interpretation of bodily complaints," neuroticism, and somatosensory amplification.

From the evidence available it appears that both dysfunctional beliefs and metacognitive beliefs may have some contributory role in health anxiety; however, no study to date has investigated the relative contribution of both dysfunctional beliefs and metacognitive beliefs in health anxiety. The aim of the present study was to explore whether metacognitive beliefs explain health anxiety beyond the domain of dysfunctional beliefs that are central to

cognitive theory. In particular we will only be exploring those metacognitive beliefs that are problematic and unhelpful in nature, such as beliefs about the uncontrollability of thinking and beliefs regarding the power of negative and positive thinking. As it is useful to demonstrate that the relationships observed are not simply a function of a third variable and to rule any potential confounding effects of the relationship observed, we controlled for another specific psychological variable. In particular we controlled for neuroticism on conceptual grounds because this construct has been shown to be empirically associated with health anxiety (McClure & Lilienfeld, 2001; Noyes et al., 2003). Based on the metacognitive model it was hypothesised that metacognitive beliefs should be positively associated with health anxiety, and they should predict symptoms independently of dysfunctional beliefs in the "cognitive" domain. Moreover, if the metacognitive model presents a better overall account of the data they should be the stronger cross sectional predictors of health anxiety.

## Method

### Participants and Procedure

A cross-sectional study was undertaken with convenience sampling used for participant selection. A new sample of students were approached about the study via University e-mail and full details were provided about the study and its aims, with the option of consenting or not. Students were then given questionnaires in their lectures and asked to fill these in if they chose to take part in the study. This particular student demographic was chosen as previous research has revealed that health anxiety is normally distributed in student populations (Marcus et al., 2008) and in nursing student's specifically (Zhang et al., 2014). Information about gender was obtained from all participants, both these demographic variables have been considered important in health anxiety (MacSwain, Sherry, Stewart, Watt, Hadjistavropoulos,

& Graham, 2009; Bleichhardt & Hiller, 2007). Other variables such as marital status were not included as this has no effect on health anxiety (Bleichhardt & Hiller, 2007), and it was not necessary to include information on educational status as they were all degree student. The sample comprised of 377 university students from a variety of nursing cohorts, and data collection took place during 2013.The study was granted ethical approval (Project Reference, 11150), and all students were provided with full details regarding the study, with the option of consenting or not.

**Instruments**

*The Whiteley Index (WI)*

The WI (Pilowsky, 1967) is one of the most frequently used measures of hypochondriacal or health anxiety symptoms. For the purpose of this study, the 14 item newer version of the WI (Barsky, 1992; Welch, Carleton, & Asmundson, 2009) that uses a 5-point response format (1 = not at all to 5 = extremely) was used because it is more appropriate for measuring health anxiety severity. Scores range from 14 (minimum) to 70 (maximum), a number of studies have established that a cut off score of 40 or above indicates the presence of hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993). The measure has shown good internal consistency in medical outpatients alpha= .80, general practice alpha = .78, and the general population alpha= .76 (Speckens, Spinhoven, Sloekers, Bolk, & van Hemert, 1996).The Cronbach alpha in the present study was .90.

*The Health Cognitions Questionnaire*

The HCQ (Hadjistavropoulos et al., 2012) is a 20-item self-report measure that assesses health anxiety-related cognitions using a 5-point Likert scale (1 “strongly disagree” to 5 “strongly agree”). Scores ranging from 20 -100, with higher scores related to more dysfunctional beliefs. The HCQ contains four subscales that measure specific dysfunctional

beliefs based upon Salkovskis and Warwick's (2001) cognitive conceptualisation of health anxiety: "likelihood of contracting or having an illness" (HCQ-L), "I feel I am likely to experience health problems"; "awfulness of illness" (HCQ-A), "Having a serious health condition would be awful"; "inability to cope with illness" (HCQ-C), "I am not sure that I can handle any serious health problem that I might develop in the future"; and "inadequacy of medical services for treating illness" (HCQ-M), "I do not have confidence in the health care system." There are two separate HCQ measures: one for those who have not been diagnosed with a medical illness and one for those who have. The current study used the former. The scale has demonstrated good internal consistency, and predictive and discriminative validity (Hadjistavropoulos et al., 2012). In the present study the internal consistency of the subscales were acceptable with alpha scores ranging from .65 (coping with illness) to .79 (awfulness of illness).

*The Meta-Cognitions about Health Questionnaire (MCQ-HA)*

This new instrument devised by the authors (available from authors on request; Bailey & Wells, 2015) is based on the widely used general metacognitive belief measure, the Metacognition Questionnaire (MCQ-30: Wells & Cartwright-Hatton, 2004). Unlike the MCQ-30 the MCQ-HA assesses specific health anxiety-related metacognitive beliefs. The measure consists of 14 items with 4-point Likert response scales from 1 ("do not agree") to 4 ("agree very much"). Scores range from 20 to 80, higher scores correspond with the existence of greater maladaptive metacognitive beliefs. Initial exploratory factor analysis has revealed a three-factor-structure, consisting of the following subscales: "*Beliefs that thoughts cause illness"* (MCQ-HAC), *"Thinking negatively can increase my chances of disease"; "beliefs about biased thinking"* (MCQ-HAB), "*I will be punished for thinking I am in good health"; and "beliefs that thoughts are uncontrollable"* (MCQ-HAU), *"I have no control over thinking about my health."* The factor structure has been supported through confirmatory

factor analysis in a separate study (Bailey & Wells, 2015) and revealed that the measure has good internal consistency and discriminant and convergent validity (Bailey & Wells, 2015). In this study the MCQ-HA explained an additional variance (24%) in health anxiety when controlling for the MCQ-30, thus demonstrating incremental validity. In the present study the internal consistency of the subscales was good with the following alpha scores: beliefs that thoughts cause illness .82, beliefs about biased thinking .81, and beliefs that thoughts are uncontrollable .80.

*Neuroticism Scale of the Eysenck Personality Questionnaire-Revised: Short Form (EPQR-N)*

The EPQ-R short scale (Eysenck, Eysenck, & Barrett, 1985) is an internationally recognised personality trait measure, which assesses aspects of psychological distress and emotional instability (e.g. Gershuny & Sher, 1998; Kendler, Gardner, & Prescott, 2002). It includes 48 items and 4 subscales: extraversion (12 items), neuroticism (12 items), psychoticism (12 items), and lie (12 items). Each question on the subscale has a binary response, "yes" or "no", and items were scored with 1 or 0, with a maximum potential score of 12 and a minimum of 0. For the purpose of this study the neuroticism subscale was used, as this trait captures key aspects of both anxiety and depression. The neuroticism subscale has been reported to have good internal consistency with Cronbach alphas of .80 (female) and .84 (male) (Eysenck et al., 1985).

**Data Analysis Strategy**

Initially we ran Spearman's rho correlations between measures of health anxiety (WI), metacognition, dysfunctional beliefs and neuroticism. A hierarchal regression analysis was conducted to explore whether specific metacognitive beliefs explain variance in health anxiety beyond the domain of dysfunctional beliefs about symptoms formulated in cognitive theory. A further regression analysis was conducted to explore whether dysfunctional beliefs

explain variance in health anxiety beyond the domain of metacognitive beliefs as formulated in metacognitive theory.

## Results

### Sample Characteristics

Of the participants 332 were female (88.1%), 43 were male (11.4 %), and 2 did not provide their gender. All participants, except one, provided details of their age. Age ranged from 18 to 50 years, with a mean age of 27 (standard deviation = 6.83) years. Fourteen percent of the study passed the cut off score of 40 or above which can indicate the presence of health anxiety/hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993).

### Correlations

An inspection of skewness coefficients and levels of significance on Kolmogorov–Smirnov tests indicated that several measures were not normally distributed. Spearman's rho correlations were run between the measures of health anxiety (WI), cognitive dysfunctional beliefs total (HCQ-T), the four dysfunctional beliefs subscales (HCQ-A, HCQ-C, HCQ-L, and HCQ-M), metacognitions about health anxiety total (MCQ-HA), the three metacognitive belief subscales (MCQ-HAC, MCQ-HAB and MCQ-HAU) and neuroticism (EPQ-R-N), as presented in Table 4.1. In line with previous studies both dysfunctional beliefs and metacognitive beliefs correlated significantly with health anxiety. Based on Dancey and Reidy's (2004) categorisation, the strength of the relationship between dysfunctional beliefs and health anxiety in this study was weak (rs ranging from .20 to .32). This is similar to previous studies that have shown that the associations between dysfunctional beliefs and health anxiety are weak to moderate, (rs ranging from .22 to .48) (Hadjistavropoulos et al., 2012). In line with previous research all metacognitive beliefs had a moderate to strong significant relationship with health anxiety (Bailey & Wells, 2013; Bouman & Meijer, 1999),

with rs ranging from .52 to .68. Neuroticism also had a weak yet significant correlation with health anxiety, which is consistent with previous research findings (Hollifield, 2001). Overall the inter-correlations obtained add to existing research and demonstrate that both dysfunctional beliefs and metacognitive beliefs share a positive and significant correlation with health anxiety. The findings additionally suggest that the association between health anxiety and metacognitive beliefs may be stronger than the relationship between health anxiety and cognition.

**Table 4.1: Inter-correlations between health anxiety, dysfunctional beliefs, metacognitive beliefs and neuroticism.**

| Variable | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | M | SD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | WITOT | .684** | .383** | .148** | .318** | .203** | .261** | .242** | .680** | .580** | .522** | 26.61 | 10.54 |
| 2. | MCQ-HAT | | .250** | .050 | .182** | .157** | .186** | .155** | .854** | .723** | .872** | 20.06 | 6.63 |
| 3. | HCQ-T | | | .342** | .573** | .603** | .584** | .750** | .340** | .219** | .126* | 58.27 | 8.88 |
| 4. | EPQ-R-N | | | | .145** | .197** | .151** | .345** | .121* | -.032 | -.014 | 4.79 | 2.92 |
| 5. | HCQ-L | | | | | .175** | .242** | .237** | .227** | .194** | .090 | 11.61 | 2.94 |
| 6. | HCQ-A | | | | | | .126* | .301** | .209** | .093 | .068 | 14.15 | 3.53 |
| 7. | HCQ-M | | | | | | | .348** | .161** | .150** | .159** | 10.49 | 2.90 |
| 8. | HCQ-C | | | | | | | | .260** | .138* | .072 | 22.00 | 4.33 |
| 9. | MCQ-HAU | | | | | | | | | .595** | .576** | 6.21 | 2.53 |
| 10. | MCQ-HAB | | | | | | | | | | .498** | 6.27 | 2.27 |
| 11. | MCQ-HAC | | | | | | | | | | | 7.57 | 2.93 |

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). WITOT, (Whiteley Index Total); MCQ-HAT, (Metacognition Questionnaire- Health Anxiety Total); HCQ-T, (Health Cognition Questionnaire Total); EPQ-R-N, (Eysenck Personality Questionnaire-Revised - Neuroticism Scale); HCQ-L (Likelihood of illness); HCQ-A (Awfulness of illness) ; HCQ-M (Inadequacy of medical services) HCQ-C (Coping with Illness); MCQ-HAU ( Uncontrollability of thoughts); MCQ-HAB (Beliefs about biased thinking); MCQ-HAC (Thoughts cause illness).

**Independent contribution of dysfunctional beliefs and metacognitive beliefs in predicting health anxiety**

To investigate the relative contribution of both dysfunctional beliefs and metacognitive beliefs to health anxiety, a hierarchical regression analysis was run. To begin with we tested for multicollinearity by examining variance inflation factors (VIFs) and tolerance statistics. After entering the predictors all seemed acceptable, with tolerance values emerging as greater than the recommended .2 (range .42–.90; Menard, 1995) and all VIF values were less than 10 (range 1.1–2.3; Myers, 1990).

With the WI as an independent variable (Table 4.2), on step 1, the EPQR-N was force entered into the equation to control for personality factors and explained 8% of variance and was significant. On step 2 the four dysfunctional belief subscales (HCQ subscales: awfulness of illness, likelihood of illness, coping with illness, and medical reassurance) were force entered as a block and explained 11% of the variance. Finally, the three metacognitive subscales (MCQ-HA subscales: beliefs that thoughts cause Illness, beliefs about biased thinking, and beliefs that thoughts are uncontrollable) were forced into the equation. The block of metacognitive beliefs explained a further significant 47% of the variance in health anxiety (Table 2). Overall the full model accounted for 66% of the variance in health anxiety (Multiple R = .82, $F(8, 371) = 90.50$, $p < .001$).

In the final equation six cross sectional predictors made a unique and statistically significant contribution to health anxiety. The three metacognitive variables emerged as the strongest independent cross sectional predictors of health anxiety: MCQ-HAU ($\beta = .46$, $p < .001$), MCQ-HAB ($\beta = .20$, $p < .001$) and MCQ-HAC ($\beta = .15$, $p < .001$). Only 2 of the 4 dysfunctional beliefs emerged as significant cross sectional predictors of health anxiety:

HCQ-L (β= .14 p < .001), and HCQ-M (β= .08, p < .01). Neuroticism also emerged as a significant cross sectional predictor (β= .12 p < .001)

To explore the relative contribution of dysfunctional beliefs to health anxiety a further hierarchical regression analysis was undertaken. In this analysis steps 2 and 3 of the previous equation were reversed, with metacognitive beliefs being controlled and dysfunctional beliefs being entered on the last step. On the second step, the metacognitive variables significantly predicted a substantial 61% of the variance in health anxiety. The dysfunctional belief variables accounted for an additional 4% of the variance on the final step and were significant.

Overall the findings indicate that specific health anxiety related metacognitive beliefs individually explained a significant amount of variance in health anxiety and emerged as stronger cross sectional predictors of health anxiety than dysfunctional beliefs.

**Table 4.2: Summary of hierarchical analysis predicting health anxiety.**

| STEPWISE STATISTICS | | | | FINAL STATISTICS | | |
|---|---|---|---|---|---|---|
| **Step** | **Variable** | **$\Delta r^2$** | ***p*** | **β** | **t** | ***p*** |
| **1 (Enter)** | EPQ-R-N | .008 | .076 | .045 | 1.364 | .173 |
| **3 (Enter)** | HCQ-L | .161 | .000 | .155 | 4.751 | .000 |
| | HCQ-M | | | .091 | 2.718 | .007 |
| | HCQ-A | | | | | |
| | HCQ-C | | | | | |
| **4(Enter)** | MCQ-HAU | .486 | .000 | .482 | 10.153 | .000 |
| | MCQ-HAB | | | .189 | 4.233 | .000 |
| | MCQ-HAC | | | .153 | 3.861 | .000 |

EPQ-R-N (Eysenck Personality Questionnaire-Revised-Neuroticism); HCQ-L (Likelihood of illness); HCQ-M (Inadequacy of medical services); HCQ-A (Awfulness of illness) ; HCQ-C (Coping with Illness);

MCQ-HAU ( Uncontrollability of thoughts); MCQ-HAB (Beliefs about biased thinking); MCQ-HAC (Thoughts cause illness).

## Discussion

The aim of the current study was to investigate for the first time the relationships between dysfunctional beliefs, metacognitive beliefs, and health anxiety. In particular the study tested whether specific health anxiety-related metacognitive beliefs explain health anxiety in addition to, and more strongly than, dysfunctional beliefs.

Consistent with established studies and current literature both metacognitive beliefs and dysfunctional beliefs were positively associated with health anxiety. The correlation between dysfunctional beliefs and health anxiety was weak and did not appear to support the importance placed upon these beliefs in cognitive theories of health anxiety (Marcus, 1999; Norris & Marcus, 2014; Salkovskis & Warwick, 1986; Warwick & Salkovskis, 1990). Furthermore, these findings are not unique, as weak to moderate associations have been found between the HCQ and other validated measures of health anxiety, such as "The Short Health Anxiety Inventory" (Salkovskis & Warwick, 2001), in other studies (Alberts, Hadjistavropoulos, Sherry, & Stewart, 2014; Hadjistavropoulos et al., 2012). This may raise questions about the specificity of the HCQ as a measure of dysfunctional beliefs or lead to questions about the centrality of such beliefs in health anxiety. Consistent with previous research (Bailey & Wells, 2013; Barenbrügge et al., 2013; Kaur et al., 2011, 2013), metacognitive beliefs showed moderate to strong significant positive correlations with health anxiety, indicating that high scores on the MCQ-HA relate to high scores on the health anxiety measure. These findings correspond with an important role of metacognitive beliefs in health anxiety as postulated in the metacognitive model.

The results of the regression analysis revealed that after controlling for neuroticism and dysfunctional beliefs, metacognitive beliefs explained a significant and large amount of the variance in health anxiety. In fact the metacognitive beliefs accounted for nearly half of the variance in health anxiety after controlling for other relevant variables (47%). These findings are consistent with the idea that metacognitive beliefs might have an important and substantial contribution to health anxiety independently of other well-established personality and cognitive variables. This finding is in line with previous research (Bailey & Wells, 2013), which found that metacognitive beliefs explained variance over other cognitive cross sectional predictors associated with health anxiety, for example illness cognition ("catastrophic interpretation of bodily complaints"). The present study extends these findings by showing that metacognitive beliefs contribute to health anxiety beyond the latent underlying "core" dysfunctional beliefs, which are considered responsible for leading individuals to catastrophically misinterpret bodily symptoms (Abramowitz & Braddock, 2008). Recent evidence also supports these findings by showing that the effect of catastrophic misinterpretation on health anxiety may well be controlled by metacognitive beliefs (Bailey & Wells, 2015). The findings of the current study are in line with metacognitive theory, which states that disorder, for example health anxiety, results from biased mental control emerging from metacognitive beliefs rather than beliefs in the cognitive domain, such as illness cognition and dysfunctional beliefs. Two dysfunctional belief domains made weak but independent contribution to health anxiety in the final equation. How might this impact on the metacognitive model? These beliefs can be explained as triggers or conclusions of the worry and rumination processes central in the model. As such we hypothesise that they are markers of the CAS rather than beliefs that drive processing.

All three metacognitive subscales emerged as independent significant cross sectional predictors of health anxiety. The strongest independent cross sectional predictor was the

subscale “beliefs that thoughts are uncontrollable,” which relates to beliefs about the uncontrollability of thinking about illness. This is consistent with other studies that have demonstrated that uncontrollability beliefs in the metacognitive domain are common across a range of psychological disorders (e.g. Ruscio & Borkovec, 2004; Sarisoy et al., 2014; Spada, Caselli, Nikcevic´, & Wells, 2015; Spada, Georgiou, & Wells, 2010; Wells & Carter, 1999; Wells & Cartwright-Hatton, 2004), including health anxiety (Bailey & Wells, 2013; Barenbrügge et al., 2013; Bouman & Meijer, 1999; Kaur et al., 2011). The other two subscales, “beliefs about biased thinking” and “beliefs that thoughts can cause illness,” also emerged as independent significant cross sectional predictors and appear to demonstrate that beliefs concerning the ability of thinking to prevent and cause illness may be important in health anxiety. In comparison only two out of the four dysfunctional beliefs, that is “likelihood of illness” and “inadequacy of medical services,” emerged as significant, albeit weaker cross sectional predictors of health anxiety. This is an interesting finding as Salkovskis and Warwick (2001) state: “all four of these factors often need to be taken into account both in the formulation and in any treatment interventions” (p. 48). However, the present results would seem to suggest that the clinician might be better placed in taking account of metacognitive beliefs.

Overall these findings have some interesting theoretical and clinical implications for health anxiety, considering that dysfunctional beliefs have such a central role in cognitive behavioural treatment protocols. Based on the present study and indeed previous findings, the specific dysfunctional beliefs investigated may not be as strongly associated with health anxiety as predicted by cognitive models. In contrast, metacognitive beliefs may be the stronger determinant of health anxiety and may need to be treated. To date two studies have demonstrated that targeting metacognitive beliefs directly has been associated with positive outcomes in reducing the symptoms of health anxiety (Bailey & Wells, 2014; Papageorgiou

& Wells, 1998). More widely, metacognitive therapy may produce outcomes in the treatment of emotional disorders that can offer advantages over cognitive therapy (Normann, Van Emmerik, & Morina, 2014).

There are a number of major limitations to the present study. The participants were predominantly white and female, so this restricts generalisability to other groups, and future research requires a more balanced demographic. Equally the participants were from a non-clinical population, and it is unclear whether the present findings can be generalised to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) categories: somatic symptom disorder and illness anxiety disorder. The study did not control for other variables that have been shown to make a strong contribution to health anxiety, in particular anxiety sensitivity (e.g. Fergus, 2014). Future studies should include this variable when exploring predictors of health anxiety. As the study was cross-sectional it does not enable us to address causal relationships. To address this issue future research needs to identify whether metacognitive beliefs have a causal role in health anxiety over and above dysfunctional beliefs and other established cross-sectional variables (Bailey & Wells, 2013). In conclusion, the present study provides further support for the role of metacognitive beliefs in health anxiety and for the first time shows that these beliefs are stronger cross-sectional predictors than dysfunctional beliefs about physical health and symptoms.

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# Chapter 5

# Metacognitive Beliefs Moderate the Relationship between Catastrophic Misinterpretation and Health Anxiety

**Robin Bailey**

**Adrian Wells**

**Published in Journal of Anxiety Disorders.**

**Metacognitive Beliefs Moderate the Relationship Between Catastrophic Misinterpretation and Health Anxiety.**

Abstract

Catastrophic misinterpretations of bodily symptoms have a central role in cognitive-behavioural models of health anxiety. However, the metacognitive (S-REF) model postulates that psychological disturbance is linked more to beliefs about thinking, i.e., metacognition. Equally the relationship between catastrophic misinterpretation and health anxiety should be moderated by metacognition, in particular negative beliefs about the uncontrollability and danger of thinking (MCQNeg). Participants (N = 351) completed measures to examine the relationship between these variables. Results indicated positive relationships between metacognition, catastrophic misinterpretation, and health anxiety. Moderation analysis showed that the effect of catastrophic misinterpretations on health anxiety was explained by the proposed inter- action with metacognition. Follow-up regression analysis demonstrated the interaction term explained variance in health anxiety when controlling for other variables, and was a stronger unique cross sectional predictor of health anxiety than catastrophic misinterpretation. Metacognition appears to be an important factor in the relationship between catastrophic misinterpretation and health anxiety, and would have important implications for existing models and treatment.

