

Metacognition, Stress & Recovery

A thesis submitted to The University of Manchester for the degree

of

Doctor of Philosophy in Clinical Psychology

in the Faculty of Biology, Medicine, and Health

2016

LORA CAPOBIANCO

SCHOOL OF HEALTH SCIENCES

DIVISION OF PSYCHOLOGY & MENTAL HEALTH

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List of Abbreviations

ANCOVA = Analysis of Covariance

ANOVA = Analysis of Variance

ASD = Acute Stress Disorder

ATT = Attention Training Technique

BPD= Borderline Personality Disorder

BRS = Brief Resilience Scale

CAS = Cognitive Attentional Syndrome

CBT = Cognitive Behavioural Therapy

CD-RISC = Connor Davidson Resilience Scale

CEKTOS = Center for Center for Cognitive and Metacognitive Therapy and Supervision

CFA = Confirmatory Factor Analysis (CFA)

CFI = Comparative Fit Index

C.R. = Critical Ratio

CSA = Coping Scale for Adults

df =Degrees of Freedom

DM = Detached Mindfulness

DMQ = Detached Mindfulness Questionnaire

DSSQ = Dundee State Stress Questionnaire

EFA = Exploratory Factor Analysis

EPQR-A = Eysenck Personality Scale Revised- Abbreviated Form

GAD = Generalized anxiety disorder

GAS = General Adaptation Syndrome

GEE= Generalized Estimating Equations

GFI = Goodness of Fit Index

GSR = Galvanic Skin Response

HADS = Hospital Anxiety and Depression Scale

HR = Heart Rate

ICSRLE = Inventory of College Students Recent Life Events

ITT = Intention to Treat

LEC = Life Events Checklist

LFS = Labour Force Survey

LOCF = Last Observation Carried Forward

MBCT = Mindfulness Based Cognitive Therapy

MBSR = Mindfulness Based Stress Reduction

MCM = Metacognitive Model

MCT = Metacognitive Therapy

MCQ = Metacognitions Questionnaire

MH = Maximum Likelihood

MMT = Mindfulness Meditation Therapy

NA = Negative Affect

NICE = National Institute for Health and Care Excellence

NHS = National Health Service

PA = Positive Affect

PANAS = Positive and Negative Affect Scale

PASAT = Paced Auditory Serial Addition

PGFI = Parsimony Goodness of Fit Index

POMS = Profile of Mood Scales

PTSD = Post Traumatic Stress Disorder

RAP = Reflexive Adaptational Process

RCT = Randomized Controlled Trial

RMSEA = Root Mean Square Error of Approximation

RNT = Repetitive Negative Thinking

RSA = Resilience Scale for Adults

sAA = Salivary Alpha-Amylase

SCID = Structured Diagnostic Clinical Interview

SD = Standard Deviation

SEM = Structural Equation Modelling

S-REF = Self-regulatory Executive Function

TCQ = Thought Control Questionnaire

TSST = Trier Social Stress Test

UMACL = UWIST Mood Adjective Checklist

VAS = Visual Analogue Scale

VIF = Variance Inflation Factor

Abstract

Metacognition, Stress, and Recovery

Lora Capobianco, The University of Manchester

For the degree of Doctor of Philosophy (PhD)

30th September 2016

The thesis explored the role of metacognition, worry and rumination in stress and recovery and is grounded in the Self-Regulatory Executive (S-REF: Wells and Matthews, 1994) model. The concept of recovery is difficult to define and therefore, three definitions of recovery were used to ensure this concept was evaluated across a variety of contexts. A multi-method approach was used that incorporated both experimental and quasi-experimental designs, which included a review of the existing literature, experimental manipulations, cross-sectional and longitudinal designs. Data included psychological and physiological outcome measures that were evaluated in analogue and clinical samples.

Chapters 1 and 2 provide an overview of the thesis and the methodologies used throughout. Chapter 3 (study 1) includes a systematic review of the literature on the role of metacognition in bouncing back from stress, which provides a backdrop for the thesis. The results highlighted that two aspects of metacognition (metacognitive beliefs and coping strategies) were found to be related to factors indicative of resilience. In particular, metacognitive beliefs were positively associated with increased stress levels, and worry and punishment were associated with increased stress symptoms. Chapters 4 and 5 were experimental manipulations of strategies central to the metacognitive model (worry and rumination) and metacognitive beliefs (e.g., thought importance), and evaluated their effects on recovery from stress. Thinking styles and metacognitive beliefs delayed recovery from psychological stress with some evidence of different impacts on psychological and physiological indices. Subsequent to this Chapter 6 focused on further validation of the Detached Mindfulness Questionnaire and confirmed the five factor solution of the scale. Chapter 7 evaluated the metacognitive predictors of resilience, psychological distress (anxiety and depression), and clinically defined recovery from stress. Negative metacognitive beliefs and detachment were found to predict resilience such that increased resilience was associated with increased detachment and decreased negative metacognitive beliefs. In addition, negative metacognitive beliefs positively predicted psychological distress two months after initial assessment, while greater detachment positively predicted recovery from psychological distress. Finally chapters 8 and 9 evaluated the role of metacognition in recovery from stress in clinical populations (individuals receiving group metacognitive therapy). Predictors of change in metacognitive therapy were evaluated using SEM, which demonstrated that changes in metacognitive beliefs precede changes in symptoms of distress. Finally, a feasibility study was conducted of two psychological therapies (MCT and MBSR) in treating a transdiagnostic sample. Both treatments were found to be acceptable and feasible, and preliminary evidence indicated that metacognitive therapy may be the more effective intervention.

The results produced two broad themes. The first is that metacognitive beliefs and thinking styles impacted on recovery from stress, which was found across populations, settings, and definitions of recovery. The second is that the detachment component of detached mindfulness predicted recovery from stress, such that greater detachment was associated with an increased probability of recovering. Further research is needed to explore the effect of metacognition on additional aspects of recovery. In summary, the thesis supports the idea that metacognition and thinking styles as implicated in the S-REF model play an important role in recovery.

Declarations

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

Data

Data for study five was collected in collaboration with CEKTOS, a cognitive and meta-cognitive therapy clinic in Denmark. The data collected was part of a treatment study investigating the effectiveness of group Metacognitive therapy in a transdiagnostic sample. The author was responsible for data entry, management, and analysis of the data. Data for the remaining studies was collected by the author for the purpose of this thesis.

Published Work

This thesis is submitted in alternative format with six papers. Five of which have been submitted to peer-reviewed journals to maximize dissemination. Study 2 has been submitted to *Anxiety, Stress and Coping*. Study three has been submitted to *Behaviour Research and Therapy*. Study four has not yet been submitted for peer-review, as in order to strengthen the paper for publication it will be combined with initial analyses by Nassif (2009), however this article is in preparation. Study five has been submitted to *Journal of Personality and Individual Differences*. Study six has been submitted to *Psychotherapy and Psychosomatics*, and finally study seven will be submitted to *Behaviour Research and Therapy*.

Authorship and Collaborator Contributions

Professor Adrian Wells, the authors supervisor, has overseen the design, conduct, analysis, and write up of all studies within this thesis and is therefore, listed as an author on each paper. Data analysis for study two was conducted in consultation with Julie Morris who has previous experience with longitudinal data and is therefore, listed as a co-author. Studies three, five, and seven received study design and analysis feedback from the authors co-supervisor, Anthony P. Morrison and he is therefore, listed as a co-author. Study six was conducted in collaboration with CEKTOS (Denmark), a cognitive and meta-cognitive therapy clinic. Therefore, Pia Callesen, Carsten Juul and Sisse-Find Nielsen are listed as co-authors due to their assistance with data collection. Additionally, David Reeves assisted with overseeing the data analysis of this study and is therefore, also listed as a co-author. David reeves is also listed as a co-author on study seven, as he conducted the randomization for the feasibility study. As stated, study four will be combined with previous work conducted by Nassif (2009), and therefore, Yasmin Nassif will be listed as a co-author for this study.

Analysis and Write Up

The analysis for the data has been conducted by the candidate, under the supervision of Professor Adrian Wells. Data analysis for study two was supported by Miss Julie Morris. Additionally, data analysis for study five was overseen by David Reeves. The candidate led the write up of each study, preparing drafts for comment from the supervisors and co-authors.

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Acknowledgements

First, I would like to thank my supervisor, Adrian Wells. Thank you for the constant encouragement and for continuously challenging me and showing me that I was capable of more than I ever thought I was, and for all the time and effort you invested in helping me to develop as a researcher. These past three years have been the most incredible learning experience.

To my co-supervisor, Tony Morrison, thank you for your continued support and advice throughout the project. I know those back-to-back supervision sessions between Rachel, Sarah, and I may not have been ideal but your input throughout the thesis has been invaluable. To my advisor, Wael El-Deredy, thank you for your continued advice and support.

Pia, Carsten and Sisse, my colleagues from Copenhagen. Thank you so much for your tireless effort in data collection for the group study.

To my friends Grace, Emily, Julia, Paolo, Shoba, Max & Gabriel. Thank you for your incredible support and constant encouragement. You've made the past three years unbelievably memorable. A big thank you to Caroline Dunton and Zia Marica for your endless amounts of love, support and feedback.

Finally, but certainly not least I have to give a big thank you to my family, my parents Ron and Marisa, and my brother Daniele. Daniele, thank you for the constant encouragement and always reminding me to look at the big picture. I hope I made your early morning commutes a little more entertaining; at least you had someone to talk to at 6 a.m.! Mom and Dad, thank you for your constant love and support and for dropping whatever you were doing to have a FaceTime chat even if it wasn't the most convenient time thanks to the time difference.

The Author

Lora Capobianco completed an undergraduate degree at McMaster University in Canada graduating Summa Cum Laude in 2013. Subsequently following the completion of her undergraduate degree she moved to Manchester, UK to pursue her PhD in Clinical Psychology at the University of Manchester. Her PhD research was supported by the President's Doctoral Scholar Award from the University of Manchester.

Rationale For Submitting The Thesis in Alternative Format

This thesis was approved for submission in the alternative format by the Faculty of Biology, Medicine, and Health. Each experimental chapter was prepared for submission to peer-reviewed journals. Chapters 1 and 2 provide an overview of the literature and methodology used throughout the thesis. Chapters 3-9 are experimental studies formatted for publication in peer-reviewed journals. Chapter 10 provides an overall discussion of the results presented in chapters 3-9 and includes the clinical implications and directions for future research.

Chapter 1: Introduction

The research described in this thesis consists of a series of studies spanning the areas of stress, metacognition, and recovery. In this chapter, these concepts are defined and theoretical models of these concepts are briefly described. Accounts of the psychological, physiological and clinical perspectives are also considered where relevant. The rationale for the current research is summarized and the aims of the studies are outlined.

1.1. Models and Definitions of Stress

Stress is a difficult concept to define. Selye (1976) defined stress with respect to an individual's physiological response to stimuli, with his first definition of stress being, "the non-specific neuroendocrine response of the body," defining stress as a physiological response and suggesting that stressors are non-specific, proposing that there are various causes of stress (Selye, 1936, 1956, 1976). Although this view defines stress using a response-based approach, stress has also been examined using a stimulus-based approach, whereby stress is defined as pressure. Stress has also been defined as: "to subject (a material thing, a bodily organ, a mental faculty) to stress or strain; to overwork, fatigue" (Stress, 2010). However, such definitions of stress fail to encompass how individuals appraise and cope with stress. Lazarus (1966) proposed that stress involves cognitive appraisal, and Cox (1987) suggests that appraisal involves monitoring and evaluating various aspects of one's interaction with the environment (Cox 1978, 1985; Cox & Mackay 1981). A more complex approach involving environmental, cognitive and coping related factors is offered by the transactional theory of stress and coping (Lazarus & Folkman, 1984). A review of psychological models of stress is discussed in section 1.1.1 of this chapter.

It is clear that definitions of stress vary, highlighting that stress is a multifaceted concept, and it would be difficult to meaningfully define this concept without also defining stressors, stress outcomes, and stress with respect to psychological disorder.

For the purposes of this thesis we define stress as a syndrome of appraisal and coping as identified as a theoretical construct by Lazarus & Folkman (1984). More specifically, stress is: “a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being” (Lazarus & Folkman, 1984, p 21).

Stress can be meaningfully measured in terms of physiological and psychological responses (further detailed in Chapter 2) and these are highly relevant to psychological disorder. We have defined stress outcomes as a measureable subjective (e.g. emotion/behavioural) or physiological response in relation to a stressor.

As individuals find different experiences or situations to be more stressful than others, we have therefore, also defined what we consider to be stressors. We define a stressor as an event or experimental manipulation likely to induce a stress syndrome.

Finally, stress can also be experienced with respect to the development of a psychological disorder. In this respect we define a psychological disorder as stress symptoms and responses that can occur with or without the presence of a stressor and that cause impairment in functioning.

1.1.1. Models of Stress

Selye (1976) examined stress with respect to an individual’s physiological responses to a stressor and introduced the concept of the General Adaptation Syndrome (GAS). According to Selye (1950), the GAS occurs in three stages: the alarm reaction, the stage of resistance, and the stage of exhaustion, and it is through these stages that the body responds and adapts to stress. Selye’s theory falls within the centralist approach to emotion and physiology.

The centralist view asserts that specific regions of the brain are responsible for physiological and emotional reactions. According to Cannon (1927) physiological and emotional responses are generated separately after being presented with an emotional stimulus. An alternative psychobiological approach is the peripheralist view; James (1894) stated that subjective emotion arises from bodily changes to an emotional event.

In a seminal study on the role of appraisal in stress responses Schachter and Singer (1962) demonstrated that appraisal plays an important role. Schachter and Singer (1962) injected half of their participants with adrenaline leading to physiological symptoms (e.g., increased sweating) while the other half received a placebo injection, thus in this condition no arousal symptoms occurred. In addition, half of the participants were given an explanation for their symptoms, whereby they were told that the drug they were given would produce symptoms such as increased sweating, and therefore these symptoms should not be attributed to emotional arousal, while the other half were not given any explanation for their symptoms. The authors theorized that individuals who were not given any explanation would look to their environment in order to find an explanation for their symptoms, therefore, to evaluate this, individuals who were not given an explanation for their symptoms were then exposed to either positive environmental cues (e.g., a happy and laughing experimenter) or to angry environmental cues (e.g., an angry experimenter). The study found that individuals who experienced changes in physiological arousal but relied on environmental cues to determine their emotion, interpreted symptoms in a way that correlated with the environmental cues that they were presented with (e.g., exposure to happy experimenter resulted in happy interpretation). Schachter and Singer (1962) argued that these results suggest that emotion is not solely dependent on physiological arousal but also on how the arousal is interpreted.

Contemporary models of stress propose a dynamic interaction between an individual's environment and emotional processing (Cox, Griffiths, & Rial-Gonzalez, 2000). Transactional

stress theories argue that stress reactions are the result of an individual's appraisals of demands and ability to cope with those demands (Lazarus, 1966; Lazarus & Folkman, 1984). Thus, the two important aspects of this model are coping and appraisal. Folkman, Lazarus, Gruen, and DeLongis (1986) assert that the first step is cognitive appraisal, whereby an individual evaluates if an encounter is relevant to their well-being. Following this step is secondary appraisal, which occurs when an individual appraises an encounter as stressful. During this stage, identification of how potential harm can be prevented, altered or avoided occurs (Park & Folkman, 1997). Folkman and Lazarus (1980) argue there are two categories of coping responses: problem-focused coping and emotion-focused coping, where coping is defined as one's cognitive and behavioural attempts to manage the demands between the person-environment interaction (Folkman, Lazarus, Gruen, & DeLongis, 1986). The final stage of the model occurs when coping has been implemented. Psychological distress may be the result of an imbalance between coping resources and demands (Lazarus & Folkman, 1984; Cox et al., 2000).

More recently, Wells and Matthews (1994) provided an account of stress that integrates appraisal and transactional theory with information processing accounts of emotion and self-regulation. This approach locates stress and coping responses within a multi-level cognitive architecture in which abnormal (e.g., persistent) stress reactions are thought to result from biased metacognitive control of processing. A more detailed account of this approach is discussed in section 1.3.1 of this chapter.

1.2. Definitions of Recovery

Recovery is a concept that is difficult to define, as it is context dependent. Recovery from an experimental stressor is different from recovery from a psychological disorder. Although there may be overlap in the processes that confer recovery, how we define an individual to be recovered in this context differs. Here we will outline the various definitions of recovery used throughout the thesis which have been defined based on the context in which they are measured.

1.2.1. Experimental Recovery From A Stressor

Experimental manipulations involving stress commonly examine how individuals recover from stress based on coping strategies (e.g., Radstaak, Geurts, Brosschot, Cillessen, Kompier, 2011) or investigate individual's physiological responses from induced stress (e.g., Dickerson & Kemeny, 2004). However, studies often fail to describe or classify what is meant by recovery, making it difficult to interpret the optimal styles or length of time required to recover from stress. Studies that do identify what is classified as recovery include definitions such as: a quick or complete return to baseline from a previous activation level; length of time taken in order for measures to return to reference levels once a task has been completed, and; the degree to which elevations occur once a stressor has ended (Chida & Hamer, 2008; Dickerson & Kemeny, 2004; Waugh, Panage, Berry Mendes, & Gotlib, 2010).

We define recovery as an individual's propensity to show a decline towards baseline levels during the recovery period as measured by psychological and physiological outcomes. We define the recovery period as the period of time following a stressor.

1.2.2. Clinical Recovery

In clinical trials, recovery is often examined on the basis of whether an individual passes the cut-off score for a specified outcome measure examining psychological symptoms. However, using this method is problematic as it does not account for variability within a treatment condition. Additionally, although two treatment conditions may be statistically different from one another, or the within-group effect may be statistically significant, this difference may lack clinical significance. Effect sizes are commonly used to assess how large a difference or change in outcomes is, but this does not address clinical significance. Jacobson, Follette, and Revenstorf (1984) defined clinically significant change as a move outside the range of the dysfunctional population or to within the range of the functional population. Jacobson and Truax (1991) added to this by proposing the use of a reliable change index to determine if the amount of change that a participant has made is statistically reliable. The reliable change index uses a two-fold change. In order to be considered improved, a participant must have made a reliable change; however, in order for a participant to be considered recovered they must not only have made a reliable change but also have crossed the cut-off. The cut-off for the outcome measure used is calculated based on criterion a, b or c outlined by Jacobson and Truax (1991).

Criterion a operationalizes an individual as having crossed the cut off when their level of functioning after completing therapy is outside of the range of the dysfunctional population, whereby the range is two standard deviations beyond the mean of the population. The formula used to calculate the cut off using criterion a is: $a = M_1 - 2(S_1)$, where M_1 is the mean of the pre-treatment clinical group and S_1 is the standard deviation of the pretreatment clinical group. Criterion b operationalizes an individual as having crossed the cut off when their level of functioning after therapy has fallen within the range of the functional population. Criterion b is calculated using the formula $b = M_0 + 2(S_0)$, where M_0 is the mean of the non-clinical

population and S_0 is the standard deviation of the nonclinical population. Finally, criterion c operationalizes an individual as having crossed the cut off when their level of functioning after therapy places them closer to the mean of the functional population than the dysfunctional population. Criterion c is calculated using the formula $c = ((S_1 \times M_0) + (S_0 + M_1)) / (S_0 + S_1)$.

We therefore, define clinical recovery as being reliably improved or recovered as calculated using the criteria outlined by Jacobson and Truax (1991).

1.2.2.1. Treatment for Emotional Disorders

Recovery from stress can also be achieved through therapy. According to the National Institute for Health and Care Excellence (NICE) guidelines, treatments for psychological disorders such as generalized anxiety disorder (GAD) (NICE, 2011) and depression (NICE, 2009) includes psychological therapy, pharmacological interventions, or a combination of both. Although there are various psychological therapies (e.g., cognitive behavioral therapy, mindfulness based therapy, and metacognitive therapy) used to treat psychological disorders, they do not all facilitate change through the same targeted causal mechanisms, which may account for the differences in treatment efficacy in psychological therapies.

According to Beck's cognitive theory of emotional disorders (Beck, 1967, 1976) psychological disorders such as anxiety and depression are a result of distortions in thinking which are evident in negative appraisals and in an individual's schemas. Schemas are the beliefs and assumptions that individuals hold that influence information processing, experiences and behaviors. These schemas become activated by situations and give rise to negative automatic thoughts which are an individual's appraisals of events that are subsequently associated with behavioral and emotional responses. Beck (1967, 1976) posits that the content of schemas are what distinguishes disorders from one another and that therapeutic change arises by challenging these schemas using techniques such as verbal reattribution (e.g., reviewing counter-evidence) and behavioral reattribution (e.g., exposure).

Verbal reattribution techniques are often the first step in eliciting change and act as a way to loosen beliefs, while behavioral reattribution techniques can be used in conjunction with verbal reattribution and allow for further cognitive change aiming to socialize patients to the cognitive model, further challenge negative automatic thoughts and assumptions, and elicit changes in affect.

One therapy that has been gaining increasing popularity is Mindfulness meditation therapy (MMT), which is based on Buddhist practices. MMT includes Mindfulness Based Cognitive Therapy (MBCT) and Mindfulness Based Stress Reduction (MBSR), however only MBSR will be discussed as this was the treatment selected for evaluation in Chapter 9. MBSR was first introduced by Kabat-Zinn (1990) and focuses on cultivating non-judgmental moment to moment awareness by using formal and informal meditation techniques. Formal meditation techniques include the body scan, yoga, and sitting meditation while informal meditation techniques which can be incorporated into everyday living include mindful eating and mindfully practicing routine activities. As MMT is based on Buddhist practices, a formal theoretical model conceptualizing how disorders are caused and how therapeutic change occurs is lacking.

Recently an influential model of psychological disorder that has clear implications for modelling recovery was advanced by Wells and Matthews (1994, 1996) and is the basis of metacognitive therapy (Wells, 2009). Metacognitive therapy (MCT) aims to alter specific and transdiagnostic underlying processes thought to be present in all psychological disorders. It is based on a theoretical model of psychological disorder the Self-regulatory Executive Function (S-REF) model, which is described in further detail in section 1.3.1. According to this theory psychological distress is a result of the cognitive attentional syndrome (CAS) which is characterized by inflexible attention, repetitive negative thinking such as worry or rumination, and unhelpful coping strategies and behaviors (that have paradoxical effects) including

thought suppression and avoidance. The CAS is a result of an individual's metacognitive beliefs which lead to prolonged negative processing and distress. MCT aims to remove the CAS by modifying metacognitive beliefs and providing alternative methods of relating to internal experiences by using strategies such as the Attention Training Technique (ATT, Wells, 1990) and detached mindfulness (DM, Wells, 2005). Both the ATT and DM can be seen as the antithesis of the CAS and aim to increase an individual's attentional control and flexibility, increasing their meta-awareness and ability to detach from thoughts without perseverative processing of them

Although therapy can aid in recovery from psychological distress, different treatments are intended to impact on different underlying causal mechanisms and treatments may not be equally effective.

1.2.3. Resilience

Recovery from stress has also been the focus of research in the area of psychological resilience. A brief overview of models of resilience will be discussed in section 1.2.3.1 of this chapter.

Definitions of resilience vary and have included: the ability to sustain normal development despite long term stress; the ability to maintain a stable equilibrium in the face of stress; and the ability to adapt positively in the face of adversity (Bonanno, 2004; Friborg, Hjemdal, Rosenvinge, Martinussen, 2003; Luthar, Cicchetti & Becker, 2000).

Although resilience has many definitions, the original meaning is the: "act of rebounding or springing back" ("Resilience", 2010), which has clear links with the concept of recovering from stress responses. Research that has operationalized resilience as the ability to bounce back has been reviewed and supported by Carver (1998), Tugade and Fredrickson (2004), and Smith et al. (2008). Thus, in the present thesis, resilience is operationalized as the ability to bounce back from stress.

1.2.3.1. Overview of Models of Resilience

The variety of definitions of resilience has resulted in a wide range of theories and models under which resilience has been operationalized. Most commonly, resilience has been examined as a trait rather than a process and as such, many theories of resilience operationalize it as a trait factor. Accordingly, most measures of resilience commonly focus on personality characteristics or protective factors (e.g., personal and social competence, social support) that confer resilience as evidenced by reviews on measures of resilience (Ahern, Kiehl, Lou Sole, & Byers, 2006; Windle, Bennett, & Noyes, 2011). In particular, of the six adult scales included in the review by Windle et al. (2011), five measures evaluated protective factors that confer resilience or denote resilience as a personality factor, while one measure, The Brief Resilience Scale (Smith et al., 2008), evaluated resilience as the ability to bounce back.

Hardiness is a common concept of psychological resilience which was identified by Kobasa (1979), and emerged from a theory of personality (Kobasa & Maddi, 1977). According to this theory, hardiness is defined by the three c's: control, commitment, and challenge. Whereby control is the belief that one can influence the course of their life, challenge is deemed to be one's ability to perceive difficulties as an opportunity for growth, and commitment is one's belief in the value and truth of who they are. The dispositional resilience scale (Bartone, Ursano, Wright, & Ingraham, 1989) is based on the construct of psychological hardiness, and Funk (1992) has described it as one of the best third generation measures of hardiness.

Additionally, Friborg et al. (2003) developed the resilience scale for adults (RSA) which assesses protective factors associated with resilience. The Resilience scale for adults is based on the work of Hjemdal (2007). Hjemdal (2007) stated that measures of resilience are not based on established theories but on empirical findings, further stating that an appropriate

measure for evaluating protective factors associated with resilience did not exist. He therefore, conducted a literature search, where five protective factors emerged: personal competence, family cohesion, social competence, structured style and social resources. Friberg et al. (2003) revised the original resilience scale for adults and added in a locus of control subscale stating that this construct was important for a resilient outcome (Werner & Smith, 1992; Cederblad, Dahlin, Hagnell & Hansson, 1993). As such, the RSA is derived as a measure of protective factors that are associated with a resilient outcome; however it is not based on an empirically tested theory.

Alternatively, Smith et al. (2008) developed the brief resilience scale (BRS) to assess resilience as the ability to bounce back from stress. Smith et al. (2008) also highlighted that, previous measures of resilience focus on protective factors, coping resources, or personality characteristics, rather than on the definition (the ability to adapt to stress or thrive in the face of adversity). Although these measures are useful in understanding the resources that aid in positive adaptation, Smith highlights that these may be more accurately described as resilience resources as these are what may increase the likelihood of resilience rather than be resilience itself. Thus, they developed the brief resilience scale based on the concept of resilience as the ability to bounce back from stress to address this issue. Smith, Tooley, Christopher, and Kay (2010) highlight the importance of coping resources in resilience and how resilience may be related to learning history which has been evidenced in self-efficacy models (Bandura, 1994). Here, successful experiences of bouncing back, receiving verbal encouragement on ability to bounce back, and having examples of successful adaptation are thought to help develop an individual's resilience.

In this thesis, resilience is operationalized as the ability to bounce back from a stressor and will therefore, be measured using the BRS. Resilience will be examined within the framework of the metacognitive model (Wells & Matthews, 1994), and unlike previous

models of resilience, the metacognitive model provides a theoretical framework and a conceptualization of the underlying self-regulatory processes that may confer resilience.

1.3. Definitions of Metacognitions

Thinking about thinking, this is a statement that defines a central feature of metacognition. Metacognition has been operationalized under a variety of contexts such as memory, learning, executive dysfunction, and self-reflection (Brown, 1978; Dinsmore, Alexander, & Loughlin, 2008; Lysaker et al., 2008, 2013). Flavell (1979) defines metacognition as, “ones knowledge and cognition about cognitive phenomena.” Metacognition can be further broken down into (a) metacognitive knowledge, (b) metacognitive experiences, and (c) metacognitive strategies (Flavell, 1979; Wells, 1995).