## Introduction

A key tenet of cognitive-behavioural models of disorder is that distress is caused by the biased interpretation of events (Beck, 1976). In health anxiety the interpretations of importance consist of catastrophic misinterpretations of bodily signs and symptoms; an

attributional process considered central in panic disorder, (Clark, 1986) and in models of health anxiety (Barsky & Wyshak, 1990; Salkovskis, 1989; Warwick & Salkovskis, 1990).

According to these theories biased appraisals tend be the result of an individual's dysfunctional beliefs regarding illness, health and physiological sensations (Barsky, 1992; Salkovskis & Warwick, 1986). Considerable empirical support exists that individuals with health anxiety hold dysfunctional illness related beliefs (e.g., Fergus, 2014; Hitchcock & Mathews, 1992; Marcus, 1999; Marcus & Church, 2003; Norris & Marcus, 2014; Rief, Hiller & Magraf, 1998). A central theme in these beliefs tends to relate to the severity and occurrence of perceived illness (Marcus & Church, 2003), and the concept that unexplained symptoms are usually serious (Barsky, Coeytaux, Sarnie, & Cleary, 1993). Furthermore, such individuals are more likely to interpret bodily symptoms as catastrophic when compared with individuals low in health anxiety, those with anxiety disorders and control groups (Haenen, de Jong, Schmidt, Stevens, & Visser, 2000; Hitchcock & Mathews, 1992; Marcus, 1999; Norris & Marcus, 2014; Rief et al., 1998; Weck, Neng, Richberg, & Stangier, 2012).

Studies of misinterpretations have typically involved presenting participants with ambiguous scenarios and asking them to indicate an illness that the symptoms may relate to if they had them, or involve rating the likelihood of serious illness based on a set of symptoms. Consistently, these studies have shown that those high in health anxiety misinterpreted symptoms as indicative of serious illnesses and tended to dismiss minor illnesses and normalising explanations, compared to those in other groups.

Two meta-analyses (Marcus, Gurley, Marchi, & Bauer, 2007; Norris & Marcus, 2014) have added further evidence supporting the role of catastrophic misinterpretations in cognitive models. However, it has also been noted that conceptual overlap exists between items in the measures of catastrophic misinterpretation and items in outcome measures of health anxiety.

Consequently, the true value of catastrophic misinterpretations as direct cross sectional predictors of health anxiety may be unclear. Additionally, these reviews point to recent data on other cognitive factors and processes that may be important in health anxiety, specifically; anxiety sensitivity (Berrocal, Moreno, & Cano, 2007), feature positive affect (Rassin, Muri, Franken, & van Straten, 2008), pessimistic cognitive style (Schwenzer & Mathiak, 2011) and intolerance of uncertainty (Fergus & Valentiner, 2011). In the latter study intolerance of uncertainty moderated catastrophic health appraisals and health anxiety, indicating that this style of dysfunctional belief may be important in the relationship between misinterpretation and health anxiety. A different theoretical perspective; the metacognitive approach which is grounded in the Self-Regulatory Executive function (S- REF) model (Wells & Matthews, 1994; Wells, 2009), proposes that psychological disturbance is linked more to beliefs about thinking than to beliefs about other things (e.g., illnesses, bodily symptoms). Specifically, in reaction to negative thoughts (e.g., "What if I have brain tumour") the health-anxiety prone individual activates extended negative appraisal in the form of worrying, ruminating and focusing on threat. Collectively these responses are known as the cognitive attentional syndrome (CAS) and represent attempts at coping or self-regulation. The CAS is more likely to persist in those individuals holding positive (e.g., "Worrying will help me detect problems before it is too late") and/or negative metacognitive beliefs (e.g., "I cannot control my health worries"). Positive beliefs motivate sustained negative thinking whilst negative beliefs lead to reduced effort in mental control or more dysfunctional forms of control. In each case health worry is more persistent and leads to greater distress. In this model, there can be several mediators and moderators of the relationship between misinterpretation and health anxiety. In particular, the CAS can be a mediator whilst metacognitive beliefs are moderators of the effect of negative cognition on health anxiety. Whilst negative and/or positive metacognitive beliefs could act as moderators, the role of negative beliefs is of particular importance in

psychological distress as these not only bias mental control efforts but also convey a sense of greater threat from cognition itself. In summary, whilst cognitive models attribute health anxiety to belief in catastrophic misinterpretations of symptoms, the S- REF model attributes health anxiety to the regulation of cognition by metacognition. In doing so the model reconceptualises health anxiety as a difficulty in controlling or regulating worry about symptoms, rather than as a problem of believing that one is terminally ill.

There is significant evidence supporting the S-REF model in anxiety and depression (Wells, 2009). Furthermore, metacognition has been shown to predict symptoms of disorder more strongly than cognition across different presentations including; OCD (e.g., Gwilliam, Wells, & Cartwright-Hatton, 2004), generalised anxiety (e.g., Khawaja & McMahon, 2011; Wells & Carter, 1999, 2001), PTSD (Bennett & Wells, 2010) and depression (e.g., Papageorgiou & Wells, 2009). In the area of health anxiety, several studies have demonstrated relationships between metacognitive beliefs posited by the model and health anxiety.

Bouman and Meijer (1999) demonstrated a positive association between health anxiety and metacognition including "negative metacognitive beliefs about uncontrollability and danger of worry". In a health anxiety focused Stroop test, Kaur, Butow, and Thewes (2011) identified metacognitions as being positively associated with an attentional bias towards both positive and negative health- related information. In a further experimental study exploring the effect of situational threat on attentional bias in the context of health anxiety, Kaur, Butow, and Sharp (2013) found metacognition was positively associated with an attentional bias to threat whereas somatosensory amplification was not. In an online community survey study (N = 1246), Barenbrügge, Glöckner-Rist, and Rist (2013) identified that both positive and negative metacognitive beliefs were independently associated with facets of health anxiety commonly conceptualised in the health anxiety literature (e.g., illness beliefs, somatic complaints and frequent medical consultations). Bailey and Wells (2013) demonstrated that

metacognition was strongly associated with health anxiety and explained additional variance over and above established correlates associated with this disorder: illness cognition, somatosensory amplification and neuroticism. Clinically, studies have also shown that metacognitive- based treatment might be effective in individual's suffering with health anxiety (Bailey & Wells, 2014; Papageorgiou & Wells, 1998). We set out to test for the hypothesised positive relationship between metacognitive beliefs and both catastrophic misinterpretation and health anxiety. We also tested for the first time if metacognitive beliefs moderate the relationship between catastrophic misinterpretations and health anxiety. The S-REF predicts that catastrophic misinterpretation will be most strongly related to health anxiety in the presence of elevated metacognitive beliefs, especially negative beliefs concerning uncontrollability and danger of worry. This is because negative thoughts (e.g., "This could be cancer") are considered normal occurrences but it is the way the individual relates to these thoughts and regulates cognition that causes disorder. Negative metacognitive beliefs interfere with the effective regulation of worry (i.e., repetitive thinking) that is triggered by negative thoughts and also make thinking itself seem harmful. As a result the perception of threat escalates. These particular metacognitive beliefs are considered central in the model and "universal" across disorders (Wells & McNicol, 2014), consistently emerging as strongly associated with and a predictor of psychopathology in general (e.g., Ruscio & Borkovec, 2004; Sarisoy et al., 2014; Spada, Georgiou, & Wells 2010; Wells & Carter, 2001; Wells & Cartwright-Hatton, 2004) which includes health anxiety (Bailey & Wells, 2013; Barenbrügge et al., 2013; Bouman & Meijer, 1999; Kaur et al., 2011). In testing for metacognitive cross sectional predictors and moderators we aimed to control for specific psychological variables that might be a confounding source of the relationships observed. In particular we controlled for neuroticism and somatosensory amplification on conceptual grounds because it is useful to demonstrate that the relationships observed are not simply a

function of a third variable; as both neuroticism and somatosensory amplification have been empirically associated with health anxiety (Barsky, 1992; Barsky & Wyshak, 1990; McClure & Lilienfeld, 2001; Noyes et al., 2003) and metacognition (Bailey & Wells, 2013). Furthermore, we aimed to run an exploratory regression in which we controlled the overlap of metacognitive variables to determine which metacognitive factors independently contributed to health anxiety as a means of further examining a unique role of uncontrollability beliefs.

## Methods

### Participants and procedure

A cross-sectional design was employed using a convenience sample and the same sample used as in chapter 2. Three hundred and fifty one students completing Nursing courses at a University in the Northwest of England completed a set of questionnaires. Students were approached about the study via University e-mail and full details were provided about the study and its aims, with the option of consenting or not. Students were then given questionnaires in their lectures and asked to fill these in if they chose to take part in the study. Nursing students were specifically chosen because there is a higher potential to identify health anxiety in this particular group (Azuri, Ackshota, & Vinker, 2010; Zhang, Zhao, Mao, Li, & Yuan, 2014). Additionally as health anxiety is deemed to be a dimensional construct existing on a continuum from mild to severe (Ferguson, 2009; Longley et al., 2010, however for a counter- point of health anxiety considered as taxonomic, (see Asmundson, Taylor, Carleton, Weeks, & Hadjstavropoulos, 2012), a non-clinical sample was deemed appropriate.. Full ethical approval was granted through two University ethics committees (Project Reference, 11150) and students were fully briefed on the nature and purpose of the study.

**Measures**

*The Whiteley Index* (Pilowsky, 1967). The Whiteley index is an internationally established measure of health anxiety and hypochondriacal symptomatology. It consists of 14 items and the 5-point Likert scale version was used in this study (Welch, Carleton, & Asmundson, 2009). Scores range from 14 (minimum) to 70 (maximum), a number of studies have established that a cut off score of 40 or above indicates the presence of hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993). The measure has shown good internal consistency in medical outpatients ¸ α= .80, general practice ¸α = .78 and the general population¸ α= .76 (Speckens, Spinhoven, Sloekers, Bolk, & van Hemert, 1996). In the current study it possessed excellent internal consistency¸ α= .90. The measure has good psychometric properties including test retest reliability, and concurrent validity (Hiller, Rief, & Fichter, 2002; Speckens et al., 1996).

*Somatosensory Amplification Scale (SSAS).* The SSAS (Barsky, Wyshak, & Klerman, 1990) is a ten-item self-rated questionnaire consisting of a 5-point Likert scale, with responses ranging from 1= "not at all" to 5="extremely". A higher total score means that the respondent is more somatized (maximum = 50). The SSAS measures three theoretical aspects of somatosensory amplification, heightened sensitivity towards unpleasant bodily symptoms, selective attention towards bodily sensations and catastrophic misinterpretations of bodily symptoms/sensations (Barsky, Goodson, Lane, & Cleary, 1988). Somatosensory amplification has been shown to be positively associated with hypochondriasis (Barsky et al., 1990; Marcus et al., 2007) and has construct validity with measures of health anxiety such as

the Whiteley Index (Barsky et al., 1990). The SSAS has demonstrated satisfactory internal consistency, ˛ = α.83 (Barsky et al., 1990). In the current sample the alpha was .70.

*Neuroticism Scale of the Eysenck Personality Questionnaire-Revised-Short Form: EPQR-S.* The EPQR-S ((Eysenck, Eysenck, & Barrett, 1985) is an internationally established personality test, which is used extensively in research to predict the occurrence and characteristics of psychological distress and emotional instability (e.g., Gershuny & Sher, 1998; Kendler, Gardner, & Prescott, 2002). It includes 48 items and 4 subscales: extraversion (12 items), neuroticism (12 items), psychoticism (12 items), and lie (12 items). For the purpose of this study, only the neuroticism subscale was used because hypochondriasis has been linked to this personality trait (Hollifield, 2001). Each question on the subscale has a binary response, "yes" or "no" and items scored 1 or 0, with a maximum potential score of 12 and a minimum of 0. In a cross cultural study covering four countries the neuroticism subscale had good internal consistency with Cronbach alphas ranging from .79 to .83 (Francis, Brown & Philipchalk, 1992). In the current sample, the alpha was .79.

*Metacognition Questionnaire: MCQ-30.* The MCQ-30 (Wells & Cartwright-Hatton, 2004) is a well-established thirty item questionnaire measuring metacognitive beliefs and processes implicated in the metacognitive model. It consists of five subscales: *cognitive confidence* (evaluates confidence in memory and attention) (MCQCC), *positive beliefs about worry* (MCQPOS), *cognitive self- consciousness* (the propensity to focus on thought processes) (MCQCSC), *negative beliefs about uncontrollability of thoughts and danger* (MCQNEG), and *beliefs about the need to control thoughts* (MCQNC). Items are rated on a 4-point Likert scale from 1 ("do not agree") to 4 ("agree very much"). For each subscale, six items are scored 1–4, with a minimum score of 6 and a maximum score of 24. Higher scores

correspond with the existence of greater maladaptive metacognitive beliefs. The MCQ has been found to be a reliable measure and demonstrates good convergent and divergent validity (Cartwright-Hatton & Wells, 1997; Wells & Cartwright-Hatton, 2004). The internal consistency for the total MCQ-30 is (α= .93), with associated subscales having Cronbach alphas ranging from .72 to .93 (Wells & Cartwright-Hatton, 2004). In the current study internal consistency for the total MCQ-30 was (α = .94), with associated subscales having Cronbach alphas ranging from α = .80 to α= .88.

*The Cognitions about Body and Health Questionnaire*- CABAH (Rief et al., 1998)

The CABAH is a self-report instrument designed to assess the cognitive features of hypochondriasis (Rief et al., 1998). It consists of four subscales (1) catastrophizing interpretation of bodily com- plaints, (2) autonomic sensations, (3) bodily weakness, (4) intolerance of bodily complaints and (5) health habits. For the purpose of this study, only the catastrophizing subscale was used as this specifically measures catastrophic misinterpretation of bodily symptoms. The CABAH total has excellent internal consistency, Cronbach's alpha = .90, whilst the subscale "catastrophizing interpretation of bodily complaints" had an alpha of .88 (Rief et al., 1998). In the present study CABAH total also had excellent internal consistency α= .82 and the subscale of "catastrophizing interpretation of bodily complaints" had an alpha of .77.

*Health Scenarios Interpretation Questionnaire-HSIQ*

The HSIQ was devised by the authors for the purpose of this study to assess interpretations of symptoms linked to different health scenarios. Participants are asked to read 10 health related scenarios and rank an outcome from 1 to 4 (40 items) according to which explanation they believe is most likely to come to mind (4 most likely – 1 least likely), if this situation actually happened to them. By asking each participant to imagine each scenario as if it was happening

to them it makes each form of interpretation more personally relevant. The four outcomes in each scenario consisted of a catastrophic misinterpretation, benign interpretation, neutral interpretation and positive interpretation, which make up the measure's four subscales. For example "On waking in the morning you notice that you have a sore mouth and throat. What do you think might be the cause of this"?

- You have been sleeping in a stuffy room (Neutral)
- You have oral/throat cancer (Catastrophic)
- You have been engaging in lots of good conversations (Positive)
- You are coming down with a cold (Benign)

The catastrophic misinterpretations were based upon common illness interpretations reported by individuals with health anxiety (Barsky et al., 2001; Malis, Hartz, Doebbeling, & Noyes, 2002). The HSIQ yields four scores based on the summation of each of the sub- scales items, maximum score on each subscale is 40 (most likely) and minimum score 10 (least likely).

Cronbach alphas for the subscales were as follows: neutral $\alpha = .67$; catastrophic ¸ $\alpha = .88$; benign ¸ $\alpha = .56$; positive and ¸$\alpha = .62$; suggesting internal consistency ranging from poor to good. To assess convergent validity Pearson's correlations were run between the catastrophic misinterpretation subscale and a measure that captures catastrophic cognitions related to health and illness, i.e., the "catastrophizing interpretation of bodily complaints" subscale of the CABAH (Rief et al., 1998). Results revealed a positive and significant correlation (CABAH subscale: $r = .35$, $p < .001$). Convergent and discriminant validity was tested to identify whether the catastrophic misinterpretation measure had a stronger relationship with the more theoretically related construct, catastrophizing interpretation of bodily complaints, compared to the personality factor, neuroticism. Pearson correlations revealed a positive significant relationship between the catastrophic misinterpretation scale and CABAH

subscale, ($r = .35$, $p < .001$), whilst the relationship with neuroticism was negative and non-significant ($r = -.022$, $p = ns$).

**Data analysis strategy**

Initially we ran Pearson inter-correlations between the predictor variables and the outcome (Whiteley index). Next we tested metacognitive moderation using bootstrapping and the PROCESS tool designed by Hayes (2012). PROCESS is a computational macro used with SPSS for path analysis based moderation. This tool enables a more modern and up to date procedure for moderation analysis (Hayes, 2009, 2012). PROCESS command model 1 was used as this estimates a moderation model with a single moderator of the effect of X (catastrophic misinterpretation) on Y (health anxiety) by M (metacognition). We further explored the moderator effects through a simple slopes analysis. Within this study we decided to not run mediation analysis because catastrophic misinterpretation is not a direct measure of the cognitive attentional syndrome i.e. worry, which would according to the SREF model be the mediator between metacognition and health anxiety. Moderation is more appropriate because the SREF model predicts negative cognition, i.e. catastrophic misinterpretation is problematic when they are interpreted as uncontrollable and dangerous. Under such circumstances the CAS is more likely to develop. Finally, using the Whiteley Index as the dependent variable a hierarchical regression analysis was conducted to determine whether metacognitive variables predict health anxiety over and above other variables known to be associated with health anxiety (i.e., neuroticism, somatosensory amplification and catastrophic misinterpretation). Furthermore, we aimed, to ascertain whether the interaction between metacognitive beliefs and catastrophic misinterpretation explained additional variance in this equation, when controlling for all other variables.

# Results

## Sample Characteristics

Three hundred and fourteen of these participants were female (89.5% of the sample) and thirty seven were male (10.5% of the sample). The age range was 19–59 years, with a mean age of 27 years (SD 7.48 years). Fourteen percent of the study passed the cut off score of 40 or above which can indicate the presence of health anxiety/hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993).

## Inter-correlations

Results (Table 5.1) showed positive and significant correlations between all variables and health anxiety in particular the catastrophic misinterpretation subscale ($r = .40$, $p < .001$). This is in line with previous research which identifies that individuals high in health anxiety are more likely to make catastrophic health interpretations.

**Table 5.1: Inter-correlations of health anxiety, catastrophic misinterpretation, neuroticism, illness cognition, somatosensory amplification and metacognition.**

| Variable | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | M | SD |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.WITOT | .396** | .416** | .646** | .317** | 508** | 671** | .468** | .599** | .598** | 26.37 | 10.14 |
| 2.CATMIS | | .186** | .351** | -.022 | .191** | .340** | .376** | .248** | .240** | 14.98 | 6.03 |
| 3.SSAS | | | .552** | .254** | .254** | .423** | .291** | .295** | .412** | 10.34 | 4.57 |
| 4.CABAHIN | | | | .211** | .460** | .586** | .444** | .569** | .522** | 9.20 | 5.41 |
| 5.EPQ-R-N | | | | | .285** | .403** | .235** | .201** | .353** | 5.74 | 3.37 |
| 6.MCQPOS | | | | | | .576** | .356** | .644** | .553** | 10.16 | 3.69 |
| 7.MCQNEG | | | | | | | .444** | .618** | .687** | 11.28 | 4.76 |
| 8.MCQCC | | | | | | | | .519** | .442** | 10.23 | 4.00 |
| 9.MCQNC | | | | | | | | | .617** | 9.56 | 3.68 |
| 10.MCQSC | | | | | | | | | | 12.58 | 4.44 |

**Correlation is significant at the .001 level (2-tailed).

*WITOT, Whiteley Index Total; CATMIS, Catastrophic Misinterpretation Subscale; SSAS, Somatosensory Amplification Scale; CABAHIN, Cognitions About Body and Health Questionnaire Interpretation Scale; EPQ-R-N, Eysenck Personality Questionnaire-Revised (Neuroticism Scale); MCQPOS, Positive Beliefs About Worry; MCQNEG, Negative Beliefs about Uncontrollability of Thoughts and Danger; MCQCC, Cognitive Confidence; MCQNC, Beliefs About Need to Control Thoughts; MCQCSC, Cognitive Self-Consciousness.*

**Moderation analysis**

To explore our main hypothesis a moderation model was tested with a moderator of the effect of X (catastrophic misinterpretation) on Y (health anxiety) by M (beliefs about uncontrollability and danger: MCQNeg). The moderator effect (Table 5.2) was highly significant B = 0.0632, 95% CI [0.3, 0.9], t = 4.357, p < .00001.

Exploration of the conditional effect of X on Y at values of the moderator, revealed the following:

1. When MCQNeg is low there is a non-significant negative relationship between catastrophic misinterpretation and health anxiety. B = −0.0130, 95% CI [−0.174, 0.148], t = −0.1587, p = .8740.

2. At the mean value of MCQNeg there is a significant positive relationship between catastrophic misinterpretation and health anxiety. B = 0.2885, 95%, CI [0.1434, 0.4336], t = 3.9111, p < .0001.

3. When MCQNeg is high there is a stronger significant positive relationship between catastrophic misinterpretation and health anxiety. B = 0.5900, 95% CI [0.3595, 0.8205], t = 5.035, p < .0001.

In the simple slopes analysis (Fig. 2) the graph shows that when MCQNeg is low there is no significant relationship between catastrophic misinterpretations and health anxiety. At the mean value of MCQNeg there is a positive relationship between catastrophic misinterpretation and health anxiety and this relationship becomes stronger with an increase in metacognitive beliefs.

To examine whether these results would hold, the same moderation analysis was run, this time replacing the HSIQ catastrophic misinterpretation subscale, with a more established

measure of catastrophic misinterpretation, “catastrophizing interpretation of bodily complaints” subscale of the CABAH (Rief et al., 1998). Again moderation was identified by the significant interaction effect B = 0.0477, 95% CI [0.1, 0.8], t = 2.078, p < .01. Overall these analyses suggest that metacognitive beliefs moderate the relationship between catastrophic misinterpretations and health anxiety.

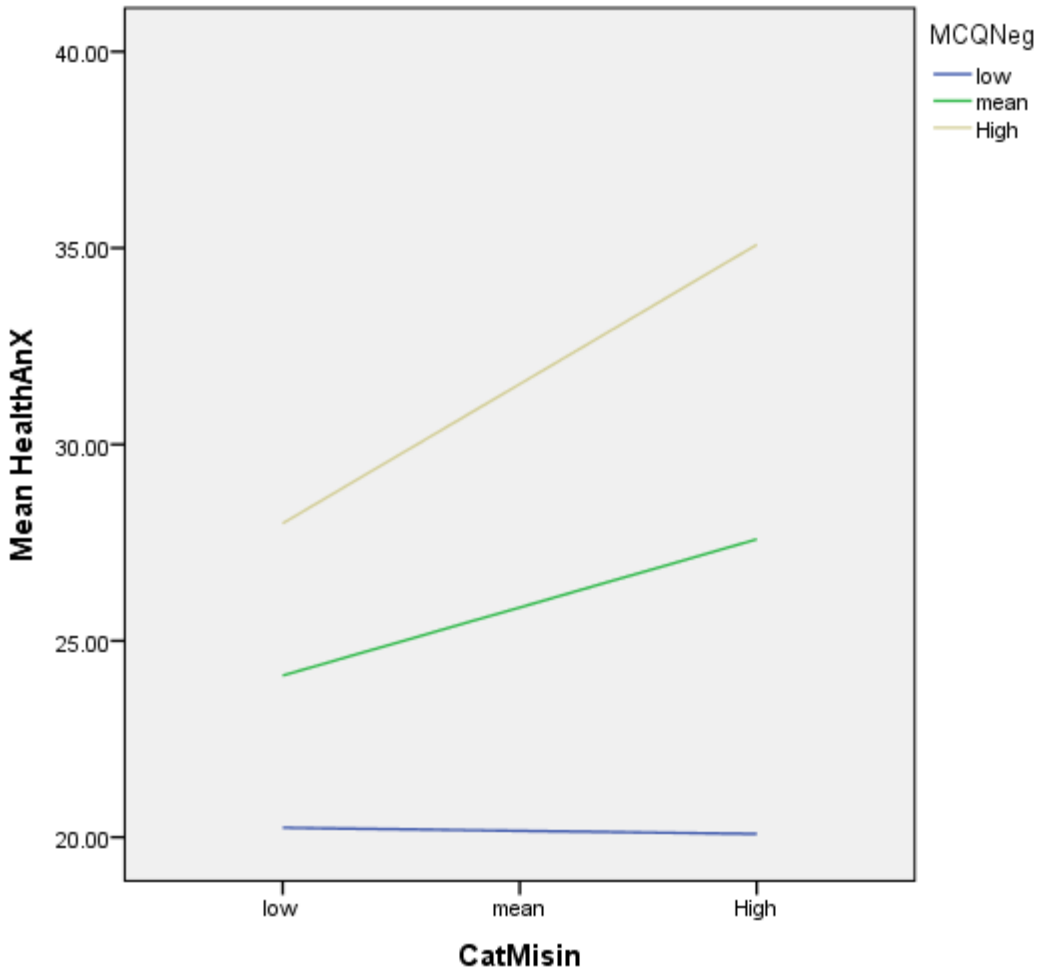
**Table 5.2:** ***Linear Model of Predictors of Health Anxiety***

| | B | SE B | t | p |
|---|---|---|---|---|
| Constant | 25.8499<br>CI(25.02, 25.67) | .4195 | 61.6142 | .0000 |
| MCQNeg (centred) | 1.1915<br>CI(0.98, 1.36) | 0.1044 | 11.4110 | .0000 |
| CatMis (Centred) | 0.2885<br>CI(0.14, 0.43) | 0.0738 | 3.9111 | .0001 |
| MCQNeg<br>X<br>CatMis | 0.0632<br>CI(0.03, 0.09) | 0.0145 | 4.3574 | .0000 |

R-sq. =.52

*Note.* B = unstandardized coefficient; MCQNeg = Negative Beliefs about Uncontrollability of Thoughts and Danger; CatMis = Catastrophic Misinterpretation subscale of Health Scenario Interpretation Questionnaire.

**Figure 2:** ***Simple slopes equations of the regression of health anxiety on catastrophic misinterpretation at three levels of metacognitive beliefs about uncontrollability and danger.***




Note. *HealthAnx = Health Anxiety; CatMisin = Catastrophic Misinterpretation; MCQNeg = Metacognitive Beliefs about Uncontrollability and Danger.*

**Regression analysis including the interaction term**

All variables in the regression analysis had significant inter- correlations ranging from r = .32 to r = .67. As the latter correlation was high we tested for multicollinearity by examining variance inflation factors (VIFs) and tolerance statistics. After all predictors were entered, none appeared problematic, all tolerance values were greater than the recommended 0.2 (range .48–.81; Menard, 1995) and all VIF values were less than 10 (range 1.2–2.0) (Myers, 1990). To control for personality factors, neuroticism (EPQR-S Neuroticism subscale) was entered at Step 1, somatosensory amplification (SSAS), catastrophic misinterpretation (CM) and the five metacognitive variables were forward-entered at step 2 to examine the unique contribution of each variable to health anxiety. Finally on step 3 following Aiken and West's (1991) recommendations for testing interaction effects, predictor variables were mean centred and an interaction term was calculated and force entered into the equation, to assess whether the combination explained variance beyond the individual variables and remained an independent predictor of health anxiety.

In the final step of the equation, seven cross sectional predictors made a unique and statistically significant contribution to health anxiety (Table 5.3). Three of these were metacognitive variables and explained the most variance in the health anxiety model, metacognitive beliefs about uncontrollability and danger (MCQNeg); 34.5% metacognitive beliefs about need to control thoughts (MCQNC); 5.6%, and metacognitive beliefs about cognitive confidence (MCQCC); 0.8%, with a significant contribution also made by the interaction term.

The interaction term explained an additional 4.1% of the variance when all other variables were accounted for. Interestingly, it accounted for more variance than catastrophic misinterpretation, supporting the finding that when combined with metacognitive beliefs of

uncontrollability and danger, catastrophic misinterpretation is a more substantive, independent cross sectional predictor of health anxiety.

**Table 5.3:** ***Summary of Hierarchical Analysis Predicting Health Anxiety.***

| **STEPWISE STATISTICS** | | | | **FINAL STATISTICS** | | |
|---|---|---|---|---|---|---|
| **Step** | **Variable** | **$\Delta r^2$** | ***p*** | **β** | **t** | ***p*** |
| **1. (Enter)** | **Neurot** | **.099** | **.000** | **.127** | **3.190** | **.002** |
| **2. (Forward)** | **MCQNeg** | **.345** | **.000** | **.296** | **5.805** | **.000** |
| | **MCQNC** | **.056** | **.000** | **.194** | **4.029** | **.000** |
| | **CM** | **.021** | **.000** | **.120** | **3.098** | **.002** |
| | **SSAS** | **.015** | **.001** | **.134** | **3.450** | **.001** |
| | **MCQCC** | **.008** | **.013** | **.098** | **2.331** | **.020** |
| **3.(Enter)** | **MCQNeg X CM** | **.041** | **.000** | **.220** | **5.834** | **.000** |

## Discussion

This study sought to test for positive relationships between metacognitive beliefs and both catastrophic misinterpretation of symptoms and health anxiety as predicted by the S-REF model. Furthermore, it tested the prediction that the effect of catastrophic misinterpretations

on health anxiety is dependent on metacognition, in particular negative beliefs about the uncontrollability and danger of worry.

Health anxiety was positively associated with attributing scenario based symptoms to a catastrophic cause. This finding is in line with previous attributional research which has also found that individuals with health anxiety tend to have an attributional style which is biased towards serious illness (Haenan et al, 2000; Hitchcock & Mathews, 1992; Fergus, 2014; Marcus, 1999; Norris & Marcus, 2014; Rief, Hiller & Margraf, 1998; Weck, Neng, Richberg, & Stangier, 2012). The replication of these findings indicates that the symptom interpretation questionnaire (HSIQ) used in this study seems to have captured this attributional style. The findings provide further evidence for cognitive and perceptual models of health anxiety. However, the outcomes relating to our main hypotheses imply that we should take a new look at catastrophic misinterpretations and the relationship that exists between them and health anxiety.

First, we tested for a hypothesised moderator effect of metacognition, specifically negative beliefs about the uncontrollability and danger of worry. The result of the analysis showed that the effect of catastrophic misinterpretations on health anxiety was explained by an interaction with metacognitive beliefs. This is a potentially important finding that is in line with the metacognitive (S-REF) model. In this model the content of thoughts or catastrophic misinterpretations are more likely to cause psychological disorder because of their relationship with metacognition. Crucially, there is an input from specific metacognitions in health anxiety and without this the effects of catastrophic misinterpretations on anxiety may be inconsequential. If this finding is reliable it presents a challenge to cognitive theories of health anxiety that give central importance to a single mechanism of catastrophic misinterpretation of symptoms. The slope analysis showed that catastrophic misinterpretation levels were not correlated with health anxiety at low levels of uncontrollability and danger

metacognitions. This is particularly compelling because the MCQ-30 used to assess metacognition in the current study assesses general metacognitions and not health anxiety metacognitions specifically. Therefore the relationship cannot be attributed to content overlap.

Second, we examined if the interaction term explained variance in health anxiety when controlling for other variables that might explain the association, and if it was a unique cross sectional predictor of health anxiety in addition to catastrophic misinterpretation. The analysis revealed seven independent cross sectional predictors of health anxiety. Three of them were metacognitive variables. The interaction term explained an additional 4.1% of the variance in health anxiety and was one of these unique cross sectional predictors. There were further independent contributions made by neuroticism, catastrophic misinterpretation, and somatosensory amplification. The results further suggest that metacognition is a potentially important factor in explaining variance in health anxiety symptoms. In the final equation catastrophic misinterpretation made an individual significant contribution. Taken with the results of the moderator analysis it is reasonable to assume that the relationship between catastrophic misinterpretation and health anxiety is complex, it may involve additional moderated, direct and indirect (mediated) pathways that should be assessed further. For example, the S-REF model suggests that catastrophic misinterpretations are examples of individual negative thoughts which act as triggers for sustained worrying, and thus the process of worrying or extended thinking may mediate the relationship between misinterpretations, and health anxiety. Should the present findings prove to be reliable and replicated in clinical samples then the clinical implications would be important. Specifically, the current practise in CBT of challenging catastrophic misinterpretations of symptoms may not be necessary or sufficient for long term recovery, but modifying metacognitions might provide a more efficient and effective strategy. Tentatively, meta-level change may be

required in order to reduce relapse and to overcome the problem of the substitution of one disease conviction with another. In particular, high negative metacognition is likely to render the individual more sensitive to engage in difficult to control extended processing in response to negative interpretations of symptoms. Thus, metacognitive therapy (Wells, 2009) might prove helpful in the treatment of health-anxiety. Pilot studies have suggested that metacognitive-focused treatment for health anxiety is feasible and associated with positive outcomes (Bailey & Wells, 2014; Papageorgiou & Wells, 1998).

There are several limitations to this study and the findings should be interpreted with caution. The study is cross-sectional in nature and therefore it cannot address causality in the relationships observed. Future studies need to address causality in relation to health anxiety and metacognition. A further limitation concerns the participants in this study; as they were self-selecting, female and relatively young; this restricts generalizability and applicability to other samples.

As we did not include any covariates that measure specific health anxiety dysfunctional beliefs, the role of these beliefs as a moderator could not be established. Future research should assess the contribution of both dysfunctional beliefs and metacognition in the relationship between catastrophic misinterpretation and health anxiety.

A further limitation of the study relates to our measure of catastrophic misinterpretation; the HSIQ. Although some preliminary data has been presented further evaluation of its psychometric properties are needed, particularly as the majority of the subscales had poor to questionable internal consistency. However, the catastrophic misinterpretation subscale had good internal consistency and demonstrated a similar significant interaction effect when replaced with an established catastrophic misinterpretation subscale.

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# Chapter 6

# Is Metacognition a Causal Moderator of the Relationship Between Catastrophic Misinterpretation and Health Anxiety? A Prospective Study.

**Robin Bailey**

**Adrian Wells**

**Published in Behaviour Research and Therapy.**

**Is Metacognition a Causal Moderator of the Relationship between Catastrophic Misinterpretation and Health Anxiety? A Prospective Study.**

Abstract

Psychological theories have identified a range of variables contributing to health anxiety, including, dysfunctional illness beliefs, catastrophic misinterpretation, somatosensory amplification and neuroticism. More recently, metacognitive beliefs have been proposed as important in health anxiety. This study aimed to test the potential causal role of metacognitive beliefs in health anxiety. A prospective design was employed and participants (n = 105) completed a battery of questionnaire at two time points (6 months apart). Results demonstrated that cognitive, personality and metacognitive variables were bi-variate prospective correlates of health anxiety. Hierarchical regression analysis revealed that only metacognitive beliefs emerged as independent and significant prospective predictors of health anxiety. Moderation analysis demonstrated that metacognitive beliefs prospectively moderated the relationship between catastrophic misinterpretation and health anxiety. Follow-up regression analysis incorporating the interaction term (metacognition x misinterpretation) showed that the term explained additional variance in health anxiety. The results confirm that metacognition is a predictor of health anxiety and it is more substantive than misinterpretations of symptoms, somatosensory amplification, neuroticism, and illness beliefs. These results may have major implications for current cognitive models and for the treatment of health anxiety.

## Introduction

Health anxiety is a condition which is characterised by beliefs that one has or will develop a serious illness based upon misinterpreting bodily symptoms (Abramowitz, Olatunji, & Deacon, 2007; Taylor & Asmundson, 2004). Typically considered a dimensional rather than a categorical construct (Longley et al., 2010), anxiety about one's health can range from mild transient concerns (Looper & Kirmayer, 2001) to severe health anxiety/hypochondriasis. Health anxiety causes high levels of psychological distress, functional impairment and excessive use of medical services (Creed & Barsky, 2004; Lee, Creed, Ma, & Leung, 2015). Cognitive behavioural theories consider dysfunctional beliefs to be a central cause of health anxiety (Marcus, Gurley, Marchi, & Bauer, 2007; Norris & Marcus, 2014). Extensive research has identified that health anxious individuals hold dysfunctional illness related beliefs (Hitchcock & Mathews, 1992; Marcus, 1999; Marcus & Church, 2003; Rief, Hiller, & Margraf, 1998) and they increase health anxious symptomatology, once they are activated by health related internal or external triggers (Abramowitz & Braddock, 2008; Taylor & Asmundson, 2004). Salkovskis' s cognitive model of health anxiety (Salkovskis & Warwick, 1986; Warwick & Salkovskis, 1990) proposes that health anxiety is linked to four specific health related dysfunctional beliefs: 'the likelihood of contracting or having an illness', ' the awfulness of illness', ' the inability to cope with illness', and 'the inadequacy of medical services for treating illness' (Salkovskis & Warwick, 2001). A number of cross sectional studies have demonstrated that these dysfunctional beliefs are specific to health anxiety and strongly associated and predictive of this dis- order (e.g. Fergus, 2014; Hadjistavropoulos et al., 2012).

In addition to dysfunctional beliefs cognitive models of health anxiety view biased interpretations in the form of catastrophic misinterpretations of bodily symptoms as important in causing health anxiety. Once dysfunctional beliefs become activated this is thought to lead the individual to catastrophically misinterpret symptoms as an indicator of the

presence of potentially serious illness (Marcus & Church, 2003; Taylor & Asmundson, 2004). Consistent with this proposal studies have demonstrated positive associations between catastrophic misinterpretations and the presence of health anxiety (e.g. Marcus et al., 2007; Norris & Marcus, 2014; Rief et al., 1998; Weck, Neng, Richtberg, & Stangier, 2012).

Similar to cognitive behavioural models, cognitive perceptual theories suggest that somatosensory amplification is instrumental in the development of health anxiety. The theory states that individuals with health anxiety have a tendency to be hypervigilant and selectively attend to somatic feelings and sensations in the body and consequently catastrophize these symptoms as an indicator of serious illness (Barsky, 1992; Barsky, Coeytaux, Sarnie, & Cleary, 1993). A number of studies have identified an association between somatosensory amplification and health anxiety (Barsky & Wyshak, 1990; Barsky, Wyshak, & Klerman, 1990); however, greater evidence exists for the cognitive misinterpretation component of the model than heightened sensitivity to somatic symptoms (Marcus et al., 2007; Norris & Marcus, 2014).

Another important variable which has been both theoretically and clinically implicated in health anxiety is the personality construct of neuroticism. Studies have shown neuroticism to be strongly positively associated with health anxiety (McClure & Lilienfeld, 2001; Noyes et al., 1994; 2003). In interpersonal models of health anxiety, neuroticism has been shown to be a predictor of health anxiety and strongly associated with attachment styles (Noyes et al., 2012). Some authors have proposed that health anxiety may just be a manifestation of neuroticism (Watson, 2013). This view, however, has been challenged with studies showing that although health anxiety is associated with neuroticism it has incremental validity over this construct (Fergus & Valentiner, 2011; Ferguson et al., 2013).

Recent advances have applied the metacognitive model of psychological disorder (Wells, 2000; Wells & Matthews, 1994; 1996) to understanding health anxiety. Central to this model is the idea that disorders such as health anxiety result from repetitive and difficult to control negative thinking marked by worry and rumination and the use of paradoxical mental control strategies such as seeking reassurance and thought suppression. Such repetitive negative thinking is the result of unhelpful metacognitions that is underlying beliefs about thoughts, (e.g. “Thinking the worst about symptoms will keep me safe” and “I cannot control my health worries”). The metacognitive model presents an explanation of health anxiety that is different from cognitive models, since health anxiety is seen as resulting more from extended and repetitive negative thinking about illness rather than from the belief that one is ill. Thus, according to the metacognitive model, meta- cognitive beliefs about repetitive thinking should be more important than beliefs about illness. This translates into different types of clinical practice; for example, in traditional CBT a patient with health anxiety, who believes that the sore throat they are experiencing is throat cancer, would be asked to generate alternative benign explanations for this symptom as a means of challenging their catastrophic misinterpretation. In contrast, in metacognitive therapy (MCT) the therapist would explore with the patient new ways of relating to the misinterpretation that consist of reduced thinking that can modify beliefs concerning the uncontrollability of health-related worrying. This would consist of postponing any attempt to deal with the interpretation until later. In CBT, patients are taught to challenge disease conviction and generate alternative content; however in MCT patients learn how to reduce their overthinking response to disease convictions when they occur. Consistent with this model several cross sectional studies have demonstrated a strong association between metacognition and health anxiety. In one study Kaur, Butow, and Thewes (2011) found that metacognitive beliefs were associated with an attentional bias towards positive and negative health related information (range of correlations .32 to .69).

Bailey and Wells (2013) found that metacognitive beliefs explained variance in health anxiety symptoms over and above other established correlates namely, illness cognition, somatosensory amplification, and neuroticism (range of correlations .46 to .47). Furthermore, metacognitive beliefs moderated the relationship between catastrophic misinterpretation of bodily symptoms and health anxiety (Bailey & Wells, 2015a) calling into question the importance given to misinterpretations. In this study the moderator effect showed that catastrophic misinterpretations alone did not predict health anxiety and an input from metacognition appears to be required to produce this association. This challenges the dominant role given to catastrophic misinterpretations because they appear inert without the involvement of metacognition. In an Italian community sample, Melli, Carraresi, Poli, and Bailey (2016) identified metacognitive beliefs were associated with symptoms of health anxiety (range of correlations .20 to.50). Bailey and Wells (In press) in a replication study found that metacognitive beliefs were again associated with health anxiety (range of correlations .52 to .68). Solem et al. (2015) identified a strong relationship between health anxiety and metacognitive beliefs in a clinical sample of obsessive compulsive disorder patients (range of correlations .23 to .48). These earlier studies have used a range of different measures of metacognitive beliefs. For example, Melli et al. (2016) used an unpublished measure, the Meta-cognitions about Heath Anxiety (MCHA), by Bouman and Meijer (1999) based on the meta- cognitions questionnaire (MCQ: Cartwright-Hatton & Wells, 1997). Bailey and Wells (2015b) have used a 3-factor-measure (the MCQ-HA) that is more specific to health anxiety than the MCQ and is also grounded in the metacognitive model. The MCQ-HA has been shown to have incremental predictive validity over the MCQ (Bailey & Wells, 2015b).

Although illness beliefs, catastrophic misinterpretation, somatosensory amplification, neuroticism and metacognitive beliefs are all associated with health anxiety, the majority of

studies have tended to be cross-sectional in nature and therefore limit any causal interpretations. In fact when considering the amount of health anxiety research conducted to date, there are few prospective studies demonstrating temporal relationships between these variables.

In the only study of its kind, catastrophizing of bodily sensations was shown to maintain health anxiety over a one-month-time period (Gautreau et al., 2014). Although this is a novel finding it is limited by the brevity of the time period between measurement occasions. Personality factors similar to neuroticism, such as emotional stability, have been shown to predict health anxiety prospectively. Ferguson (2004) found that lower levels of emotional stability positively predicted future levels of health anxiety over a 16-17-month-period. Anxiety sensitivity has also been shown to be significantly associated with health anxiety Abramowitz, Deacon, & Valentiner, 2007; Abramowitz, Olatunji, et al., 2007) in particular the "physical" dimension of this construct. However, there is only one prospective study and anxiety sensitivity did not emerge as a significant predictor (Olatunji et al., 2009).