We define metacognitive knowledge as an individual’s stored knowledge and beliefs. Metacognitive knowledge can occur as implicit or explicit knowledge. Implicit knowledge is the rules or programs regarding thinking. Alternatively, explicit knowledge is verbally expressed, such as “*Worrying is uncontrollable*” (Wells & Matthews, 1994). Additionally, in Wells (2000) theory of metacognitive therapy theory (MCT; Wells, 2000) an important distinction in metacognitive knowledge is that it can occur in the form of positive and negative metacognitive beliefs. Positive metacognitive beliefs regard the usefulness of worry and other coping strategies (e.g., “*Worrying helps me cope*”), whereas negative metacognitive beliefs regard uncontrollability, danger, and importance of thoughts (e.g., “*Worrying puts my body under stress*”). For the purposes of this thesis, which is grounded in the metacognitive model, metacognitive knowledge is defined as an individual’s stored explicit knowledge and beliefs which includes positive and negative metacognitive beliefs about thinking.

Furthermore, a dimension of metacognition central to the Wells and Matthews (1994, 1996) model of stress are the strategies used to cope with stress. Many of these, especially those relevant to psychological disorder are metacognitive in nature and involve the execution

of particular thinking styles such as worry or thought suppression as a means of dealing with negative thoughts. In this thesis, metacognitive strategies are defined as the responses one makes in an attempt to control or alter thinking, which has a subsequent impact on emotion and cognitive regulation. Metacognitive strategies may aid in the downregulation of psychological distress or alternatively they may amplify and prolong distress. For example, Wells (1995) describes how individuals with generalized anxiety disorder (GAD) use worry as a way to cope with their thoughts; however, this strategy is maladaptive and prolongs distress.

According to metacognitive theory, metacognitive knowledge and strategies interact and influence one another. For example, an individual's metacognitive knowledge and beliefs will subsequently impact how they respond to their thoughts and their selection of metacognitive strategies. Wells & Matthews (1994, 1996) propose that metacognitions are the driving force behind a thinking style termed the cognitive attentional syndrome (CAS) that causes prolonged and abnormal stress reactions.

For the purposes of this thesis, which is guided by the Wells and Matthews (1994, 1996) model, two areas of metacognition are of primary concern: metacognitive knowledge and metacognitive strategies.

1.3.1. Introduction to the S-REF Model

The metacognitive model is derived from the theoretical framework outlined by Wells & Matthews (1994), called the Self-Regulatory Executive Function (S-REF) model. The S-REF model is based on the interactive processing of self-relevant information, within a three-level cognitive architecture: automatic low-level processing, controlled processing of appraisal and regulation of action, and stored self-knowledge and beliefs. The first level of processing is automatic and requires low levels of resources. At the second level, controlled processing of appraisals and regulation of thoughts and actions occurs. Here, processes such as conscious monitoring and control occur. Finally, the third level includes stored self-knowledge and self-

beliefs. The S-REF model emphasizes the role of metacognitive knowledge in determining the nature of processing. The processing of the SREF model is driven by an individual's self-beliefs which can be divided into two types: (1) declarative beliefs and (2) procedural beliefs. Declarative beliefs are explicit, such as, "*If I worry, I'll be prepared.*" Procedural beliefs or knowledge play an important meta-cognitive function by acting as a plan to guide cognition (Wells & Matthews, 1994). Such plans can maintain dysfunctional processing by selecting strategies such as worry or rumination which lead to a perpetuation of negative threat-related processing.

Central to the S-REF model is the cognitive attentional syndrome (CAS), a transdiagnostic thinking style that contributes to emotional distress. The CAS is characterized by heightened self-focused attention, perseverative thinking (e.g., worry or rumination), and threat-monitoring. Although self-focused attention is not always problematic it begins to pose challenges for self-regulation when such states become inflexible, whereby it intensifies internal experiences and increases attentional demands, thus limiting the ability to select active coping strategies. Threat-monitoring is also a common strategy associated with the activation of the CAS and refers to increased attention for potential threatening stimuli. This can be activated through an individual's beliefs or knowledge. For example, a person with health anxiety may believe that they are vulnerable to a heart attack and therefore, will monitor their heart rate, leading to a constant cycle of monitoring symptoms for potential danger.

Metacognitive therapy (MCT; Wells, 2000, 2009) which is grounded in the S-REF model focuses on removing the CAS and modifying the metacognitive beliefs behind it. MCT also helps patients develop new ways of responding to thoughts and beliefs using a more flexible and decentered approach.

The S-REF model provides advantages over previous cognitive models by allowing dysfunction to be modelled within a range of specific interacting levels. The S-REF model

raises the possibility that biases can be top-down initiated, such that stored knowledge and beliefs can influence lower levels of processing, but that they can also be bottom-up initiated; proposing that processing is a continuous dynamic interaction. Previous theories have suggested that attentional bias in emotional disorders is associated with involuntary control over attention as evidenced by the emotional Stroop task (MacLeod & Hagen, 1992); however, Wells and Matthews (1994) propose that both voluntary and involuntary processing contribute to bias. This notion creates implications for the treatment of emotional disorder. For example, it may not be necessary to re-train biases through massed practise as is the case in Attention Bias Modification (McLeod, Matthews, & Tata, 1986) but sufficient to bring the CAS under top-down control. Although the metacognitive approach shares similarities with cognitive approaches there are considerable differences. While cognitive models focus on modifying the content of individual's beliefs, the metacognitive model focuses on modifying styles of thinking, allowing for the control of processes such as worry and rumination to be directly modified. The S-REF modelling of interactive levels of processing therefore allows for new treatment techniques to be developed, as exemplified by metacognitive therapy and the so called neurobehavioral therapies (Siegle, Ghinassi & Thase, 2007; Wells, 2000, 2009).

1.4. Aims and Objectives of the Thesis

The overarching aim of the thesis was to investigate the relationships between metacognition, stress and recovery, as implicated by the S-REF model. In order to provide a multi-faceted view, metacognition (metacognitive knowledge and strategies) was evaluated in relation to laboratory stress and naturally occurring stressors across different domains of recovery (psychological, physiological, and clinical).

In order to achieve this objective, six main aims were set:

AIM 1: To investigate if metacognition plays a role in psychological resilience in response to stress.

AIM 2: To investigate the impact of two emotion regulation strategies (worry and rumination) on psychological and physiological recovery from induced stress.

AIM 3: To evaluate the impact of negative metacognitive beliefs on psychological and physiological recovery from induced stress.

AIM 4: To evaluate the metacognitive predictors (metacognitive beliefs and detached mindfulness) of psychological resilience. This includes evaluating the psychometric properties of the Detached Mindfulness Questionnaire (DMQ).

AIM 5: To investigate if changes in metacognitive beliefs predict and precede changes in symptoms of psychological distress in a transdiagnostic sample of individuals receiving group Metacognitive Therapy.

AIM 6: To compare group Metacognitive Therapy and Mindfulness Meditation therapy in a transdiagnostic sample in order to evaluate the acceptability and feasibility of these treatments in aiding in recovery from distress.

2. Chapter 2: Methodology Employed Throughout This Thesis

2.1. Overview of Methods

In order to address the research aims a range of experimental and quasi-experimental methodologies were used incorporating a variety of inferential and multivariate statistics. A broad range of experimental designs and statistical analyses were required to test the specific cross-sectional and causal hypotheses. The data collected is primarily longitudinal, being collected over a number of time points, and is a combination of psychological and physiological outcomes

2.2. Study 1: The Role of Metacognition in Bouncing Back From Stress: A Systematic Review

The first study was a systematic review regarding the role of metacognition in resilience to stress. As little is known on metacognition and resilience we reviewed the literature to investigate if metacognitive factors were associated with resilience to provide a backdrop and framework for further studies. The review followed the guidelines outlined in the PRISMA statement on the design and reporting of systematic reviews (Moher, Liberati, Tetzlaff, & Altman, 2009). All papers were quality assessed using the Downs and Black (1998) Checklist for Measuring Quality. A systematic review provides additional benefits over a traditional literature review as it uses a fixed and rigid methodology to identify, assess, appraise, and synthesize the evidence, which helps to minimize bias and allow for replicability of results. The fixed process to reviewing the literature is one of the distinguishing features between a systematic review and a traditional literature review. However, one of the limitations to a systematic review is that the scope of the results can be narrow as a systematic review aims to answer a specific question with accompanying search terms.

2.3. Experimental Paradigms

Studies two and three are lab based manipulations of metacognition that investigate the effects of metacognition on physiological and psychological outcomes. The use of experimental paradigms provides a variety of advantages such as it allows for causal hypotheses to be tested, can ensure that the independent variable is being manipulated, and allows for greater control over internal validity. A review of physiological and psychological outcome measures of stress and stress paradigms will be discussed below. Both experimental paradigms used physiological and psychological measures of stress which is beneficial as it allows for a multi-method approach. One of the primary advantages of a multimethod approach is triangulation such that by combining data from a range of sources, results can be examined and confirmed using different perspectives (Greene, Caracelli & Graham, 1989). In addition, it supports complementarity such that data collected from different methods allows for a broader picture of the research issue (Greene, Caracelli & Graham, 1989). In order to avoid repetition the experimental paradigms will not be discussed in detail here but in their respective chapters.

2.3.1. Physiological Measures of Stress

Studies three and four used experimental paradigms to evaluate the impact of metacognitive strategies and metacognitive beliefs on recovery from stress on both physiological and subjective measures of stress. Various physiological indicators can be used to evaluate stress levels such as heart rate, blood pressure, cortisol levels, and skin conductance. Cortisol is a widely used biomarker of stress in experimental studies as it is a steroid hormone that is released from the adrenal cortex in times of stress; however, due to the high costs associated with this measure it was unable to be used. Instead skin conductance, also referred to as galvanic skin response (GSR), skin conductance levels, or electrodermal

response, was used as to measure participant's physiological response to stress, as increased sweat gland activity has been associated with increased autonomic nervous system activity during states of emotional arousal (Matthews, Deary, & Whiteman, 2009). A GSR monitor can be used to measure this as when sweat glands are activated it leads to a decrease in electrical resistance, which can be measured by placing two electrodes to the base of an individual's fingers and passing a small current through them (Montagu & Coles, 1966). Studies have reliably found an association between increased skin conductance levels and induced stress (Carrillo et al., 2001; Knight & Borden, 1979; Kohler, Scherbaum, & Ritz, 1995).

2.3.2. Psychological Measures of Stress

As a subjective, psychological measure of stress we used the positive and negative affect scale (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS was selected over other subjective measures of stress as it is a brief measure of positive and negative affect that can easily be repeatedly administered during a laboratory based experiment. Alternative measures of mood state include the Profile of Mood Scales (POMS; McNair, Lorr & Droppleman, 1971), and the UWIST Mood Adjective Checklist (UMACL; Matthews, Jones & Chamberlain, 1990). The POMS is a 65 item self-report measure of affect states with six subscales: anger-hostility, confusion-bewilderment, depression-dejection, fatigue-inertia, tension-anxiety, and vigour-activity. The UMACL is also a self-report measure of affect states with 29 items and four subscales: energetic arousal, tense arousal, hedonic tone, and general arousal. Although the POMS has a short version, 35 items, the length of these measures were ultimately problematic for repeated delivery during the experimental paradigm and therefore, the PANAS was selected.

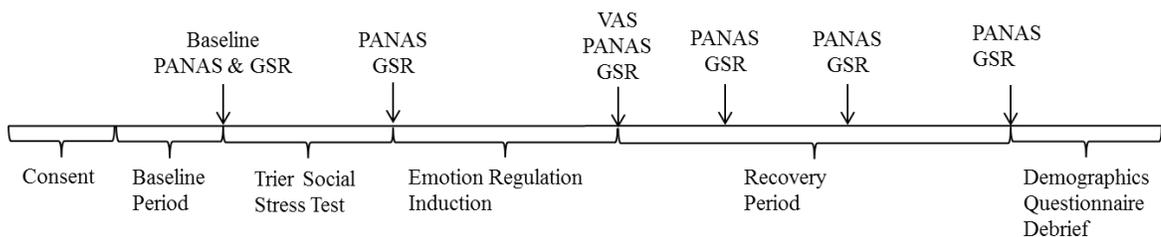
2.3.3. Stress Paradigms

There are a variety of laboratory tasks that are used to induce stress, such as: the emotional Stroop task, the cold pressor task, emotional films, and physical stressors such as exercise. In order to evaluate which paradigm was most appropriate we consulted the review by Dickerson & Kemeny (2004) who evaluated various acute stressors and their influence on cortisol responses in order to identify the most suitable stress paradigm. Dickerson & Kemeny (2004) found that motivated performance tasks with social-evaluative threat and uncontrollable manipulations are associated with the largest increases in cortisol reactivity. Motivated performance tasks include completing a mental arithmetic problem or delivering a speech. Social-evaluative threat can be induced by instructing the participant that they will be videotaped during their speech or by including an evaluative audience during the task. Finally, uncontrollable manipulations include performing under time constraints, false feedback of poor performance, and criticism from the experimenter during the task, or the presence of continuous or intermittent loud noise. Based on this the stress paradigm that met all of these criteria was the Trier Social Stress Test (TSST; Kirschbaum, Pirke & Hellhammer, 1993), which is further outlined in chapters four and five. One modification was made to the original paradigm outlined by Kirschbaum et al. (1993) such that instead of delivering a speech in front of a panel of judges a camera was used and participants were told that their speech was going to be recorded and evaluated by a group of their peers. The use of a panel was not possible due to the limited space in the testing rooms and the logistical issues posed concerning when testing could occur as the same panel of volunteers would have needed to have been available for all testing sessions.

2.3.4. Study 2: Worry and Rumination: Do They Prolong Physiological or Affective Recovery From Stress?

An overview of the experimental paradigm is outlined in Figure 2.1. In order to avoid repetition a more detailed description of the experimental paradigm is found in chapter four, however a brief overview will be discussed here. The study was an experimental manipulation comparing the effects of three emotion regulation strategies on recovery from stress (induced using the TSST). The ethical approval letter and participant information sheet can be found in Appendix 1 and 2. Prior to the experiment participants were randomly assigned to one of three conditions: worry, rumination, or distraction. The emotion regulation induction was adapted from Nolen-Hoeksema & Morrow (1993) who had participants engage in rumination or distraction by using an imagination induction where participants were asked to focus their attention on the thoughts that were presented to them. The induction has been used and modified by numerous researchers (e.g., Donaldson & Lam, 2004; Lavender & Watkins, 2004; Watkins & Teasdale, 2001) to investigate the effects of emotion regulation strategies.

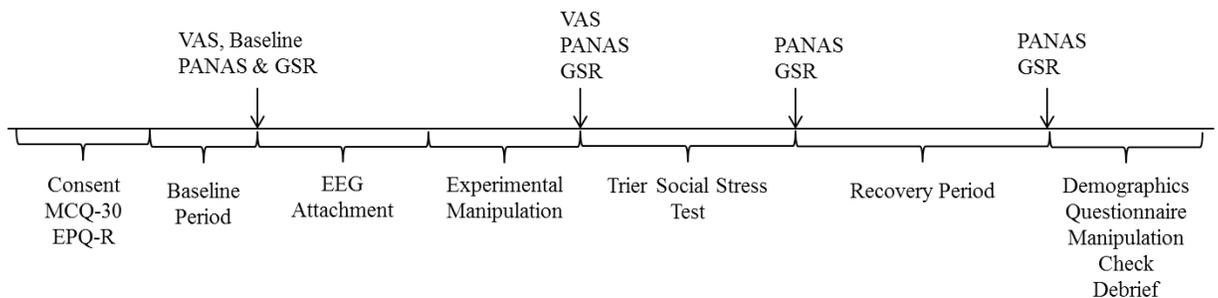
Figure 2.1. Overview of Study 2 Experimental Paradigm



2.3.5. Study 3: The Effect of Thought Importance on Stress Responses: A Test of Metacognitive Theory

An overview of the experimental paradigm is outlined in Figure 2.2 and is based on the experimental paradigm used by Myers and Wells (2013).

Figure 2.2 Overview of Study 3 Experimental Paradigm



A detailed description of the experimental paradigm is described in chapter five. The study used an analogue sample, randomly assigned to either the experimental group or control group. The ethical approval and participant information sheet can be found in Appendix 4 and 5. The experimental group underwent a metacognitive belief manipulation where the negative metacognitive belief of thought importance was increased.

2.4. Studies 4 & 5: Psychometric Properties of the Detached Mindfulness Questionnaire in a Non-Clinical Sample & A Prospective Cohort Study of the Metacognitive Predictors of Bouncing Back From Stress

Data for studies four and five were analyzed from the same data set and therefore, an overall discussion of the study design and measures will be discussed prior to individual study descriptions of the analyses. The ethical approval letter and participant information sheet can be found in Appendix 9 and 10.

Questionnaires were administered every 4 weeks resulting in a longitudinal data set as data was collected over three time points: time one (first data collection), time two (four weeks after time one), time three (four weeks after time two). As there was no intervention or manipulation involved it allowed for naturalistic observations of an individuals stress reactions and responses. Longitudinal designs are beneficial as they allow for examination of changes in key variables over time. Such designs provide a variety of advantages such as increased ecological validity; however, longitudinal designs are not without their limitations and they offer less control than experimental designs over threats to internal validity.

Study 4 aimed to evaluate the psychometric properties of the DMQ (Nassif & Wells, 2007), as it is an unpublished measure further validation was required prior to use as a predictor variable. Study 5 was a prospective cohort study, which was conducted to assess the metacognitive factors associated with resilience, and therefore, a battery of questionnaires was used.

2.4.1. Questionnaires

Nine questionnaires were administered as part of a prospective cohort study; however, as questionnaires were collected as part of a larger study not all questionnaires were used in the analyses as they were not relevant to the hypothesis that was being tested in this thesis. The questionnaires assess psychological vulnerability factors including trauma history, daily hassles, metacognitions, stress recovery, and emotion.

Five measures were administered to assess aspects of stress and recovery. Resilience was assessed using the brief resilience scale (BRS; Smith et al., 2008). The BRS is a six item measure of resilience defined as the ability to bounce back. Alternative measures of resilience such as the Connor Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003), Dispositional Resilience Scale (Bartone, 1989), and the Resilience Scale (Wagnild & Young,

1993) identify resilience as a trait, making them incompatible with how we operationalized resilience in this study (as recovering or bouncing back). Additionally, the Dundee State Stress Questionnaire (DSSQ; Matthews et al., 1999, 2002) was considered, however it was problematic for our current aims for a few reasons. The first was that the DSSQ measures thinking styles which overlaps with the CAS and is measured by the Thought Control Questionnaire (TCQ; Wells & Davies, 1994) in the current study. In addition, the DSSQ includes aspects of metacognition as it measures confidence. Therefore, as we did not want to confound causal measures with measures of outcomes and as we operationalized resilience as the ability to bounce back the BRS was deemed the most suitable measure.

A predominant focus of stress research has been the effect that major life events have on stress symptomology, psychopathology and resilience, prompting the inclusion of the life events checklist (LEC-5; Weathers et al., 2013) to assess trauma history. Although major life events may play an important role in an individual's resilience the accumulation of daily hassles or day to day stressors may also be an important index. Kanner, Coyne, Schaefer & Lazarus (1981) found that daily hassles were associated with psychological symptoms even after life events were controlled for. In fact, Eckenrode (1984) suggests that the effect that major life events have on an individual is mediated through daily hassles. Therefore, to account for fluctuations in daily hassles (stressors) the Inventory of College Students Recent Life Experiences (ICSRLE; Kohn, Lafreniere & Gurevich, 1990) was used in analyses in favour of the LEC-5.

Finally, to assess emotional distress the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) was administered to assess anxiety and depression symptomology. As the HADS has been used as a diagnostic indicator of anxiety and depression it was included as it would also allow us to apply criteria to examine clinically meaningful recovery.

Four measures of metacognition were administered, however not all were intended for simultaneous use in the final analyses due to the overlap in some of the measures. For example, both the MCQ-30 and CAS-I assess dimensions of positive and negative metacognitive beliefs. The measures used to assess dimensions of metacognition include: The Cognitive Attentional Syndrome-1 (CAS-1; Wells, 2009), the metacognitions questionnaire-30 (MCQ-30; Wells & Cartwright-Hatton, 2004), the detached mindfulness questionnaire (DMQ; Nassif & Wells, 2007), and the thought control questionnaire (TCQ; Wells & Davies, 1994).

As stated, both the CAS-1 and MCQ-30 assess metacognitive beliefs; however, the CAS-1 also assesses coping behaviours such as reassurance seeking as well as the extent to which individuals have been engaging in worry and rumination. Although the CAS-1 and MCQ-30 both assess metacognitive beliefs only the MCQ-30 was used to assess them in predictor analyses as it is an established instrument with known psychometric properties and unlike the CAS-1 provides a multi-dimensional measure of metacognitive beliefs. It has five subscales of metacognitive beliefs which include: positive metacognitive beliefs about worry, negative metacognitive beliefs about uncontrollability and danger, cognitive confidence, cognitive self-consciousness and need for control.

A second facet of metacognition that was assessed was detached mindfulness (DM), which Wells & Matthews (1994, 1996) describe as a state of processing that allows for adaptive metacognitive monitoring and control over internal processes. The Detached Mindfulness Questionnaire (DMQ; Nassif & Wells, 2007) was developed to assess detached mindfulness and preliminary analyses demonstrated that the scale measures five constructs of detached mindfulness: attention flexibility, meta-awareness, thought control, detachment/observing self and cognitive decentering.

Finally, metacognition also includes the thought control strategies that individual use in response to thoughts and therefore the TCQ was included to assess this. The TCQ measures five dimensions of thought control: distraction, social control, worry, punishment, and re-appraisal. Preliminary analysis of the TCQ demonstrated that the punishment subscale was associated with measures of stress vulnerability and psychopathology (Wells & Davies, 1994). Therefore, we were interested in evaluating if any of the dimensions of the TCQ emerged as a predictor of resilience.

2.5. Study 6: Modelling the Causal Relationship Between Change in Metacognition and Symptom Improvement During Transdiagnostic Group Metacognitive Therapy

This study used data from a treatment study of group MCT in Denmark. The study used a longitudinal 3-wave panel design such that there were three assessment points (pre, mid, and post treatment). Cross-lagged pathways were used to assess the study hypotheses.

Data for the study was collected in collaboration with our colleagues in Denmark who were conducting an investigation on the effectiveness of group MCT in a trans-diagnostic sample, the data release form for this study can be found in Appendix 20. The primary outcome measures for the study were the Hospital Anxiety and Depression Scale and the CAS-I. Although the author was not involved in data collection she was responsible for study designs, data entry, management and the analysis. We used the data collected from the treatment study to investigate if changes in metacognitions, as measured by the CAS-I, predicted and preceded changes in symptoms, as measured by the HADS.

2.6. Study 7: Group Metacognitive Therapy versus Mindfulness Meditation Therapy in a Transdiagnostic Patient Sample: A Feasibility Study

The seventh study focused on comparing how two psychological interventions effect recovery from psychological distress (anxiety and depression). A feasibility study was conducted to compare group MCT with MBSR. Feasibility studies aim to evaluate if it is possible to conduct a study. These designs are beneficial as they allow for various parameters to be estimated, such as providing the standard deviation of a proposed outcome measure in a specific population which may inform a sample size calculation for a definitive trial. In addition, feasibility studies provide evidence on treatment adherence and compliance, acceptability of randomization, recruitment rates, and follow up rates; all of which are important parameters that can be used to inform a definitive trial. The trial was pre-registered with the clinical trials data base clinicaltrials.gov. The trial followed CONSORT reporting guidelines (Schulz, Altman, & Moher, 2010). The ethical approval letter and participant information sheet can be found in Appendix 22 and 23.

Participants were randomized to receive eight weeks of either group metacognitive therapy (MCT) or mindfulness based stress reduction (MBSR). The sample was transdiagnostic, therefore, participants had anxiety, depression, or comorbid disorders; however, as this study was a feasibility study the main outcomes were the number of participants recruited, number of dropouts, amount of missing data, the number of sessions attended, and how credible patients found the treatment. Participants were not screened using the Structured Diagnostic Clinical Interview (SCID) but were assessed for suitability based on our inclusion and exclusion criteria (further detailed in chapter 9) and required a score of 5 or greater on the GAD-7 and PHQ-9, which is indicative of mild anxiety or depression (Kroenke, Spitzer, & Williams, 2001; Spitzer et al., 2006).

Randomization to trial arms was conducted by a statistician independent to the research team who used block randomization and stratified based on gender and primary reason for seeking treatment (anxiety, depression, or both). Subjects were randomized in blocks of 8 to 12 depending on recruitment.

The primary symptom outcome measure was the Hospital Anxiety and Depression Inventory (HADS) and the secondary outcome measure was the CAS-I which measures individual's metacognitions. Treatment acceptability was measured using a treatment acceptability measure which was adapted from Borkovec and Nau (1972) and was administered at the end of session 2. As participants received eight weeks of therapy, mid-treatment scores were obtained at the start of session four and end of treatment scores were obtained one week after the final session. In order to assess treatment effects over time, follow up measures were obtained at 6-month post treatment.

2.7. Overview of Statistical Analyses Used Throughout The Thesis

2.7.1. Generalized Estimating Equations

Analyses for study two focused on the period following the stressor as this was germane to the primary hypothesis. There are a range of statistical techniques that can be used to analyze longitudinal data including analyses of covariance, regression models, and structural equation models. For this study as we were interested in evaluating the overall pattern of rate of change between groups a generalized estimating equation (GEE) analysis, fitting a linear trend in time, was conducted over the recovery period (post emotion regulation, 10, 20, and 30 minutes into the recovery period). GEE analyses are an extension of generalized linear models and are advantageous as they allow the correlation between successive measurements to be modelled, however, one of the limitations of GEE analyses is that they are sensitive to outliers, and if these are present will not allow the analysis to produce

consistent estimators (Qu & Song, 2004; Qu, Lindsay & Li, 2000). A GEE analysis can be considered a global test of change over time and is a more efficient analysis, whereas a simple change analysis between individual time points is a local test. Therefore, we conducted an overall analysis of change to evaluate if there were any differences between groups in their trend and if significant differences existed then follow-up tests involving repeated measures analysis of covariance's (ANCOVA) were conducted.

2.7.2. Analysis of Covariance (ANCOVA)

Study three evaluated group differences over time using a repeated measure analysis of covariance. Three time points were evaluated: post-experimental manipulation, post-stress, and post-recovery, with baseline scores used as a covariate. This was the most appropriate analysis for the data set as it allowed for the identification of an interaction effect between the within and between subjects factor on the dependent variable, following on from this follow-up testing was used to locate where any differences occurred.

2.7.3. Evaluating the Psychometric Properties of Questionnaires

Study four was conducted in order to evaluate the psychometric properties of the DMQ (Nassif & Wells, 2007). As the DMQ is an unpublished measure and requires ongoing validation, before using it as a predictor variable in study five the psychometric properties of the measure were explored further.

In order to assess construct validity, we conducted a confirmatory factor analysis (CFA) and assessed the convergent validity of the scale. CFA was selected in favour of alternate analyses as it allows for the specification of the relationship between factors. Prior to conducting a CFA an exploratory factor analysis (EFA) was run using a five factor solution in order to evaluate if the factors were similar to the initial EFA by Nassif (2009). Oblique

rotation was used to allow for inter-factor correlations. The scree plot can be seen in Appendix 11. As the results demonstrated similar item loadings a CFA was conducted using the five factor latent structure. In conducting a CFA, it is important to evaluate that the data is multivariate normal, as a common concern in SEM analyses is that the data is multivariate kurtotic which may affect tests of variance and covariance (DeCarlo, 1997). Thus, in order to evaluate this we inspected the multivariate kurtosis and critical ratio (C.R.) in AMOS. West, Finch and Curran (1995) suggested that values greater than 7 on rescaled values of kurtosis are indicative of non-normality. Upon reviewing the kurtosis values for the items, no item demonstrated a departure from normality. The model was first analyzed without any correlated error variables as one of the assumptions of CFA is that errors of measurement associated with each observed variable are uncorrelated (Byrne, 2001). Correlated errors were then added based on modification indices which indicate systematic measurement error in item responses (Aish & Joreskog, 1990). A variety of fit indices were used to evaluate if the addition of correlated errors improved model fit including the chi-square statistic, the Goodness of Fit Index (GFI), Parsimony Goodness of Fit Index (PGFI), Root Mean Square Error of Approximation (RMSEA), and the Comparative Fit Index (CFI). Construct validity was also evaluated by assessing the scales convergent validity. This was evaluated using Pearson correlations to examine the associations between the DMQ and related constructs as measured by the MCQ-30.

Scale reliability was assessed by examining the internal consistency and test-retest reliability. Internal consistency was evaluated based on corrected item-total correlations and Cronbach's alphas for the subscales. Test-retest reliability was evaluated using Pearson's re-test correlations, where greater r coefficients are indicative of a higher correlation between subscales over time. Additionally, scale instability was calculated based on repeated measures

t-tests to evaluate the differences between subscales over time. This was tested over a 4 week interval.

2.7.4. Linear and Logistic Regression

Study five was a prospective cohort study aimed at evaluating the metacognitive predictors of resilience. Multiple linear regressions were run to evaluate which metacognitive factors (MCQ, TCQ or DMQ) predicted resilience (BRS) and symptoms of psychological distress (HADS total). Gender and hassles (ICSRLE) at each time point were used as covariates in the regression models.

A multiple linear regression was selected for data analysis as this allowed for the identification of which metacognitive factors best predicted resilience and psychological distress while controlling for daily stress exposure and gender. Variables were entered using forced entry such that the author specified the order that variables were entered in the model except for the last step which is when metacognitions were entered. On this step variables were entered using stepwise entry as there was no a priori hypothesis regarding which specific metacognitive variables would be predictive of resilience. There are a variety of assumptions associated with multiple regression analyses including appropriate sample size, absence of multicollinearity and outliers, that the data is normally distributed, that there is a linear relationship between variables, and that there is homoscedasticity. Sample size requirements are variable, for example, Stevens (1996) has suggested that 15 subjects per predictor is required, while Tabachnick and Fidell (2007) have suggested that sample size should be calculated using the following formula: $N > 50 + 8m$, where m is the number of independent variables. Sample size for the study was calculated a priori using the statistical software G*Power (Faul, Erdfelder, Lang & Buchner, 2007) which estimated 140 participants. A more detailed description of the sample size calculation is found in chapter seven. The absence of

both multicollinearity and outliers is also important. To evaluate the presence of multicollinearity tolerance values and variance inflation factor (VIF) values can be evaluated. Tolerance values less than 0.1 are indicative of multicollinearity and VIF values greater than 10 would also be indicative of multicollinearity (Marquardt, 1970; Mason, Gunst, & Hess, 1989; Menard, 1995; Neter, Wasserman, & Kutner, 1989). Like many statistical analyses multiple regressions are sensitive to outliers, therefore extreme values must be identified prior to analysis. There are a variety of methods than can be selected to deal with extreme values including eliminating them from the data set or winsorizing the data. Finally, to evaluate normality, linearity and homoscedasticity scatterplots must be reviewed. Multiple regressions requires that the variables be normally distributed around the dependent variable, that there is a linear relationship between the dependent and independent variables, and that the variance of the errors is the same across all independent variables. Therefore, this was assessed by evaluating the Q-Q plots and histograms to ensure the dependent variables were normally distributed, these plots are listed in the Appendicies in Appendix 12 to 15. In addition, normality was assessed by evaluating the Kolmogorov-Smirnov and Shapiro-Wilk tests, whereby if the significance value is greater than 0.05 then the data is considered to be normally distributed, however if the significance value is less than 0.05 it is indicative of a deviation away from a normal distribution (Field, 2009).

Finally, in order to assess which metacognitive factors predicted psychological recovery a logistic regression was used. The assumptions of logistic regression are the same as those outlined previously for multiple regressions. One of the benefits of a logistic regression is that it allows the prediction of categorical outcomes (e.g., recovered or deteriorated). Variables were entered in the fashion as described previously for the multiple regressions whereby all variables were entered using forced entry except for the metacognitive variables which were entered using stepwise entry. Stepwise entry has been criticized in both logistic

and multiple regressions as stepwise procedures are influenced by the random variation in the data (Tabachnick & Fidell, 2007).

2.7.5. Structural Equation Modelling

The data in study six were analyzed using structural equation modelling (SEM) in AMOS for SPSS version 23 (Arbuckle, 2014). SEM is a confirmatory hypothesis testing approach that allows for the analysis of a structural theory (Byrne, 2001) by assessing the pathways between variables that are important to the underlying theoretical model (Schumacker & Lomax, 2004). SEM provides a variety of advantages over alternative methods such as linear regression analysis. For example, SEM allows for latent variables to be assessed. Latent variables are those that are not directly observed or measured. Additionally, SEM allows for path analyses whereby direct and indirect hypothesized relationships are evaluated in a single analysis, unlike regression analyses SEM can evaluate these relationships simultaneously. SEM was selected as the most appropriate measure for analyses as we were interested in comparing two competing models over time which required the use of cross-lagged correlations. Cross-lagged analyses allow for testing of a series of a priori models. Models remain the same however the direction of the relationship between variables differs which allows for directional dominance pathways between variables to be examined and encourages model parsimony (Cole & Maxwell, 2003; Martens & Haase, 2006; Selig & Little, 2012). Parsimony is an important construct in model comparison and has been defined as the ratio of degrees of freedom in the model being tested to that in the null model (Marsh & Hau, 1998). Parsimony is also regarded as its ability to constrain possible outcomes (Popper, 1959; Roberts & Pashler, 2000). A model with the least free parameters (more degrees of freedom) is preferred (Mulaik, 1998).

2.7.6. Analyses of Feasibility Studies

Study 7 was a feasibility study comparing group MCT with MBSR in a transdiagnostic sample. As one of the primary aims of the study was to assess the feasibility of delivering these two treatments in trans-diagnostic groups, a variety of feasibility outcomes were used. Feasibility was assessed based on the number of participants recruited, the number of dropouts, amount of missing data, and the number of sessions attended. Treatment acceptability assessed aspects such as whether the participants thought the treatment would be helpful, if they would recommend the treatment, and if they thought the therapist was helpful. Data from all participants who were randomized to treatment (completers and dropouts) were used for feasibility analyses.

Analyses on treatment effectiveness were calculated using an intention to treat (ITT) analysis as this allowed for a complete data set. Missing data was imputed using a last observation carried forward approach from dropouts and for two participants from the MBSR condition that were lost to follow up. Two participants from the MCT condition were found to meet the exclusion criteria during the first session but were allowed to remain in the treatment as the primary aim was feasibility. An a-priori decision was made in the first session not to use their data for efficacy analyses. Categorical variables were assessed using a Chi-Square test, and a univariate ANOVA was used to compare groups on treatment adherence and pre-treatment screening measures (GAD-7 and PHQ-9). ANCOVA's were used to examine the difference between groups at post treatment and follow up with gender, pre-treatment scores, and medication use entered as covariates. In addition, within and between groups effect sizes were calculated based on Cohen's *d* (1988) to determine the size of the treatment effects. Although effect sizes are an important measure of treatment effect it does not provide clinically meaningful data, therefore reliable clinical improvement was calculated as outlined by Jacobson and Truax (1991).

2.8. Summary of Methodologies

Overall the thesis incorporates a broad range of methodologies and statistical analyses, which allows for the investigation of metacognition, stress and recovery to be evaluated in a variety of ways, with each methodology providing various advantages. In addition, metacognition, stress and recovery will be evaluated in both analogue and clinical samples which allows for generalizations to be made across populations. However, it is not possible to include all methodologies, and as such the thesis does not investigate the relationships between metacognition, stress and recovery using qualitative methods. As such, future research may investigate these relationships using qualitative methods and designs.

3. Chapter 3: The Role of Metacognition in Bouncing Back From Stress: A Systematic Review

Lora Capobianco and Adrian Wells
University of Manchester

Author Note

Miss Lora Capobianco, School of Psychological Sciences, University of Manchester, lora.capobianco@postgrad.manchester.ac.uk, Zochonis Building, 2.43, School of Psychological Sciences, University of Manchester, Manchester, UK, M13 9PL, 07 527 989115

Professor Adrian Wells, School of Psychological Sciences, University of Manchester, & Manchester Mental Health and Social Care NHS Trust, PhD, Adrian.wells@manchester.ac.uk, Rawnsley Building, Manchester Royal Infirmary, Oxford Road, Manchester, UK, M13 9WL, 0161 276 5399

Correspondence concerning this article should be addressed to Prof. Adrian Wells, University of Manchester, Rawnsley Building, Manchester Royal Infirmary, Oxford Road, Manchester, UK, M13 9WL. Email: adrian.wells@manchester.ac.uk
Phone Number: +44 (0)161 276 5399

Conflicts of Interest and Source of Funding: The study was conducted for partial completion of the first authors PhD, which was supervised by Professor Adrian Wells and funded by the Presidents Doctoral Scholar Award from the University of Manchester. The authors report no conflict of interest.

3.1. Abstract

Background: Psychological resilience has been defined in a variety of ways and in the context of various theories. However current models lack an understanding of the psychological processes that confer resilience. One possibility, derived from the S-REF model is to examine the role of metacognition and perseveration as a step to understanding the psychological processes underlying resilience. The systematic review examined the literature on the role of metacognition in resilience.

Methods: An electronic search of PsychInfo and EMBASE databases between 1980 and 2016 was conducted using the terms stress recovery, psychological resilience and metacognition. Additional searches were conducted using the search terms metacognition questionnaire and stress, and thought control questionnaire and stress in order to ensure that articles investigating metacognitive factors and stress were included. Studies were excluded if they did not have a validated measure of resilience, the metacognitions questionnaire (MCQ-30), and/or the thought control questionnaire (TCQ), if they were a laboratory based study or resilience interventions, qualitative interview, or a review article.

Results: 30 eligible papers were identified. Both positive and negative metacognitive beliefs were found to increase stress levels. Worry and punishment (perseveration) were associated with greater PTSD and stress symptoms. In addition, worry was found to be associated with long term PTSD.

Conclusions: The results highlight the underlying role that metacognition and perseverative thinking may play in resilience and provides evidence supporting the application of the S-REF model in this area, which might provide a more comprehensive framework for exploring the underlying processes that may confer resilience.

Keywords: Resilience, Metacognition, Stress, Recovery

3.2. Introduction

The concept of resilience has been gaining increased attention. For example, both the UK Government and National Health Service (NHS) in the UK have outlined standards for promoting resilience in children and young people in order to help them cope with stressful life events (HM Government, 2003, 2004; Department of Health, 2004). Although there is a growing interest in developing resilience, gaps and discrepancies remain in the resilience literature. Researchers have yet to create a cohesive definition of resilience; as such resilience has been defined as both a process and a personality trait. Definitions of resilience include: the absence of psychopathology following a negative life event; the ability to overcome stress and adversity while maintaining normal physical and psychological function; the capacity to positively adapt and cope despite adversity; and a stable personality trait characterized by the ability to bounce back from negative experiences. (Agaibi & Wilson, 2005; Bonanno, 2004; Block & Block, 1980; Block & Kremen, 1996; Harel, Kahana, & Kahana, 1993; Lazarus, 1993; Windle, 2011; Wu et al., 2013; Yehuda, 1998).

3.2.1. Models of Resilience

Current research lacks not only an agreed upon definition but also a model of resilience that provides an understanding of the processes underlying it. One common theory of resilience is that of psychological hardiness, which was described by Kobasa (1979) as a personality variable. Hardiness is also referred to as dispositional resilience which is a general tendency to be resilient in the face of stress (Bartone, 2006, 2007). Hardiness encompasses three characteristics: commitment to values and goals, a sense of control, and perceiving stressors as a challenge. Such components are theorized to promote adaptive coping behaviours in response to stress. Bartone (1999) investigated hardiness in U.S. Army soldiers and found that individuals high in hardiness had a lower risk of psychiatric symptoms.

Alternatively, Block and Block (1980) proposed the concept of ego-resiliency, which is also conceptualized as a personality variable. Block's theory of personality is based on an affect processing system with two components: ego-control and ego-resilience. Ego-control is responsible for impulse control whereas ego-resiliency is the ability to modify ego-control based on the environmental context (Block & Kremen, 1996). Ego-resilience predisposes individuals to positive engagement with the world through positive affect (Tellegen, 1985). Thus, based on this theory, highly resilient individuals are more likely to experience positive affect and have increased psychological adjustment due to increased flexibility, whereas individuals low in resilience lack adaptive flexibility and when faced with a stressful event may respond in a perseverative manner (Block & Kremen, 1996; Klohnen, 1996).

Additional theories of resilience stem from the use of positive emotions in the face of stress. One such theory is the broaden-and-build theory (Fredrickson, 1998, 2001), which posits that positive emotions broaden individuals thought-action repertoire, which allows them to build physical, social, and psychological resources (Fredrickson, 2001). The Broaden and Build theory is in line with Masten's (2001) view of resilience which states that resilience is a common trait stemming from basic adaptational systems, one of which is the use of positive emotions. Various studies investigating resilience do not always operate under a specific theory or model but rather discuss the benefits of positive emotions and other factors such as specific personality traits (e.g., neuroticism), or coping strategies in buffering the effects of stress.

3.2.2. A Metacognitive Approach to Resilience

The Self-Regulatory Executive Function model (S-REF; Wells & Matthews, 1994, 1996) may provide a framework for understanding the factors and processes that confer resilience. This model has given rise to measures of metacognition and thinking styles that have proven to be prospective predictors of stress responses (Wells, 2009). The model asserts that the activation of a cognitive attentional syndrome (CAS), a certain thinking style, contributes to prolonged emotional distress. The CAS is activated by individual's metacognitions which direct attention, style of thinking and coping responses which in turn may lead to the persistence of negative emotion and development of psychological disorder. Metacognitions are defined as, "stable knowledge or beliefs about one's own cognitive system, and knowledge about factors that affect the functioning of the system; the regulation and awareness of the current state of cognition, and appraisal of the significance of thought and memories" (p. 302; Wells, 1995). Metacognition can be divided into three factors: metacognitive knowledge, experiences and strategies. Metacognitive knowledge refers to the beliefs and theories that individuals hold, metacognitive experience refers to the appraisals and feelings that individuals hold regarding their mental status, and metacognitive strategies are the responses individuals make to control and alter their thinking (Wells, 2009).

Various studies support the notion that metacognition is associated with psychological distress. Papageorgiou & Wells (2003) found that positive metacognitive beliefs lead to the use of rumination, and that the association between rumination and depression was mediated by negative metacognitive beliefs. Spada, Nikčević, Moneta & Wells (2008) found that metacognition was associated with perceived stress and negative emotion (anxiety and depression); in addition Spada et al. (2008) found that metacognition moderated the relationship between perceived stress and negative emotion. Further to this, Yılmaz, Gencöz & Wells (2011) investigated the temporal precedence of metacognition in the development of

anxiety and depression and found that negative metacognitive beliefs regarding uncontrollability and danger of worry predicted anxiety and depression symptoms. This association remained even when stressful life events and demographic variables were controlled for. In addition, with respect to depression, negative metacognitive beliefs regarding uncontrollability and danger of worry predicted depressive symptoms even when major life events and demographic factors were controlled (Yılmaz, Gencöz & Wells, 2011).

The purpose of this review was to examine the if metacognition plays a role in resilience in response to a stressor.

3.3. Methods

A systematic search of PsychINFO and EMBASE was conducted following PRISMA guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009) using the search terms stress recovery, psychological resilience and metacognition. Two additional searches were conducted using the search terms metacognition questionnaire and stress; thought control questionnaire and stress. The search was initially conducted across the lifespan, however as there were a limited number of studies using children and the elderly that met the inclusion and exclusion criteria a decision was made to eliminate these studies and focus on adults.

3.3.1. Definition of Terms

For the purposes of this review we defined resilience as the ability to bounce back from stress (Smith et al., 2008). In addition, we defined a stressor as a negative life event such as a cancer diagnosis, or having been part of the military, and we defined metacognition as the knowledge and cognitive process involved in the interpretation, monitoring, and control of cognition, which can be divided into metacognitive knowledge, experiences and strategies (Flavell, 1979; Nelson, Stuart, Howard, & Crawley, 1999; Wells, 1995).

3.3.2. Inclusion Criteria

The studies that were included met the following criteria: empirical study that was published in a peer reviewed journal from 1980 up to and including January 2016, written in English, examined recovery from a stressful or traumatic event, metacognition, or thought control strategies, and used either a validated measure of resilience, the metacognitions questionnaire (MCQ-30), and/or the thought control questionnaire (TCQ). Studies reporting on children, adolescents, adults and older adults were included, however after reviewing the studies, only studies on adults were included due to the low number of studies on children and older adults that met the inclusion criteria.

3.3.3. Exclusion Criteria

Studies were excluded if they did not use a validated measure of resilience, the MCQ-30, or the TCQ. This meant that studies that used a measure of anxiety or depression to classify individuals as resilient based on the presence or absence of psychological symptoms were excluded. Additionally, studies that used a one-item measure that was created by the researchers were also eliminated. Laboratory based studies and studies examining interventions (e.g., resilience interventions), qualitative interviews, and review articles were also eliminated. Studies in languages other than English were excluded alongside book chapters and dissertation abstracts.

3.3.4. Study Selection and Quality Ratings

A total of 26 eligible papers were identified from 3353 papers (Table 3.1 summarizes the reviewed papers; Figure 3.1 depicts the selection process). The relevance of 26 papers was assessed in a full text review, after which 2 papers were no longer considered appropriate while an additional 6 paper were identified after hand-searching. Therefore, 30 papers were deemed appropriate and quality assessed using the Checklist for Measuring Quality (Downs & Black, 1998) by the first author (L.C.) and a peer who was independent of the research team and University. The checklist contains 27 items that are scored 0 or 1, no or yes respectively, with the exception of two items, item 5 is scored 0 to 2 and item 27 is scored 0 to 5. The maximum score for the scale is 31. The scale was considered appropriate as it has high internal consistency, good test-retest reliability and inter-rater reliability. As Downs & Black (1998) highlight, a majority of quality assessment tools are aimed at evaluating randomized control trial (RCT) methodology, and as a majority of the studies included are cross-sectional or longitudinal designs the scores for the checklist will be lower for this reason. The checklist was used as a guide in order to produce a detailed and critical evaluation of the studies. Studies with a score of 14 or less were classified as poor, studies scoring between 15 and 19 were rated as fair, while those with a score greater than 20 were rated as good. The intra-class correlation coefficient for the inter-rate reliability was excellent at 0.92. The information extracted from the eligible papers included: details regarding the sample and sample size, age range, country, year of study, questionnaires used, main findings, and quality rating using the checklist for measuring quality (Downs & Black, 1998).

Figure 3.1. Paper Selection Flow Chart

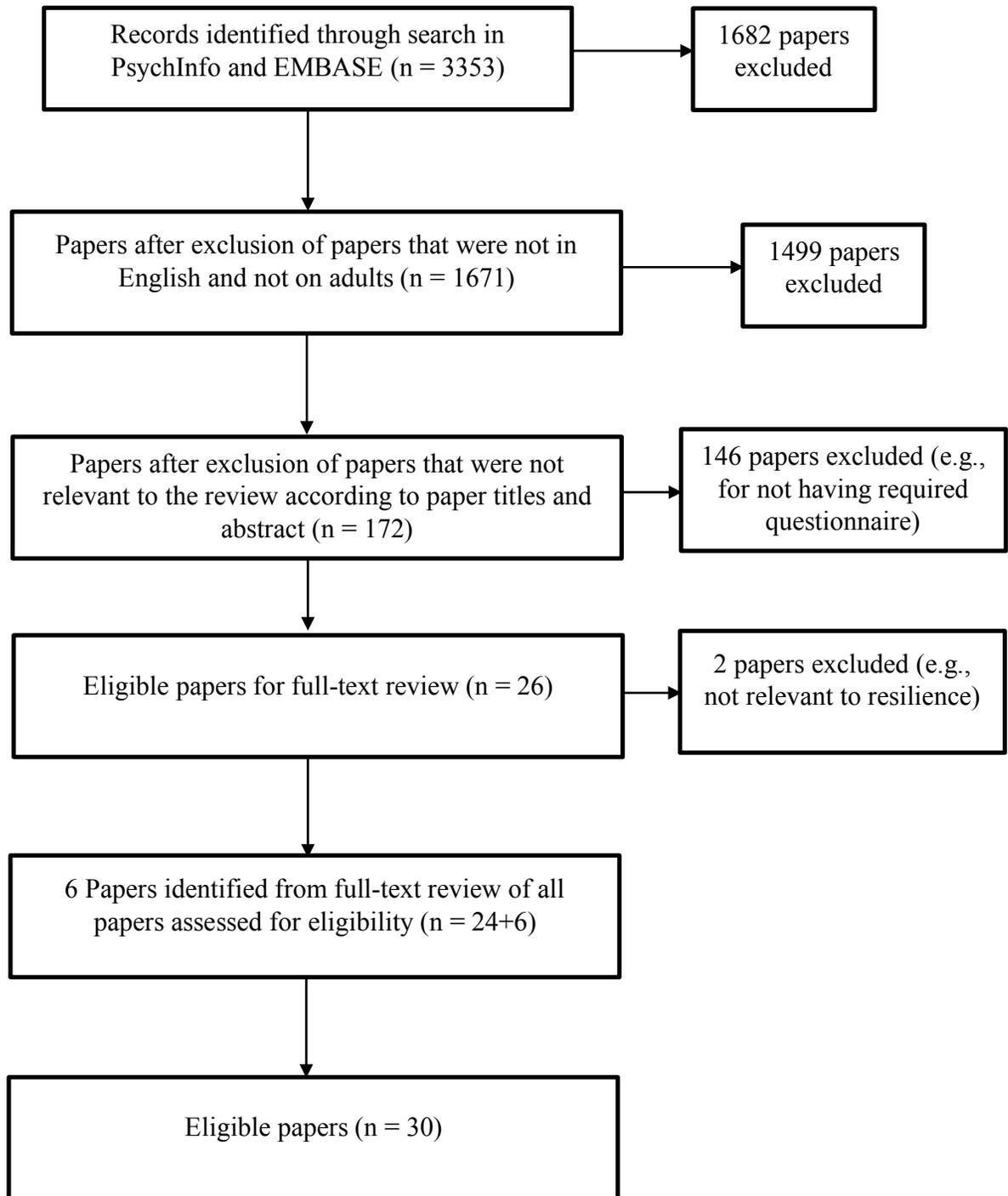


Table 3.1. Summary of Papers Included in Systematic Review.

| No | Authors | Year | Title | Country | Sample | Design | Resilience/ Metacognition Measure | Findings | Quality Rating |
|----|---|------|--|-----------|--|-----------------|---|---|-------------------|
| 1. | Connor, Davidson, & Lee | 2003 | Spirituality, Resilience, and Anger in Survivors of Violent Trauma: A Community Survey | USA | 605 Adults with previous violent trauma (277 M, 327 F) | Cross-sectional | CD-RISC | Increased resilience was associated with increased physical and mental health. In addition, increased resilience was associated with decreased PTSD symptoms. | 14 Poor |
| 2. | Pietrzak, Johnson, Goldstein, Malley, & Southwick | 2009 | Psychological resilience and postdeployment social support protect against traumatic stress and depressive symptoms in soldiers returning from operations Enduring Freedom and Iraqi Freedom | USA | 284 Army veterans (254 M, 30 F) | Cross-sectional | CD-RISC | Individuals with PTSD were less resilient than those without PTSD. Resilience was Negatively associated with PTSD symptoms. Increased resilience was associated with decreased symptoms of depression. | 16 Fair |
| 3. | Haglund, et al. | 2009 | Resilience in the Third Year of Medical School: A Prospective Study of the Associations Between Stressful Events Occurring During Clinical Rotations | USA | 101 Medical Students (47M, 54 F) | Longitudinal | CD-RISC | Adaptive coping negatively correlated with depression and PTSD Maladaptive coping was positively associated with anxiety, depression, and PTSD scores. | 13 Poor |
| 4. | McGarry et al. | 2013 | Paediatric health-care professionals: Relationships between psychological distress, resilience and coping skills | Australia | 54 , Paediatric health care professional (9 M, 45 F) | Cross-sectional | CD-RISC | Positive correlations between PTSD, depression, anxiety, stress, and burnout. Non-productive coping strategies were positively correlated with PTSD, depression, anxiety and negatively associated with resilience. | 15 Fair |

Table 3.1. Summary of Papers Included in Systematic Review.

| No | Authors | Year | Title | Country | Sample | Design | Resilience/ Metacognition Measure | Findings | Quality Rating |
|----|-------------------------------------|------|--|---------|---|-----------------|---|--|-------------------|
| 5. | McCanlies et al. | 2014 | Positive Psychological Factors are Associated with Lower PTSD Symptoms among Police Officers: Post Hurricane Katrina | USA | 114 Police Officers (84 M, 30 F) | Cross-sectional | CD-RISC | PTSD symptoms decreased as resilience increased. Mean level of resilience was less apparent in individuals with symptoms of re-experiencing arousal | 18 Fair |
| 6. | Robinson, Larson & Cahill | 2014 | Relations Between Resilience, Positive and Negative Emotionality, and Symptoms of Anxiety and Depression | USA | 355 College Students (175 M, 180 F) | Cross-sectional | CD-RISC | CD-RISC was associated with positive emotionality & largest relationship with anhedonic depression rather than posttraumatic stress. | 14 Poor |
| 7. | Escolas, Pitts & Safer | 2013 | The Protective Value of Hardiness on Military Posttraumatic Stress Symptoms | USA | 561 Post deployment military personnel (404 M, 157 F) | Cross-sectional | The Dispositional Resiliency Scale-15 | Hardiness was negatively related to PTSD symptoms and may be a protective factor for those with extensive military experience. | 14 Poor |
| 8. | Fredrickson, Tugade, Waugh & Larkin | 2003 | What Good Are Positive Emotions in Crises? A Prospective Study of Resilience and Emotions Following the Terrorist Attacks on the United States on September 11th, 2001 | USA | 47 College students & recent graduates (18 M, 29 F) | Cross sectional | Ego-Resiliency Scale | Individuals high on trait resilience share affect-related traits: low neuroticism, high extraversion & openness. Individuals high on trait resilience had less depressive symptoms and greater positive emotions | 12 Poor |
| 9. | Riulli, Savicki, & Spain | 2010 | Positive Emotions in Traumatic Conditions: Mediation of Appraisal and Mood for Military Personnel | USA | 632 US military personnel (626 M, 6 F) | Cross-sectional | Ego-Resiliency Scale | Resilience was correlated with positive affect. Current mood was a significant predictor of adjustment beyond trait resilience. | 13 Poor |