In view of the important role assigned to metacognitive beliefs in the metacognitive model and their observed positive associations with health anxiety in cross-sectional studies, we set out to test for prospective relationships between these beliefs and sub- sequent health anxiety. A prospective relationship would be consistent with the hypothesised causal contribution of metacognition.

Based on cross-sectional data it was hypothesised that somatosensory amplification, neuroticism, catastrophic misinterpretations, dysfunctional illness beliefs and metacognitive beliefs would be associated with health anxiety longitudinally. In line with the main aim of the study and metacognitive theory in particular, it was hypothesised that metacognitive beliefs measured at time point 1 would explain variance in health anxiety at time point 2 (six

months later), when controlling for these other associated constructs. It was further predicted that the prospective relationship between metacognition and health anxiety would be unidirectional rather than bi-directional i.e., that metacognitions will predict later health anxiety but health anxiety will not predict later metacognition scores. Finally, based on previous cross- sectional findings and metacognitive theory we tested the hypothesis that the prospective relationship between catastrophic misinterpretation and health anxiety would be moderated by metacognitive beliefs rather than dysfunctional beliefs about illness (schema), and this interaction would emerge as a significant additional predictor of health anxiety over time.

## Methods

### Participants

All participants were drawn from nursing cohorts as this group have been shown to experience elevated levels of health anxiety (Azuri, Ackshota, & Vinker, 2010; Zhang, Zhao, Mao, Li, & Yuan, 2014). Using an analogue sample can be useful when studying health anxiety because it is considered to exist on a continuum (Looper & Kirmayer, 2001) as a dimensional construct (Ferguson, 2009; Longley et al., 2010), with mild cases being associated with clinical problems (Hadjistavropoulos & Lawrence, 2007). Equally Marcus et al. (2007) found that elevated health anxiety and health anxious beliefs were similar in both clinical and non-clinical samples. New cohorts of students were approached about the study via University e-mail and full details were provided about the study and its aims, with the option of consenting or not. Students were then given questionnaires in their lectures and asked to fill these in if they chose to take part in the study, and this procedure was then repeated at the second time point. Data collection took place between 2013 and 2015. One hundred and five participants who took part at Time 1, and returned matching questionnaires

at Time 2. Twenty five participants (19.2%) completed Time 1 data but did not complete Time 2 data. The Time 1 questionnaire scores of those who did and did not participate at Time 2 were not significantly different. Information about gender was obtained from all participants, both these demographic variables have been considered important in health anxiety (MacSwain, Sherry, Stewart, Watt, Hadjistavropoulos, & Graham, 2009; Bleichhardt & Hiller, 2007). Other variables such as marital status were not included as this has no effect on health anxiety (Bleichhardt & Hiller, 2007), and it was not necessary to include information on educational status as they were all degree students. Full ethical approval was granted by the University's ethics committee (Project Reference, 13175).

**Measures**

*The Whiteley index* (WI: Pilowsky, 1967)

The WI (Pilowsky, 1967) is one of the most frequently used measures of hypochondriacal or health anxiety symptoms. For the purpose of this study, the 14 item newer version of the WI (Barsky, 1992; Welch, Carleton, & Asmundson, 2009) that uses a 5-point response format (1 = not at all to 5 = extremely) was used because it is more appropriate for measuring health anxiety severity. Scores range from 14 (minimum) to 70 (maximum), a number of studies have established that a cut off score of 40 or above indicates the presence of hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993). The measure has shown good internal consistency in medical outpatients alpha= .80, general practice alpha = .78, and the general population alpha= .76 (Speckens, Spinhoven, Sloekers, Bolk, & van Hemert, 1996). In the current study the WI had excellent internal consistency, $\alpha$=.89.

*Neuroticism scale of the Eysenck Personality Questionnaire- Revised: short form* (EPQR-N)

The EPQ-R short scale (Eysenck, Eysenck, & Barrett, 1985) is a trait measure, which captures important aspects of emotional instability and anxiety (e.g., Gershuny & Sher, 1998; Kendler, Gardner, & Prescott, 2002). Consisting of 4 subscales: extraversion (12 items), neuroticism (12 items), psychoticism (12 items), and lie (12 items), only the neuroticism subscale was used in this study. The scale has a dichotomous "yes" or "no" format and items scored 1 or 0, with a maximum potential score of 12 and a minimum of 0. The neuroticism subscale has been reported to have good internal consistency with Cronbach alphas of .80 (female) and .84 (male) (Eysenck et al., 1985), in the current study it had an alpha of .84.

*The cognitions about body and health questionnaire:* CABAH (Rief et al., 1998).

The CABAH is a scale related to cognitive behavioral concepts of health anxiety (Rief et al., 1998) and has been widely used to assess cognitions regarding illness and health as well as attitudes associated with bodily complaints (Hiller, Leibbrand, Rief, & Fichter, 2005). The version used in this study consists of 28 statements that define the following four subscales: catastrophizing interpretation of bodily complaints, autonomic sensations, bodily weakness, and intolerance of bodily complaints. Scores range from 0 to 84, with higher scores denoting more negative cognitions about health, The overall internal consistency of the CABAH is excellent alpha= .90, and for the subscales it is moderate to good, ranging from .67 to .88 (Rief et al., 1998). Four of the subscales showed discrimination between somatoform disorders and hypochondriasis (Rief et al., 1998). An original fifth subscale was excluded (health habits) because it has failed to reveal significant group differences between patients with hypochondriasis and a clinical control group (Rief et al., 1998). The CABAH has been shown to positively correlate with the WI (Leibbrand, Hiller, & Fichter, 2000).The Cronbach alpha in the present study was .86.

*Somatosensory amplification scale* (SSAS)

The SSAS (Barsky, Wyshak, & Klerman, 1990) is a ten item self-rated questionnaire consisting of a 5-point Likert scale, with responses ranging from 1= “not at all” to 5=“extremely”. A higher total score means that the respondent is more somatized (maximum = 50). The SSAS measures three theoretical aspects of somatosensory amplification; heightened sensitivity towards unpleasant bodily symptoms; selective attention towards bodily sensations and catastrophic misinterpretations of bodily symptoms/sensations (Barsky, Goodson, Lane, & Cleary, 1988). Somatosensory amplification has been shown to be positively associated with hypochondriasis (Barsky et al., 1990; Marcus et al., 2007) and has construct validity with measures of health anxiety such as the Whiteley Index (Barsky et al., 1990). The SSAS has demonstrated satisfactory internal consistency, α. = 83 (Barsky et al., 1990). The alpha is the current study was .70.

*The health cognitions questionnaire* (HCQ; Hadjistavropoulos et al., 2012)

The HCQ is a 20 item questionnaire which measures specific health anxiety related dysfunctional beliefs based upon Salkovskis and Warwick (2001) cognitive conceptualisation of health anxiety. Measured on a five-point-scale that ranges from 1 (strongly disagree) to 5 (strongly agree), the HCQ contains the following subscales: ‘Likelihood of contracting or having an illness’ (HCQ-L), ‘Awfulness of illness’ (HCQ-A), ‘Inability to cope with illness’ (HCQ- C), and ‘Inadequacy of medical services for treating illness’ (HCQ- M). There are two separate HCQ measures one for those who have not been diagnosed with a medical illness and one for those that have; the current study used the former. The scale has shown good internal consistency, predictive and discriminative validity (Hadjistavropoulos et al., 2012). In the current study the measure had a Cronbach alpha of .81.

*The metacognitions about health questionnaire* (MCQ-HA): (Bailey & Wells, 2015b)

This MCQ-HA is based on the widely used general metacognitive belief measure, the Metacognition Questionnaire (MCQ-30: Wells & Cartwright-Hatton, 2004). Unlike the MCQ-30 the MCQ-HA assesses specific health anxiety-related metacognitive beliefs. The measure consists of 14 items with 4-point Likert response scales from 1 ("do not agree") to 4 ("agree very much"). Scores range from 20 to 80, higher scores correspond with the existence of greater maladaptive metacognitive beliefs. Initial exploratory factor analysis has revealed a three-factor structure, consisting of the following subscales: "*Beliefs that thoughts cause illness"* (MCQ-HAC), "Thinking negatively can increase my chances of disease*"; "Beliefs about biased thinking"* (MCQ-HAB), "I will be punished for thinking I am in good health"; and "*Beliefs that thoughts are uncontrollable*" (MCQ-HAU), "I have no control over thinking about my health.*"* The factor structure has been supported through confirmatory factor analysis in a separate study. A further study has revealed that the measure has good internal consistency and discriminant and convergent validity. In this study the MCQ-HA explained an additional variance (24%) in health anxiety when controlling for the MCQ-30, thus demonstrating incremental validity. In the present study the internal consistency of the subscales was good with the following alpha scores: beliefs that thoughts cause illness .82, beliefs about biased thinking .81, and beliefs that thoughts are uncontrollable .80. The internal consistency of the current measure was .86.

## Procedure

The study received full ethical approval from the University of Manchester's ethics committee. A convenience sample of students from a range of nursing cohorts was used.

Participants were informed of the study through University email and presented with a participant information sheet outlining the study and that data would be collected over two time points. Participants at time point 1 were asked to supply an identification code known only by them which was written on the cover page of the instrument battery. When the participants consented to take part at time point 2 (six months later), they were asked to provide the same identification code as completed at time 1, so questionnaire batteries could be matched. Questionnaires at time 2 were administered in a randomized order in order to prevent sequencing effects.

**Data analysis**

Pearson inter-correlations were initially run between the study variables at Time 1 and Time 2, as well as prospective correlations between Time 1 variables and the outcome (Whiteley index) at Time 2. Hierarchical regression analysis was then conducted, to test for the independent prospective predictors of health anxiety at Time 2. In this approach we controlled for health anxiety at Time 1 and other predictors that have been associated with the development of health anxiety, namely; neuroticism, somatosensory amplification, catastrophic misinterpretation, and dysfunctional illness beliefs and then we tested the contribution of metacognition when entered on the final steps of the model. Next we completed a moderation analysis to explore a prospective moderation model with a single moderator of the effect of X (catastrophic misinterpretation-time 1) on Y (health anxiety-time 2) by M (metacognition-time 1). A final hierarchical regression analysis was undertaken to ascertain whether the interaction between meta- cognitive beliefs and catastrophic misinterpretation explained additional variance in the equation, when controlling for all other variables.

## Results

### Sample Characteristics.

Of the 105 participants 76 (72.4%) were female and 29 (27.6%) male. The age of the sample ranged from 19 to 49 years (M = 26, SD = 6.52). Eight percent of the study passed the cut off score of 40 or above which can indicate the presence of health anxiety/hypochondriasis (Gerdes et al., 1996; Noyes et al., 1993)

### Intercorrelations

Descriptive statistics for all study measures at both time points are presented in Table 6.1. In line with cognitive and metacognitive models the majority of time 1 variables were positively and significantly correlated with time 1 health anxiety, r's ranging from .31 to .61. The only exceptions being the metacognitive belief “thinking causes illness” and two dysfunctional beliefs “inadequacy of medical services” and “awfulness of illness” which were not significantly associated with health anxiety. All time 2 variables were positively and significantly correlated with health anxiety, r's ranging from .24 to .53, except for the metacognitive belief “thinking causes illness” which did not emerge as a significant correlation. Inter-correlations were also run between all-time 1 variables and time 2 health anxiety. Results showed that the majority of time 1 variables were prospectively and significantly correlated with health anxiety at time 2. The only exception being the dysfunctional belief “inadequacy of medical services” which was not significant.

Table 6.1: Descriptive statistics for study measures according to time point

| Measures | Mean Time 1 | SD Time 1 | Mean Time 2 | SD Time 2 |
|---|---|---|---|---|
| MCQHAT | 17.76 | 5.14 | 18.93 | 6.07 |
| MCQHAC | 7.75 | 3.54 | 8.13 | 3.80 |
| MCQHAB | 5.87 | 1.57 | 6.10 | 1.87 |
| MCQHAU | 5.51 | 1.74 | 6.19 | 2.28 |
| CABAHT | 8.97 | 6.06 | 7.98 | 6.10 |
| WI | 26.36 | 9.36 | 22.74 | 8.27 |
| SAS | 11.93 | 5.23 | 11.61 | 5.84 |
| EPQ | 6.12 | 3.49 | 6.10 | 3.54 |
| HCQT | 56.69 | 8.52 | 56.57 | 9.86 |
| HCQC | 20.76 | 4.15 | 20.81 | 5.35 |
| HCQM | 11.65 | 1.70 | 10.59 | 2.78 |
| HCQL | 11.11 | 2.83 | 10.80 | 3.30 |
| HCQA | 14.45 | 2.57 | 14.36 | 2.89 |

MCQHAT (Metacognitions about health anxiety Total); MCQHAC (Thoughts cause illness); MCQHAB (Beliefs about biased thinking); MCQHAU (Uncontrollability of thoughts); CABAHT, (Interpretation of bodily symptoms subscale: Cognition about Body and Health Questionnaire); WI, (Whiteley Index); SAS (Somatosensory Amplification Scale); EPQ, (Eysenck Personality Questionnaire-Revised - Neuroticism Scale); HCQT (Health Cognitions Total); HCQC (Coping with Illness); HCQM (Inadequacy of medical services); HCQL (Likelihood of illness); HCQA (Awfulness of illness).

**Prospective predictors of health anxiety**

The main analysis (Table 6.2) tested the independent prospective predictors of health anxiety at time 2. Multicollinearity was tested by examination of variance inflation factor (VIF) and tolerance statistics. After all predictors were entered, none appeared problematic, all tolerance values were above the recommended .2 (range .38 - .91; Menard, 1995) and all VIF values well less than 10 (Cohen, Cohen, West, & Deacon, 2003; Myers, 1990).

Using time 2 health anxiety (WI2) as the dependent variable, the WI1 was entered on step one to control for time 1 health anxiety and it explained 52% of the variance ($p < .001$). EPQ-

R was entered on step two to control for neuroticism, this explained .1% of the variance and was non-significant. Step 3 controlled for cognitive variables, catastrophic misinterpretation and somatosensory amplification and this block explained 1% of the variance and was non-significant. Dysfunctional illness beliefs were entered at step 4 and contributed 2.7% of the variance, but this was also non- significant. Finally, on step 5 the three metacognitive variables were entered as a block, and they explained 14% of the variance which was significant ($p < .001$).

In the final overall equation three variables prospectively predicted health anxiety and made a unique and statistically significant contribution to symptoms at time 2. As expected health anxiety at Time 1 emerged as the strongest predictor of health anxiety ($b = .45$, $p < .001$), the other two predictors were metacognitive variables; beliefs that thoughts are uncontrollable ($b = .27$, $p < .005$) and beliefs about biased thinking ($b = .24$, $p < .005$). Overall these findings show that specific health anxiety related metacognitions uniquely explained variance in health anxiety symptoms over time and their contribution was not explained by shared variance with illness beliefs, misinterpretations, neuroticism and somatosensory amplification. Indeed, these latter variables failed to emerge as prospective predictors of health anxiety at each step or in the final model.

Although the regression revealed that metacognitive beliefs were positive predictors of health anxiety, which is consistent with a causal relationship between metacognition and the development of health anxiety, it does not rule out the possibility of reciprocal causation i.e. that health anxiety may also cause elevated dysfunctional metacognitions. To test this a further regression analysis was run. The dependent variable this time was meta- cognitive beliefs (MCQ-HA total) at time2. On step 1 we controlled for metacognitive beliefs at time 1 (MCQ-HA total) and this explained 43% of the variance in metacognitive beliefs at time 2, and was significant. On step two we entered WI at time 1 which explained an additional

sss.9% of the variance in metacognitive beliefs at time 2 but was not significant. Time 1 metacognitive beliefs emerged as the only significant predictor ($b = .58$, $p < .001$). Overall these findings indicate that metacognitive beliefs prospectively predict health anxiety and variation in metacognition is not the consequence of health anxiety.

**Table 6.2: Summary of hierarchical analysis predicting Time 2 health anxiety**

| STEPWISE STATISTICS | | | | FINAL STATISTICS | | |
|---|---|---|---|---|---|---|
| **Step** | **Variable** | **$\Delta r^2$** | ***p*** | **β** | **t** | ***p*** |
| **1 (Enter)** | WITI | .521 | .000 | .449 | 4.820 | .000 |
| **2 (Enter)** | EPQT1 | .001 | .645 | .040 | .596 | .559 |
| **3 (Enter)** | CABAHT1 | .011 | .313 | .001 | .018 | .986 |
| | SAST1 | | | -.019 | -.251 | .802 |
| **4 (Enter)** | HCQ-LT1 | .027 | .226 | .028 | .413 | .680 |
| | HCQ-MT1 | | | .054 | .896 | .373 |
| | HCQ-AT1 | | | .124 | 1.931 | .057 |
| | HCQ-CT1 | | | .015 | .240 | .811 |
| **5(Enter)** | MCQ-HAUT1 | .138 | .000 | .273 | 3.032 | .003 |
| | MCQ-HABT1 | | | .237 | 3.016 | .003 |
| | MCQ-HACT1 | | | .015 | .240 | .811 |

WIT1, (Whiteley Index); EPQT1, (Eysenck Personality Questionnaire-Revised - Neuroticism Scale); CABAHT1, (Interpretation of bodily symptoms subscale: Cognition about Body and Health Questionnaire); SAST1 (Somatosensory Amplification Scale);HCQ-LT1 (Likelihood

of illness); HCQ-MT1 (Inadequacy of medical services); HCQ-AT1 (Awfulness of illness) ; HCQ-CT1 (Coping with Illness); MCQ-HAUT1 ( Uncontrollability of thoughts); MCQ-HABT1 (Beliefs about biased thinking); MCQ-HACT1 (Thoughts cause illness).

**Prospective moderator analysis**

To explore whether metacognitive beliefs at time 1 prospectively moderated the relationship between catastrophic misinterpretation and health anxiety, a moderation model was tested with a moderator of the effect of X (catastrophic misinterpretation-time 1: CABAH1) on Y (health anxiety-time 2: WIT2) by M (metacognition- time 1: MCQ-HA Total1). Using Process (command model-1), a computational bootstrapping tool for path analysis based moderation (Hayes, 2012), the moderator effect was highly significant B = .0646, 95% CI [.02, .10], t = 3.13, p < .005.

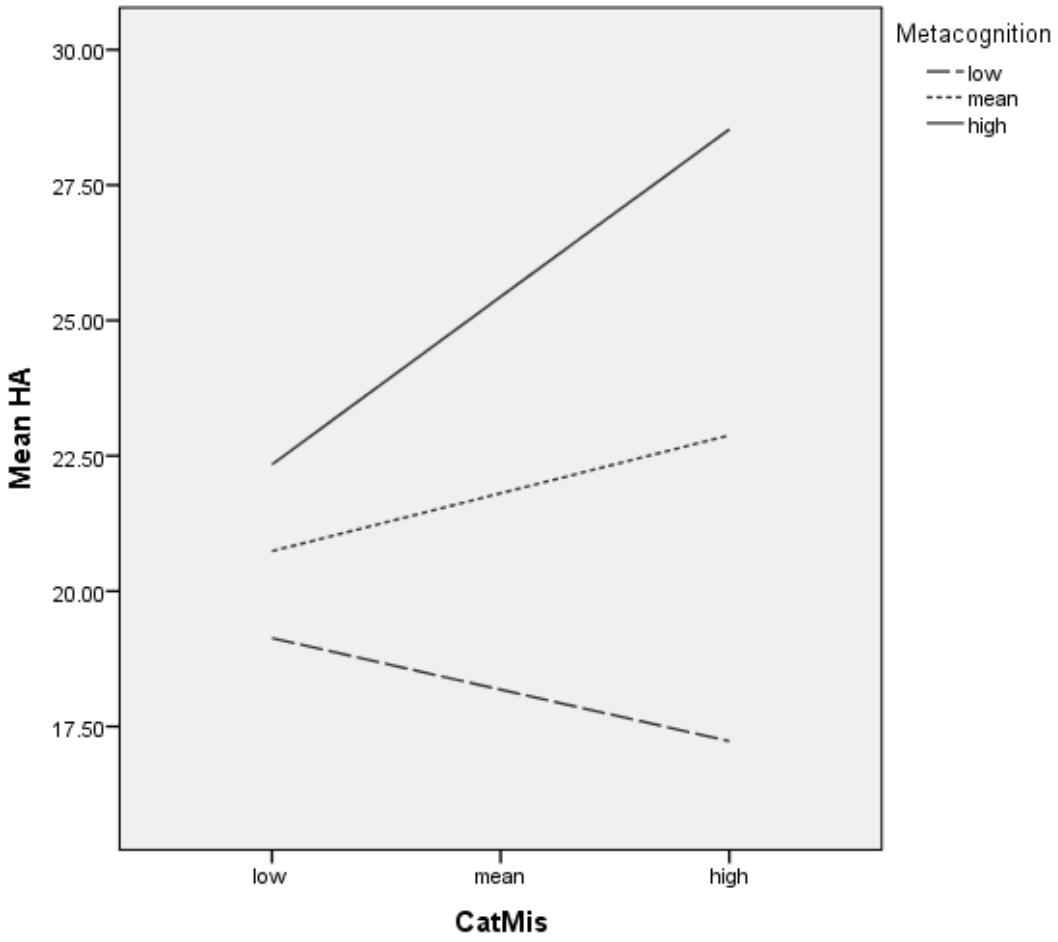
Exploration of the conditional effect of X on Y at values of the moderator, revealed the following:

1. When MCQ-HA total T1 is low there is a non-significant negative relationship between catastrophic misinterpretation T1 and health anxiety T2. B = - .1566, 95% CI [-.4299, .1167], t = -1.1368, p = .2584.
2. At the mean value of MCQ-HA total T1 there is a non-significant positive relationship between catastrophic misinterpretation T1 and health anxiety T2. B = .1765, 95% CI [-.0734, .4265], t = 1.4016, p = .1642.
3. When MCQ-HA total T1 is high there is a strong significant positive relationship between catastrophic misinterpretation T1 and health anxiety T2. B = .5096, 95% CI [.1350, .8843], t = 2.699, p = .0082.

The simple slopes analysis (Fig.3) depicts these interaction effects. It is only when MCQ-HA total is high that the prospective relationship between catastrophic misinterpretation and health anxiety strengthens and becomes significant. In essence this prospective moderation means that in order for misinterpretation to cause subsequent health anxiety, metacognitive beliefs must be highly elevated at the same time.

Of the individual subscales of the MCQ-HA, only “beliefs about uncontrollability” emerged as a significant prospective moderator, B = .1331, 95% CI [.01, .25], t = 2.12, p = .035.

**Figure 3: Simple Slopes Analysis.**




It is important to establish if the moderator effects obtained with metacognition is specific to this dimension or is a feature of other health-related (cognitive-level) beliefs. To explore this, a further model was tested with a moderator of the effect of X (catastrophic misinterpretation-time 1) on Y (health anxiety-time 2) by M (dysfunctional beliefs-time 1). The moderator effect in this instance was not significant B = .0257, 95% CI [-.01, .06], t = 1.467, p = .1453. However the subscale “Likelihood of contracting or having an illness' (HCQ-L)” was borderline significant as a moderator (B = .128, 95% CI [.00, .25], t = 1.98, p = .050), suggesting that a limited range of cognitive beliefs might also impact on the relationship

between misinterpretation and health anxiety. However, true moderation by such cognitions is not central to cognitive conceptualisations which typically view schemas as giving rise to misinterpretations which then lead to health anxiety. Thus, the relationship between cognition, misinterpretation and health anxiety may require further elaboration.

**Regression analysis including the interaction term**

A further hierarchical regression analysis was undertaken to ascertain whether the interaction between metacognitive beliefs and catastrophic misinterpretation explained additional variance in the equation, when controlling for all other variables. The same steps as the first regression analysis were employed only this time we added the interaction effect on the last step. On this occasion the interaction effect made a significant ($p < .05$) contribution to health anxiety at time 2 and explained an additional 2% of the variance, when controlling for the other variables.

In the final step of the equation three variables prospectively predicted health anxiety and made a unique and statistically significant contribution to symptoms at time 2. As expected health anxiety at Time 1 emerged as the strongest predictor of health anxiety ($b = .41$, $p < .001$), the other two predictors were; beliefs that thoughts are uncontrollable ($b = .25$, $p < .01$) and the interaction term ($b = .17$, $p < .05$).

## Discussion

This is the first study to test if metacognitive beliefs predict health anxiety six months later, when controlling for important personality variables and cognitive factors.

The study builds on earlier cross-sectional data and demonstrates several theoretically consistent bi-variate prospective correlates of health anxiety. However, the regression models show that metacognition was the only unique prospective predictor of sub- sequent health

anxiety scores. In these analyses, cognitive and personality factors did not explain unique variance in later health anxiety. Furthermore, testing of reciprocal associations between metacognition and health anxiety across time revealed that the relationship between metacognition and health anxiety was unidirectional: metacognition appears to cause health anxiety but not vice-versa.

The two metacognition dimensions that made independent contributions were Beliefs about biased thinking (e.g. 'If I think positively about physical symptoms I will be caught off guard'), and beliefs that thoughts are uncontrollable (e.g. 'I cannot have peace of mind so long as I have physical symptoms'). This result is in line with the metacognitive model which predicts that beliefs about thinking are causally linked to symptoms of psychopathology, in this case health anxiety. The results are consistent with a number of other prospective studies which have demonstrated a causal relationship between metacognition, depression, and anxiety (for e.g., Hjemdal, Stiles, & Wells, 2013; Papageorgiou & Wells, 2009; Weber & Exner, 2013; Yılmaz, Gençoz, & Wells, 2011).

Whilst the prospective associations are consistent with a causal role of metacognitions in health anxiety, these relationships could of course be a consequence of other variables that were not measured in this study. If we assume metacognitions are causal then beliefs about biased thinking may be a causal factor in health anxiety in two different ways. First, individuals may hold beliefs about the usefulness of maintaining a pessimistic stance towards symptoms as a coping strategy e.g. ('thinking the worse about symptoms will keep me safe'). This will lead to sustained negative thinking that will maintain a sense of threat and hypervigilance for health-related information such as bodily experiences.

Second, individuals may hold beliefs regarding the danger of thinking positively and so they may actively avoid or dismiss positive health related thoughts and information, (e.g. 'Thinking positively about my health will tempt fate and I will become ill'). Similar findings

were observed in an experimental study which explored the effect of health threat on attentional bias (Kaur, Butow, & Sharpe, 2013). The authors found that those individuals with dysfunctional metacognitions had an attentional bias away from positive health related words after receiving reassuring feedback. In fact the association between metacognitions and attentional bias was particularly strong in the absence of objective health threat. So despite being in a positive state of mind individuals may still believe that biasing their thinking towards worry is a good thing, for example, to prevent them becoming ill.

The metacognitive beliefs about the uncontrollability of thoughts, such as 'Only if I have a diagnosis will I be able to stop worrying' also appear to have a causal role in health anxiety. These specific beliefs are likely to be problematic because they can increase perceptions of threat regarding illness based worry and rumination, and guide attempts to control illness related thoughts, through behaviours that have counter-productive consequences. For example, trying to deal with worry by seeking reassurance transfers the control of mind to other people, and thought suppression is rarely effective leading to a persistence or greater sense of uncontrollability (Wells, 2009).

Other than metacognition the only other significant predictor of time 2 health anxiety was health anxiety at time 1. Neuroticism, somatosensory amplification, catastrophic misinterpretation and dysfunctional beliefs all failed to emerge as unique prospective predictors. This finding stands in contrast to cross sectional data, but could indicate that these constructs are involved more in the maintenance of health anxiety rather than its cause (see Marcus et al., 2007; Norris & Marcus, 2014; for a review). The findings here differ from previous longitudinal studies which found that catastrophic misinterpretation (Gautreau et al., 2014) and emotional instability i.e. neuroticism (Ferguson, 2004), prospectively predicted health anxiety, but it seems that future studies must now consider metacognition in testing relationships of this kind.

In support of our final hypothesis we found that metacognitive beliefs prospectively moderated the relationship between catastrophic misinterpretation and health anxiety. Equally the interaction term explained variance in health anxiety when controlling for other variables that might explain the association, and also emerged as an independent predictor of health anxiety. This prospective data builds on earlier cross sectional data showing that catastrophic misinterpretation was only associated with health anxiety when metacognitive beliefs were high (Bailey & Wells, 2015a). It extends these findings by demonstrating that the moderating effects of metacognitive beliefs are protracted and can be detected 6 months later.

The regression results found in the current study are challenging for cognitive models of health anxiety which are based on a central mechanism of catastrophic misinterpretation of symptoms and associated illness related beliefs. It would seem that misinterpretations and illness beliefs are inconsequential when metacognitions are controlled. However, a nuanced picture emerges from the moderator analysis, which suggests that misinterpretations may combine with metacognition and causally predict additional variance in health anxiety. Whilst this stands in contrast to predictions of cognitive behavioural models that posit a central causal mechanism involving misinterpretations of symptoms, it does fit well with the metacognitive model of pathology where beliefs about cognition are at centre stage.

Overall if these findings are reliable they will have very important clinical implications. If metacognitive beliefs have a causal role in health anxiety targeting these beliefs may produce more long- term effects. A systematic review has revealed recovery rates from hypochondriasis to be between 30 and 50% (Olde Hartman et al., 2010). Additionally in a recent meta-analysis (Olatunji et al., 2014) on the effectiveness of CBT for health anxiety, effect sizes dramatically reduced from post treatment (g = .95) to follow up (g = .34). The therapeutic effects of CBT based treatments may diminish over time because treatment targets maintenance factors but may not deal with important causal factors such as meta-

cognitions. It remains to be determined if focusing on meta- cognitive beliefs as a treatment priority could produce longer term benefits, enhance recovery and prevent relapse, as some preliminary data suggest (Bailey & Wells, 2013; Papageorgiou & Wells, 1998). However, the results support a closer examination of metacognition in health anxiety and a move towards evaluating metacognitive therapy (Wells, 2009) in this context.

There are a number of major limitations to the present study. The participants were predominantly female and young, so this restricts generalizability to other groups. The participants were students and therefore it is unclear whether the present findings can be generalized to the DSM-5 categories: somatic symptom disorder and illness anxiety disorder. The regression analysis carried out may have been underpowered. The number of participants (105) was low when using 11 predictors, and may have prevented detecting other effects. Overall the findings of this study indicate that metacognitive beliefs might be an important variable in both the development and maintenance of health anxiety and they cast doubt over the centrality of misinterpretations and illness beliefs as causes of health anxiety.

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# Chapter 7

# Metacognitive Therapy in the Treatment of Hypochondriasis: A Systematic Case Series.

**Robin Bailey**

**Adrian Wells**

**Published in Cognitive Therapy and Research.**

Abstract

Hypochondriasis is a debilitating condition which can have profound psychological and functional effects. The most effective psychological treatments are cognitive and behavioural therapies. However, the degree of improvement across these treatments is variable, often with modest recovery and a high dropout rate. The aim of this study was to provide a preliminary investigation of effects associated with metacognitive therapy (MCT) applied to DSM-IV hypochondriasis. Four consecutively referred patients were treated using established A–B single case series methodology. Following MCT all patients demonstrated large and clinically meaningful improvements in specific hypochondriacal symptoms and more general negative affect measures. Treatment gains were maintained at 6-month follow-up. Substantial changes were also observed in metacognitive beliefs. Overall this case series provides preliminary evidence that MCT can be applied to hypochondriasis and it supports a move towards a more definitive evaluation of the treatment in this group.

## Introduction

Hypochondriasis or severe health anxiety is characterised by, disproportionate and persistent cognition, behaviour and affect focused on somatic symptoms and/or fear of developing a serious illness. There is an excessive preoccupation with illness or disease (Owens et al. 2004) in the absence of supporting medical evidence and contrary to continual medical reassurance (Lucock et al. 1998; Meechan et al. 2005).

The prevalence rates for hypochondriasis based on diagnostic criteria range from 0.8 to 9.5 % amongst clinical samples (Creed and Barsky 2004; Fink et al. 2004) and hypochondriasis has been shown to negatively impinge upon daily living, employment and psychosocial

functioning (Robbins and Kirmayer 1996; Lucock and Morley 1996; Noyes et al. 1993). The disorder is also linked to overutilization of health care services and an associated financial burden (Williams 2004).

Cognitive and behavioral models have been developed to conceptualize and treat this disorder (Barsky and Klerman 1983; Barsky et al. 1988; Salkovskis 1996; Salkovskis and Warwick 1986; Warwick and Salkovskis 1990). Generally based on Beck's (1976) schema theory, the main tenet of the CBT model of hypochondriasis posits that individuals have a tendency to catastrophically misinterpret bodily symptoms as a sign of untreated pathology (Salkovskis 1989; Warwick and Salkovskis 1990). Therapy therefore aims to target these specific misappraisals as a key component of treatment, as a means of reducing health anxious symptoms (Barsky and Ahern, 2004; Warwick et al. 1996). Cognitive behavioural therapy for hypochondriasis (e.g. Barsky and Ahern 2004; Clark et al. 1998; Hedman et al. 2011; Rief et al. 1998; Thomson and Page 2007; Visser and Bouman 2001; Warwick et al. 1996; Warwick and Salkovskis 1990) appears to be effective. A recent systematic review, however, revealed recovery rates of between 30 and 50 % (olde Hartman et al. 2009) with similar dropout rates from treatment (Greeven et al. 2007). Surprisingly, CBT has failed to demonstrate the same levels of treatment superiority seen in other anxiety disorders (McManus et al. 2008) or in some cases have superior efficacy over non-specific therapies (Thomson and Page 2007).

Attempts to improve CBT have included mindfulness based cognitive therapy (MBCT). In a recent trial (McManus et al. 2012) MBCT, which combined mindfulness based meditation with psychoeducation derived from CBT models of health anxiety, (e.g. Warwick and Salkovskis, 1990) demonstrated evidence as a potential treatment for health anxiety in addition to usual services.

In the search for alternative treatments the present study examined the effects associated with a new form of treatment: metacognitive therapy (MCT: Wells 1995, 2009). This approach may be a way forward because it specifically aims to reduce mental preoccupation and worry, a key feature of hypochondriacal thinking. Unlike standard CBT, MCT does not focus on challenging the content of thoughts and ordinary beliefs, nor does it include mindfulness based meditation. In hypochondriasis, therefore, it does not reality test misinterpretations of symptoms or beliefs about illness. Instead it focuses on interrupting worry and modifying beliefs about the uncontrollability and value of engaging in persistent health-related cognition. It also uses detached mindfulness and attention training techniques which are specific strategies intended to show that the patient has choice and flexibility in their response to inner experiences.

Metacognitive therapy is based upon the self-regulatory executive function theory (S-REF) of emotional disorder (Wells 2000; Wells and Matthews 1994, 1996). Psycho- logical distress is linked to a cognitive attentional syndrome (CAS), which consists of perseverative thinking in the form of worry, and rumination, maladaptive coping behaviours (e.g. checking), a heightened attentional focus on threat and counterproductive thought control strategies (Wells and Matthews 1994, 1996). The theory states that the CAS is driven and guided by metacognitive beliefs which are both positive and negative in nature (Wells 2000) (e.g. ‘‘I must worry about my symptoms in order to prevent illness’’ and ‘‘I cannot stop my worries unless I have a diagnosis’’). MCT has been developed as a means of both conceptualising and treating specific psychological disorders, including generalised anxiety disorder (Wells 1997, 2009), depression (Wells and Papageorgiou 2004), obsessive compulsive disorder (Wells 1997), post-traumatic stress disorder (Wells and Sembi 2004) and social anxiety (Wells and Papageorgiou 2001) .

There is some evidence supporting the applicability of aspects of this model to hypochondriasis. Studies have shown that metacognitive beliefs are positively correlated with hypochondriasis (Bouman and Meijer 1999; Kaur et al. 2011). Additionally, a recent study by the authors of this paper, (Bailey and Wells 2013) demonstrated that metacognition accounted for additional variance over and above other established correlates associated with health anxiety i.e. somatosensory amplification (e.g. Barsky 1992), illness cognition (e.g. Salkovskis and Warwick 1986) and neuroticism (e.g. Noyes et al. 2003). In addition, CBT based treatments for hypochondriasis appears to change metacognitions (Buwalda et al. 2008).

Processes such as worry and rumination are considered important in both metacognitive theory and in the maintenance of hypochondriasis in general. For example, rumination is often considered a fundamental symptom of hypochondriasis (Fink et al. 2004) with individuals being fixed upon finding the origins (Deacon and Abramowitz 2008), and significance (Wells 2009) of somatic symptoms. A number of studies have demonstrated an association between rumination and somatic concerns (Rector and Roger 1996), avoidance of medical diagnosis (Lyubomirsky et al. 2006) and recently hypochondriasis (Marcus et al. 2008). A recent study by Fergus (2013) established strong relationships between worry and rumination and hypochondriasis independent of negative affect. In this study worry and rumination had stronger correlations with hypochondriasis than intrusive negative thoughts, which are consistent with a tenet of MCT whereby the style of sustained thinking is more problematic than an individual thought itself (Wells 2009). Further studies have shown that engaging in perseverative thinking processes, such as worry and rumination may actually have the effect of not only increasing negative emotional states but also increasing, enhancing and maintaining somatic symptoms (Brosschot et al. 2006; Brosschot and Van Der Doef 2006; Brosschot et al. 2005; Pieper and Brosschot 2005; Rector and Roger 1996). One

experimental study found that worry does in fact precede subjective health concerns and active disengagement from worry, using an established metacognitive technique, i.e. worry postponement (Wells 1997), reduces somatic complaints (Brosschot and Van Der Doef 2006).

Emerging evidence has suggested that a heightened attentional focus on threat or ‘‘threat monitoring’’ (part of the CAS) is associated with metacognition in hypochondriasis, and may influence and shape health related information processing (Kaur et al. 2011). Additionally in an experimental study dysfunctional metacognitions have also been associated with an attentional bias away from positive stimuli following reassurance (Kaur et al. 2013). These studies indicate that health anxious individuals may hold metacognitive beliefs that guide attention to threat (positive beliefs about negative thinking) and away from non-threat (negative beliefs about positive thinking).

Papageorgiou and Wells (1998) found that an attentional manipulation in the form of attention training brought about significant change in three patients suffering from hypochondriasis. As a stand-alone treatment this intervention produced reduction in health related worry, threat monitoring and illness beliefs, which were maintained at 3 and 6 months post treatment follow up. A further study using the same metacognitive technique on patients with hypochondriasis found that attention training reduced attention to bodily sensations and health related anxieties (Weck et al. 2012).

These data support the applicability of the metacognitive model to understanding the development and maintenance of hypochondriasis and suggest that MCT may be beneficial. We therefore set out to examine the effects associated with a brief course of MCT in a series of patients with hypochondriasis.

## Method

### Design

This study used a case series methodology with an A–B replication across patients with follow-up. It aims to establish if there is a relationship between the introduction of an intervention i.e. MCT (independent variable) and a change in an outcome measure i.e. hypochondriasis (dependent variable) (Levin et al. 2003) and begin to establish the generalizability of treatment efficacy across individuals with the disorder (Bergin and Strupp 1970; Kazdin 1992). Although A–B designs often represent a relatively weak form of single-case methodology, early innovations in psychological science have been the product of case studies (Morgan and Morgan 2001) and have contributed extensively to the effectiveness of psychological practice (Chambless and Ollendick 2001; Westen and Bradley 2005).

Following an assessment to determine suitability for the study, patients were assigned to a no-treatment baseline phase ranging from 3 to 4 weeks with the aim to observe stability in the outcome measures. Patients completed measures on a weekly basis over the baseline with no treatment occurring during this period. Following the baseline period, the treatment protocol of MCT for hypochondriasis was delivered by RB on a weekly basis under the supervision of AW. Each treatment session lasted no more than 1 h. Following treatment, patients were requested not to engage in any psychological therapy, and then followed up at 6 months; no patient received any further treatment during the follow-up period.

### Patients

Four patients were included in the case series, three females and one male, with a mean age of 46.7 years. Patients were all assessed by an independent psychiatrist who used clinical judgement based on DSM IV diagnostic criteria to make a primary diagnosis. Patients were

consecutively referred to an outpatient therapy service for psychological treatment. This service is a private non-NHS organization in which patients can self-refer for psychological therapy. The principal investigator (RB) works as a psychological therapist in this organization. The sample used was the first four patients with a primary diagnosis of hypochondriasis who were referred to the first author for treatment. There were no other patients assessed or referred in this case series. All participants in this study were treatment seeking patients who were receiving treatment as usual with the first author (RB) and were all private fee paying patients. The private organisation granted permission that all patients could be asked whether they would like to take part in the study. Written consent was sought from each patient that they were happy that data collected may be used anonymously in scientific journals for mental health service users, carers and health professionals. All patients in the study gave their consent.

The participants met the following criteria:

A. Aged 18–65.

B. Not receiving any other psychological treatment for this disorder.

C. No existing diagnosed physical illness.

D. Current psychotropic medication was accepted.

*Patient 1*

Patient 1 was a female who had experienced hypochondriasis for over a year following the death of a friend. She was preoccupied with fears of having a serious illness that would develop over time and lead to a premature death. She had no concurrent axis one disorder and was medication free. At assessment she had a Whiteley Index score of 41 which is above the

cut-off of 40 normally used to indicate hypochondriasis (Gerdes et al. 1996; Noyes et al. 1993).

*Patient 2*

Patient 2 was a male with a 4-year-history of hypochondriasis triggered by the belief he had an undiagnosed illness in a certain part of his body. He had extensive contact with medical services but had never received any definitive or formal diagnosis. This client had a co-diagnosis of depression and had been taking anti-depressant medication (Fluoxetine) for over 3 years. This patients Whiteley Index score at assessment was 41.

*Patient 3*

Patient 3 was a female who had developed hypochondriasis following the development of a serious illness 3 years earlier. Since this time she had no physical illness and despite years of appropriate medical evaluation, reassurance and normal test results was still preoccupied with having some type of serious illness. She had a co-diagnosis of depression and had been taking anti-depressant medication (Citalopram) for over a year. This patients Whiteley Index score at assessment was 56.

*Patient 4*

Patient 4 was a female who reported experiencing hypochondriasis over a 2-year-period which had progressively worsened. This was attributed to working in a medical environment in which she was constantly exposed to illness related information. She was not on any anti-depressant medication; however, she had three sessions of generic counselling for her hypochondriasis a year before entering therapy. The patient's initial Whiteley Index score was 55.

**Measures**

*The Whiteley Index* (WI; Pilowsky 1967)

The Whiteley Index is one of the most frequently used measures of hypochondriasis. It consists of fourteen attitudes and concerns associated with hypochondriasis and contains three factors: disease fear, disease conviction, and bodily preoccupation. For the purpose of this study the newer version of the Whiteley Index (Barsky 1992; Welch et al. 2009), which uses a five-point response format (1 = not at all to 5 = extremely), was used because it is more appropriate for measuring hypochondriasis severity. A number of studies have established that a cut off score of 40 or over on this instrument indicates the presence of hypochondriasis (Gerdes et al. 1996; Noyes et al. 1993). The measure has been shown to have good test–retest reliability and both discriminant and convergent validity (Fink et al. 1999; Speckens 2001).