Table 3.1. Summary of Papers Included in Systematic Review Continued.

| No | Authors | Year | Title | Country | Sample | Design | Resilience/ Metacognition Measure | Findings | Quality Rating |
|-----|-----------------------------------|------|---|--------------|---|-----------------|---|---|-------------------|
| 10. | Mak, Ng, & Wong | 2011 | Resilience: Enhancing Well-Being Through the Positive Cognitive Triad | China | 1419 University students (660 M, 759 F) | Cross-sectional | Ego-Resiliency Scale | Resilience was positively associated with life satisfaction and negatively associated with depression. | 14 Poor |
| 11. | Mautner, et al. | 2013 | The impact of resilience on psychological outcomes in women after preeclampsia: an observational cohort study | Austria | 67 Adults with Preeclampsia (all F) | Cross-sectional | Resilience Scale | Increased resilience was associated with less symptoms of depression. Greater resilience was associated with increased mental health. | 16 Fair |
| 12. | Tian, & Hong | 2014 | Assessment of the relationship between resilience and quality of life in patients with digestive cancer | China | 970 Digestive cancer (699 M, 271 F) | Cross-sectional | Resilience Scale | Resilience could explain 33% of the variance in psychological distress and 16% of the variance in fatigue. | 14 Poor |
| 13. | Newton-John, Mason & Hunter | 2014 | The Role of Resilience in Adjustment and Coping With Chronic Pain | Australia/UK | 101 Chronic pain patients (44 M, 57 F) | Cross-sectional | BRS | Resilience was positively associated with social support, chronic pain specific variables (e.g. pain self-efficacy), & greater likelihood of attending work. | 15 Fair |
| 14. | Hjemdal et al. | 2006 | Resilience Predicting Psychiatric Symptoms: A Prospective Study of Protective Factors and their Role in Adjustment to Stressful Life Events | Norway | 159 University students (36 M, 123 F) | Longitudinal | Resilience Scale for Adults (RSA) | Individuals with increased resilience were unchanged on psychiatric symptoms when exposed to stressful life events. Individuals low in resilience had greater psychiatric symptoms when exposed to stressful life events. | 13 Poor |

Table 3.1. Summary of Papers Included in Systematic Review Continued.

| No | Authors | Year | Title | Country | Sample | Design | Resilience/ Metacognition Measure | Findings | Quality Rating |
|-----|--------------------------------------|------|--|---------|--|--------------------------------|---|---|-------------------|
| 15. | Hjemdal, Frigborg & Stiles | 2012 | Resilience is a good predictor of hopelessness even after accounting for stressful life events, mood and personality (NEO-PI-R) | Norway | 535 University students (119 M, 413 F) | Cross-sectional | RSA | Total resilience score and all subscales of the RSA except structured style were associated with less hopelessness. The protective factors in the RSA provide a unique contribution in predicting hopelessness over and above the constructs of stressful life events, depressive and anxiety symptoms and personality. | 16 Fair |
| 16. | Matthews, Hillyard, & Campbell | 1999 | Metacognition and Maladaptive Coping as Components of Test Anxiety | UK | 84 University students (28 M, 56 F) | Cross-sectional & Longitudinal | MCQ-30 | Negative metacognitive beliefs regarding uncontrollability and danger and cognitive confidence were correlated with tension, worry, test-irrelevant thinking and bodily symptoms. Adaptive coping factor was associated with decreased worry and test irrelevant thinking. | 15 Fair |
| 17. | Spada, Mohiyeddini, & Wells | 2008 | Measuring metacognitions associated with emotional distress: Factor structure and predictive validity of the metacognitions questionnaire 30 | UK | 1304 Adults (447 M, 857 F) | Cross-sectional | MCQ-30 | Negative metacognitive beliefs regarding uncontrollability and danger were predictive of anxiety and depression. | 17 Fair |

Table 3.1. Summary of Papers Included in Systematic Review Continued.

| No | Authors | Year | Title | Country | Sample | Design | Resilience/ Metacognition Measure | Findings | Quality Rating |
|-----|------------------------------|------|---|-----------|--|-----------------|---|--|-------------------|
| 18. | O'Carroll & Fisher | 2013 | Metacognitions, worry and attentional control in predicting OSCE performance test anxiety | UK | 240 Medical Students (110 M, 130 F) | Cross-sectional | MCQ-30 | In females performance test anxiety was predicted by trait worry and negative beliefs about worry, while in males performance test anxiety was predicted by trait worry, negative beliefs about worry, and attention focus. | 15 Fair |
| 19. | Thewes, Bell & Butow | 2013 | Fear of cancer recurrence in young early-stage breast cancer survivors: the role of metacognitive style and disease-related factors | Australia | 218 Breast Cancer survivors (all F) | Cross-sectional | MCQ-30 | MCQ-30 total score independently predicted Fear of cancer (FCR), accounting for 36% of the total variation in FCRI scores. A 1.0-point increase on FCR would lead to 3.2 point increase on negative beliefs about worry subscales. | 14 Poor |
| 20. | Toffalini, Veltri & Cornoldi | 2015 | Metacognitive aspects influence subjective well-being in parents of children with cancer | Italy | 30 Experimental (10 fathers, 20 mothers) 36 Hospital control (14 fathers, 22 mothers) 30 controls (10 fathers, 20 mothers) | Cross-Sectional | MCQ-30 | All MCQ-30 subscales except cognitive self-consciousness correlated with subjective well being in parents of children with cancer. Metacognition explained 77% of the variance in individuals subjective well being | 13 Poor |

Table 3.1. Summary of Papers Included in Systematic Review Continued.

| No | Authors | Year | Title | Country | Sample | Design | Resilience/ Metacognition Measure | Findings | Quality Rating |
|-----|------------------|-------|--|-----------|--|--------------------------------|---|---|-------------------|
| 21. | Cook et al. | 2015b | The Association of Metacognitive Beliefs With Emotional Distress After Diagnosis of Cancer | UK | 229 Cancer patients (79 M, 150 F) | Cross Sectional | MCQ-30 | Metacognitive beliefs were associated with symptoms of anxiety, depression, and PTSD. Metacognitive beliefs cause and maintain distress both directly and indirectly by driving worry. | 16 Fair |
| 22. | Davis et al. | 2016 | Metacognitive capacity predicts severity of trauma-related dysfunctional cognitions in adults with posttraumatic stress disorder | USA | 51 War Veterans (46 M, 5 F) | Cross-sectional | MCQ-30 | Increased negative metacognitive beliefs regarding uncontrollability and danger and need to control thoughts were associated with increased negative cognitions about the self | 14 Poor |
| 23. | Warda & Bryant | 1998 | Thought control strategies in acute stress disorder | Australia | 20 acute stress disorder (6 M, 14 F) 20 non-acute stress disorder (8 M, 12 F) | Cross-sectional | TCQ | ASD participants had greater use of punishment and worry. Both groups used distraction, social control and reappraisal more than worry. Punishment and worry were positively associated with anxiety/depression. Social control was negatively correlated with anxiety and depression | 14 Poor |
| 24. | Reynolds & Wells | 1999 | The Thought Control Questionnaire – psychometric properties in a clinical sample, and relationships with PTSD and depression | UK | 124 Psychiatric inpatients and out patients (55 M, 69 F) | Cross-sectional & Longitudinal | TCQ | <i>PTSD group:</i> increased distraction was associated with decreased anxiety and depression. <i>Depressed group:</i> depression was associated with less reappraisal and distraction and increased in self-punishment. Anxiety was associated with worry and punishment. | 17 Fair |

Table 3.1. Summary of Papers Included in Systematic Review Continued.

| No | Authors | Year | Title | Country | Sample | Design | Resilience/ Metacognition Measure | Findings | Quality Rating |
|-----|--|------|--|---------|---|-----------------|---|---|-------------------|
| 25. | Holeva, TARRIER, & Wells | 2001 | Prevalence and predictors of acute stress disorder and PTSD following road traffic accidents: Thought control strategies and social support. | UK | 265 Adults in road traffic accident (111M, 154 F) | Longitudinal | TCQ | Six variables predicted both PTSD and acute stress disorder: Loss; Social Support; TCQ Distraction; TCQ Punishment; TCQ Worry; and TCQ Social Control | 18 Fair |
| 26. | Roussis & Wells | 2006 | Post-traumatic stress symptoms: Tests of relationships with thought control strategies and beliefs as predicted by the metacognitive model | UK | 171 University students (74 M , 97 F) | Cross-sectional | TCQ | Positive beliefs about worry predicted worry as a thought control strategy and stress symptoms. Negative metacognitive beliefs predicted stress symptoms independently of worry as a thought control strategy. | 13 Poor |
| 27. | Roussis & Wells | 2008 | Psychological factors predicting stress symptoms: Metacognition, thought control, and varieties of worry | UK | 217 University students(96 M, 121 F) | Longitudinal | TCQ | Worry as a thought control strategy predicted PTSD over and above initial levels of stress and worry as a symptom of anxiety & stress exposure | 17 Fair |
| 28. | Scarpa, Wilson, Wells, Patriquin & Tanaka | 2009 | Thought control strategies as mediators of trauma symptoms in young women with histories of child sexual abuse | USA | Women with history of child sexual abuse (76 F) | Cross-sectional | TCQ | Increased severity of childhood sexual abuse was associated with increased use of worry and punishment thought control strategies and decreased use of social control. In addition, increased use of worry and punishment were associated with increased PTSD symptoms while increased social control was associated with decreased PTSD. | 15 Fair |

Table 3.1. Summary of Papers Included in Systematic Review Continued.

| No | Authors | Year | Title | Country | Sample | Design | Resilience/ Metacognition Measure | Findings | Quality Rating |
|-----|------------------------------|------|--|---------|---|-----------------|---|--|-------------------|
| 29. | Bennett, Beck, & Clapp | 2009 | Understanding the relationship between posttraumatic stress disorder and trauma cognitions: The impact of thought control strategies | USA | 295 Adults in motor vehicle accident (80 M, 215 F) | Cross-Sectional | TCQ | Increased PTSD was associated with increased use of worry and self punishment. Distraction was noted as an adaptive strategy, as it was associated with decreased PTSD and dysfunctional cognitions. | 14 Poor |
| 30. | Valdez & Lilly | 2012 | Thought Control: Is It Ability, Strategies, or Both That Predicts Posttraumatic Symptomatology in Victims of Interpersonal Trauma? | USA | 171 Adult survivors of interpersonal trauma (56 M, 114 F) | Cross-sectional | TCQ | Weak thought control ability was associated with increased use of reappraisal, punishment, worry, and suppression. All four strategies were associated with increased post traumatic stress symptoms. Association between weak thought control ability and increased post traumatic stress symptoms was mediated by the use of punishment and suppression. | 14 Poor |

3.4. Results

3.4.1. Overview of Studies

The studies included were on adults (age range: 18-59). Eleven studies were conducted on students and non-students. Seven studies were on individuals who have a diagnosable illness such as cancer, acute stress disorder, preclampsia, and chronic pain. Four studies were on military personnel and war veterans, five studies were on individuals who had experienced a traumatic event (e.g., interpersonal trauma, motor vehicle accident), and the final three studies were on police, health care professionals, and parents of children with cancer. Studies were primarily from North America (n = 12) and the United Kingdom and Europe (n = 13) with the remaining studies from Australia and China (n = 5).

Eligible studies required the use of a validated measure of resilience, the MCQ-30, or the TCQ. Six different measures of resilience were used across 13 studies. Measures of resilience include the Dispositional Resilience scale (Bartone, Ursano, Wright, & Ingraham, 1989), Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003), Ego-Resiliency Scale (Block & Kremen, 1996), Resilience Scale (Wagnild & Young, 1993), Resilience Scale for Adults (RSA; Friborg et al., 2003), and the Brief Resilience Scale (BRS; Smith et al., 2008). All of these measures view resilience as a trait, and argue that individuals who hold certain characteristics or protective factors are more resilient than others. A variety of scales have been developed to measure resilience however no scale has gained broad acceptance. Alternatively, the Metacognitions Questionnaire-30 (MCQ-30; Wells & Cartwright-Hatton, 2004) and Thought Control Questionnaire (TCQ; Wells & Davies, 1994) examine beliefs and coping strategies that individuals use in the face of stress and trauma, which influences their ability to be resilient in these situations and overcome adversity. Both metacognitive beliefs and thought control strategies are central components of the Metacognitive model (Wells & Matthews, 1994, 1996).

Quality ratings for the studies ranged from 12-18 (poor to fair). Total quality rating scores for studies are listed in Table 3.1. Studies rated as poor lacked information on the reporting, internal validity, and external validity sections of the checklist for measuring quality (Downs & Black, 1998).

3.4.2. Factors Associated with Resilience

Resilience has been associated with various protective factors that may buffer the effects of stress or development of psychiatric disorder. Three primary areas were found to be associated with resilience: personality and affect, psychological disorder, and coping strategies. Studies investigating these themes include: Connor, Davidson, & Lee, 2003; Escolas, Pitts, Safer, & Bartone, 2013; Fredrickson, et al., 2003; Haglund, et al., 2009; Hjemdal, Friborg, & Stiles, 2012; Hjemdal, Friborg, Stiles, Rosenvinge, & Martinussen, 2006; Jordan, Robinson, Larson, & Cahill, 2014; Riolli, Savicki, & Spain, 2010; Mak, Ng, & Wong, 2011; Mautner, et al., 2013; McCanlies, et al., 2014; McGarry et al., 2013; Newton-John, Mason, & Hunter, 2014; Pietrzak, Johnson, Goldstein, Malley, & Southwick, 2009; Tian & Hong, 2014.

Various studies examined the influence that personality traits have on individual's resilience. Resilience was found to be positively correlated with extraversion and openness, while negatively correlated with neuroticism (Fredrickson, Tugade, Waugh, & Larkin, 2003; McGarry, et al., 2013; Newton-John, Mason, & Hunter, 2014). Fredrickson et al. (2003) argue that these traits predispose individuals towards positive affectivity, which has also been found to play a role in individual's levels of resilience. Both positive and negative affect have been found to correlate with resilience, whereby increased positive affect is associated with increased resilience, while increased negative affect has been negatively correlated with resilience (Jordan et al., 2014; Fredrickson et al., 2003; Riolli, Savicki, & Spain, 2010). Fredrickson et al. (2003) also outline that positive emotions mediate the path between

increased levels of resilience and decreased level of depression, indicating that positive emotions may act as a buffer against depression.

The review is comprised of several participant groups experiencing a variety of stressors such as but not limited to: cancer, serving in the military, and experiencing a motor vehicle accident. Irrespective of participant group increased resilience was found to be negatively correlated with anxiety, depression and PTSD (Connor, Davidson, & Lee, 2003; Escolas et al., 2013; Hjemdal, et al., 2006; Jordan et al., 2014; Fredrickson et al., 2003; Mak, Ng, & Wong, 2011; Mautner, et al., 2013; McCanlies et al., 2014; McGarry et al., 2013; Pietrzak, Johnson, Goldstein, Malley, & Southwick, 2009; Tian, & Hong, 2014). Two studies found that individuals high in resilience remained unchanged on levels of psychiatric symptoms even when exposed to stressful life events (Escolas et al., 2013; Hjemdal, et al., 2006). Thus, regardless of the type of stressful life event individuals experience individuals high in resilience are less likely to experience anxiety, depression, or PTSD. Resilience has also been investigated with respect to vulnerability factors specifically that of hopelessness which has been associated with depression and may also mediate the relationship between depression and suicide (Beck, Steer, Kovacs & Garrison, 1985). Hjemdal et al. (2012) found that resilience was predictive of hopelessness even when stressful life events, symptoms of depression and anxiety, and personality traits were controlled for. It is important to note that often resilience is defined with respect to the presence or absence of psychological disorder, such that resilient individuals lack psychological disorder while individuals low in resilience are more likely to have psychological disorder (anxiety, depression, and/or PTSD). However, although these associations have been reported an explanation of the processes by which resilience occurs is not described

Coping strategies will be discussed in two sections. The first will discuss studies that evaluated coping strategies using various questionnaires such as: the Oslo social support scale (Dalgard, 1996), Coping Scale for Adults (CSA; Frydenberg & Lewis, 1997), and the Brief COPE (Carver, 1997) and the second will be those that evaluated strategies using the metacognitive measure: the Thought Control Questionnaire (TCQ).

Three studies evaluated the association between coping strategies and resilience (Haglund et al., 2009; McGarry et al., 2013; Newton-John et al., 2014), with each study using a different questionnaire. Haglund et al. (2009) assessed risk and resilience factors in third year medical students and assessed coping strategies using the Brief COPE (Carver, 1997). They found that adaptive coping strategies were negatively associated with anxiety and PTSD, while maladaptive coping strategies were positively associated with anxiety, depression, and PTSD. Similarly, McGarry et al. (2013) evaluated coping strategies associated with resilience and adverse psychological outcomes, however they used the CSA (Frydenberg & Lewis, 1997). They also found that non-productive coping strategies (e.g., self blame, worry, ignoring the problem, keeping to self) were positively correlated with PTSD, depression, and anxiety. In addition, non-productive coping strategies were negatively correlated with resilience (McGarry et al., 2013). Finally, Newton-John, Mason & Hunter (2014) assessed a common factor associated with resilience, that of social support. They found that there was a positive correlation between increased resilience and increased social support. Overall, maladaptive coping strategies and a lack of social support are associated with decreased resilience and increased adverse psychological outcomes.

3.4.3. Metacognition: Strategies and Beliefs

The association between metacognition and resilience can be evaluated based on metacognitive strategies and metacognitive beliefs. A broad range of coping strategies were previously reviewed, below we will discuss the role of the coping strategies assessed by the TCQ (Wells & Davies, 1994). The TCQ was developed to assess a range of strategies that individuals use to control unwanted or unpleasant thoughts and includes reappraisal, distraction, punishment, social control, and worry (Wells & Davies, 1994). Six studies evaluating the TCQ were included and will be reviewed below (Bennett, Beck, & Clapp, 2009; Holeva, TARRIER, & Wells, 2001; Reynolds & Wells, 1999; Roussis & Wells, 2006, 2008; Scarpa, Wilson, Wells, Patriquin & Tanaka, 2009; Valdez, & Lilly, 2012; Warda & Bryant, 1998).

Additionally, metacognitive beliefs play an important role in the metacognitive model. Evidence for the potential association between metacognitive beliefs and resilience will be reviewed. Metacognitive beliefs were evaluated in five studies (Cook, et al., 2015b; Davis et al., 2016; Matthews, Hillyard, & Campbell, 1999; O'Carroll & Fisher, 2013; Spada, Mohiyeddini, & Wells, 2008; Toffalini, Veltri, & Cornoldi, 2015; Thewes, Bell, & Butow, 2013; Toffalini, Veltri, & Cornoldi, 2015).

3.4.4. Coping Strategies as Measured by the TCQ

There are a range of thought control strategies that can be used to cope with negative thoughts, some of which may be counterproductive. The TCQ measures five thought control strategies: distraction, social control, worry, punishment, and reappraisal. The associations of these thought control strategies with psychological distress will be discussed.

Reynolds and Wells (1999) found that worry was specifically associated with anxiety, and punishment with depression. Warda & Bryant (1998) found that patients with and without

acute stress disorder used distraction, social control and reappraisal more than worry. Interestingly, irrespective of the type of stressor experienced, increased use of worry and punishment was associated with increased PTSD and stress symptoms (Holeva, Tarrrier & Wells, 2001; Roussis & Wells, 2006, 2008; Scarpa, Wilson, Wells, Patriquin & Tanaka, 2009; Valdez & Lilly 2012; Warda & Bryant, 1998) both cross sectionally and longitudinally. The thought control strategy of social control was found to be beneficial whereby it was associated with decreased PTSD (Bennett, Beck & Clapp, 2009; Holeva, Tarrrier & Wells, 2001; Scarpa, Wilson, Wells, Patriquin & Tanaka, 2009). In addition, social control was also found to partially account for the relationship between PTSD and dysfunctional cognitions (Bennett, Beck & Clapp, 2009), however as these relationships are primarily cross-sectional we cannot infer on the causative nature of these association.

Three studies did however discuss the longitudinal relationships of thought control strategies. Holeva, Tarrrier and Wells (2001) found that worry as a thought control strategy, change in perceived social support, and the interaction between perceived social support and TCQ social control were independent contributors to PTSD status three months after individuals had experienced a road traffic accident. Roussis and Wells (2008) also found that the use of worry as a thought control strategy was predictive of PTSD in students three months after having experienced a stressful event. Worry was predictive of long-term PTSD over what could be predicted on the basis of stress symptoms, stress exposure and anxiety symptoms (Roussis & Wells, 2008). Interestingly, Reynolds & Wells (1999) also examined the association between coping strategies and recovery from psychological distress, depression and PTSD. They found that the use of distraction and reappraisal increased with recovery while the use of punishment and worry decreased as recovery increased. The results support the notion that specific metacognitive coping strategies may help buffer against stress proneness whilst others may be associated with lower resilience.

3.4.5. Metacognitive Beliefs

Broadly, metacognitive beliefs have been positively associated with stress symptoms and negative emotion (Cook et al., 2015b; Matthews, Hillyard & Campbell, 1999; Roussis & Wells, 2006; Spada, Mohiyeddini, & Wells, 2008). In addition, metacognitive beliefs affect individuals subjective well being, such that increased metacognitive beliefs are associated with decreased subjective well being (Toffalini, Veltri & Cornoldi, 2015). However, this can be broken down further as according to metacognitive theory individuals hold both positive and negative metacognitive beliefs and these beliefs have been associated with the maintenance of distress. Negative metacognitive beliefs regarding the uncontrollability and danger of worry have been found to be a main contributor to anxiety and depression (Cook et al., 2015b; Roussis & Wells, 2006; Spada, Mohiyeddini, & Wells, 2008; Thewes, Bell, & Butow, 2013). In particular, cross-sectional studies highlight that individuals who believe that worrying is uncontrollable and dangerous as well as believe that they needed to control their thoughts have increased levels of stress, decreased level of self-reflectivity and awareness of others (Davis et al., 2015; Roussis & Wells, 2006). Matthews, Hillyard and Campbell (1999) found that higher negative metacognitive beliefs concerning uncontrollability and danger as well as lower cognitive confidence were correlated with increased tension, worry, and bodily symptoms (e.g., increased heart rate) in undergraduate students prior to a university examination. Similarly O'Carroll and Fisher (2013) investigated test anxiety in medical students prior to writing an examination and found that negative beliefs about uncontrollability and danger of worry, low cognitive confidence, need to control thoughts, cognitive self-consciousness, and trait worry were all positively correlated with test anxiety. In particular, in both males and females trait worry and negative beliefs about uncontrollability and danger of worry predicted test anxiety, however in males attention focus was also an independent contributor.

Metacognitive beliefs concerning uncontrollability and danger are not the only metacognitive beliefs implicated in the maintenance of distress. Three additional metacognitions have been found to be related to maintaining distress: cognitive self consciousness, need for control and low cognitive confidence, all of which have been found to be positive predictors of depression (Spada, Mohiyeddini, & Wells, 2008). In addition, individuals who held positive beliefs about worrying, such that they believed worrying was helpful, had increased levels of stress (Roussis & Wells, 2006). Therefore, maladaptive metacognitive beliefs have been implicated in the maintenance of psychological distress and therefore may also be implicated in resilience.

Metacognitive beliefs and coping with distress are intertwined. The beliefs individuals hold influence their response to stress and subsequently the strategies they will use (Wells, 2009). It is therefore potentially useful to consider the literature on relationships between metacognitions, strategies and distress. Roussis & Wells (2006) found that in university students there was a direct relationship between negative metacognitive beliefs regarding uncontrollability and danger and increased stress symptoms and that those individuals who used worry as a thought control strategy had greater stress symptoms. Further to this, Cook et al. (2015b) found that in individuals with cancer negative metacognitive beliefs had a direct relationship with anxiety symptoms. In addition to this, there was a significant indirect relationship between negative metacognitive beliefs and symptoms of anxiety, whereby negative metacognitive beliefs increased anxiety symptoms by exacerbating worry (Cook et al., 2015b). Positive metacognitive beliefs have been found to mediate the use of worry as a coping strategy which led to increased distress (Roussis & Wells, 2006). Therefore, metacognitive beliefs not only influence levels of distress but also the selection of coping strategies individuals use to cope with stress.

3.5. Discussion

Research investigating resilience is steadily growing but significant conceptual issues and discrepancies in the data are apparent. With a growing number of theories and definitions or often a lack thereof, an understanding of resilience is in its infancy. The results highlighted three areas that the resilience literature has primarily focused on: personality, psychological disorder, and coping strategies. The results also indicated that operationalizing resilience in terms of metacognition might provide a specific theoretical framework for future work.

3.5.1. Common Factors Associated with Resilience

Commonly resilience has been defined and operationalized under theories and definitions whereby resilience is associated with specific personality traits. Resilience has been positively correlated with extraversion and openness while negatively correlated with neuroticism (Fredrickson, et al., 2003; McGarry et al., 2013; Newton-John et al., 2014). Fredrickson et al. (2003) argue that these traits predispose individuals to have greater positive affect, and in turn greater positive affect has also been associated with increased levels of resilience. However, positive affect connoting greater resilience may be a problematic interpretation of the concept of resilience as this does not take into account other factors that may be predisposing individuals towards greater levels of resilience. Furthermore, low resilience has been viewed as the presence of symptoms of negative affect such as anxiety or low mood and therefore, conceptualising resilience in terms of positive affect may present a problem of conceptual overlap.

A second common conceptualization of resilience is the absence of psychological disorder. As highlighted in the results, irrespective of the type of stressor experienced, increased resilience was associated with decreased anxiety, depression, and PTSD (Escolas et al., 2013; Hjemdal, et al., 2006; Jordan et al., 2014; Fredrickson et al., 2003; Mak, Ng, &

Wong, 2011; Mautner, et al., 2013; McCanlies et al., 2014; McGarry et al., 2013; Tian, & Hong, 2014). However, this conceptualization is also problematic as it lacks an understanding of what the underlying mechanisms are that maintain psychological disorder.

Resilience research has also investigated the use of coping strategies however these are not always considered with respect to a theory or model but rather are defined on the basis of being adaptive or maladaptive. For example, the Brief COPE (Carver, 1997) has two subscales which assess adaptive and maladaptive coping strategies. Adaptive coping strategies include seeking emotional or instrumental support, positive reframing, humour, and acceptance, while maladaptive coping strategies include self-blame, denial, substance use, venting, and behavioral disengagement (Carver, 1997). Alternatively, the Coping Scale for Adults (Frydenberg & Lewis, 1997), which also categorizes certain coping strategies as maladaptive, identifies self blame, worry, wishful thinking, ignoring the problem, keeping to self, and tension reduction as non-productive coping strategies (Frydenberg & Lewis, 1997). As can be seen, both the CSA and Brief COPE consider different coping strategies to be adaptive and maladaptive. However, defining coping strategies on the basis of being adaptive or maladaptive is problematic. For example, distraction is often argued to be an adaptive coping strategy and in some situations it may be. For example, in depression distraction may interrupt the process of depressive rumination, resulting in a positive effect on mood (Wells & Matthews, 1994). However, distraction can also have a negative impact whereby it can lead to avoidance. For example, in phobia patients Foa and Kozak (1986) hypothesized that distraction prevents emotional processing and inhibits fear reduction. Additionally, a review by Rodriguez and Craske (1993) highlighted that various theories of exposure therapy suggest that when distraction is included as part of exposure therapy it has a negative impact on treatment outcome. Therefore, the context that strategies are used in is an important consideration which appears to be ignored by this type of classification

3.5.2. A Metacognitive Account of Resilience

One approach may be to examine resilience within the frame of the Metacognitive model (Wells & Matthews, 1994, 1996), as it takes into account both cognitive and metacognitive factors involved in self-regulation. The model states the cognitive attentional syndrome (CAS), the response individuals make to deal with negative thoughts, beliefs and emotions, is a cause of psychological disorder and that the CAS prevents negative emotion from self-correcting. The CAS is the result of metacognition, which directs an individual's attention, determines thinking style, and directs coping responses. In support of an application of this model to resilience two aspects of metacognition were found to be related to factors indicative of resilience.

Understanding the dynamic between metacognitive beliefs and coping strategies may provide a more cohesive understanding of individual's psychological resilience. The thought control strategies that individuals used to respond to negative thoughts were found to be associated with various psychological disorders. In particular, the use of worry and punishment were associated with increased PTSD and stress symptoms (Holeva, Tarrrier & Wells, 2001; Roussis & Wells, 2006, 2008; Scarpa, Wilson, Wells, Patriquin & Tanaka, 2009; Valdez & Lilly 2012; Warda & Bryant, 1998), while the thought control strategy of social control was found to be beneficial such that it was associated with decreased PTSD (Bennett, Beck & Clapp, 2009; Holeva, Tarrrier & Wells, 2001; Scarpa, Wilson, Wells, Patriquin & Tanaka, 2009). In addition, worry as a thought control strategy was predictive of long term PTSD (Holeva, Tarrrier & Wells, 2001; Reynolds & Wells, 1999; Roussis & Wells, 2008). Reynolds & Wells (1999) found that increased recovery from psychological distress, depression and PTSD was associated with greater use of distraction and reappraisal while decreased recovery was associated with increased punishment and worry.

According to the Metacognitive Model (Wells & Matthews, 1994, 1996) metacognitive beliefs are the driving force behind an individual's thinking styles and have been associated with the maintenance of psychological disorders such as anxiety, depression and PTSD. Both positive and negative metacognitive beliefs have been found to be positively associated with increased levels of stress (Cook et al., 2015b; Matthews, Hillyard & Campbell, 1999; O'Carroll & Fisher, 2013; Roussis & Wells, 2006; Spada, Mohiyeddini, & Wells, 2008). In particular, negative metacognitive beliefs concerning uncontrollability and danger have been found to be the main contributor to anxiety and depression (Cook et al., 2015b; Roussis & Wells, 2006; Spada, Mohiyeddini, & Wells, 2008; Thewes, Bell, & Butow, 2013).

Individual's metacognitive beliefs subsequently impact on individuals coping strategies. Negative metacognitive beliefs regarding uncontrollability and danger had a direct relationship with stress and anxiety symptoms (Cook et al 2015b; Roussis & Wells, 2006). Cook et al. (2015b) and Roussis and Wells (2006) also found that the relationship between negative metacognitive beliefs and stress and anxiety symptoms was mediated by the use of worry, such that negative metacognitive beliefs increase levels of anxiety and stress by exacerbating worry. Cross sectional relationships highlight that positive metacognitive beliefs have also been found to influence coping strategies such that positive metacognitive beliefs facilitate the use of worry and cause increased levels of distress (Roussis & Wells, 2006).

3.5.3. Limitations

The results of the review must be considered with respect to its limitations. Research on children and older adults was excluded due to a paucity of studies and therefore we cannot evaluate the effects across the life-span. Additionally, experimental studies and studies evaluating resilience interventions were excluded. This may have eliminated alternative conceptualizations of resilience as often interventions are based on a theoretical model. Finally,

the quality appraisal tool used may have decreased the scores for the studies included as it is best used for randomized control trial (RCT) methodology, therefore the scores should only be considered as a guide.

3.5.4. Future Considerations

Although research in resilience has shown promising results further research and refinement is required. Future studies should further evaluate the role of metacognition in resilience and the specific metacognitive factors that promote resilience. In addition, research on interventions that aim to build resilience could focus on the potential role of metacognitive factors.

3.6. Conclusions

Overall, the study provides a review of the factors that influence resilience and offers support for the role of metacognition. Overall there are a small number of studies that currently address this area and issues remain concerning the definition that should be used for defining resilience. One of the advantages in exploring metacognitive factors is the lack of conceptual overlap that exists between specific measures of metacognitive beliefs and thought control strategies and the way resilience is operationalised and measured. Such conceptual overlap and criterion cross-contamination may be a significant problem for some of the other studies reviewed.

4. Chapter 4: Worry and Rumination: Do They Prolong Physiological or Affective Recovery From Stress?

Short title:

Do Worry and Rumination Prolong Recovery From Stress?

Lora Capobianco, BA, Julie A. Morris, MSc, and Adrian Wells, PhD
University of Manchester

Author Note

Miss Lora Capobianco, School of Psychological Sciences, University of Manchester, lora.capobianco@postgrad.manchester.ac.uk, Zochonis Building, 2.43, School of Psychological Sciences, University of Manchester, Manchester, UK, M13 9PL, 07 527 989115

Miss Julie A. Morris, Institute of Population Health, University of Manchester; julie.morris@manchester.ac.uk, 1st floor, Education & Research Centre, University Hospital of South Manchester, Wythenshawe Hospital, Southmoor Road, Manchester, UK, M23 9LT, 0161 291 5815

Professor Adrian Wells, School of Psychological Sciences, University of Manchester, & Manchester Mental Health and Social Care NHS Trust, PhD, Adrian.wells@manchester.ac.uk, Rawnsley Building, Manchester Royal Infirmary, Oxford Road, Manchester, UK, M13 9WL, 0161 276 5399

Correspondence concerning this article should be addressed to Prof. Adrian Wells, University of Manchester, Rawnsley Building, Manchester Royal Infirmary, Oxford Road, Manchester, UK, M13 9WL. Email: adrian.wells@manchester.ac.uk
Phone Number: +44 (0)161 276 5399

Conflicts of Interest and Source of Funding: The study was conducted for partial completion of the first authors PhD, which was supervised by Professor Adrian Wells and funded by the Presidents Doctoral Scholar Award from the University of Manchester. The authors report no conflict of interest.

Submitted to Anxiety, Stress, and Coping

4.1. Abstract

Anxiety and depression have been linked to repetitive negative self-regulation styles in the form of worry and rumination respectively. Following predictions of the metacognitive model (Wells & Matthews, 1994) the current study compared the effect on recovery of three strategies: worry, rumination, and distraction in a stress-exposure paradigm. It was predicted that worry and/or rumination would be associated with delayed recovery on physiological and/or self-report indices when compared to distraction. Fifty-four participants were randomly assigned to one of the self-regulation conditions and then completed a modified version of the Trier Social Stress Test (TSST; Kirschbaum, Pirke & Hellhammer, 1993). Galvanic skin response and negative affect measurements were obtained at six different time points. Galvanic skin response indicated a prolonged recovery in the rumination condition when compared with the distraction condition ($p = 0.01$). Individuals in the worry condition reported an immediate delayed recovery from stress marked by higher negative affect scores in comparison to the distraction condition ($p = 0.01$). These findings may provide important insights into the effects of different forms of repetitive negative thinking on physiological and psychological recovery from stress. The different response patterns observed are discussed within the context of the metacognitive model.

Keywords: Worry; Rumination; Metacognition; Stress Recovery; Psychophysiology

4.2. Introduction

Repetitive negative thinking (RNT) in the form of worry and rumination have been postulated as paradoxical transdiagnostic self-regulatory processes in the metacognitive model of psychological disorder (Wells & Matthews, 1994, 1996). Worry is a characteristic feature of anxiety whilst rumination is more characteristic of depression. Whilst these processes differ in content and temporal perspective they also have overlapping features (Wells & Papageorgiou, 1995).

The Metacognitive Model (Wells & Matthews, 1994) proposes that emotional disorders of anxiety and depression are maintained by the activation of a type of coping or self-regulation dominated by worry, rumination and paradoxical coping strategies that impair flexible cognitive control (Wells & Matthews, 1994, 1996; Wells, 2000). This style is called the Cognitive Attentional Syndrome (CAS). The CAS is associated with negative emotional outcomes as it maintains a sense of threat and can delay the down-regulation of emotional responses. Therefore, a prediction arising from the model is that RNT in the form of worry and rumination should prolong recovery from stress-exposure.

Worry is one of the key cognitive features of Generalized Anxiety Disorder (GAD), and has been defined as a chain of negative thoughts that are predominantly verbal and aimed at problem solving (Borkovec, Robinson, Pruzinsky, & DePree, 1983). Worry is a future oriented process that is used to anticipate danger and develop ways to avoid it. Borkovec, Alcaine, & Behar (2004) proposed that worry is a cognitive avoidance response to perceived threat, whereby individuals use worry as a means of problem solving any future danger. Worry seeks answers to questions such as “What should I do in the future,” and “How can I avoid danger?” (Wells, 2009).

The use of worry as a coping strategy appears to have an effect on stress responses. One of the predictions of the metacognitive model is that worry may inhibit emotion processing of threat related thoughts, causing these thoughts to be maintained. Consistent with this idea, worry after laboratory stressors increases intrusive thoughts in the days that follow (Butler, Wells & Dewick, 1995; Wells & Papageorgiou, 1995).

Worry may also cause physiological effects, which have been most commonly measured by changes in heart rate. Knepp & Friedman (2008) examined the effect of cardiovascular activity in high and low worriers. Participants completed six laboratory tasks while heart rate (HR), HR spectral analysis, impedance cardiography, and blood pressure were measured. They found that high worriers had an elevated heart rate in comparison to low worriers. These results are consistent with associations found between elevated HR and worry in both GAD (Thayer, Friedman, & Borkovec, 1996) and in high state and trait worry (Dua, & King, 1987; Pieper, Brosschot, van der Leeden & Thayer, 2007; Roger & Jamieson, 1988).

Additionally, Fisher & Newman (2013) examined heart rate, respiratory sinus arrhythmia and salivary alpha-amylase (sAA) in response to a laboratory stressor during and following an experimental worry induction in three distinct populations (a control group, high trait worriers, individuals with Generalized Anxiety Disorder). Participants were randomly assigned to one of two conditions, worry or relaxation, and underwent a corresponding mood induction and completed two paced auditory serial addition (PASAT) tasks. In the PASAT task, participants are presented with single-digit numbers and must progressively add numbers so that each number is added to the one that was previously presented. In this study all groups showed an increase in heart rate in response to the stressor, but individuals with GAD had greater sympathetic nervous system arousal at baseline which led to greater heart rate reactivity in response to the stressor.

Another common self-regulation strategy, rumination, has also been linked to negative outcomes following stress (Nolen-Hoeksema, 1991). Rumination has been commonly linked to depression and has been defined in various ways such as difficult-to-control repetitive thoughts concerning personal problems. According to Nolen-Hoeksema's (1991) response styles theory, rumination is defined as, "repetitively focusing on the fact that one is depressed; on one's symptoms of depression; and on the causes, meanings, and consequences of depressive symptoms" (Nolen-Hoeksema, 1991, p. 569). Nolen-Hoeksema & Morrow (1991) examined individual response styles in response to a major earthquake, which occurred in the San Francisco Bay Area. They found that individuals who engaged in a ruminative style of responses had greater levels of depressed mood than individuals who did not use this response style 10 days and 7 weeks after the earthquake. Zoccola, Dickerson & Zaldivar (2008) investigated rumination and cortisol responses to laboratory stressors by having participants complete a speech task. Following the speech individuals indicated the frequency of the thoughts they experienced during a 10 minute rest period after the stressor. They found that individuals who reported greater post-task rumination had higher cortisol levels in response to the speech task. Cortisol levels for these individuals remained elevated throughout most of the 40-minute recovery. In a subsequent study, Zoccola, Quas & Yim (2010) found that trait-rumination prolonged salivary cortisol recovery through a 45 min recovery period following the termination of a stressor.

Studies have used skin conductance to measure physiological responses to stress, as it has been associated with the sympathetic nervous system which regulates a variety of bodily functions and is associated with the fight or flight response. During heightened emotional or physical states the sympathetic nervous system activates the cardiovascular and adrenal catecholamine systems (Jansen, Nguyen, Karpitsky, & Mettenleiter, 1995). One measurable indicator of increased catecholamine levels is through sweat gland secretions (Hansen &

Sawatzky, 2008). Such responses can be detected with a galvanic skin response (GSR) device, which measures the electrical conductance in the skin associated with sweat gland activity (Liew, 2001; Taravainen, Koistinen, Valkonen-Korhonen, Partanen & Karjalainen, 2001).

In summary, data are consistent with predictions of the metacognitive model and suggest that both worry and rumination impact emotional regulation and prolong recovery from natural or laboratory based stress exposures. However, so far studies have not directly compared the effects of worry and rumination and examined each of these against a control mentation strategy. Furthermore, they have not examined the effects on subjective as well as physiological indices of emotion (e.g. GSR) and recovery in the same paradigm.

The present study set out to examine these effects. We hypothesized that there would be a negative effect of worry and rumination on recovery from a stressor when compared with a control condition. We did not know if this would occur immediately or over a longer time interval but aimed to explore the time-course. We hypothesized that worry and rumination would be associated with a delayed recovery when compared to distraction, and that this effect would be observed in subjective and/or physiological measures of symptoms. The design of the study enabled us to examine the pattern of effects of worry and rumination against a control condition, which served to control for the provision of a post-stress cognitive processing task of fixed duration and was intended to prevent the occurrence of naturally occurring worry and rumination during that time.

4.3. Methods

4.3.1. Participants

A total of 54 undergraduates (38 women, 16 men) from the University of Manchester participated in the study. The mean age of the sample was 20.0 years (SD = 1.7, range: 18-26 years). Participants were recruited from an online experimental recruitment system, which allows participants to receive course credit in exchange for experimental participation. This project was approved by the University of Manchester research ethics committee (no. 1, ref 13290).

4.3.2. Measures

Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS is a brief self-report measure of mood state. It comprises 20-items consisting of two mood scales, which measure both positive affect (for example, “excited,” “alert,” “interested.”) and negative affect (for example, “ashamed,” “nervous,” “hostile.”). Participants respond on a 5-point Likert-scale which ranges from 1 (*very slightly or not at all*) to 5 (*extremely*).

Participants completed the PANAS at six different time points throughout the experiment (instructions: “Please rate each emotion to indicate how you are feeling at the moment”).

Galvanic Skin Response (GSR). Skin conductance was recorded throughout the entire experiment. To measure skin conductance a Neulog GSR logger sensor NUL-217 was used. GSR measurements were recorded in microsiemens at 60 second intervals. Data was then sectioned into relevant time periods (baseline, stress, emotion regulation, 10, 20, and 30 minutes into the recovery period) and mean values were calculated for each of the time intervals. Sensors were placed at the base of participant’s non-dominant index and ring

fingers, and participant's skin was prepared with an alcohol wipe and moistened with water using a cotton pad as suggested by the developers. The lab used for testing consisted of a temperature controlled room at 23C.

Visual Analogue Scale (VAS). A VAS was used after the thinking style induction to evaluate the extent to which participants were engaging with the task. Participants completed an 11-point Likert scale item: "Rate how well were you able to stay on task with responses ranging from 0 (*did not stay on task*) to 100 (*stayed on task the entire time*), which can be found in Appendix 3.

4.3.3. Materials

Video

A calming ten-minute nature video was shown to participants to enable them to relax and to allow a baseline skin conductance measurement to be taken.

Stimuli

To induce different styles of thinking (worry and rumination) a list of prompts was used. The complete list of experimental prompts can be found in Appendix 4. For the rumination condition, prompts focused participants' attention on thoughts that were emotion-, symptom- or self-focused. For example, "*Why am I feeling the level of motivation I feel right now?*" Alternatively, participants assigned to the worry condition received prompts that focused their attention on thoughts concerning the future, danger, and threat. For example, "*What if you were unable to maintain your current lifestyle (standard of living)?*" The rumination and worry stimuli were presented in the form of questions. The rumination stimuli began with the question, "why?", because rumination aims to analyse and question the reason for events. In contrast, the worry stimuli began with the question, "what if?", because anxious

thoughts, such as worry, represent future-oriented danger-related thinking. The distraction group did not receive any written prompts; instead they were given a set of simple filler tasks involving word search. The distraction condition was used as an active control group, as having participants not engage in a task for 8 minutes would not allow us to minimise the amount of worry or rumination that might spontaneously occur. Moreover, we wanted to separate the effects of worry/rumination from the effects of simply engaging in active cognitive processing.

4.3.4. Procedure

Once participants provided informed consent they were randomly assigned to one of the experimental groups using online research randomization software (Research Randomizer Version 4.0). There was no stratification or control for factors used in the randomization process.

On arrival at the laboratory the GSR sensors were attached to the base of the index and ring fingers of participant's non-dominant hand. Participants first watched a ten-minute nature video, after which, baseline GSR and PANAS ratings were obtained. Following the baseline measurements participants began the Trier Social Stress Test (TSST) (Kirschbaum, Pirke, & Hellhammer, 1993). The TSST requires participants to deliver a five- minute speech on why they are the best candidate for their dream job, and received a standardized amount of time to prepare for their speech. Participants were told that their speech would be video-taped and shown to a group of their peers; however the participants did not know that there was no tape in the camera and thus their speech would not be evaluated. The use of deception was explained to participants during the debriefing period after the experiment was completed. Next, participants completed a five- minute mental arithmetic task. This task requires participants to count backwards from 1022 in decrements of 13, while the experimenter

provided negative feedback such as tapping their fingers impatiently. Both the speech and math tasks were completed in front of the experimenter who was trained in delivering the TSST.

Following the stress induction participants completed their second PANAS rating and GSR measurements were noted, following which participants then engaged in their allocated mentation task (worry, rumination or distraction) which lasted for 8 minutes. Participants in the worry and rumination condition were asked to read and respond to all of the prompts, which were given in the same order to all participants. Following the experimental manipulation participants provided PANAS and GSR ratings, and completed the visual analogue scale to assess how well they stayed on task.

Finally, participants were asked to sit quietly for 30 minutes, during which three additional PANAS and GSR ratings were obtained at ten- minute intervals. Following the rest period, participants completed a demographics questionnaire and they were debriefed on the deception in the experiment.

4.4. Results

4.4.1. Participant Characteristics

The demographic characteristics of participants are presented in Table 4.1. The groups did not differ in age $F(2,50) = 0.36, p = 0.70$, or gender $\chi^2(2, N = 54) = 0.18, p = 0.92$.

Table 4.1. Study 2 Participant Characteristics

| Variable | Worry (N=18) | Rumination (N=18) | Distraction (N=18) |
|----------------------------------|-----------------|----------------------|-----------------------|
| Age, <i>M(SD)</i> | 19.72 (0.89) | 20.11 (1.79) | 20.18 (2.27) |
| Sex (Female : Male) | 13:5 | 12:6 | 13:5 |
| Manipulation Check <i>M(SD)</i> | 77.35 (17.69) | 81.11 (12.43) | 76.94 (22.76) |
| NA Baseline, <i>M(SD)</i> | 14.94 (4.13) | 12.06 (2.13) | 11.22 (1.59) |
| NA Post-Stress, <i>M(SD)</i> | 20.59 (5.98) | 19.50 (6.40) | 20.33 (7.92) |
| NA Post-Mentation, <i>M(SD)</i> | 16.94 (5.74) | 13.67 (3.79) | 13.83 (4.08) |
| NA Recovery 1, <i>M(SD)</i> | 13.59 (3.78) | 12.83 (2.94) | 12.83 (4.45) |
| NA Recovery 2, <i>M(SD)</i> | 12.10 (2.76) | 11.94 (1.63) | 13.12 (3.76) |
| NA Recovery 3, <i>M(SD)</i> | 10.76 (1.35) | 11.50 (1.46) | 12.89 (2.91) |
| GSR Baseline, <i>M(SD)</i> | 3.65 (2.80) | 3.64 (3.09) | 3.40 (2.94) |
| GSR Post-Stress, <i>M(SD)</i> | 7.06 (3.13) | 6.25 (2.50) | 5.40 (3.44) |
| GSR Post-Mentation, <i>M(SD)</i> | 6.80 (3.31) | 6.78 (2.58) | 5.33 (3.54) |
| GSR Recovery 1, <i>M(SD)</i> | 6.29 (3.37) | 6.61 (2.82) | 4.95 (3.44) |
| GSR Recovery 2, <i>M(SD)</i> | 6.14 (3.50) | 6.73 (2.82) | 4.73 (3.50) |
| GSR Recovery 3, <i>M(SD)</i> | 5.96 (3.32) | 6.91 (2.89) | 4.63 (3.44) |

Note. M = Mean, SD = Standard Deviation, NA = Negative Affect, GSR = Galvanic Skin Response

4.4.2. Manipulation Check

To ensure that the Trier Social Stress Test elicited stress a paired t-test was conducted on the baseline and post stressor negative affect values as these were administered directly before and after the stress induction and before the mentation task. Based on the recommendation by Dixon and Tukey (1968), outliers were Winsorized, meaning that they were replaced with less extreme values in order to improve statistical power. Outliers were replaced with values two standard deviations above the mean. The Trier Social Stress test

elicited a significant amount of stress in the worry group, $t(16) = 3.77, p = 0.002$, Cohen's $d = 1.11$, rumination group, $t(17) = 5.47, p < 0.001$, Cohen's $d = 1.60$, and control (distraction) group, $t(17) = 5.06, p < 0.001$, Cohen's $d = 1.70$. Stress levels immediately after the TSST were similar across the groups, $F(2, 51) = 0.09, p = 0.91, \eta_p^2 = 0.004$, and can be seen in Figure 4.2 and Table 4.1.

4.4.3. Psychological and Physiological Outcomes

To assess the overall pattern of rate of change between groups a generalized estimating equation (GEE) analysis, fitting a linear trend in time was conducted over the recovery period (post emotion regulation, 10, 20, and 30 minutes into the recovery period). Analyses focused on the period following the stress induction as the hypotheses aimed to evaluate the impact of emotion regulation strategies on recovery from stress. If a significant interaction was found, follow-up tests involving repeated measures analyses of covariance's (ANCOVA) were conducted on the recovery period. The post-stress induction scores were used as a covariate. F values from the ANCOVA are not reported as the parameter estimates represent the differences between groups. The parameter estimates describe the average difference between groups at each time point, with positive values indicating that a group is above the comparison group, distraction, thus indicating higher values, whereas negative values indicate that a group is below the comparison group, indicating lower values. These parameter estimates are shown in Table 4.2.

Table 4.2. Parameter Estimates: Galvanic Skin Response & Negative Affect Study 2

| Time Point | Group | b | p |
|-------------------------------|--------------|----------|----------|
| Galvanic Skin Response | | | |
| Emotion Regulation | | | |
| | Worry | -0.15 | 0.67 |
| | Rumination | 0.62 | 0.08 |
| Recovery 1 | Worry | -0.24 | 0.61 |
| | Rumination | 0.85 | 0.07 |
| Recovery 2 | Worry | -0.17 | 0.75 |
| | Rumination | 1.21 | 0.03 |
| Recovery 3 | Worry | -0.11 | 0.86 |
| | Rumination | 1.54 | 0.01 |
| Negative Affect | | | |
| Emotion Regulation | | | |
| | Worry | 4.67 | 0.01 |
| | Rumination | 0.14 | 0.94 |
| Recovery 1 | Worry | 0.96 | 0.52 |
| | Rumination | 0.98 | 0.51 |
| Recovery 2 | Worry | -0.19 | 0.31 |
| | Rumination | -1.51 | 0.20 |
| Recovery 3 | Worry | -2.21 | 0.03 |
| | Rumination | -1.56 | 0.12 |

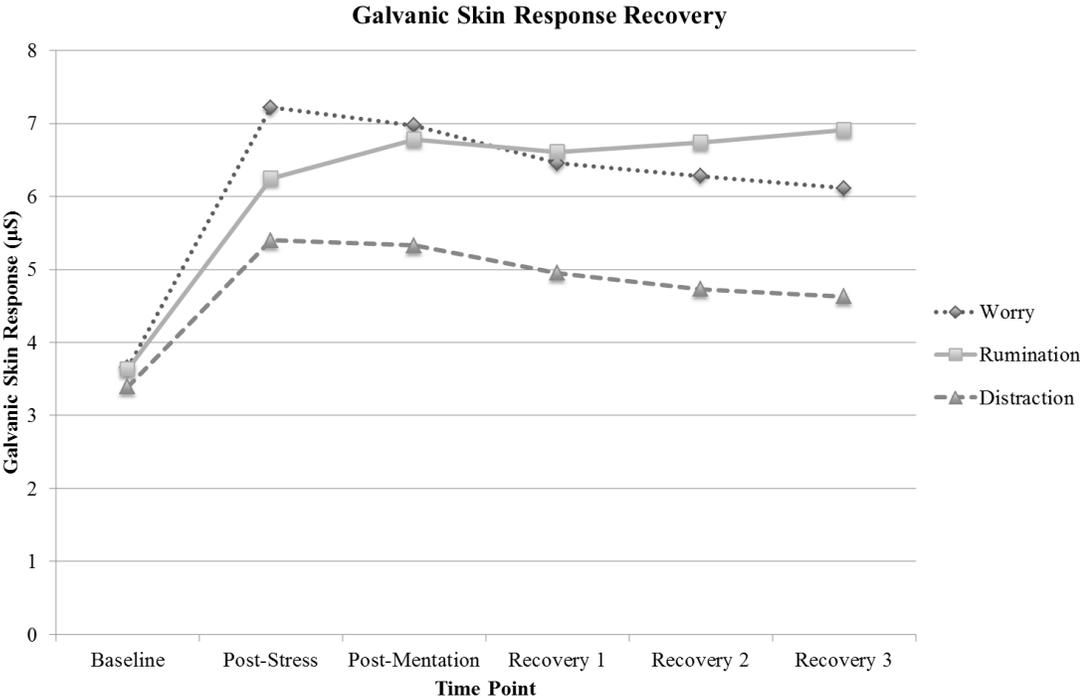
GEE analyses revealed a borderline significant group by time interaction [Wald $\chi^2= 5.9$ $p = 0.053$] which indicated that there was some evidence of a difference in recovery between the three groups.

Follow-up tests to assess group differences demonstrated that there was no significant difference between worry and distraction (control group) in GSR response at any of the time points in the recovery period. Examination of parameter estimates show that differences in the worry condition ranged from 0.24 units to 0.11 units. However, in contrast the rumination condition did not exhibit recovery; increasing parameter values indicate a worsening of response. The largest difference occurs at the final time point in the recovery period, where the

average difference between the rumination group and the distraction group is 1.54 units, $p = 0.01$. These results are illustrated in Figure 4.1, which shows that immediately after the mentation manipulation the worry group show a reduction in GSR response whilst the rumination group show an increase when compared to the effect post-stress.

In summary, on physiological indices of stress, rumination appeared to prolong recovery, whereas worry appeared to produce a pattern of recovery that was similar to the distraction group.