*The Meta-Cognitions about Health Questionnaire (MCHQ)*

The MCHQ is a questionnaire which contains 20 items relating to metacognitive beliefs and attitudes about health, illness and physical symptoms. The questionnaire was devised by the authors for the purpose of this study. The questionnaire identifies and assesses five distinct factors: Negative beliefs about Positive Thinking (e.g. ‘‘I will be punished for thinking I am in good health’’; Positive Metacognitive Beliefs, e.g. ‘‘Anticipating illness means I won’t be taken by surprise’’); Negative Metacognitive Beliefs about Uncontrollability, (e.g., ‘‘Only if I have a diagnosis will I be able to stop worrying’’); Negative Metacognitive Beliefs about Danger, e.g., (‘‘I could lose my mind through health worry’’); and General Negative Beliefs: Superstition (e.g. ‘‘Thinking I am ill means I am ill’’). Items are rated on a four point scale 1 (Do Not Agree) to 4 (Agree Very much). Higher scores on this measure indicate more

problematic metacognitions. Reliability analysis using unpublished data from a previous study (Bailey and Wells 2013) indicates that the MCHQ has high internal consistency (a = .91). Using the same data the MCHQ presented good convergent validity with a strong correlation co-efficient (r = .73) with an established measure of metacognition,

*Metacognitions Questionnaire-30 (MCQ-30).*

The Metacognitions Questionnaire-30 (MCQ: 30 Wells and Cartwright-Hatton 2004)

The MCQ-30 (Wells & Cartwright- Hatton, 2004) The MCQ-30 is a well-established thirty item questionnaire measuring metacognitive beliefs and processes implicated in the metacognitive model. It consists of five subscales: cognitive confidence (evaluates confidence in memory and attention) (MCQCC), positive beliefs about worry (MCQPOS), cognitive self- consciousness (the propensity to focus on thought processes) (MCQCSC), negative beliefs about uncontrollability of thoughts and danger (MCQNEG), and beliefs about the need to control thoughts (MCQNC). Items are rated on a 4-point Likert scale from 1 ("do not agree") to 4 ("agree very much"). For each subscale, six items are scored 1–4, with a minimum score of 6 and a maximum score of 24. Higher scores correspond with the existence of greater maladaptive metacognitive beliefs. The MCQ has been found to be a reliable measure and demonstrates good convergent and divergent validity (Cartwright-Hatton & Wells, 1997; Wells & Cartwright-Hatton, 2004). The internal consistency for the total MCQ-30 is (α= .93), with associated subscales having Cronbach alphas ranging from .72 to .93 (Wells & Cartwright-Hatton, 2004).

*Beck Anxiety Inventory* (BAI; Beck et al. 1988)

A 21-item self-report measure designed to capture the main components of anxiety and is adept at discriminating between symptoms of depression (Beck et al. 1988). Items are scored on a 4 point scale from 0 (not at all) to 3 (severe), with a total score being arrived at by

adding each item, giving a range of 0–63. More elevated scores are indicative of the severity of anxiety. The BAI has high internal consistency with Cronbach's alphas ranging from 0.90 to 0.94 (Fydrich et al. 1992; Creamer et al. 1995; Osman et al. 1993) and high test–retest reliability (r = .75; Beck and Steer 1990). The BAI was used in this study as it was a clinical sample and using these measures can help detect co-morbidity which is quite common in health anxiety. The BAI was not used in other studies in this thesis as the samples were not clinical samples and student samples tend to show floor effects.

*Beck Depression Inventory II* (BDI; Beck et al. 1996)

A 21-item self-report measure designed to capture the main components and intensity of depressive symptomology (Beck et al. 1996). Items are scored on a 4 point scale from 0 (not at all) to 3 (severe), with a total score being arrived by adding each item, and scores range between 0 and 63, with categorical depression ratings of ''minimal'' (0–13), ''mild'' (14–19), ''moderate'' (20–28), and ''severe'' (29–63). The BDI-II has good internal consistency (a = .92) and 1-week test–retest reliability (r = .93; Beck et al. 1996). The BDI was used in this study as it was a clinical sample and using these measures can help detect co-morbidity which is quite common in health anxiety. The BDI was not used in other studies in this thesis as the samples were not clinical samples and student samples tend to show floor effects.

**Procedure**

Patients completed the WI, MCHQ and BAI at all stages of the baseline, during individual treatment sessions and at 6 month follow up. The BDI and MCQ-30 were completed at baseline, post-treatment and follow-up (6 months after last session). As the patients were treatment seeking, a fixed baseline was used in the study to balance access to treatment and

methodological rigour. Patients received between 6 and 9 one-hour-sessions, these were stopped when patients scored 10 or below on all items of the CAS-1 (Wells, 2009). After the baselines remained stable, patients commenced treatment sessions.

**Treatment**

The treatment used in this study was derived from Wells' (2000) metacognitive theory of psychological disorder and was based on a MCT treatment manual (Wells 2009) with a generic model used and applied to hypochondriasis. The protocol consisted of the following components:

1. Case formulation: An idiosyncratic case formulation based on the metacognitive model was developed with each client. The formulation linked hypochondriasis to a pattern of processing dominated by worrying, paying repeated attention to the body/health information, and overt behaviours that give over-importance to thoughts about illness and disease. This pattern of responding was linked to positive and negative metacognitive beliefs (e.g. ''Thinking the worst about my symptoms means I will detect any problem before it is too late''; ''I can only have peace of mind if I find out what is wrong with me'' and ''I am going to make myself ill with worrying'').

2. Socialisation: The therapist shared the formulation with the patient and used socialisation questions to demonstrate the role of worry and rumination in hypochondriasis: (e.g. ''If you had control over your worry about your health how much of a problem would you have left?''; ''If you believe worrying causes illness but can also prevent illness, how easy is it to stop worrying?'' and ''Have you been trying to find an answer to your symptoms by analysing them? Has it worked yet? How easy is it to have peace of mind so long as you do this?'')

3. Developing metacognitive flexibility: Patients were introduced to the technique of ‘‘detached mindfulness’’ with the aim of learning to discriminate between initial negative thoughts about health and their usual mal- adaptive worry and attentional response. The technique enables patients to experience and develop new ways of responding to thoughts that involves suspending worry, focusing on threat and analysing causes.

4. Challenge beliefs about the uncontrollability of worry and rumination: Patients were asked to carry out the behavioural experiment of ‘‘worry/rumination postponement’’ in response to negative health-related thoughts. Subsequently, patients were asked if they could try to lose control of health worries to demonstrate that this was not possible. Beliefs about the danger of negative thoughts and worry were modified using verbal methods questioning the evidence and counter evidence, (e.g. “What evidence do you have that thoughts can cause cancer?’’ ‘‘How can thoughts change cell structure?’’ Negative beliefs about positive thinking, which are particularly problematic in hypochondriasis, were also modified e.g. ‘‘Thinking positively about my health will tempt fate and I will become ill.’’)

5. Challenge positive metacognitive beliefs and abandon unhelpful thought control strategies: Beliefs regarding the benefits of rumination/worry, the usefulness of threat monitoring for detecting illness and the power of thinking in preventing illness were targeted using verbal reattribution and behavioural experiments. Thought suppression experiments were implemented to highlight the paradoxical effect of this strategy (e.g. trying to avoid or suppress thoughts of cancer) and its role in strengthening uncontrollability beliefs and reinforcing the preoccupation with illness.

6. Relapse prevention: This consisted of collaboratively writing a ‘blueprint’, which included an individualised metacognitive case formulation. The main treatment interventions were also

revisited and recorded. Patients were encouraged and motivated to implement these strategies in event of potential relapse so that gains made over the course of treatment were maintained.

**Data Analysis**

The main aim of single case series designs is to examine whether the introduction of specific experimental interventions bring about meaningful change in the patients symptoms from the pre-treatment baseline condition (Phase A) to the treatment condition (Phase B) and whether these are maintained at follow up. A traditional means of evaluating outcome has been through visual analysis and graphical representation (Richards et al. 1999; Parsonson and Baer 1992) to infer whether there is a relationship between the independent and dependent variable and the strength of such relationship. As a result all scores at baseline, treatment sessions and follow-up on the primary outcome measures (WI, MCHQ and BAI) for each patient are visually illustrated in Fig. 1. This is supplemented with baseline, post-treatment and follow up scores on all other outcome measures (BDI and MCQ-30) for all four patients, which are presented in Fig. 2

**Clinical Significance**

When representative normative data exist for a clinical but not a non-clinical sample, Jacobson and Truax's (1991) definition (a) should be used. That is "level of functioning following therapy should fall outside the range of the dysfunctional population, where range is defined as extending to two standard deviations beyond the mean for that population". Appropriate normative data on representative clinical samples has been presented for the Whiteley index, in a number of studies (McManus et al 2012; Noyes, Happell, & Yagla, 1999; Lovas & Barsky, 2010; Barsky cited in Lovas & Barsky, 2010). Based upon the overall mean (46.92) and standard deviation (11.11) of the cumulative sample (N=238)

calculated from these studies, the cut-off point (a) for clinically significant change was calculated using an established software application, i.e. The Leeds Reliable Change Indicator (Agostinis, Morley, & Dowzer, 2008) and gave a cut off of 25. Once this was established, post-treatment or follow-up scores of 25 or below were deemed to fall outside of the range of the dysfunctional population.

To ensure that any clinical significant change which has occurred is reliable, Jacobson, Follette, & Revenstorf (1984) introduced the reliability change index (RCI). This is calculated by subtracting post treatment scores from pre-treatment scores, and the result is divided by the standard error of the differences.

If the RCI is greater than 1.96, then it is likely that the change is reliable ($p < .05$) (Jacobson & Truax, 1991). To work out the size of the scale points necessary for there to be a significant change from pre-test to post test, the Sdiff is multiplied by this level of significance i.e. (1.96). Again using The Leeds Reliable Change Indicator (Agostinis et al, 2008) the Sdiff was established as 4.969 and the RCI for the Whiteley index was therefore 10 (Sdiff x 1.96).

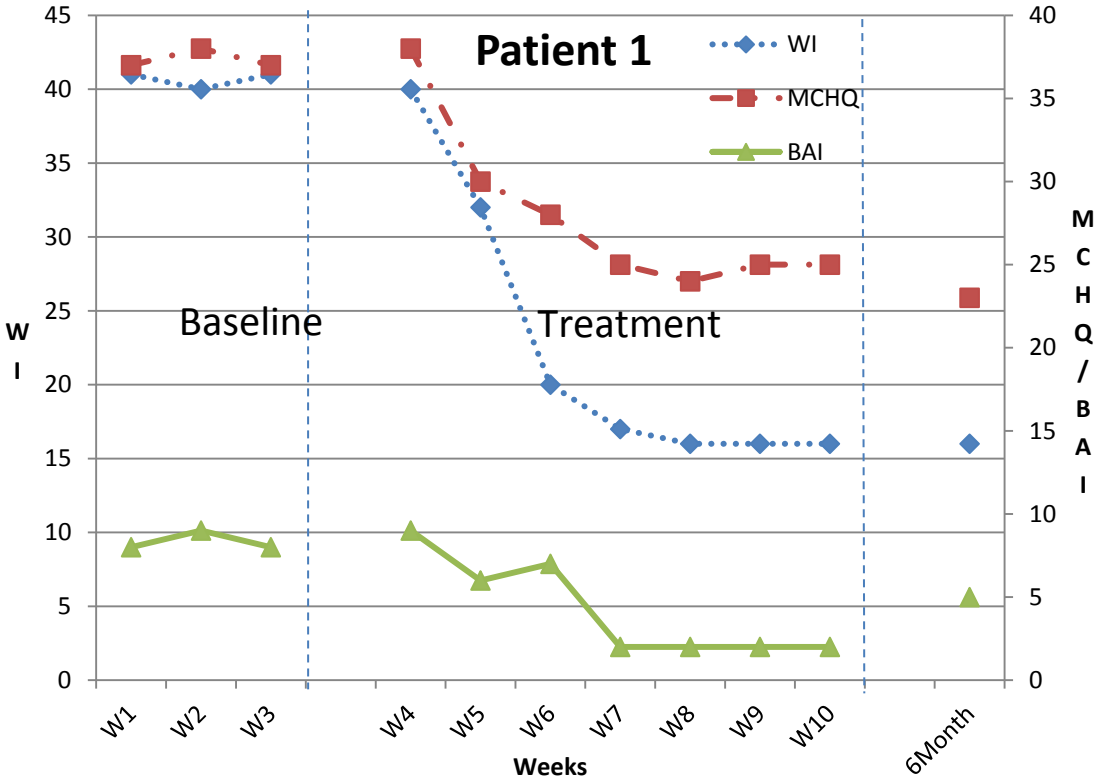
As both clinical significance and RCI are used to assess client improvement the following criteria was applied i.e. 1) Recovered: crossed the cut off score and met the RCI criteria, 2) Improved: met RCI criterion but not the cut score, 3) Unchanged: met neither criteria nor 4) Deteriorated: met the RCI criterion but RCI is negative (Jacobson & Truax, 1991).

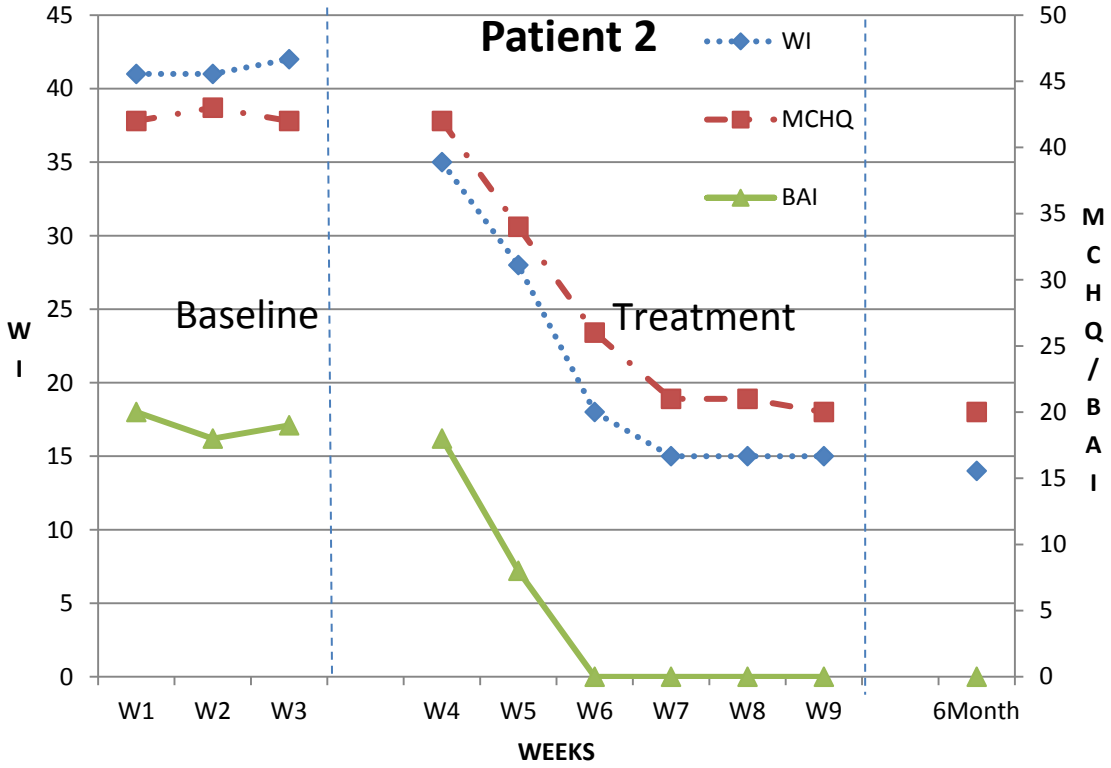
## Results

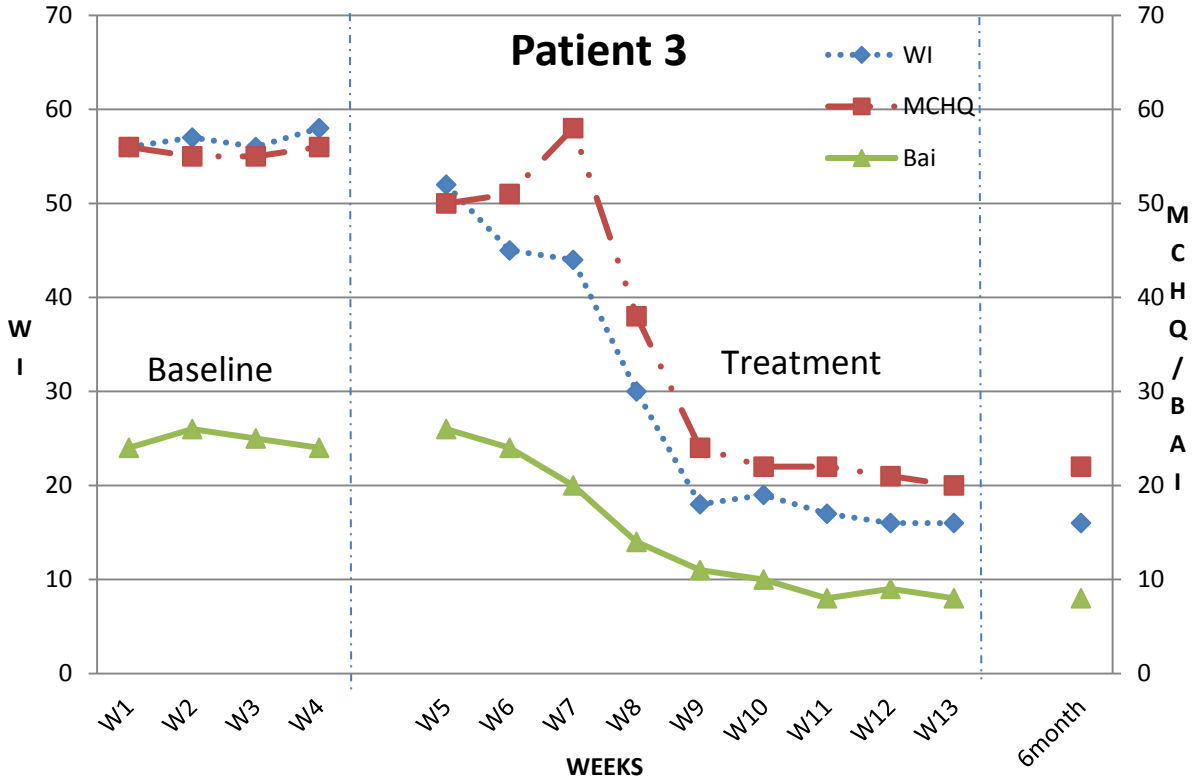
### Primary Outcomes

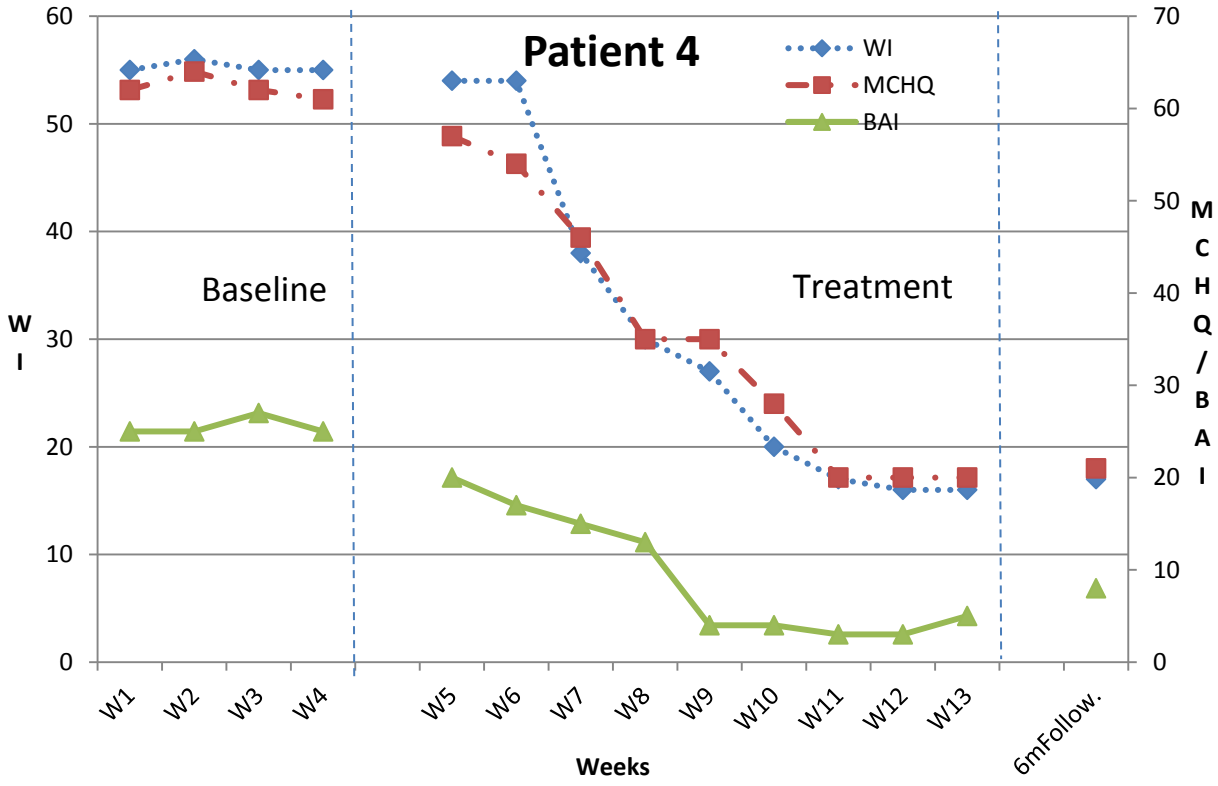
All measures appeared relatively stable during the baseline period for all patients. Scores remained above the established cut off of 40 on the Whiteley Index (Gerdes et al. 1996; Noyes et al. 1993) and equally specific metacognitive beliefs regarding illness did not change during this period. When the treatment was introduced all patients showed substantial reductions on the WI, MCHQ and BAI during the treatment phase and these effects were maintained at the 6 month follow up. In this group of patients the main treatment effects were gained in the first half of the therapy, which focused upon using treatment strategies to alleviate symptoms of distress. These were maintained in the latter half, which focused more on consolidating gains and completing relapse prevention. At post treatment and follow up all participants' Whiteley Index scores were lower than the mean score on the same measure in two non- clinical samples as reported by Welch et al. (2009) [Group 1 (M = 27.35, SD = 8.92) Group 2 (M = 27.44, SD = 10.02)]. Similarly, BAI scores fell within the minimal anxiety range and were similar to those found in a non-clinical population reported by Borden et al. (1991) (M = 10.75 SD = 9.12).