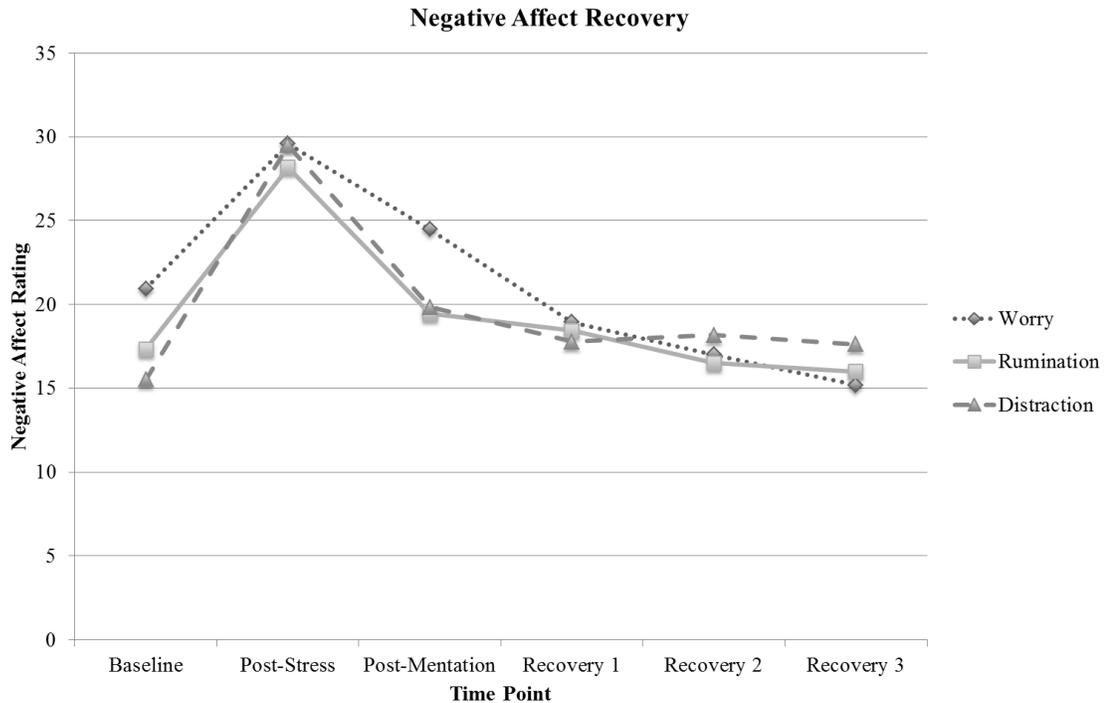
Figure 4.1. Study 2 Galvanic Skin Response Over Time



For negative affect, GEE analyses demonstrated a significant group by time interaction [Wald $\chi^2 = 11.7$ $p = 0.003$]. The pattern of recovery for the worry condition showed that following the mentation period negative affect was higher than in the rumination or distraction conditions, suggesting that worry had an immediate effect of slowing recovery in negative affect, this outcome can be seen in Figure 4.2.

Follow-up tests based on parameter estimates showed that worry appeared to have an immediate effect of maintaining stress levels following the emotion regulation induction, $t(50) = 2.49$, $p = 0.01$, with $b = 4.67$. At this point individuals in the worry group are recovering more slowly than the distraction condition at 4.67 units. This negative effect does not persist and with time the worry group catches up with the other groups. The rumination condition showed a similar recovery to the distraction group. The results indicate that worry delays recovery on negative affect immediately following stress induction however rumination showed little effect on negative affect recovery.

Figure 4.2. Study 2 Negative Affect Response Over Time



4.5. Discussion

This study compared the effect of mentation strategies that are commonly linked with anxiety and depression; worry and rumination, with a control condition of distraction on physiological and subjective emotional recovery from induced stress. We hypothesized that individuals in the worry and rumination conditions would have a prolonged trajectory in stress recovery in comparison to individuals in the distraction condition. This is because worry and rumination are emotion regulation strategies that maintain processing of threat and negative mood states, which in the metacognitive model prolong subcortical emotion processing. In manipulating worry and rumination directly, we were able to explore more specific patterns of effects of these strategies on objective and physiological stress responses. Additionally, during the recovery period we were able to examine the immediate and more protracted effects on recovery.

In line with our hypotheses rumination appeared to be associated with a delay in recovery from stress in comparison to distraction. This effect appeared on physiological but not self-report indices. Furthermore, the rumination condition prolonged stress recovery and demonstrated the greatest effect 30 minutes into the recovery period. Thus, it appears that rumination may have a delayed impact, delaying physiological recovery to a greater extent as time since stress exposure elapses. This effect was not observed in connection with worrying.

In contrast, self-report negative affect data revealed a somewhat different pattern. The worry group displayed delayed recovery from stress that was more immediate and occurred soon after the worry induction. The rumination manipulation did not appear to impact on self-report negative affect at any phase.

These results support our initial hypotheses that repetitive negative thinking in the form of worry or rumination delays the rate of recovery from exposure to stress. The inclusion of a control condition means that the effect is unlikely to be a non-specific effect of cognitive processing. Furthermore, the difference in response effect manifested by worry and rumination groups supports the interpretation that we are assessing effects of these different forms of mentation rather than non-specific factors or the effect of a cognitive task.

Worry and rumination are the underlying emotion regulation strategies typically associated with the maintenance of anxiety and depression, respectively. The results add further evidence on how these processes may differentially impact psychological and physiological indices of stress response. The data highlights a discrepancy between self-report measures and physiological measures and argues for the importance of using a multi-method approach in evaluating the impact of thinking styles. Discrepancies between self-report measures and objective measures have previously been reported. For example, a study by Nater et al. (2010) examined psychological and physiological responses to stress in individuals with borderline personality disorder (BPD). They found that on self-report measures

individuals with BPD reported greater and more threatening levels of acute stress in comparison to healthy controls. However, cortisol responses for BPD patients indicated that they had decreased cortisol and alpha-amylase levels at baseline and in response to stress in comparison. Perhaps data of this kind is a marker for the preponderance of worry based RNT rather than rumination in these individuals. Future research may benefit the field by determining if there are response signatures that accompany different varieties of RNT.

We did not predict specific differences between worry and rumination. The identification of early effects of worry on self-report affect but later-effects of rumination on physiological responses deserves some consideration. These differences may reflect functional dimensions of these different types of thinking. Specifically, worry is normally used to anticipate danger and prepare for action and it is likely to exert effects within a short time-frame as the internal anxiety program for avoidance and vigilance is activated. However, rumination is past oriented with little motivation to detect, avoid, or deal with danger in the present or future. Thus, it is more likely to call reflective memory-based activity which could delay later stages of stress recovery that might be more dependent on memory-based processes.

The effect of worry and rumination found in the study adds further evidence to the proposal that perseverative thinking styles following stress exposure impact on symptoms (Nolen-Hoeksema, 1991; Wells & Papageorgiou, 1995). Although we did not assess the potential underlying mechanism by which these processes may transmit such effects, the results provide further support for the metacognitive model that gives a central role to worry and rumination (Wells & Matthews, 1994; 1996).

The clinical implications of the present findings must remain tentative, but the data suggests that interventions that directly reduce the propensity to self-regulate with strategies of worry and rumination may improve immediate and/or delayed reactions to stress. These data

add to the literature on traumatic stress reactions that has shown that the tendency to use worry to deal with negative thoughts soon after negative life events increases the severity of symptoms later on (Holeva, Tarrier, & Wells, 2001; Warda & Bryant, 1998; Roussis & Wells, 2008). Furthermore, metacognitive therapy aimed at reducing worry and rumination appears effective in treating prolonged traumatic stress responses (Wells & Colbear, 2012; Wells, Walton, Lovell, & Proctor, 2015) suggesting that a greater focus on regulating RNT could provide clinical benefits and potentiate stress recovery.

Future studies should examine the recovery period in greater detail. We noticed patterns of response that appear time-dependent, thus future studies could extend the range of monitoring to explore the longer-term effect and determine when symptom parameters return to baseline. Additionally, future studies should examine effects using a range of indices of stress such as cortisol levels and cardiovascular recovery.

The present study is limited by its sample which consisted of undergraduate participants, thus decreasing the generalizability of the findings. Furthermore, other research has demonstrated age differences in emotion regulation (Orgeta, 2009). Thus, it is uncertain whether rumination, worry, or distraction would function similarly in an older adult or younger population. The duration of our recovery period was short so we could not examine the long term effect of worry and rumination. As this study is the first to examine both effects in the same paradigm the results may not be reliable and so we temper our conclusions. Our study did not set out to test for statistically significant differences between worry and rumination and was not powered to do so, but this is clearly an area for future studies.

In conclusion, we observed that worry and rumination each had a negative but specific effect on recovery from stress compared to a control condition; however long term effects require further examination.

5. Chapter 5: The Effect of Thought Importance on Stress Responses: A Test of Metacognitive Theory

Lora Capobianco, Anthony P. Morrison, and Adrian Wells
University of Manchester

Author Note

Lora Capobianco, School of Psychological Sciences, University of Manchester; Tony Morrison, School of Psychological Sciences, University of Manchester; Adrian Wells, School of Psychological Sciences, University of Manchester

Correspondence concerning this article should be addressed to Adrian Wells, School of Psychological Sciences, University of Manchester, Manchester, UK, M13 9PL. Email:

Adrian.wells@manchester.ac.uk

Conflicts of Interest and Source of Funding: The study was conducted for partial completion of the first authors PhD, which was supervised by Professor Adrian Wells and funded by the Presidents Doctoral Scholar Award from the University of Manchester. The authors report no conflict of interest.

Under Review at Behaviour Therapy and Research

5.1. Abstract

Objectives: Negative metacognitive beliefs are central determinants of distress in the metacognitive model of psychological vulnerability. The current study tested this assertion in 78 undergraduate students assigned to either an experimental (metacognitive belief manipulation) or control (no metacognitive belief manipulation) condition.

Methods: All participants underwent a fake EEG, where they were told that the EEG would detect negative thoughts. The experimental subjects were informed that if they had a negative thought they may be exposed to a burst of loud noise, while the control condition was told that they may be exposed to a burst of loud noise at random irrespective of the type of thought they had. Participants also underwent the Trier Social Stress Test (TSST; Kirschbaum, Pirke, & Hellhammer, 1993).

Results: Results showed that on physiological measures there were no significant differences between groups. However, on self-report measures participants in the experimental condition reported greater levels of negative affect and lower levels of positive affect in response to stress and during recovery from stress in comparison to the control condition.

Conclusions: Results are consistent with the metacognitive model and have implications for understanding stress responses and recovery.

Key words: Metacognition, Negative Metacognitive Belief, Stress, Experiment

5.2. Introduction

Wells and Matthews (1994) proposed that a cognitive-attentional syndrome of repetitive negative thinking, fixation on threat, and paradoxical mental regulation strategies link stress exposure to emotional disorder. This syndrome is the result of metacognitions, a central component of which are beliefs about the importance of thoughts in causing or preventing negative outcomes. More specifically, whilst acute emotional reactions to stressful situations feed off various specific processes such as biases in appraisal, coping preferences, and social knowledge, prolonged or dysfunctional reactions are considered the result of the cognitive-attentional syndrome (CAS), driven by beliefs such as, “negative thoughts can cause negative events.”

Consistent with the model, repetitive negative thinking in the form of worry and rumination is associated with worse emotional outcomes following exposure to life stress. Nolen-Hoeksema and Morrow (1991) investigated the use of rumination in response to the 1989 Loma Prieta earthquake in San Francisco and found that individuals who used rumination to respond to the stressor were more likely to be depressed 10 days and 7 weeks after the earth quake. Roussis and Wells (2008) investigated the use of worry as a thought control strategy in predicting symptoms of stress, and found that the tendency to use worry in this way following stressful life events predicted the severity of stress symptoms three months later.

Similarly, there is evidence of reliable positive associations between metacognitive beliefs, thinking styles of worry and rumination, and symptoms of emotional disorder. For example, Spada, Mohiyeddini and Wells (2008) investigated whether negative metacognitive beliefs would predict anxiety and depression, and found that negative beliefs that worry was uncontrollable and dangerous were the strongest predictors of anxiety and depression.

Additionally, they also found that beliefs about the need to control thoughts and cognitive self-

consciousness predicted depression. Yilmaz, Gencöz, and Wells (2015) investigated the relationship between metacognitive beliefs and depressive symptoms. They found that increased levels of positive and negative metacognitive beliefs about rumination were associated with higher levels of depressive symptoms. Cook et al. (2015b) examined the association of metacognitive beliefs with emotional distress after receiving a cancer diagnosis. Participants completed measures of anxiety, depression, metacognitive beliefs, posttraumatic stress disorder symptoms, worry and illness perceptions, within three months of receiving a diagnosis of cancer and prior to receiving any treatment. The authors found that negative metacognitive beliefs increased emotional distress by increasing the amount that individuals engage in worrying.

Experimental manipulations of negative metacognitive beliefs have been shown to increase symptoms in obsession-prone individuals. Myers and Wells (2013) manipulated thought-event fusion beliefs in individuals with high and low obsessions. In order to manipulate such beliefs, participants were informed that they would undergo an EEG experiment and that if they had a thought about water it would be detected by the EEG apparatus and this may result in hearing a burst of loud noise. They found that the experimental induction of negative metacognitive beliefs led to a greater number of intrusions and greater level of discomfort.

Despite these earlier findings, the effect of metacognitive beliefs on reactions to and recovery from stress remains an under-researched area. In particular, questions remain concerning the generality of metacognition and its effects on stress responses. Whilst clear positive relationships have emerged between metacognition and symptoms in the context of emotional disorder (Wells, 2009), the metacognitive model assumes that there is no major discontinuity between the symptoms of stress and emotional disorder. Thus, the model should explain both normal as well as pathological stress symptoms. The current study aimed to test

the hypothesised causal role of negative metacognitive beliefs in general stress responses. It was hypothesized that an induction of negative metacognitive beliefs would be associated with intensified stress symptoms and/or a delayed recovery from stress. The current study adapted the fake EEG paradigm used by Myers and Wells (2013) to manipulate metacognitive beliefs, but with the addition of the Trier Social Stress Test, to manipulate specific metacognitive beliefs in the context of stress exposure.

5.3. Methods

5.3.1. Participants

Participants were recruited from the University of Manchester via an online recruitment system, which allows participants to receive course credit for participating in experiments. A total of 78 undergraduate students (54 women, 21 men) participated in the study. A power calculation was used to determine the appropriate sample size and was based on a similar study by Myers & Wells (2013). Participants age ranged from 18 to 44 ($M = 20.73$, $SD = 4.55$). The study was approved by the University of Manchester Research Ethics Committee (ref 14351) prior to starting the study.

5.3.2. Measures

5.3.3. Primary Dependent Variables

Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS is a self-report measure of current mood state. It consists of two mood scales, which contain 10-items per scale. It measures both positive affect (e.g., *determined, enthusiastic, excited*) and negative affect (e.g., *nervous, irritable, guilty*). Responses are rated using a 5 point likert scale which ranges from 1 (*very slightly or not at all*) to 5 (*extremely*). Participants completed the PANAS at four different time points throughout the experiment (instructions: “Please rate each emotion to indicate how you are feeling at the moment”).

Galvanic Skin Response (GSR). Skin conductance was recorded using the Neulog GSR logger sensor NUL-217. GSR measurements were recorded in microsiemens. The data was then cleaned by sectioning measurement into corresponding time intervals throughout the experiment (e.g., baseline, intervention, stress, and recovery) and mean values were calculated for each of the time intervals. Sensors were placed at the base of participant’s non-dominant index and ring fingers, and participant’s skin was prepared with an alcohol wipe and moistened with water using a cotton pad as suggested by the developers.

5.3.4. Secondary Measures

Visual Analogue Scale. A VAS was administered three times throughout the experiment: after the experimental manipulation, after the stress induction, and following the rest period. Individuals were asked to report the number of negative thoughts they experienced (“*How many negative thoughts did you have?*”) and how much discomfort they felt (“*How much*”).

discomfort did you feel as a whole?”), which was rated on a scale from 0 (*None*) to 100 (*Most discomfort I could have*), which can be found in Appendix 7.

Abbreviated Form of Eysenck Personality Scale Revised (EPQR-A; Francis, Brown, & Philipchalk, 1992). The EPQR-A is an abbreviated version of the EPQ revised, which assesses and individual's personality traits. There are EPQR-A consists of four subscales: extraversion, neuroticism, psychoticism, and lie. However, only the neuroticism scale was evaluated in the study as individuals high in neuroticism have been found to have a greater negative reaction to stress (Gunther, Cohen, & Armeli, 1999). The EPQR-A contains 24 items, which are rated on a yes/no scale.

Metacognition Questionnaire (MCQ-30; Wells & Cartwright-Hatton, 2004). The MCQ-30 is a short form of the original MCQ which included 65 items. The MCQ-30 measures differences in metacognitive beliefs, judgments, and monitoring tendencies. There are five subscales, which include: cognitive confidence (e.g., *"I have little confidence in my memory for places."*), positive beliefs about worry (e.g., *"I need to worry in order to remain organised."*), cognitive self-consciousness (e.g., *"I think a lot about my thoughts."*), 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., *"It is bad to think certain thoughts."*). The MCQ-30 demonstrates good internal consistency, convergent validity, and acceptable test-retest reliability (Wells & Cartwright-Hatton, 2004; Spada, Mohiyeddini, & Wells, 2008; Yilmaz, Gencöz, & Wells, 2008).

Manipulation Check. A manipulation check was conducted at the end of the study, which can be found in Appendix 8. Participants rated two 11-point Likert scale items assessing their appraisal of the experimental paradigm. The items included: “How much did you believe that you would hear an unpleasant noise randomly during the experiment?”, or “How much did you believe that you would hear an unpleasant noise during the experiment caused by your thoughts?”, dependent on if participants were assigned to the control or experimental conditions respectively, and “How much did you believe that the EEG would pick up your mental reactions to stress?”, responses ranged from 0 (*did not believe this was true*) to 100 (*completely convinced this was true*).

5.3.5. Procedure

After completing informed consent, participants were randomly allocated to either the experimental or control condition through simple random assignment using the online research randomization software: Research Randomizer (Version 4.0).

On arrival at the laboratory, participants first completed the following questionnaires: MCQ-30, demographics, and EPQR-A. Then the GSR sensors were attached on the base of the index and ring fingers of participant’s non-dominant hand. Participants then sat quietly for two minutes to allow for baseline GSR measures to be obtained and to adjust to the experimental setting. After the two minute baseline period participants completed a baseline measure of self-reported affect, as measured by the PANAS.

Participants were then instructed that the purpose of the experiment was to examine “mental reactions to stress” and that they would complete a stressful task during which their brain-wave activity would be measured by electroencephalography (EEG). Participants were then fitted with an EEG cap and electrodes were attached. Typical EEG experiments require

the use of gel to be placed beneath the electrodes; however as actual EEG recordings were not necessary, gel was not used. Participants were then shown a pre-recorded video of real EEG waves and told that the EEG was detecting brain activity well; however the participants did not know that these were not their actual brain waves, and that the EEG machine was not turned on.

Participants were then read a specific set of instructions depending on the condition they were assigned to. The instructions for the experimental condition were as follows:

“For the next three minutes, I’d like you to think about anything you want. The EEG will measure your mental reactions such as negative thoughts. I’m going to set it up so that when you have these reactions the machine will decide whether to expose you to a burst of loud noise that can make you jump.”

Instructions for the control condition were:

“For the next three minutes, I’d like you to think about anything you want. The EEG will measure your mental reactions such as negative thoughts. I’m going to set it up so that unrelated to when you have these reactions you may randomly be exposed to a loud noise that can make you jump”

The only difference between these sets of instructions was the idea that the noise would be heard in reaction to having a negative thought or it would be played at random. After the three minute induction participants completed the PANAS and VAS.

Prior to beginning the stress task participants were read a set of instructions based on their assigned group to remind them that the EEG was still recording. The experimental group were given the following instruction:

“ Okay we are about to start the stress task, again just to remind you the computer will detect negative thoughts and may decide to expose you to a loud noise when you have one of these thoughts.”

The control group were instructed as follows:

“Okay we are about to start the stress task, again just to remind you the computer may expose you to a loud noise at random.”

Following these instructions participants underwent the Trier Social Stress Test (TSST: Kirschbaum, Pirke, & Hellhammer, 1993). The TSST is comprised of two stress tasks: a speech task and a math task. During the speech task participants are asked to present a five-minute speech on their dream job. Participants are instructed that their speech will be video-taped and rated by a panel of judges; however participants are unaware that there is no tape in the camera and therefore their speech is not being recorded. The second portion of the TSST is a five-minute mental arithmetic task, where participants are required to serially subtract the number 13 from 1022, while the experimenter provided negative feedback by tapping their fingers impatiently. After having completed the stress induction participants then completed their third PANAS rating and second VAS rating.

Finally, participants were given 10 minutes to sit quietly and recover from the stress induction. At the end of the recovery period a final PANAS rating was obtained and a manipulation check was administered. Before leaving the lab participants were debriefed on the deception used in the experiment and asked to re-consent to the study.

5.4. Results

5.4.1. Participant Characteristics

Participant's demographic characteristics are displayed in Table 5.1. The groups did not differ in gender $\chi^2(1, N = 75) = 3.51, p = 0.061$ or age across groups $F(1,73) = 0.13, p = 0.72$, supporting the effects of randomisation in controlling these factors. There were no significant difference between groups on any of the MCQ-30 or EPQ-R subscales and therefore these were not used as covariates in subsequent analyses.

Table 5.1. Study 3 Participant Characteristics

| Variable | Experimental (N = 38) | Control (N = 37) |
|--|--------------------------|---------------------|
| Age, <i>M(SD)</i> | 20.92(4.28) | 20.54(4.87) |
| Sex (Female : Male) | 31:7 | 23:14 |
| Noise Belief, Manipulation Check, <i>M(SD)</i> | 58.8 (27.91) | 67.57 (33.20) |
| EEG Belief, Manipulation Check, <i>M(SD)</i> | 69.47 (25.33) | 77.30 (25.23) |
| Baseline GSR, <i>M(SD)</i> | 2.01(1.13) | 2.53(1.52) |
| Post-Manipulation GSR, <i>M(SD)</i> | 2.91(1.68) | 3.06(1.72) |
| Post-Stress GSR, <i>M(SD)</i> | 4.21(2.01) | 4.43(2.14) |
| Recovery GSR, <i>M(SD)</i> | 3.94(1.99) | 4.06(1.81) |
| NA 1, <i>M(SD)</i> | 13.05(2.82) | 13.57(5.37) |
| NA 2, <i>M(SD)</i> | 13.32(2.82) | 14.68(5.50) |
| NA 3, <i>M(SD)</i> | 19.61(5.84) | 18.16(6.27) |
| NA 4, <i>M(SD)</i> | 14.71(4.70) | 14.14(5.21) |
| PA 1, <i>M(SD)</i> | 24.60(6.87) | 22.14(6.73) |
| PA 2, <i>M(SD)</i> | 24.03(7.23) | 20.92(6.76) |
| PA 3, <i>M(SD)</i> | 20.16(7.29) | 20.65(7.31) |
| PA 4, <i>M(SD)</i> | 18.34(6.04) | 17.95(6.00) |

Note. M = Mean, SD = Standard Deviation, GSR = Galvanic Skin Response NA = Negative Affect, PA = Positive Affect

5.4.2. Manipulation Check

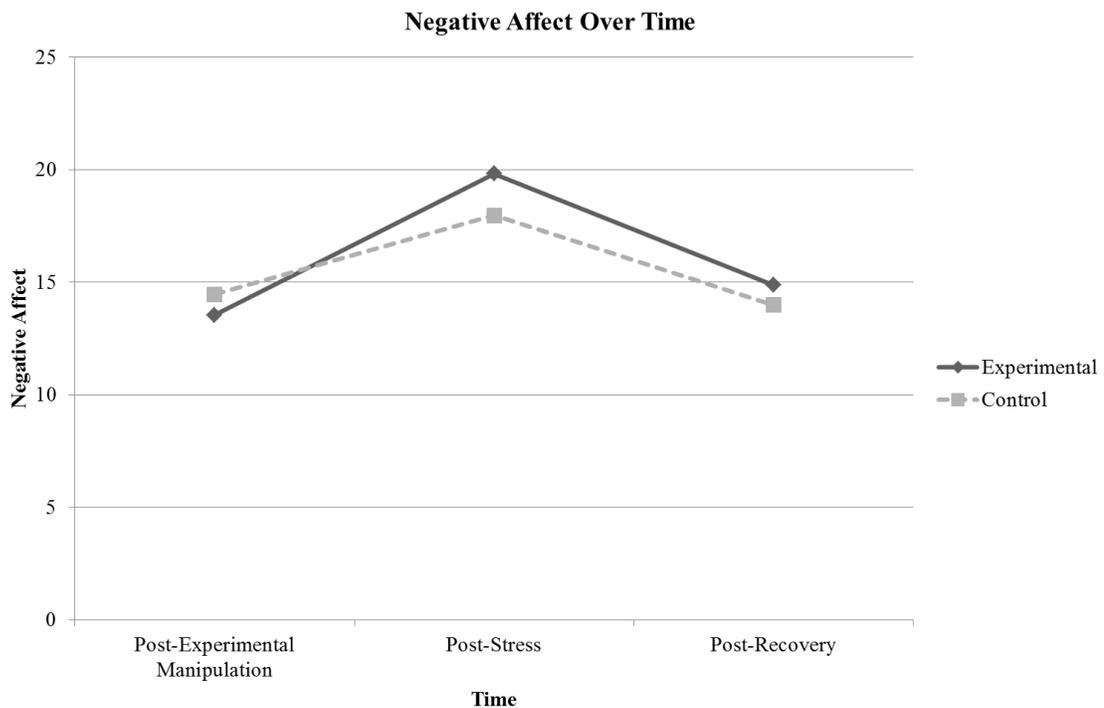
In order to assess the credibility of the deception used in the study an independent samples t-test was conducted. The groups did not differ in the belief that they would hear a noise in relation to their thoughts, $t(73) = -1.24$, $p = 0.22$. Additionally, the groups did not differ in the belief that the EEG would detect their negative thoughts, $t(73) = -1.34$, $p = 0.18$.

Table 5.1 highlights the means and standard deviations of the manipulation check.

5.4.3. Affect Ratings

To evaluate differences between groups over time a repeated measures analysis of covariance (ANCOVA) was conducted over three time points, post-experimental manipulation, post-stress, and post-recovery, with baseline used as a covariate. There was a significant main effect of time, $F(2,144) = 6.28$, $p = 0.002$, $\eta_p^2 = 0.08$. Additionally, there was a significant group by time interaction, $F(2,144) = 4.01$, $p = 0.02$, $\eta_p^2 = 0.053$. Pairwise t-tests were conducted to investigate within group differences. In order to control for multiple testing Bonferroni correction was applied to adjust the alpha level ($p=.013$). Within group tests revealed significant differences for the experimental condition between post-experimental manipulation and post-stress, $t(37) = -7.83$, $p < 0.001$, and post-stress and post-recovery, $t(37) = 7.13$, $p < 0.001$. Similarly, significant differences were also observed for the control group between post-experimental manipulation and post-stress, $t(36) = -4.68$, $p < 0.001$, and post-stress and post-recovery, $t(36) = 6.58$, $p < 0.001$. Figure 5.1 shows that both groups show an initial increase then a decrease in negative affect. The interaction term of the mixed model shows that these effects were greatest in the experimental group

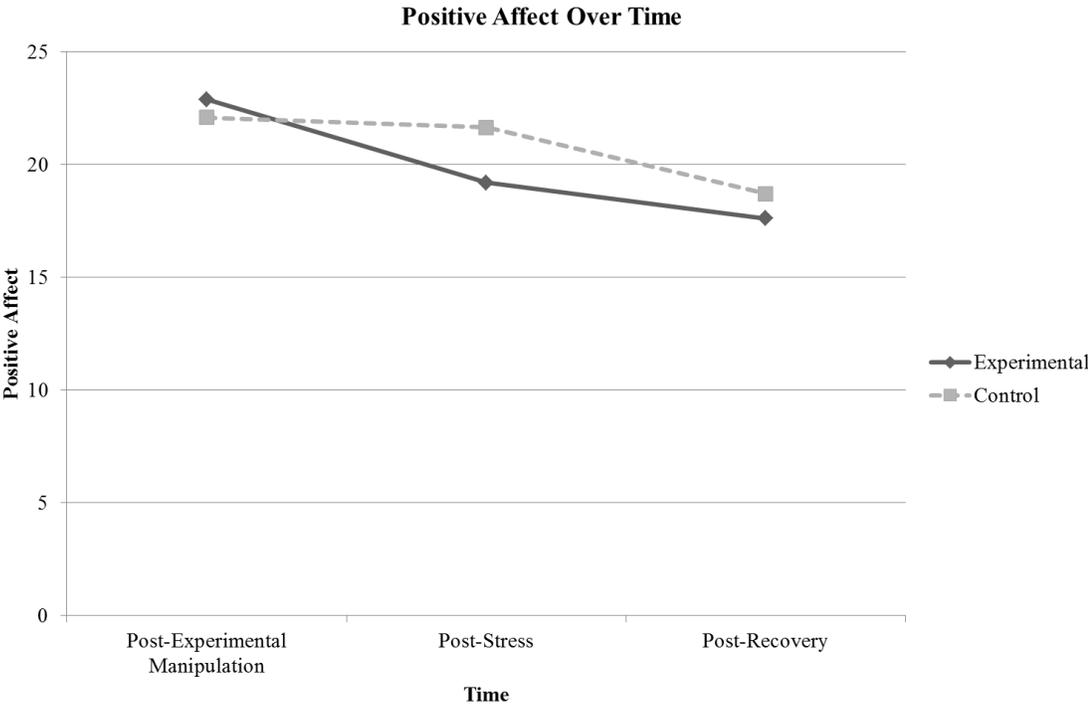
Figure 5.1. Study 3 Negative Affect Over Time



A repeated measures analysis of covariance (ANCOVA) was used to assess differences in positive affect. Three time points were assessed, post-experimental manipulation, post-stress, and post-recovery. Baseline level of positive affect was the covariate for this analysis. There was no significant main effect of time, $F(2,144) = 1.79$, $p = 0.17$, $\eta_p^2 = 0.024$; however, there was a group by time interaction, $F(2,144) = 5.06$, $p = 0.008$, $\eta_p^2 = 0.07$. To further investigate within-group effects, pairwise t-tests with Bonferroni correction were run. Significant differences were observed for the experimental condition between post-experimental manipulation and post-stress, $t(37) = 4.19$, $p < 0.001$; however, there was no significant difference between post-stress and post-recovery, $t(37) = 2.57$, $p = 0.014$. There was no significant difference in the control group between post-experimental manipulation and post-stress, $t(36) = 0.40$, $p = 0.69$; however, significant differences were observed between and post-stress and post-recovery, $t(36) = 4.10$, $p < 0.001$. Figure 5.2 depicts the

differences in positive affect responses between groups. The experimental group experienced a significant decrease in positive affect following the experimental manipulation and continued to experience a decrease in positive affect following stress exposure, although this continued decrease was not significant. In contrast, the control group did not experience a significant decrease in positive affect following the experimental manipulation; however, they did experience a significant reduction in positive affect between the post-stress measurement interval and post recovery measurement point.

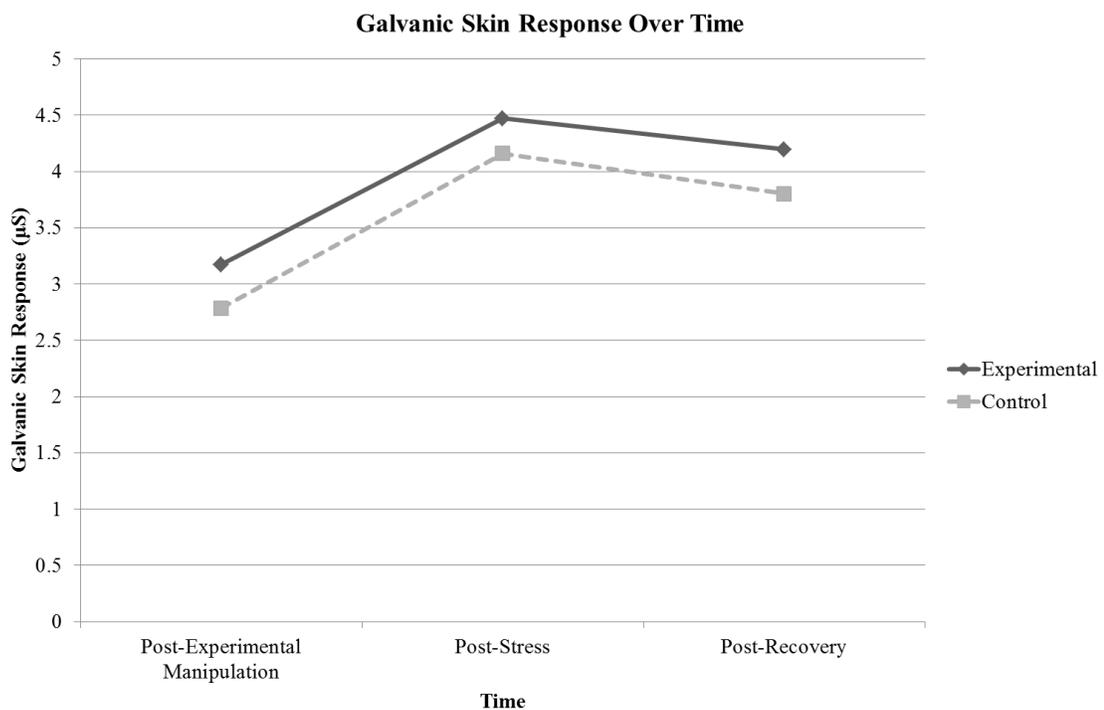
Figure 5.2. Study 3 Positive Affect Over Time



5.4.4. Galvanic Skin Response

In order to assess the physiological differences in stress response between groups repeated measures analysis of covariance (ANCOVA) was conducted over three time points (post-experimental manipulation, post-stress, and post-recovery) with baseline GSR as a covariate. There was a significant main effect of time, $F(2,144) = 11.64, p < 0.001, \eta_p^2 = 0.14$, however there was no significant group by time effect, $F(2,144) = 0.043, p = 0.96, \eta_p^2 = 0.001$. Figure 5.3 shows that both the experimental and control conditions displayed a similar pattern in their physiological reaction. Although the experimental group exhibited a heightened response in comparison to the control group there was no significant difference in this reaction, indicating that manipulating individual's metacognitive beliefs did not impact physiological reactions.

Figure 5.3. Study 3 Galvanic Skin Response Over Time



5.5. Discussion

The current study aimed to investigate the effects of negative metacognitive beliefs on stress responses, specifically the belief that negative thoughts could cause an aversive event (burst of white noise). The primary hypothesis was that individuals assigned to the experimental group, where negative meta-beliefs were enhanced, would experience a greater immediate reaction to stress and/or delayed recovery from stress in comparison to a control condition where the aversive event was believed to be random.

In line with our hypotheses, the experimental condition exhibited an immediate increase in negative affect after the experimental manipulation and also experienced greater negative affect during the recovery period. In addition, the experimental group also experienced less positive affect after the experimental manipulation and continued to exhibit decreased levels of positive affect following stress exposure and the recovery period. The results indicate that manipulating individuals' beliefs about thoughts has an impact on subjective reaction to stress, but it did not significantly impact physiological measures.

According to the metacognitive model (Wells & Matthews, 1996) an individual's positive and negative metacognitive beliefs can impact on responses to thoughts and influence symptoms and emotions. In particular, individuals who believe that thoughts are important and have power to prevent or cause negative outcomes are more likely to engage in extended mental regulation strategies that lead to greater entanglement with stress-related cognitions. Thus, the results of the study support the application of the S-REF model to understanding stress reactions by providing further experimental evidence that negative metacognitive beliefs impinge on emotional reactions to stress by immediately amplifying and also prolonging negative emotions. These results also extend previous findings by Palmier-Claus, Dunn, Morrison and Lewis, (2011) who found that individuals at risk of developing psychosis who placed greater importance on controlling their thoughts experienced an increase in negative

affect in response to stress. Additionally, Myers and Wells (2013) manipulated negative metacognitive beliefs in individuals with high and low obsessions and found that those with high obsessions assigned to the experimental group had greater discomfort and spent more time thinking about a target thought than the high obsession control group.

The present results appeared in the domain of self-report outcomes rather than physiological indices. This may reflect technical anomalies in using the physiological measure or may reflect the sensitivity of the self-report measures to demand characteristics of the study. However, it may be that self-report and physiological indices of distress react differently to metacognitive manipulations.

Should the results be replicated the observed effects have potential clinical implications, such that interventions aimed at reducing stress reactivity and enhancing recovery ('bouncing back') might focus on implementing techniques that challenge metacognitive beliefs. Metacognitive theory posits that it is not the content of individual's thoughts that cause disorder but that emotional disorders are caused by metacognitive beliefs that propagate maladaptive thinking styles that lock individuals into prolonged and recurrent states of negative self-relevant processing (Wells, 2009). However, some current psychological approaches reinforce the belief that thoughts are harmful. For example, an implicit message in cognitive behavioral therapy (CBT) is that negative thoughts can cause mental health problems. The study results support the notion that metacognitive knowledge is involved in psychological vulnerability to stress as it manifests in emotional reactivity, and by implication such metacognitions could also, in the correct form, confer psychological resilience, as predicted by Wells and Matthews (1996).

The study has a number of limitations. As the study was conducted on undergraduate students, it is not appropriate to generalize the results to a wider population. Future research could focus on expanding the paradigm to examine the effects in other populations, especially

clinical patients. As the results of the study required the use of multiple t-tests and a Bonferroni correction was applied there was an increased chance of forcing a type 2 error, thus the results should be interpreted with caution. An additional limitation was that we did not evaluate the type of process individuals used during the recovery period so we lack information on the mediators of the effect of metacognition on emotional outcomes. One could speculate that because individuals in the experimental condition believed negative thoughts were more important than others that they were engaging in maladaptive coping strategies that maintain the CAS such as rumination, thus prolonging their negative emotional response. However, further studies are needed to examine this and future studies could replicate the study and examine the recovery period and its relationship to the cognitive-attentional syndrome.

In summary, the study aimed to evaluate if manipulating metacognitive beliefs has an effect on stress recovery. We found evidence that increasing metacognitions about the importance of stress-related thoughts led to an increase in stress symptoms following stress-exposure. Individual differences in metacognitions appear to be linked to the profile of stress responses and recovery as predicted by the metacognitive model.

6. Chapter 6: Psychometric Properties of the Detached Mindfulness Questionnaire in a Non-Clinical Sample

Lora Capobianco & Adrian Wells

Author Note

Miss Lora Capobianco, School of Psychological Sciences, University of Manchester, Hons BA; & Professor Adrian Wells, School of Psychological Sciences, University of Manchester, & Manchester Mental Health and Social Care NHS Trust, PhD

Conflicts of Interest and Source of Funding: The study was conducted for partial completion of the first authors PhD, which was supervised by Professor Adrian Wells and funded by the Presidents Doctoral Scholar Award from the University of Manchester. The authors report no conflict of interest.

6.1. Abstract

Objective: Detached mindfulness (DM) is defined as a state of meta-awareness of thoughts coupled with disengagement of sustained processing of them and is an important construct that is central to the metacognitive model (Wells & Matthews, 1994). The detached mindfulness questionnaire (DMQ) was developed by Nassif and Wells (2007) to evaluate this construct however it has not yet been extensively validated in a non-clinical sample. Thus, the aim of this study was to validate the DMQ and evaluate the psychometric properties of the measure to add to the data currently available.

Methods: 150 participants from the University of Manchester completed the DMQ and metacognitions questionnaire-30, twice over a four week period.

Results: A confirmatory factor analysis confirmed a five factor solution for the detached mindfulness questionnaire, with fit indices indicating an acceptable to good fit. The scale demonstrated acceptable internal consistency and good convergent validity. All subscales except the uncontrollability/danger subscale demonstrated acceptable test-retest reliability

Conclusions: The results add to the previous findings regarding the properties of the DMQ, and further support that the DMQ appears to be a useful tool for evaluating components of detached mindfulness.

6.2. Introduction

The term mindfulness has a variety of definitions and can be used in different contexts. One application of mindfulness has been used with respect to different learning styles where it has been associated with metacognitive monitoring of thinking (Salomon & Globerson, 1987). In psychopathology, Kabat-Zinn the founder of Mindfulness Based Stress Reduction defines mindfulness as “paying attention in a particular way: on purpose, in the present moment, and non-judgmentally” (Kabat-Zinn, 1994, p 4.). Operationalised in this way, mindfulness is a description of non-judgemental focusing but it lacks any kind of theoretical underpinnings of the process, a factor that limits its psychological development. An alternative description of mindfulness has been presented by Wells and Matthews (1994) in their information-processing model of psychological disorder. They view mindfulness more specifically as a way to develop adaptive metacognitive monitoring and control over internal processes (Wells & Matthews, 1994, 1996; Wells, 2000).

Wells & Matthews (1994, 1996) described a useful state of processing that they termed ‘detached mindfulness’. They further suggest that detached mindfulness, a theory-based technique, was developed within the context of the self-regulatory executive function (S-REF) model of emotional disorder. According to the S-REF theory psychological disorders are linked to the activation of a type of maladaptive coping style called the cognitive attentional syndrome (CAS), which becomes activated in response to negative thoughts. The CAS is dominated by maladaptive coping strategies such as worry, rumination, and threat monitoring which maintains emotional distress.

Wells and Matthews (1994) proposed a beneficial therapeutic strategy should be if individuals could learn to distance themselves from negative thoughts and suspend sustained conceptual processing and coping efforts. Such a state was considered to have a beneficial impact on multiple levels in the cognitive system including the modification of metacognitive

knowledge and strengthening executive control of processing. Detached mindfulness (DM) is a technique that can modify an individual's style of thinking and the relationship one has with their thoughts (Wells, 2005a). DM is a form of inner-awareness consisting of objective awareness of thoughts and the exercising of control over extended goal directed processing such as worry and rumination.

Although DM and traditional mindfulness may have some overlapping features the nature of these processes and underlying mechanisms appear to differ in important respects. Meta-awareness is a concept common to both DM and mindfulness however in mindfulness meta-awareness is used to become aware of attention, whereas in DM meta-awareness is used more specifically to become aware of spontaneous negative thoughts (Wells et al., 2008). Furthermore, mindfulness deals with judgements of events by instructing individuals to focus on the breath and to use it as an anchor for returning to present moment experiences. However, DM instructs individuals to disengage any further action or processing in response to thoughts, in effect to leave the thought alone, it does not do this by re-focusing of attention, which would be considered as a further 'reaction' to thoughts (Wells, 2005a)

A measure of detached mindfulness, the Detached Mindfulness Questionnaire (DMQ), was originally developed by Nassif and Wells (2007). The DMQ is a 22-item measure consisting of five key characteristics of detached mindfulness previously described by Wells (2005a): (1) meta-awareness; (2) cognitive decentering (3) attentional detachment (4) low conceptual processing, and (5) low goal directed coping. Meta-awareness is the ability to be aware of and conscious of thoughts. Cognitive decentering is the ability to see thoughts as merely an event in the mind that is separate from reality. Attentional detachment is the ability to flexibly move attention between different events so that it is not anchored to any one event. DM involves low conceptual processing meaning that one can suspend the use of analytical and perseverative forms of thinking, and finally DM also involves low goal directed coping

such that one does not aim to avoid or remove thoughts. The initial evaluation of the DMQ demonstrated acceptable reliability and internal consistency (Nassif, 2009) but replication of the factor structure and data on subscale stability over time needs to be established

As the DMQ has not been fully validated in a non-clinical sample, the purpose of this study was to validate the DMQ in a non-clinical sample and to further evaluate the psychometric properties of the measure, specifically the construct validity of the 5-factor structure and the retest reliability were tested alongside internal reliability and convergent validity.

6.3. Methods

6.3.1. Design

The design of the study was longitudinal. Participants completed the questionnaire three times, with four weeks between each time point. Ethical approval was obtained from the University of Manchester Research Ethics Committee (Ref 15286; Committee No. 1).

6.3.2. Participants

Data was collected from 150 participants at the University of Manchester. There were 30 males and 120 females, the mean age was 23 (ranging from: 18-38, SD = 4.57).

6.3.3. Procedure

The study was advertised on the University of Manchester web server for students and staff to complete. The study was also advertised on an online recruitment system, which allows University of Manchester students to receive course credit for participating in experiments.

6.3.4. Measures

Detached Mindfulness Questionnaire (DMQ; Nassif & Wells, 2007). The detached mindfulness questionnaire consists of 22 items that evaluates five facets of detached mindfulness: meta-awareness, attention flexibility, detachment/observing self, thought control, and cognitive decentering. Items are rated using a Likert scale ranging from 1 (Disagree) to 5 (Agree), except for items 16 and 20 from the thought control subscale, where these items are reverse scored. High scores on the subscales are considered to be adaptive while low scores are considered to be maladaptive. For example, a high score on the thought control subscale is indicative of low levels of suppression of thoughts. Preliminary analyses of the DMQ demonstrate that the questionnaire has good internal consistency. Nassif (2009) reported the following Cronbach's alpha's for the subscales: meta-awareness = 0.61, attention flexibility = 0.69, detachment/observing self = 0.82, thought control = 0.58 and cognitive decentering = 0.69.

Metacognitions Questionnaire-30 (MCQ-30; Wells & Cartwright-Hatton, 2004). The MCQ-30 is the short form the of Metacognitions questionnaire. The 30-item measure uses a four point Likert scale with responses ranging from 1 (do not agree) to 4 (agree very much). The questionnaire assesses five constructs: positive metacognitive beliefs about worry, negative metacognitive beliefs about uncontrollability and danger, cognitive confidence, cognitive self-consciousness and need for control. The MCQ-30 has demonstrated good internal consistency and convergent validity. Alpha reliabilities for the subscales are: cognitive confidence ($\alpha = 0.93$), positive beliefs ($\alpha = 0.92$), Cognitive self-consciousness ($\alpha = 0.92$), Uncontrollability and danger ($\alpha = 0.91$), and need to control thoughts ($\alpha = 0.72$). All subscales except the uncontrollability/danger subscale demonstrated acceptable test-retest reliability. Test-retest

reliability values between 0.7-0.9 are deemed acceptable (Streiner & Norman, 2003). Re-test coefficients for the subscales were: cognitive confidence = 0.69, positive beliefs = 0.79, cognitive self - consciousness = 0.87, uncontrollability/danger = 0.59, and need for control = 0.74 (Wells, & Cartwright-Hatton, 2004).

6.3.5. Analysis Plan

AMOS for SPSS version 22 was used to conduct Confirmatory Factor Analysis (CFA) using the Maximum Likelihood (MH) method. Factor loadings for the first item of each latent variable were constrained to 1.0 while all other items were able to vary freely.

6.4. Results

Scale descriptive statistics are displayed in Table 6.1. The means for scale subscales were comparable to those obtained by Nassif (2009).

Table 6.1. Means with standard deviations in parentheses, Subscale Correlations and Cronbach's Alpha of the DMQ.

| | Total Sample (n = 150) M(SD) | 95% Confidence Interval (Total sample) | | Male (n = 30) M(SD) | Female (n = 120) M(SD) | 1 Month Follow Up Total Sample M(SD) | Cronbach's Alpha T1 | Cronbach's Alpha T2 | Test Retest Coefficient (4 week interval) |
|-----------------------|------------------------------------|--|-------------|---------------------------|------------------------------|--|---------------------|---------------------|--|
| | | Lower Bound | Upper Bound | | | | | | |
| Detachment | 15.69 (4.17) | 15.02 | 16.37 | 16.37 (4.50) | 15.53 (4.09) | 16.05 (4.44) | 0.84 | 0.89 | 0.69** |
| Meta-Awareness | 11.87 (2.12) | 11.53 | 12.22 | 11.90 (2.12) | 11.87 (2.13) | 11.49 (4.72) | 0.67 | 0.70 | 0.64** |
| Thought Control | 12.71 (3.03) | 12.22 | 13.20 | 12.67 (3.23) | 12.73 (2.99) | 13.18 (2.75) | 0.63 | 0.57 | 0.64** |
| Attention Flexibility | 16.43 (3.75) | 15.82 | 17.03 | 17.07 (3.31) | 16.27 (3.85) | 16.08 (3.82) | 0.68 | 0.75 | 0.66** |
| Cognitive Decentering | 19.54 (2.85) | 19.08 | 20.00 | 19.60 (2.72) | 19.53 (2.90) | 19.27 (3.24) | 0.61 | 0.76 | 0.54** |

Note: M = Mean; SD = standard deviation; ** significant at 0.01 level

6.4.1. Gender Differences

Descriptive statistics are presented in Table 6.1. Independent samples t-test with Bonferroni correction were conducted to evaluate gender differences. After Bonferroni adjustments the critical alpha was set at 0.01 (0.05 divided by 5). There were no significant differences between gender at this level.

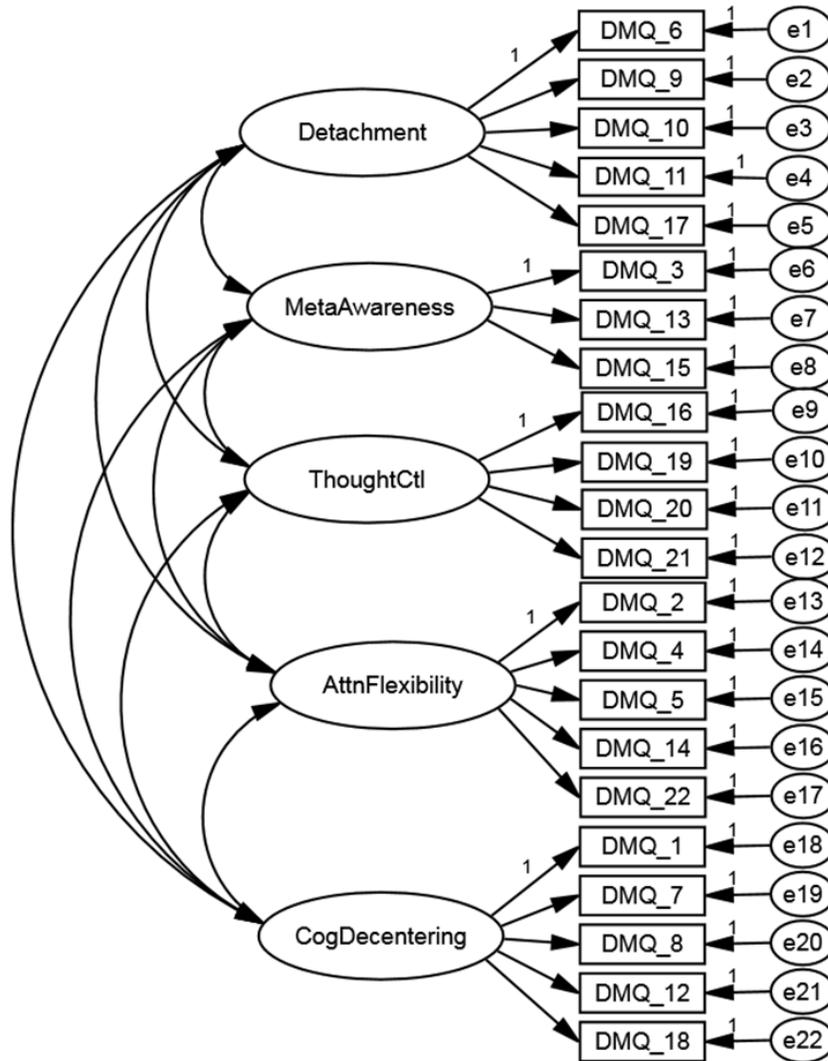
6.4.2. Construct Validity

Confirmatory factor analysis (CFA) using SPSS AMOS version 22 was run to confirm the five factor latent structure underlying the DMQ items using maximum likelihood. The five factors of the CFA are: Detachment, Meta-Awareness, Thought Control, Attention Flexibility, and Cognitive Decentering.

The initial model for CFA is shown in Figure 6.1. The Chi-square statistic was significant, $\chi^2(199) = 386.58$, $p < 0.001$, suggesting that the five-factor model did not fit the data. However, we examined a range of fit indices to determine if the model was comparable to that obtained previously by Nassif and Wells. The first fit index used was the ratio between the chi square value and the degrees of freedom. Bollen (1989) suggests that if dividing the χ^2 value by the degrees of freedom (df) yields a value less than two then the model has acceptable fit. Using this criterion the value is 1.94 in the present data ($386.58/199 = 1.94$) indicating an acceptable fit. Four additional fit indices were used to evaluate model fit: the Goodness of Fit Index (GFI) which indicates that a model has good fit with a value close to 1 (Hu & Bentler, 1995), Parsimony Goodness of Fit Index (PGFI) which takes into account model complexity, indicates good model fit with a value of 0.5 (Mulaik, James, Van Alstine, Bennett, Lind, Stilwell, 1989), Root Mean Square Error of Approximation (RMSEA) which indicates 0.06 is the critical value for close fit, and the Comparative Fit Index (CFI) which suggests that a value of above 0.95 would indicate good fit. Values for the corresponding fit

indices are presented in table 6.2, however the fit indices for the model in Figure 6.1 suggest that further adjustments were needed.

Figure 6.1. Confirmatory Factor Analysis without correlated errors for the DMQ.



Note: e = error, ThoughtCtl = Thought Control, AttnFlexibility = Attention Flexibility, CogDecentering = Cognitive Decentering

Based on modification indices correlated errors were required for the following items 1, 15, 7, 22, 8, 16, 8, 22, 13 and 21. This improved model fit indices (Table 6.2) so that all indices were either acceptable or good however the chi square statistic remained significant, $\chi^2(193) = 299.22, p < 0.001$. The revised model based on modification indices is displayed in Figure 6.2.