**Figure 4. Scores on The Whiteley Index, Metacognitions about Health Questionnaire and Beck Anxiety Inventory for each patient during baseline, treatment and follow up.**


Patient 1
WI
MCHQ
BAI
Baseline
Treatment
W
I
MCHQ/BAI
Weeks
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
6Month


Patient 2
WI
MCHQ
BAI
Baseline
Treatment
W
I
MCHQ/BAI
WEEKS
W1
W2
W3
W4
W5
W6
W7
W8
W9
6Month


Patient 3
WI
MCHQ
Bai
Baseline
Treatment
WI
MCHQ/BAI
WEEKS
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
W11
W12
W13
6month


Patient 4
WI
MCHQ
BAI
Baseline
Treatment
WI
MCHQ/BAI
Weeks
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
W11
W12
W13
6mFollow.

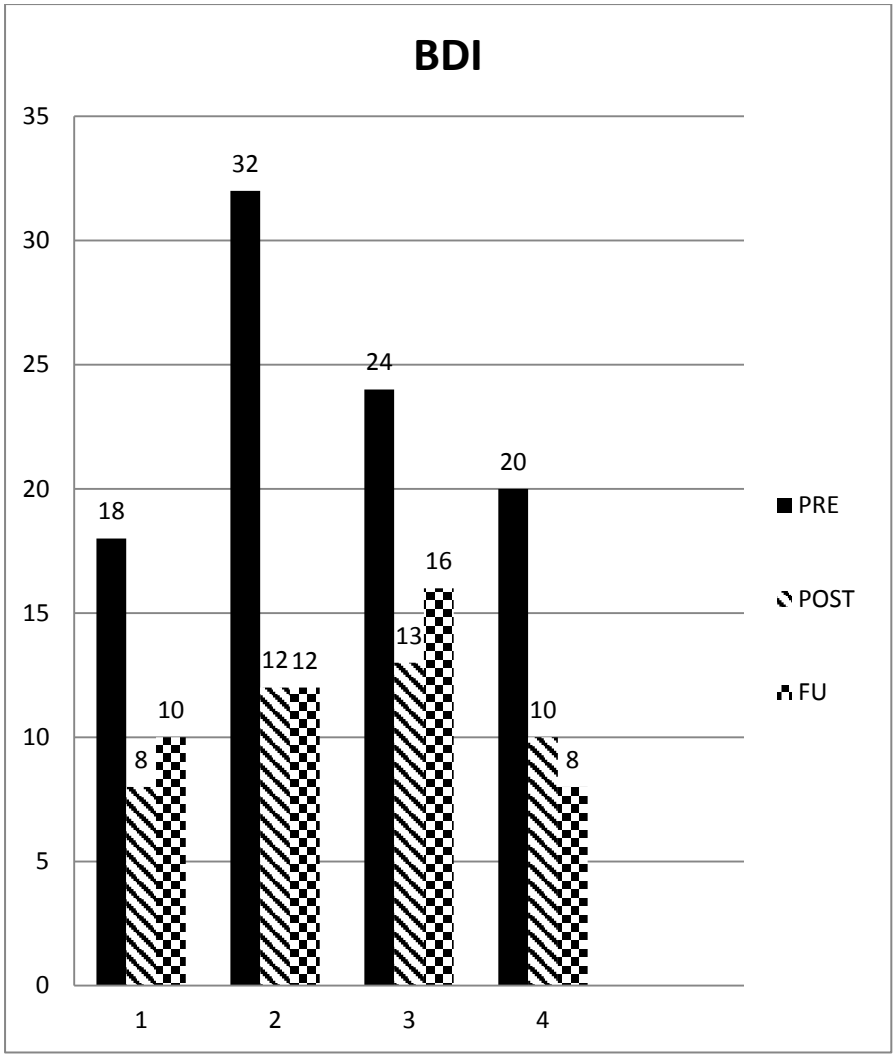
**Secondary Outcomes**

The baseline, post treatment and follow up scores for the BDI and MCQ-30 were substantially lower at post treatment and follow up compared to baseline. At post treatment and follow up three out of four patients BDI scores fell within the minimal depression range and were similar to those found in a non-clinical population reported by Osman et al. (2008) (M = 12.50, SD = 10.50). The BDI score of patient 3 fell slightly outside of these ranges post treatment and follow up. In line with treatment goals, which aimed to target metacognition and associated processes, scores on the MCQ-30 decreased from baseline to post treatment and follow up. This mirrored the hypochondriacal specific metacognitive measure MCHQ which showed similar effects.

Clinical Significance

At post treatment and 6 month follow up all patients scores on the Whiteley Index were below the cut-off point established in this study (25) and can be considered as a move from a dysfunctional to functional population. All patients exceeded the 10 RCI established in this study, thus indicating reliable and significant change between pre and post test scores. All patients therefore met the recovered criteria at both post treatment and follow up.

**Figure 5: Scores on the Beck Depression Inventory & Metacognition Questionnaire- 30 pre-treatment, post-treatment and follow-up for each patient.**


BDI
35
30
25
20
15
10
5
0
18
8
10
32
12
12
24
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16
20
10
8
1
2
3
4
PRE
POST
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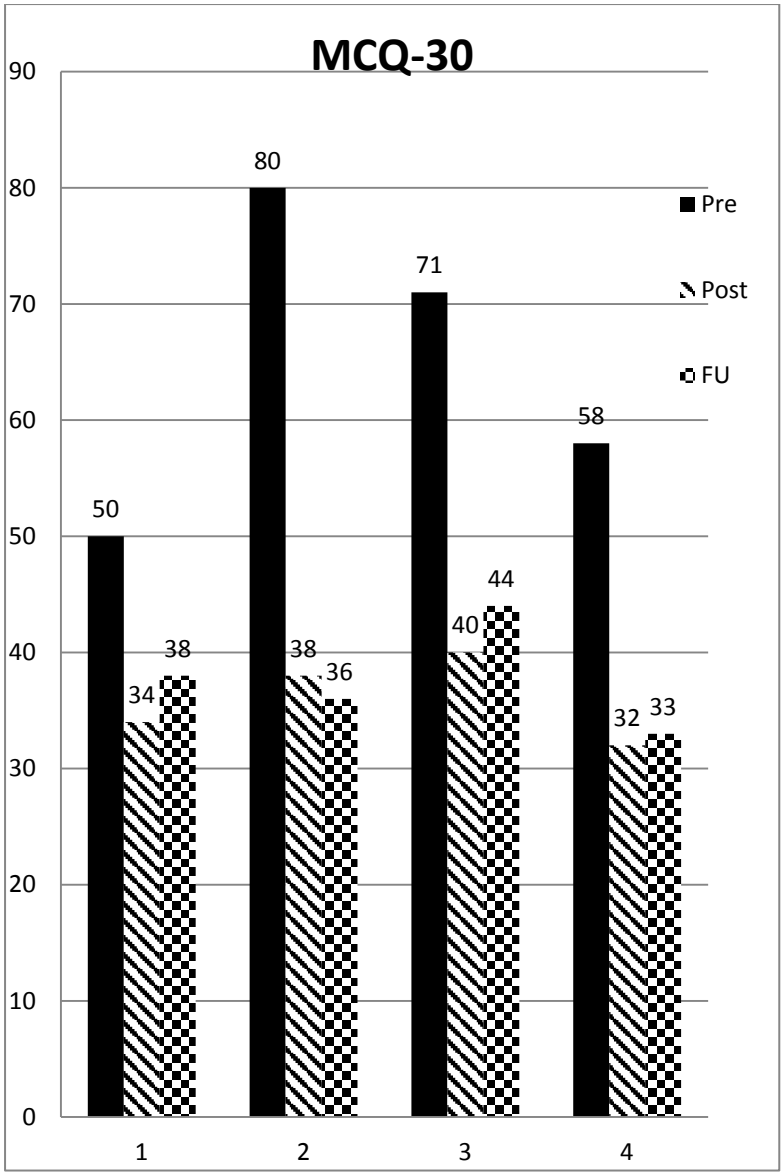
MCQ-30
90
80
70
60
50
40
30
20
10
0
1
2
3
4
Pre
Post
FU
50
34
38
80
38
36
71
40
44
58
32
33

## Discussion

The aim of this study was to test the effects associated with the introduction of MCT as a treatment in hypochondriasis. The outcomes provide preliminary evidence that MCT is associated with large and clinically meaningful improvements in specific hypochondriacal symptoms and more general negative affect measures. Substantial reductions in all outcome measures were observed for all patients com- pared with baseline. In line with metacognitive theory reductions in metacognitions were also observed.

Whilst these findings support the continued evaluation of this treatment approach, there are significant limitations with the present study. The number of patients treated is small which limits generalizability of effects. We do not know if the patients are representative of a larger cohort with hypochondriasis. The lack of a control condition means that we cannot partial the effects of time and non- specific factors from the effects of treatment. All of the measures used in the study were self-report and not administered by an independent assessor which may have impacted on how patients responded. As this case series used a relatively new application of the MCT treatment protocol, adherence to a formalised treatment manual was not observed nor formally assessed. Although patients were all assessed by an independent psychiatrist who used clinical judgement based on DSM IV diagnostic criteria to make a primary diagnosis, the absence of a detailed structured clinical interview may reduce the validity of the diagnosis made.

In conclusion, this case series provides preliminary evidence that MCT can be applied to cases of hypochondriasis and demonstrates that the intervention was associated with improvement in symptoms. However future evaluations of MCT in this client group and with larger more definitive trials are needed to deduce any effectiveness from this intervention.

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## Chapter 8. General Discussion

The overarching aim of the thesis was to investigate the role metacognition plays in the maintenance and development of health anxiety and explore the clinical implications of targeting such beliefs. Rather than the thesis being an exploratory process, the aim was to test the applicability of a specific theoretical model, i.e. the S-REF model. By doing this the designs and analysis employed are specifically employed to test this applicability of the S-REF model to health anxiety. As outlined in Chapter 1 limited evidence exists on the role of metacognition in health anxiety when compared to the available evidence on other theoretical models such as cognitive and behavioural theories. The studies reported in chapters 2-7 set out to explore the role of metacognition in health anxiety. The following section highlights

and summarises the key findings from these chapters. The theoretical significance of these results is then discussed along with a consideration of the pertinent methodological implications. In the final section a summary of conclusions and suggestions for future work are presented

**Summary of Thesis Findings**

In Chapter 2 a cross sectional design was used to investigate whether metacognition was associated with health anxiety when controlling for other factors. As discussed in previous chapters, somatosensory amplification (e.g., Barsky, 1992), illness cognition (e.g., Salkovskis & Warwick, 1986), and neuroticism (e.g., Noyes et al., 2003) have all been linked to health anxiety. However, little is known about the contribution of individual differences in metacognition to health anxiety. Metacognition showed a significant positive correlation with health anxiety and remained significant after controlling for variables normally associated with health anxiety (i.e., neuroticism, somatosensory amplification, and illness cognition). Hierarchical multiple regression determined metacognition as the best cross sectional predictor of health anxiety in particular "negative metacognitive beliefs about uncontrollability and danger," "beliefs about the need for thought control," and "cognitive confidence". These findings suggest that metacognition may have a role in health anxiety, and demonstrates the predictive potential of specific metacognitions over and above other established correlates of symptoms.

In Chapter 3 the development and initial evaluation of a new measure that aimed to capture specific metacognitive beliefs was described. Exploratory factor analysis allowed initial item selection and interpretation which was followed by more detailed testing of the construct validity of factors using confirmatory factor analysis. This resulted in a 14-item-measure with three separate factors: "Beliefs that Thoughts can cause Illness", "Beliefs about

Biased thinking", and "Beliefs that Thoughts are Uncontrollable". Further analysis of the measure supported its psychometric properties with preliminary evidence suggesting good internal consistency, incremental, convergent and discriminant validity in relation to associated measures. The preliminary findings from this study support the assessment of health anxiety specific metacognitions and provide justification for using this measure in other studies.

In Chapter 4 the role of metacognition in health anxiety was investigated further by evaluating key tenets of the metacognitive model versus the cognitive model. Regression analyses were run to ascertain whether metacognitive beliefs explain variance in health anxiety beyond the domain of dysfunctional beliefs about symptoms (schemas). Metacognitive beliefs were shown to explain almost half of the variance (49%) in health anxiety when controlling for dysfunctional beliefs. They were also found to be the strongest independent cross sectional predictors of health anxiety. This is in agreement with the results in Chapter 2 and emphasises that metacognition may be more important in health anxiety than the symptom-related beliefs emphasised in cognitive models.

The study reported in Chapter 5 aimed to separate out the roles of cognition (catastrophic misinterpretation) and metacognition in relation to health anxiety and determine if these constructs might interact in determining levels of health anxiety. Such interaction would be consistent with the Wells and Matthew's (S-REF) metacognitive model. The study presented evidence consistent with the S-REF model that the effect of catastrophic misinterpretations on health anxiety was explained by the proposed interaction with metacognition. Additionally, this interaction effect explained more variance in health anxiety and was a stronger independent cross sectional predictor of health anxiety than catastrophic misinterpretation alone.

Although chapters 2, 4 and 5 demonstrate significant associations between metacognition and health anxiety, they were cross-sectional study designs and therefore do not address causal relationships. Therefore a study was conducted that (reported in Chapter 6) parallels the work of chapter 4 but employed a longitudinal design to explore the potential causal relationship between metacognition and health anxiety. Regression analysis revealed that only metacognitive beliefs emerged as independent and significant prospective predictors of health anxiety. Replicating findings in chapter 4, metacognitive beliefs prospectively moderated the relationship between catastrophic misinterpretation and health anxiety.

In chapter 7, based on the emerging support for a role of metacognition a study was conducted to provide preliminary data on whether metacognitive therapy for health anxiety could work. This study conducted of a single-case replication to provide a preliminary investigation of effects associated with metacognitive therapy (MCT) applied to health anxiety. The results provisionally supported the use of MCT and showed that all four patients treated demonstrated large and clinically meaningful improvements in health anxiety both at post treatment and follow up. These improvements also corresponded with substantial changes in patients metacognitive beliefs. Overall this case series provided preliminary evidence that MCT can be applied to health anxiety.

## Theoretical Implications

### Is metacognition associated with health anxiety?

One of the key aims of the thesis was to assess whether metacognition was associated with health anxiety. Evidence from all studies in the thesis indicated that metacognitive beliefs are strongly and positively associated with health anxiety. The relationships we observed are similar in magnitude to those observed in previous studies of relationships between metacognition and health anxiety (Bouman & Meijer, 1999; Kaur, Butow, &

Thewes, 2011) as well as depressive symptoms (e.g., Papageorgiou & Wells, 2003) and worry (e.g., Cartwright-Hatton & Wells, 1997; Wells & Cartwright-Hatton, 2004; Wells & Papageorgiou, 1998). There was consistent evidence of this association whether using a general measure of metacognitive beliefs (MCQ-30) or a specific measure of health anxiety related metacognitions (MCQ-HA). In Chapter 2, the general MCQ-30 measure emerged as having the stronger associations with health anxiety than other measures that have been associated with health anxiety. The MCQ-30 is a general measure and an implication is that a more specific measure of metacognitions in the context of health-anxiety cognition might explain further variance in health-anxiety. This is in line with other research in metacognitive therapy that has identified disorder specific metacognitions as being important, for example in the area of depression (Papageorgiou & Wells, 2003) and addictions (Spada & Wells, 2006). Additionally having a specific health anxious metacognitive measure could also increase face validity and clinical utility when applied to treatment seeking health anxious individuals.

To further explore the association of metacognition with health anxiety we developed and explored the properties of a new measure that specifically measured metacognition in health anxiety, i.e., the MCQ-HA. Factor analysis indicated three specific metacognitive beliefs “Beliefs that Thoughts can cause Illness”, “Beliefs about Biased thinking”, and “Beliefs that Thoughts are Uncontrollable”, all of which were associated with health anxiety. When the MCQ-HA was used (see Chapters 4 and 6), the three metacognitive belief domains had stronger cross sectional and longitudinal associations with health anxiety than other health anxiety specific variables. All these findings add further support to the metacognitive model and confirms our prediction that both general and specific metacognitive beliefs are positively associated with health anxiety.

When using both the MCQ-HA and MCQ-30 a number of different metacognitive beliefs emerged as being specifically associated with health anxiety. According to S-REF theory (Wells & Matthews, 1994), both positive and negative metacognitions are considered universal and central to the model (Wells, 2002). Supporting this theoretical premise in all our studies positive beliefs as measured by the subscale "positive beliefs about worry" on the MCQ-30 and "beliefs about bias thinking" on the MCQ-HA were positively associated with health anxiety. Positive metacognitive beliefs in health anxiety may have an instrumental role in both the development and maintenance of this disorder. Individuals, for example, may hold positive beliefs about the usefulness of maintaining a negative catastrophic stance towards symptoms as a coping strategy (e.g. 'Thinking about the worst case scenario will keep me safe'). This can ultimately lead to perseverative negative thinking that will maintain a sense of threat and hypervigilance for health-related information such as bodily experiences. Equally in all studies negative beliefs as measured by the subscale "negative beliefs about uncontrollability of thoughts and danger" on the MCQ-30 and "Beliefs that thoughts are un- controllable" as measured by the MCQ-HA were all positively associated with health anxiety and emerged in all studies as having the strongest association. These specific negative metacognitive beliefs, such as "I have no control over my health worries", may be particularly problematic in health anxiety because they can increase perceptions of threat regarding illness- based worry. As a result this can increase attempts to control illness related thoughts, through maladaptive behaviours and thought control strategies which have counter-productive consequences, such as thought suppression and reassurance seeking. In line with the S-REF model these negative metacognitive beliefs consistently emerge as being strongly associated with all forms of psychopathology in general (e.g., Ruscio & Borkovec, 2004; Sarisoy et al., 2014; Spada, Georgiou, & Wells 2010;Wells & Cartwright-Hatton, 2004). The current findings are consistent with a study by Barenbrügge, Glöckner-Rist, and

Rist (2013) that explored the role of both positive and negative metacognitive beliefs in relation to health anxiety and found both were relatively independent from one another along two dimensions. In this study positive metacognitive beliefs were specifically associated with both health anxiety and frequent medical attendance. Negative metacognitive beliefs where associated with disease conviction, disease worry, frequent medical attendance and depression. Overall the findings in all of the empirical studies in the thesis indicate that metacognitions may be as important to health anxiety as they are to other disorders, such as depression and generalized anxiety.

**Does metacognition contribute significantly to health anxiety independently of established health anxiety correlates?** The previous section detailed how the current thesis supports the idea that metacognition is associated with health anxiety. This led to the consideration of whether metacognition can contribute to health anxiety when controlling for other health anxiety variables. Up until this point an abundance of evidence existed that variables, such as catastrophic misinterpretations (e.g. Marcus et al., 2007; Norris & Marcus, 2014), somatosensory amplification (Barsky & Wyshak, 1990), dysfunctional beliefs (Salkovskis & Warwick, 2001) and neuroticism (McClure & Lilienfeld, 2001) are independent cross sectional predictors of health anxiety. Whilst, with much more of a limited evidence base, metacognition had been shown to be a predictor of health anxiety (Bouman & Meijer, 1999). No studies to date had explored the relationship between metacognition and health anxiety when controlling for these other established variables. If the S-REF model is correct then metacognitions should contribute as correlates of health anxiety that are independent of individual differences in cognitive content, somatosensory amplification, dysfunctional beliefs and neuroticism.

In Chapter 2 the regression analysis conducted on the cross sectional data found that three metacognitive dimensions accounted for an addition 18% variance over and above the

control variables. These findings provide preliminary evidence that metacognitive beliefs about thoughts make a contribution to health anxiety independently of general anxiety vulnerability (neuroticism) and cognition (catastrophic misinterpretation and somatosensory amplification). In Chapter 4 the results from Chapter 2 could be extended by analysing the independent contribution of metacognitive beliefs and dysfunctional illness beliefs in predicting health anxiety. This more detailed analysis was motivated by the fact that no studies to date had investigated together the relative contribution of both dysfunctional beliefs and metacognitive beliefs in health anxiety. In essence this was an evaluation of the metacognitive versus the cognitive models. As in Chapter 2 the fact that metacognitive beliefs accounted for nearly half of the variance in health anxiety after controlling for dysfunctional beliefs indicated the importance of metacognition in health anxiety. Dysfunctional cognitive beliefs did make weaker and significant individual contributions and it should be considered how this effect is explained in the metacognitive model. In the metacognitive model these declarative beliefs are perceived as triggers or outputs of the worry and rumination processes central in the health anxiety. As such it could be hypothesised that dysfunctional beliefs about "likelihood of illness" and "inadequacy of medical services" are markers of the cognitive attentional syndrome (triggers or outputs) rather than beliefs that drive this style of processing (Wells & Matthews, 1996; Wells, 2002). A reversal of the steps in the regression in this study highlighted this further with dysfunctional beliefs explaining small additional 4% variance when controlling for metacognition (61%). For the first time it shows that metacognition are stronger cross-sectional predictors than dysfunctional beliefs about physical health and symptoms. The results in Chapters 2 and 4 are consistent with previous metacognitive research where metacognition has been shown to predict symptoms of disorder more strongly than cognition across different presentations including; OCD (e.g., Gwilliam, Wells, & Cartwright-Hatton,

2004), generalised anxiety (e.g., Khawaja & McMahon, 2011; Wells & Carter, 2001), PTSD (Bennett & Wells, 2010; Takarangi, Smith, Strange, & Flowe, 2016) and depression (e.g., Papageorgiou & Wells, 2009).

**The relationship between cognition (catastrophic misinterpretation) and health anxiety may be dependent upon metacognition**. A further aim of the thesis was to specifically explore the role metacognition actually plays in the relationship between catastrophic misinterpretations and health anxiety. To explore this further (chapter 5) moderation analysis was used to establish the relationship between these variables. As predicted by the S-REF model the moderation analysis revealed that the relationship that exists between catastrophic misinterpretation and health anxiety appears dependent upon metacognition, in particular "beliefs about uncontrollability". This finding has a number of key theoretical implications. Firstly, when metacognitions are low the relationship between catastrophic misinterpretation and health anxiety are non-significant, this is at odds with the cognitive theory that catastrophic misinterpretations trigger health anxiety (Salkovskis & Warwick, 1986). In a study looking at priming associations between bodily sensations and catastrophic misinterpretations (Hermans, et al., 2010) the authors found no difference in catastrophic priming effects between patients with panic disorder (a form of health anxiety) and a nonclinical group of health professionals with no history of panic disorder. In fact both groups were equal in the tendency to interpret benign bodily symptoms in a catastrophic fashion; however only the panic disordered group reported these interpretations as problematic. The finding of no difference between individuals with panic disorder and healthy controls in their tendency to catastrophically misinterpret bodily symptoms has also been found in a range of other studies (e.g. Schniering & Rapee, 1997; Teachman, Smith-Janik, & Saporita, 2007)**.** Overall these findings support a key prediction of metacognitive theory in that negative thoughts (e.g., "What if my heart is defective") are considered normal

occurrences experienced by the majority of people and do not on their own cause disorder. The theory further stipulates it is the way the individual relates to these thoughts and regulates cognition that causes disorder (Wells, 2009). Again in our moderation analysis in chapter 5 this prediction was further supported in that the relationship between catastrophic misinterpretation and health anxiety only became positive and significant when metacognition increased to the mean and higher levels. Added to this the study revealed that the interaction effect between metacognition and catastrophic misinterpretation was a stronger independent cross sectional predictor of health anxiety than catastrophic misinterpretation alone.

Although chapter 2, 4 and 5 provide some evidence for the association between metacognition and health anxiety and the moderation effect on catastrophic misinterpretation and health anxiety, this was only explored at a cross sectional level. To investigate a more causal relationship between metacognition and health anxiety required a longitudinal design. In chapter 6 such a study is reported with the aim of replicating the findings from studies reported in chapters 2, 4, and 5 but by testing the S-REF model prospectively in relation to health anxiety. As predicted all metacognitive variables were prospectively correlated with health anxiety. Other variables were also associated with health anxiety prospectively such as neuroticism and catastrophic misinterpretations which supports previous studies (Ferguson, 2004; Gautreau, et al., 2014), as were somatosensory amplification and three out of four dysfunctional beliefs. This builds upon earlier cross-sectional data and demonstrates several theoretically consistent bi-variate prospective correlates of health anxiety. The results of the regression analysis revealed a different outcome with only health anxiety at time 1 and two metacognitive variables, “beliefs that thoughts are uncontrollable” and “beliefs about biased thinking”, emerging as prospective independent cross sectional predictors of health anxiety over a 6 month time difference. Again this is line with predictions made by the S-REF model

that metacognitions are important variables in the development of psychopathology (see Wells, 2009 for a review) and consistent with a number of other prospective studies which have demonstrated a causal relationship between metacognition, depression, and anxiety (for e.g., Hjemdal, Stiles, & Wells, 2013; Papageorgiou &Wells, 2009; Weber & Exner, 2013; Yılmaz, Gencoz, & Wells, 2011).

Consistent with the findings in Chapter 5 concerning the moderating role of metacognition on catastrophic misinterpretation and health anxiety, the same observation was observed prospectively in Chapter 6. It extends these findings by demonstrating that the moderating effects of metacognitive beliefs are protracted and can be detected 6 months later. Of further interest the regression analysis also revealed that the interaction between metacognition and catastrophic misinterpretation, explained additional variance when controlling for other variables that might explain the association, and also emerged as an independent predictor of health anxiety. So theoretically catastrophic misinterpretations on their own may not have a causal role in the development of health anxiety and only causally predict additional variance when they are combined with metacognition, a proposal that is made by metacognitive theory (Wells, 2009).

**Targeting metacognitive beliefs and the CAS in therapy may alleviate symptoms of health anxiety.** As the evidence presented in all chapters suggests metacognitive beliefs are important in the development and maintenance of health anxiety, the final aim of the thesis (chapter 7 and 8) was to investigate whether targeting these beliefs clinically would help reduce the symptoms of health anxiety. Chapter 7 presents the first study of its kind to show that specifically targeting metacognitions via a full MCT treatment protocol is associated with reduction in health anxiety. Although this is a preliminary investigation previous studies have demonstrated that particular MCT interventions are effective in targeting the processes that S-REF theory state maintain health anxiety. Research has shown

that engaging in perseverative thinking processes such as worry and rumination (CAS) may actually have the effect of not only increasing negative emotional states but also increase somatic symptoms, such as tiredness, abdominal pain, nausea, and physiological experiences including cardiovascular, endocrinological and immunological activity in both experimental and real life settings (Brosschot, Pieper, & Thayer, 2005; Brosschot & van der doef, 2006; Pieper & Brosschot, 2005; Rector & Roger, 1996; Thomsen, et al, 2004 ).

In a study exploring worry and rumination, Broschot, Gerin and Thayer (2006) identified that these cognitive processes are more important than physiological responses experienced while a stressor is taking place, i.e. worry and rumination actually enhance and maintain physiological responses and somatic symptomology. With this in mind it could potentially indicate an important role relating to perseverative thinking in health anxiety. Firstly, in line with the S-REF model rather than somatic concerns being the trigger for bouts of health anxiety this research would indicate that worry and rumination actually give rise to and maintain physiological responses and somatic symptoms/ preoccupation, and therefore as long as worry and rumination are running as processes symptoms will persist and increase. In a further experimental study Brosschot and Van Der doef (2007) found that worry does in fact precede subjective health concerns and active disengagement from worry, using an established metacognitive technique, i.e. worry postponement (Wells, 1997), reduces somatic complaints. In Chapter 7 the technique of worry postponement was used as an integral part of the treatment protocol to assist in targeting beliefs about the uncontrollability of health worry and helping patients learn how to disengage from health worry/rumination.

Other specific MCT techniques were used in the treatment evaluated in Chapter 7, and the treatment followed the MCT as outlined in the treatment manual by Wells (2009). In particular, to develop metacognitive flexibility the technique of detached mindfulness was used as a way to help patients to discriminate between trigger catastrophic misinterpretations

about health and their usual maladaptive worry and attentional response. The aim of detached mindfulness is to enable the patient to respond to internal states without engaging in repetitive thinking, thought control strategies or goal directed responses, with the aim of achieving a de-centred metacognitive awareness of internal events (Wells, 2005). The use of detached mindfulness as a technique is different from one of the main treatment techniques used in CBT for the treatment of health anxiety, i.e. cognitive restructuring (Asmundson, Abramowitz, Richter, & Whedon, 2010). In CBT the patient is encouraged to generate more benign alternatives to their perceived symptoms as a means of de-catastrophising their misinterpretation (Salkovskis & Warwick 1986; Warwick & Salkovskis, 1990). As found in the studies of Chapters 5 and 6 metacognition may actually be a more useful focus of treatment than catastrophic misinterpretation alone. This has also been highlighted in another study (Fergus, 2013) where worry and rumination had stronger correlations with health anxiety than intrusive negative thoughts, highlighting the style of sustained thinking is more problematic than an individual thought itself (Wells, 2009). Specific studies in other anxiety states have also investigated the difference in effect when applying detached mindfulness and cognitive restructuring. In socially anxious individuals, Gkika and Wells (2015) found detached mindfulness to have wider ranging effects than cognitive restructuring, also mixing these two techniques may be disadvantageous. In health anxiety it might be that working on metacognition may reduce the high relapse rates observed in CBT treatment studies (olde Hartman et al, 2009; Olatunji, et al, 2014). In the case study completed in Chapter 7 all patients maintained clinical and significant changes at six month follow up, but the design, very low sample size and short follow-up interval limits any generalisability. An implication of the data is that by teaching individuals ways to detach from catastrophic misinterpretations rather than engaging with them, this may overcome the problem of patients substituting one disease conviction with another. This could potentially reduce the length of sessions, if

session time is spent teaching the patient how to reality test a potentially endless list of disease convictions. As noted in Chapter 1 some CBT treatments are long and at the upper limit can range from 17 to 81 sessions (Thomson & Page, 2007; Weck, Gropalis, Hiller, & Bleichhardt, 2015). In the current case series the average length of sessions was 8 sessions, tentatively demonstrating that targeting metacognitions rather the content of cognition may result in a shorter course of therapy.

In the current case series we aimed to calculate whether patients made clinically significant changes during treatment. Using Jacobson and Truax's (1991) definition (a) we established a cut off of 25 on the primary measure of health anxiety the Whitley Index. Once this was established, post-treatment or follow-up scores of 25 or below were deemed to fall outside of the range of the dysfunctional population and thus demonstrate clinical significance. In this study all patients met clinical significance after the MCT treatment, and this was maintained at follow up. Previous cut-off points used in a range of CBT based studies (Welch, Carleton, & Asmundson 2009) have been based upon an arbitrary cut off point of patients scoring 40 or below (Gerdes et al. 1996; Noyes et al. 1993), Using Jacobson's and Truax's (1991) criteria in the current study gave a more reliable and stringent cut off for clinical change compared to those used in previous CBT studies.

In line with treatment goals, which aimed to target metacognition and associated processes, scores on metacognitive measures decreased from baseline to post treatment. This provides some initial evidence that targeting metacognition and associated process with specific MCT techniques may reduce symptoms of health anxiety.

### Strengths and Weaknesses of the Methods Adopted.

A variety of methods were used within this thesis. However, all of these methods have positive and negative attributes. In Chapters 2, 4 and 5 the studies were all cross- sectional in

design. Although this design appeared to capture associations it could not address causality in the relationships observed. In Chapter 6 this particular issue was addressed, where a more robust prospective design was used to attempt to capture some of these casual mechanisms. In particular data was collected at two time points, separated by six months, which provided the ability to examine the prospective predictors of health anxiety. However, it should be noted that whilst prospective studies can provide data consistent with causal relationships there may remain significant additional un-assessed variables that are accounting for the relationships observed. Follow-up studies involving experimental manipulation of metacognitions to examine the impact on health anxiety would be an important next step.

In all studies except the case series there were issues with the participants used. As most were self-selecting females between the ages of 20 and 30 years, this restricts generalizability and applicability to other samples. Equally, as the participants were nursing students, it is unclear whether the present findings can be generalized to the DSM-5 categories: somatic symptom disorder and illness anxiety disorder. Although all participants were drawn from nursing cohorts this group has been shown to experience elevated levels of health anxiety (Azuri, Ackshota, & Vinker, 2010; Zhang, Zhao, Mao, Li, & Yuan, 2014). In all the studies in this thesis only 10-14% of the participants actually met the cut off of above 40 on the Whiteley index which indicates the presence of severe health anxiety. As only a small sample actually met this clinical cut off this may have potential implications for the applicability of the findings in relation to clinical samples. Equally it has implications for the development of metacognitive treatment approaches, as these have been constructed on the study's findings, which again come from a non-clinical sample. Contemporary theories however have conceptualized the condition of health anxiety as a dimensional as opposed to a psychiatric construct, existing on a continuum from mild to severe (Ferguson, 2009; Longley et al, 2010; Salkovskis & Bass, 1997; Taylor & Asmudson, 2004; Williams, 2004; Warwick

& Salkovskis, 1990). Equally Marcus (2007), found that elevated health anxiety and health anxious beliefs were similar in both clinical and non-clinical samples. So the range of scores in the studies may well be representative of the dimensional nature of this particular presentation and the treatment approaches developed maybe applicable to both mild and severe health anxiety.

In all the studies there was an over-reliance on the use of self-report measures as the main source of measurement. The main measure we used to assess health anxiety was the Whiteley Index. One of the disadvantages of using this measure is that it has been criticised for containing items that have been deemed to not be associated with health anxiety and it may not measure all facets of health anxiety (Salkovskis, Rimes, Warwick, & Clark, 2002). As a result we cannot rule out the possibility that a different pattern of results would have emerged if we had measured a wider range of health anxiety features. However, in a recent study that compared the Whiteley Index with two other established measures of health anxiety, The Health Anxiety Inventory (Salkovskis et al., 2002) and the Illness Attitude Scale (Kellner, Abbott, Winslow, & Pathak, 1987)**,** all three measures had equally good convergent and discriminant validity, test-retest reliability, and were sensitive to change (Hedman. et al., 2015). Consistent with these findings, Melli, Carraresi, Polli, and Bailey, (2016), replicated the findings of Chapters 2, 4 and 5, finding that metacognition was a significant independent predictor of health anxiety and moderated the relationship between anxiety sensitivity and health anxiety. In this study they did not use the Whiteley Index but another established measure of health anxiety, the Health Anxiety Inventory. Also one of the reasons for using the Whiteley index rather than the Health Anxiety Inventory is the Whitley Index does not have items that relate to metacognitive processes such as worry. The Health Anxiety Inventory however, has a high number of worry related items and would increase the chance of criterion contamination.

In a number of chapters in the thesis some of the measures used did not have established Psychometric properties. In Chapter 5 we used a measure constructed specifically for the study, The Health Scenario Questionnaire, to assess interpretations of symptoms linked to different health scenarios. Although some preliminary data were presented here further evaluation of the psychometric properties of this measure is needed, particularly as some subscales had poor to questionable internal consistency. However, the catastrophic misinterpretation subscale had good internal consistency and demonstrated a similar significant interaction effect when replaced with an established catastrophic misinterpretation subscale. In chapters 5 and 6 we also used a new measure of metacognition the MCQ-HA. In Chapter 3 we do present some preliminary data on this measures psychometric properties, however this again was carried out in a non-clinical sample, limiting specificity of the measure in relation to a clinical group. Also in this study we did not establish the stability of MCQ-HA subscale scores over time and therefore do not have data on the re-test reliability of the scales.

In our clinical application of MCT for health anxiety there were a number of issues related to the design that was chosen. A case series was used to test the usefulness of MCT, this particular design is considered one of the weakest forms of clinical design (Peterson, 2004) and in particular A–B designs often represent a relatively weak form of single-case methodology (Borckardt, et al., 2008). However, early innovations in psychological science have been the product of case studies (Morgan & Morgan, 2001) and have contributed extensively to the effectiveness of psychological practice (Chambless & Ollendick, 2001; Westen & Bradley, 2005). As we were setting out to examine the effects associated with a brief course of MCT in a series of patients with health anxiety for the first time, this particular design was considered an acceptable starting point. As the main goal of a case series was to determine whether there is a causal relationship between the introduction of an

independent variable (i.e. MCT) and change in a dependent variable (health anxiety) (Levin, O'Donnell, & Kratochwill, 2003), this enabled us to assess whether MCT can be applied to cases of health anxiety and whether the intervention was associated with improvement in symptoms. Although there are merits with using a case series design, there are further issues that may limit this design. The number of patients treated was small, in this case four, which limits generalizability of effects. We also do not know if the patients are representative of a larger cohort with hypochondriasis. Equally we chose hypochondriacal patients, rather than screening for participants from student populations, as the problem with students who may meet cut off may not be very severe, and therefore less sensitive to treatment effects because of lower severity and less distress. The lack of a control condition also means an inability to partial out the effects of time and non-specific factors from the effects of treatment. These particular issues could have been addressed if the design was a randomised control trial and the therefore we would be better able to deduce any effectiveness from this intervention.

## Future Directions

A number of opportunities for further development of this research exist. As mentioned in the methodology section future studies could aim to replicate the studies completed in this thesis using clinical samples. Equally more robust experimental studies that manipulate metacognition directly may be a useful way to replicate chapter 6 findings that metacognition is casual mechanism in health anxiety. Studies that explore the relationship between metacognitive beliefs and aspects of the CAS may enable us to directly test out all aspects of the S-REF model, for example to examine whether metacognition moderates the relationship between worry/rumination and health anxiety.

Future developments clinically would involve a more definitive trial where MCT is compared to an established validated treatment of health anxiety, such as CBT. Previous

evidence has shown that MCT has performed better than CBT when treating a range of psychological conditions, for example GAD (van der Heiden, 2014) and PTSD (Wells, Walton, Lovell & Proctor, 2015). The comparison between the two approaches could also elucidate whether targeting the key variables specific to each model is associated with clinical change and to what degree.

## Conclusions

The studies conducted and reported in this thesis have presented preliminary evidence that metacognition is an important variable in both the cause, maintenance, and treatment of health anxiety. These findings are consistent with theoretical accounts as proposed by the S-REF model (Wells & Matthews, 1994, 1996) which highlights the importance of metacognition in psychological disorder and clinical accounts whereby targeting metacognition reduces psychological distress (Normann, Emmerik & Morina, 2014). For the first time we have examined and compared key principles of MCT theory against key principles of one of the more well researched psychological theories of health anxiety, the cognitive behavioural model. Results from the studies chapters indicate that there appears to be a substantive role for metacognition above and beyond variables associated with cognitive behavioural models. Overall the findings from the thesis indicate that metacognition might be an important variable in both the development and maintenance of health anxiety and the data casts some doubt over the centrality of misinterpretations and illness beliefs as causes of health anxiety.

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## Metacognitive Beliefs in Health Anxiety: The MCQ-HA.

***This questionnaire is concerned with beliefs people have regarding thinking about their health. Please read each item and then state how much you generally agree with it by circling the appropriate number. Please respond to all the items. There are no right or wrong answers.***

**Gender:……. Age:……**

| | | Do not agree | Agree slightly | Agree moderately | Agre very m |
|---|---|---|---|---|---|
| 1. | Thinking of illness could change my health. | 1 | 2 | 3 | 4 |
| 2. | I cannot have peace of mind so long as I have physical symptoms. | 1 | 2 | 3 | 4 |
| 3. | I will be punished for thinking I am in good health. | 1 | 2 | 3 | 4 |
| 4. | Thinking negatively can increase my chances of disease. | 1 | 2 | 3 | 4 |
| 5. | Worrying about illness is likely to make it happen. | 1 | 2 | 3 | 4 |
| 6. | Some thoughts have the power to make me ill | 1 | 2 | 3 | 4 |
| 7. | Dwelling on thoughts of illness is uncontrollable. | 1 | 2 | 3 | 4 |
| 8. | Thinking the worse about symptoms will keep me safe. | 1 | 2 | 3 | 4 |
| 9. | Worrying about my health will damage my body. | 1 | 2 | 3 | 4 |
| 10 | If I think positively about physical symptoms I will be caught off guard. | 1 | 2 | 3 | 4 |
| 11. | Worrying about my health will help me cope. | 1 | 2 | 3 | 4 |
| 12. | I have no control over thinking about my health. | 1 | 2 | 3 | 4 |
| 13. | Only if I have a diagnosis will I be able to stop worrying. | 1 | 2 | 3 | 4 |
| 14. | Thinking positively about my health will tempt fate and I will become ill. | 1 | 2 | 3 | 4 |

**MCQ-HA: Scoring Key.**

Sum scores to produce a subscale total. The subscales are.

Beliefs about Biased Thinking-MCQ-BT: 3, 8, 10, 11, 14.

Beliefs that Thoughts can Cause Illness-MCQ-C: 1, 4, 5, 6, 9.

Beliefs that Thoughts are Uncontrollable-MCQ-U: 2, 7, 12, 13.

An overall total MCQ score can be obtained by summing the subscale totals.

## Health Scenario Interpretation Questionnaire

***Please read each scenario below and rank each outcome from 1 to 4 according to which explanation is most likely to come to mind (4 most likely – 1 Least Likely) if this situation happened to you.***

1. On waking in the morning you notice that you have a sore mouth and throat. What do you think might be the cause of this?

    - You have been sleeping in a stuffy room ------
    - You have oral/throat cancer ------
    - You have been engaging in lots of good conversations ------
    - You are coming down with a cold ------

2. You notice that a cut on your arm is not healing fast enough. What might be the reason behind this?

    - You have an auto immune disease such as HIV ------
    - You think it takes time to heal correctly ------
    - You have been wearing new long sleeved clothing all week ------
    - You have a vitamin deficiency ------

3. Over the space of a couple of days you have noticed pains in your chest. What do you think is wrong?

    - You have indigestion ------
    - You have heart disease------
    - You must be getting effects from exercising more ------
    - You been moving/ lifting heavy objects ------

4. You have been forgetful recently.

    - You have symptoms of early onset dementia ------
    - You have been having too many late nights out with friends ------
    - You are very busy at work ------
    - You are getting older ------

5. You have been experiencing feeling tired recently, especially after you have eaten lunch. What do you think might be the cause of this?

    - You have type 2 diabetes ------
    - You are very busy at the moment ------

- You have been eating more carbohydrates than usual ------
- You have food intolerance ------

6. At the end of the day you notice muscle aching and sore joints. What might be the reason for this?

   - Your seating position is not optimal ------
   - You have arthritis ------
   - You have been doing more walking and exercise ------
   - You have a mild muscle strain ------

7. When looking in the mirror you notice that your skin tone is slightly different than normal and you have a few more moles. Why might this be?

   - You are developing a suntan ------
   - The lighting in the room maybe affecting how you look ------
   - You have liver or skin cancer ------
   - You skin is drier than normal ------

8. Lately you have been experiencing pins and needles intermittently. What might it be?

   - You are tired and stressed ------
   - You have Multiple Sclerosis ------
   - You are excited about something ------
   - You have been sitting in the same position a lot ------

9. You have been experiencing headaches and blurred vision. What may be wrong with you?

   - You have a blood clot on your brain ------
   - You have been watching lots of your favourite TV programmes and movies ------
   - You have done too much work ------
   - You are dehydrated ------

10. You have been to the toilet and notice redness on the toilet paper. What could be the cause of this?

    - You have bowel cancer ------
    - You remember you had eaten a red food stuff e.g. beetroot, red peppers the previous night. ------
    - You have wiped too hard ------
    - You have haemorrhoids ------

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