Table 6.2. Confirmatory Factor Analyses Fit Indices

| | DMQ CFA no Correlated Errors | DMQ CFA with Correlated Errors |
|---------------------|---------------------------------|-----------------------------------|
| Chi Square Value | 386.58 | 299.22 |
| df | 199 | 193 |
| p value | <0.001 | <0.001 |
| Chi Square:df ratio | 1.94 | 1.55 |
| GFI | 0.82 | 0.86 |
| PGFI | 0.64 | 0.65 |
| RMSEA | 0.08 | 0.06 |
| CFI | 0.79 | 0.88 |

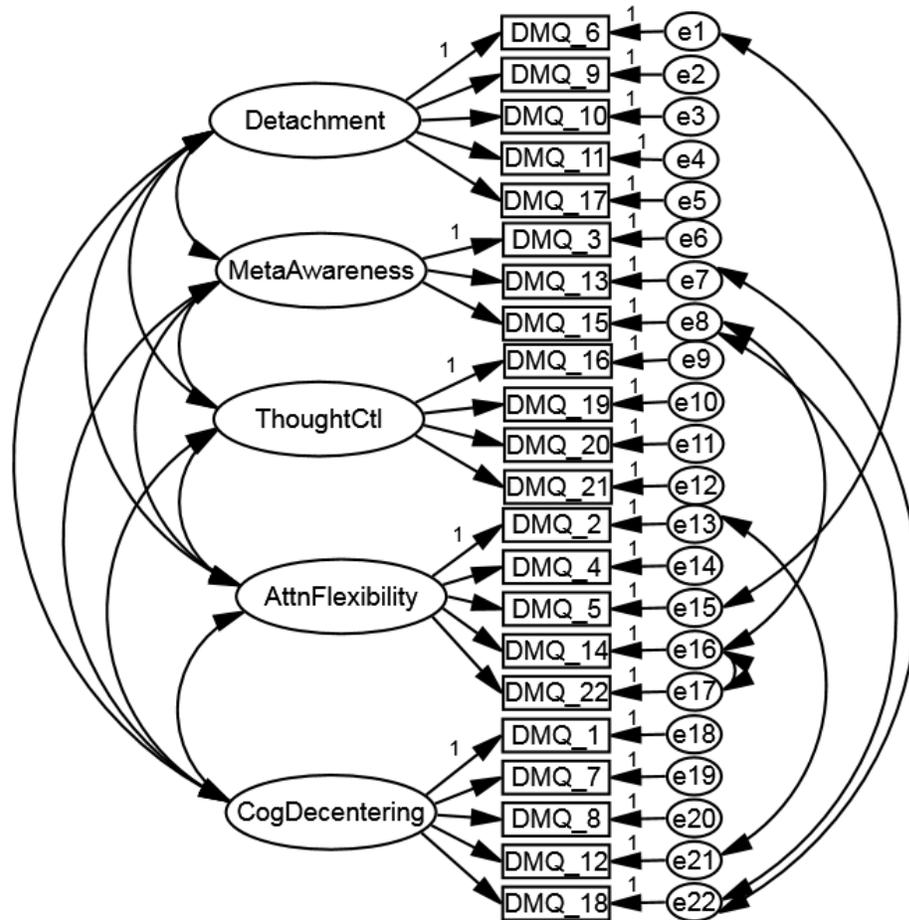
Note: GFI = Goodness of Fit Index, PGFI = Parsimony Goodness of Fit Index, RMSEA = Root Mean Square Error of Approximation, CFI = Comparative Fit Index

6.4.3. Internal Consistency

Corrected item-total correlations for each subscale were as follows: Detachment (0.50-0.73), Meta-Awareness (0.45-0.59), Thought Control (0.29-0.61), Attention Flexibility (0.31-0.55), and Cognitive Decentering (0.18-0.52). This demonstrates that each item is associated with the corresponding subscale. Although the cognitive decentering subscale had one item scoring 0.18, when these correlations were re-tested at time 2 the item-total correlations were (0.30-0.66). Thus, all subscales were above the minimum value of 0.2 (Kline, 1986)

Cronbach's alpha was computed for each subscale and these scores are shown in Table 6.1 and ranged from 0.61-0.84 at time 1 and 0.57-0.89 at time 2 demonstrating poor to acceptable internal consistency.

Figure 6.2. Confirmatory Factor Analysis with correlated errors for the DMQ.



Note: e = error, ThoughtCtl = Thought Control, AttnFlexibility = Attention Flexibility, CogDecentering = Cognitive Decentering

6.4.4. Stability of Subscales

Repeated measures t-tests were used to evaluate the differences between subscales over time. Analyses revealed that there was a significant decrease in meta-awareness (mean T1 = 11.87, SD = 2.12, mean T2 = 11.49, SD = 2.17; $t(149) = 2.61$, $p = 0.01$) and a significant increase in adaptive thought control, meaning there was a reduction in thought suppression (mean T1 = 12.71, SD = 3.03, mean T2 = 13.19, SD = 2.75; $t(149) = -2.34$, $p = 0.02$) however neither of these significant effects remained after the Bonferroni correction was applied. Pearson re-test correlations were calculated for each subscale and demonstrated low to mediocre stability over time. The correlations for each subscale were: detachment = 0.69 ($p < 0.01$), meta-awareness = 0.64 ($p < 0.01$), thought control = 0.64 ($p < 0.01$), attention flexibility = 0.66 ($p < 0.01$), and cognitive decentring = 0.54 ($p < 0.01$). The cognitive decentring subscale had poor test-retest reliability, suggesting that this subscale may be less stable over time and could reflect a more state-like construct.

6.4.5. Convergent Validity

Table 6.3 provides the Pearson correlations which were run to examine the associations between the DMQ and related constructs as measured by the MCQ-30. The relationships between detached mindfulness and metacognitive beliefs include positive and negative associations. The largest correlation was between attention flexibility and negative metacognitive beliefs about uncontrollability and danger or worry ($r = -0.56$). The negative coefficient means that stronger beliefs about the uncontrollability and dangerousness of worry are associated with lower attention flexibility. Pearson's correlations revealed no significant correlations between the DMQ subscales and the MCQ-positive metacognitive beliefs about worry subscale. However, all subscales except meta-awareness had a significant negative correlation with negative metacognitive beliefs. Meta-awareness and attention flexibility

negatively correlated with the cognitive confidence subscale. The cognitive confidence subscale of the MCQ is negatively scored which means that as attention flexibility increases cognitive confidence increases. Thought control, attention flexibility and cognitive decentering significantly correlated with cognitive self consciousness. Finally, meta-awareness and thought control positively correlated with the need for control. The results are comparable to those found by Nassif (2009) and support consistency in relationships between DMQ subscales and meaningfully related constructs.

Table 6.3. Convergent Validity of the DMQ and MCQ-30.

| | MCQ-Pos | MCQ-Neg | MCQ-CogConf | MCQ-SelfConsc | MCQ-Needcont |
|-----------------------|---------|----------|-------------|---------------|--------------|
| Detachment | -0.079 | -0.214** | -0.099 | -0.005 | -0.013 |
| Meta-Awareness | 0.063 | -0.073 | -0.236** | 0.086 | 0.379** |
| Thought Control | -0.124 | -0.275** | 0.051 | -0.364** | -0.274** |
| Attention Flexibility | -0.102 | -0.560** | -0.164* | -0.264** | -0.139 |
| Cognitive Decentering | 0.00 | -0.363** | -0.078 | -0.187* | -0.014 |

Note: MCQ = Metacognitions Questionnaire; MCQ-pos = positive metacognitive beliefs about worry; MCQ-Neg = negative metacognitive beliefs about worry and uncontrollability; MCQ-CogConf = Cognitive Confidence; MCQ-SelfConsc = Cognitive Self-Consciousness; MCQ-Needcont = Need for Control, * $p < 0.05$, ** $p < 0.01$

6.5. Discussion

The aim of this study was to further evaluate the psychometric properties of the detached mindfulness questionnaire in a non-clinical sample. The DMQ appears to be a potentially useful tool for evaluating multiple dimensions of detached mindfulness.

However, confirmatory factor analysis did not produce exemplary findings for the five-factor model. A range of fit indices suggested a reasonable fit and did replicate the results reported previously (Nassif, 2009). The five-factor structure requires further testing and

refinement in a larger sample.

All subscales demonstrated acceptable internal consistency based on item-total correlations. Although the cognitive decentering subscale showed one item with a value below the cutoff of 0.2, when this was re-tested at time 2 it provided an acceptable value. Cronbach's alpha was used to evaluate internal consistency and demonstrated poor to good internal consistency at time 1, while at time 2 all subscales demonstrated acceptable to good internal consistency except for the attention flexibility subscale which decreased on this parameter. As demonstrated in table 6.1 at time 1 four subscales (meta-awareness, thought control, attention flexibility, and cognitive decentering) failed to reach an alpha value of 0.7, which has been noted as the minimum value for an acceptable alpha value (Nunnally, 1978). Alpha values were re-tested at time 2 which resulted in acceptable alpha values for all subscales except the thought control subscale. The increase in alpha values may be due to a practice effects resulting in greater consistency. There are various sources for low alpha values which may include poor associations between items on the subscales or low number of items on the subscales (Tavakol & Dennick, 2011). In addition, the low alpha values may be a result of the fact that the concepts being evaluated are unusual and not readily understood and will need to be considered for future refinements to the questionnaire. Retest coefficients showed some variability over time and suggest that the measure may be influenced by environmental factors or by the effects of repeated administration, further work needs to be undertaken to establish the stability of the construct, but it may be assumed that there is modest short-term stability. More specifically, the attention flexibility, cognitive decentering, and detachment subscales remained the most stable over the retest interval, however the meta-awareness subscale demonstrated a significant decrease over the 1 month retest interval and the thought control subscale demonstrated a significant increase over the 1 month retest interval. Retest correlations showed that four subscales were moderately stable over time, with cognitive

decentering demonstrating the lowest level of stability.

To evaluate the DMQ's convergent validity, correlational analyses were run between the MCQ-30, as it measures converging theoretical constructs. The strongest correlation was between DMQ-attention flexibility and MCQ-negative metacognitive beliefs about uncontrollability and danger of worry. This relationship is likely to be strong because individuals who have beliefs that they have limited control over thinking are more likely to experience their attention as constrained and also under reduced conscious control. Overall, the correlations between the DMQ and MCQ were acceptable and demonstrate meaningful relationships between the constructs.

The DMQ-thought control subscale differs from the other subscales. In this study we reverse scored items 16 and 20 in comparison to the original study conducted by Nassif (2009). We believe that going forward this is the optimal way to score the scale this scoring indicates that a high score is adaptive indicating low levels of suppression whereas low scores are maladaptive indicating increased use of thought suppression. Thus, it is not useful to calculate a sum score for the instrument unless items 16 and 20 are reverse scored as it would alter the interpretation of the scale.

The DMQ requires further validation in additional populations; however preliminary analyses suggest that the questionnaire can be used to assess dimensions of detached mindfulness. Future studies should assess the ability of the scale to predict symptoms of anxiety and depression. We were unable to assess in detail any gender differences in factor structure due to the relatively small number of males in this study (n=30). This is an area for future research. Additionally, future studies should compare the DMQ to mindfulness questionnaires in order to further distinguish between the constructs of mindfulness as used in meditation therapy and detached mindfulness.

7. Chapter 7: A Prospective Cohort Study of the Metacognitive Predictors of Bouncing Back From Stress

Lora Capobianco, Anthony P. Morrison, and Adrian Wells

University of Manchester

Author Note

Lora Capobianco, School of Psychological Sciences, University of Manchester; Tony Morrison, School of Psychological Sciences, University of Manchester; Adrian Wells, School of Psychological Sciences, University of Manchester

Correspondence concerning this article should be addressed to Adrian Wells, School of Psychological Sciences, University of Manchester, Manchester, UK, M13 9PL. Email:

Adrian.wells@manchester.ac.uk

Conflicts of Interest and Source of Funding: The study was conducted for partial completion of the first authors PhD, which was supervised by Professor Adrian Wells and funded by the Presidents Doctoral Scholar Award from the University of Manchester. The authors report no conflict of interest.

7.1. Abstract

Stress exposure can range from everyday hassles to a traumatic event. However, irrespective of the number or type of stressors that individuals experience some people are resilient in the face of stress while others are not. Few studies have examined the internal processes that may underlie resilience. One promising perspective suggested by the Wells and Matthews (1994) model may be to examine the role of metacognition in resilience. Based on this model we tested the hypothesis that specific metacognitions will impair or enhance bouncing back after stress. One-hundred and fifty (n=150) undergraduate and postgraduate students completed a questionnaire battery three times over a two-month period. Regression analyses demonstrated that two domains of metacognition: negative beliefs concerning uncontrollability and danger of worry and detachment were predictive of resilience, such that increased negative metacognitive beliefs were associated with decreased resilience while greater detachment was associated with increased resilience, this was found both cross-sectionally and longitudinally. Negative metacognitive belief regarding uncontrollability and danger of worry was predictive of psychological distress two months after initial assessment and individuals with greater detachment were more likely to recover from anxiety and depression. Thus, metacognition appears to play a role in psychological resilience to stress.

Keywords: Metacognition, Resilience, Stress, Recovery

7.2. Introduction

Experiencing stress is common and can range from an everyday stressor or hassle to a major life event. The recent Labour Force Survey (LFS) highlighted that in 2014/15 stress accounted for 43% of all working days lost due to ill health (Health and Safety Executive [HSE], 2015). Irrespective of the type of stressor, some individuals do not cope well with stress which can result in psychological disorder such as anxiety or depression. However, for individuals who do manage to cope well questions remain concerning the factors that make them better able to cope and be more resilient to stress than others.

The concept of resilience is complex and has resulted in various definitions and models for understanding it. For example, resilience has been defined as, “the ability to maintain a stable, healthy level of psychological and physical functioning” (Bonnano, 2004), a dynamic process involving positive adaptation to adversity (Luthar et al., 2000), and as a personality trait that encompasses an individual’s ability to adapt to their external environment (Block & Kremen, 1996). However, another approach to defining resilience and the one used in the current study is through its most basic definition, which is: “to bounce or spring back” from adversity and stressful events (“Resilience”, 2010).

The complexity surrounding resilience is further compounded by a lack of theoretical consensus. Block and Block (1980) operationalize resilience as a personality trait stating that ego-resiliency is the result of a set of traits that reflects an individual’s resourcefulness and ability to flexibly respond to environmental circumstances. However, other theories focus on a range of protective factors that enable individuals to have a healthy adaptational profile in comparison to individuals who are less well adjusted. Researchers have argued that protective factors such as dispositional attitudes, family support, and external support systems are important factors in characterizing an individual as resilient (Garmezy, 1993; Rutter, 1990; Werner, 1989, 1993).

Although previous research has focused on resilience as a personality trait and the protective factors that may confer resilience, more recent research has begun to focus on the processes through which individuals are able to adapt or bounce back from stress or trauma (Luthar et al., 2000). As highlighted by Rutter (2006) resilience may derive from what people do in order to deal with adversity, such as their coping mechanisms, and emphasizes that resilience should examine dynamic processes rather than risk and protective factors. Recently, the role of cognitive processes such as attention have been investigated in resilience. Thoern, Grueschow, Ehlert, Ruff, & Kleim (2016) found that individuals with a greater attentional bias towards positive stimuli had greater trait resilience. Previous research has also supported the notion that an attentional bias towards positive stimuli is associated with adaptive stress responses and less psychopathology (Johnson, 2009; Joormann, Talbot, Gotlib, 2007).

One theory that may provide a more comprehensive approach to understanding resilience is the Metacognitive Model (MCM; Wells, 2009) which has grown out of the Self-Regulatory Executive Function (S-REF) model originally articulated by Wells & Matthews (1994, 1996). The model offers specific implications for understanding resilience to stress. According to the MCM prolonged psychological distress is associated with the activation of a style of thinking called the cognitive attentional syndrome (CAS). The CAS is a state of prolonged negative thinking in which the individual uses thinking styles of worry, rumination, focusing on threat, and other similarly paradoxical coping strategies that cause a prolongation of distress. The CAS is hypothesized to result from metacognitions which exist in the form of knowledge, experiences, and strategies. Such components direct attention, determine thinking style and coping responses in response to stress (Wells, 2009). Metacognitive knowledge refers to the beliefs that individuals hold about their thinking and can be further categorized into positive and negative metacognitive beliefs. Positive metacognitive beliefs concern the usefulness of cognitive activities that lead to the CAS, such as; “If I worry, I’ll be prepared”,

while negative metacognitive beliefs concern the uncontrollability, dangerousness and importance of thoughts, for example; “I cannot control my thoughts,” which are likely to impact on the perseveration of worrying. Metacognitive strategies also play an important role in prolonged distress, as some strategies backfire, produce paradoxical effects and extend negative processing. Take for instance worrying as a means of anticipating and avoiding future problems, this strategy prolongs the perception of threat. Then there are the metacognitive experiences of misinterpreting negative thoughts (e.g., worry about worry) and not engaging effort in mental control. Taken together, the model provides an understanding of a range of factors that prolong distress and of those that are likely to aid in understanding the processes that increase the ability to “bounce back.”

A growing number of studies have found that the metacognitions predicted by the MCM are associated with anxiety and depression (Huntley & Fisher, 2016; Hjemdal, Stiles & Wells, 2013; O’Carroll & Fisher, 2013; Yilmaz, Gencöz, & Wells, 2011). For example, Halvorsen et al. (2015) used discriminant analysis to compare metacognitions and thought control strategies in individuals who were currently depressed, previously depressed, and those who had never been depressed. Individuals who were currently depressed had greater negative metacognitive beliefs about uncontrollability and danger and greater use of worry, rumination and punishment than individuals who were previously depressed or never depressed. Additionally, individuals who were previously depressed and never depressed could be distinguished on the basis of their thought control strategies whereby previously depressed individuals had greater use of reappraisal while individuals who had never been depressed had greater use of distraction. The role of metacognition also impacts health anxiety, where for example, Bailey and Wells (2016) found that beliefs that thoughts are uncontrollable and beliefs about biased thinking prospectively predicted health anxiety symptoms.

Metacognitions have also been shown to prospectively predict traumatic stress symptoms

(Holeva, Tarrier & Wells, 2001; Roussis & Wells, 2008) and anxiety and depression (Yilmaz, Gencöz, & Wells, 2011).

Apart from metacognitive beliefs, a further construct related to metacognition that should be of additional importance in understanding mechanisms of resilience was described by Wells and Matthews (1994, 1996) and is termed 'detached mindfulness'. Detached Mindfulness (DM) is the manner in which an individual relates to his or her cognition. It has two components; *mindfulness* which means being aware of inner thoughts and *detachment* which means refraining from further processing or coping efforts linked to a thought. In effect DM is a state of processing that is the opposite of the CAS and therefore the ability to activate this state should confer greater resilience.

Following from the MCM and the results demonstrating an effect of metacognitions on stress symptoms we hypothesized that metacognitions would be prospective predictors of psychological resilience. However, metacognition is a multi-component factor and we were interested to determine for the first time which domains could be involved. A strength of the approach we adopted is that we could base the multidimensional assessment around two measures that tap metacognitions centrally implicated in the MCM; beliefs and DM. We hypothesized that metacognitive beliefs would negatively predict resilience and that DM would positively predict resilience. We also predicted that these factors would show similar relationships with clinically reliable changes in anxiety and depression.

7.3. Methods

7.3.1. Participants

Participants were recruited from the University of Manchester using an online recruitment system. Undergraduate participants were offered course credit in exchange for their participation for participating in experiments. A total of 150 undergraduate and postgraduate students (120 women, 30 men) participated in the study. The statistical program G*power (Faul, Erdfelder, Lang, & Buchner, 2007) was used to calculate the required sample size based on an effect size of 0.3 and power of 0.95. The effect size was calculated using Cohen's (1988) f^2 statistic which is a measure of effect size for analyses such as an ANOVA or a multiple regression. The f^2 statistic is calculated using the formula: $f^2 = R^2 / 1 - R^2$. The R^2 values were obtained from Smith, Tooley, Christopher, & Kay (2010) who examined resilience, as measured by the Brief Resilience Scale, in predicting health-related measures, as measured by the PANAS and PHQ-15. Both the PANAS and PHQ-15 are measures of health related variables and although neither are used in our study we will be evaluating health related variables and deemed this appropriate to base our sample size on. The power calculation resulted in a sample size of 115 participants, assuming an approximate 20% drop out rate we aimed for a total sample size of 140 participants. Participants age ranged from 18 to 38 ($M = 23.01$, $SD = 4.57$). The study was approved by the University of Manchester Research Ethics Committee no. 1 (ref 15286), prior to starting the study.

7.3.2. Measures

7.3.3. Primary Dependent Variable

Brief Resilience Scale (BRS; Smith et al., 2008). The BRS is a measure of resilience as the ability to bounce back from stress. The items are scored on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Three items are positively worded (items 1, 3, and 5; e.g., “*It does not take me long to recover from a stressful event*”) while three items are negatively worded (items 2, 4, 6; e.g., “*It is hard for me to snap back when something bad happens*”). Items 2, 4, and 6 are reverse scored. The scale demonstrates good internal consistency with Cronbach’s alpha for the scale ranging between .80–.91, additionally the scale has good test-retest reliability between 0.62 and 0.69 (Smith et al., 2008).

7.3.4. Secondary Outcome Measures

Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). The Hospital Anxiety and Depression scale is a 14-item measure of anxiety and depression symptoms. The scale consists of two subscales: anxiety and depression, which are scored using a four-point Likert Scale from 0 to 3, with higher scores indicating greater levels of anxiety and depression. Both subscales demonstrate good internal consistency, with alpha reliabilities of 0.80 for anxiety and 0.81 for depression (Bjelland, Dahl, Haug, Neckelmann, 2002). The scale demonstrates good reliability and validity (Bjelland et al., 2002; Hermann, 1997).

Inventory of College Students’ Recent Life Experiences (ICSRLE; Kohn, Lafreniere, & Gurevich, 1990). The ICSRLE is a 49 item measure that assesses everyday stressors. The scale has seven subscales: developmental challenge, time pressure, academic alienation, romantic problems, assorted annoyances, general social mistreatment, and friendship problems. Items

are scored using a four item Likert scale ranging from 1 (not at all part of my life) to 4 (very much part of my life). Alpha reliabilities for the full scale are reported based on gender, 0.88 for males and 0.89 for females (Kohn, Lafreniere, & Gurevich, 1990).

Meta-cognitions Questionnaire 30 (MCQ-30; Wells & Cartwright-Hatton, 2004). The MCQ-30 assesses metacognitive beliefs and processes involved in the maintenance of psychological disorders. The scale has five subscales: positive metacognitive beliefs about worry (e.g., Worrying helps me to solve problems), negative metacognitive beliefs about uncontrollability and danger (e.g., “When I start worrying, I cannot stop”), cognitive confidence (e.g., “My memory can mislead me at times”), cognitive self-consciousness (e.g., “I pay close attention to the way my mind works”) and need for control (e.g., “It is bad to think certain thoughts”). Responses are scored on a scale ranging from 1 (do not agree) to 4 (agree very much). The scale demonstrates good convergent validity, and acceptable test–retest reliability (Wells & Cartwright-Hatton, 2004; Spada, Mohiyeddini, & Wells, 2008; Yilmaz, Gencöz, & Wells, 2008). Wells & Cartwright-Hatton (2004) demonstrated good internal consistency for the subscales reporting the following Cronbach’s alpha’s for the subscales: cognitive confidence = 0.93, positive beliefs = 0.92, cognitive self-consciousness = 0.92, negative beliefs regarding uncontrollability and danger = 0.91 and need to control thoughts = 0.72.

Thought Control Questionnaire (TCQ; Wells & Davies, 1994). The TCQ is a 30-item measure that assesses individual differences in thought control strategies. The scale has five subscales assessing different thought control strategies which include: distraction, worry, social control, punishment, and reappraisal. Items are scored using a four-point Likert scale ranging from 1 (never) to 4 (almost always). Analyses of the TCQ demonstrate that it has

good test-retest reliability ($r = 0.83$), and each subscale demonstrates acceptable-good internal consistency with alpha reliabilities of 0.72 for distraction, 0.71 for worry, 0.79 for social control, 0.64 for punishment, and 0.67 for re-appraisal (Wells & Davies, 1994), with similar internal consistency for subscales reported in Reynolds and Wells (1999).

Detached Mindfulness Questionnaire (DMQ; Nassif & Wells, 2007). The detached mindfulness questionnaire evaluates five aspects of detached mindfulness: meta-awareness, attention flexibility, detachment/observing self, thought control, and cognitive decentering. The 22-item measure is scored using a five point Likert scale ranging from 1 (Disagree) to 5 (Agree). Preliminary analyses of the DMQ demonstrate that it has good internal consistency. Cronbach's alpha's for the subscales are: meta-awareness = 0.61, attention flexibility = 0.69, detachment/observing self = 0.82, thought control = 0.58 and cognitive decentering = 0.69 (Nassif, 2009).

7.3.5. Procedure

After signing up for the study participants were sent a link to a web site (SelectSurvey.Net) containing the participant information sheet and consent form, after consenting to the study they were then able to access the questionnaires. The questionnaire battery was distributed three times within a two month period. A two month interval was selected as this has clinical relevance; within one month stress symptoms normally begin to decrease however if they persist longer it could be indicative of a chronic or delayed stress response (deRoos-Cassini, Mancini, Rusch, & Bonanno, 2010), therefore this interval allowed us to investigate the short and long term effects of stress within a meaningful clinical response pattern.

7.3.6. Data Analysis Plan

In order to examine which metacognitive factors (MCQ, TCQ or DMQ) predicted resilience (BRS) and symptoms of psychological distress (HADS total), bivariate Pearson correlations were run followed by linear regression analyses. Gender as well as daily stress exposures (ICSRLE), the latter at all time points were used as covariates in the regression models.

Further analyses were then conducted to examine the metacognitive factors that influence recovery from distress, we first categorized individuals based on their recovery by calculating change scores on the HADS total score from time 1 to time 3. In order to examine clinically significant change, a reliable change score was calculated based on Jacobson and Truax (1991) which indicated that individuals had to have changed by at least five points. In addition, participants had to be below the cut off score which was calculated to be 11 based on Criterion C outlined by Jacobson and Truax (1991). Normative data reported in Crawford, Henry, Crombie and Taylor (2001) was used to calculate the cut off score. Based on this individuals were classified to be either: recovered, indicating that they had made a reliable change and that they were below the cut off, no change, indicating that their scores between time 1 and time 3 did not change, or deteriorated, indicating that their changes in scores between time 1 and time 3 had reliably deteriorated and their score was above the cut off. Individuals who had made a reliable improvement but did not fall below the cut off score were also classified as recovered for purposes of analysis as only four participants fell into this category.

7.4. Results

7.4.1. Data Descriptives

150 participants completed the study at time 1, 138 participants completed the study at time 2, and 133 participants completed the study at time 3. Chi square analyses were conducted to evaluate differences between dropouts and completers on age and gender at time two and three which demonstrated no significant differences. To evaluate differences between drop outs and completers at time two and time three on predictor variables, t-test analyses were conducted which revealed no significant differences therefore indicating that there was no bias present in the data. As less than 10% of the data was missing, mean values were imputed for missing data. As these values were not missing at random, multiple imputation was not deemed appropriate. Means and standard deviations of the questionnaires at time 1, time 2, and time 3 are reported in Table 7.1. A one-way ANOVA explored any differences between genders at time 1, which demonstrated a significant difference between genders on two subscales of the TCQ. Females had greater social control ($M = 12.94$, $SD = 2.59$ versus $M = 11.80$, $SD = 2.30$), $F(1,148) = 4.58$, $p = 0.34$ and they also had greater use of worry ($M = 9.85$, $SD = 2.94$ versus $M = 8.57$, $SD = 2.88$), $F(1,148) = 4.60$, $p = 0.34$. Correlations between variables at time 1 are reported in Table 7.2, which revealed no substantial correlations ($r > 0.9$) indicating that there was no collinearity or problematic criterion overlap between the predictor variables.

Table 7.1. Study Characteristics: Means and Standard Deviations Across Time Points

| | Time 1 (n = 150) | Time 2 (n = 150) | Time 3 (n = 150) |
|--|---------------------|---------------------|---------------------|
| BRS, M(SD) | 3.21 (0.74) | 3.24 (0.71) | 3.23 (0.76) |
| ICSRLE Total, M(SD) | 70.64 (16.20) | 67.10 (15.54) | 64.85 (14.84) |
| HADS Total, M(SD) | 11.55 (5.90) | 10.69 (5.99) | 10.90 (6.47) |
| MCQ-30 | | | |
| Positive Metacognitive Beliefs About Worry, M(SD) | 10.58 (3.64) | 11.07 (3.61) | 11.10 (3.46) |
| Negative Metacognitive Beliefs About Uncontrollability and Danger, M(SD) | 11.93 (4.54) | 11.33 (4.32) | 11.69 (3.12) |
| Cognitive Confidence, M(SD) | 10.55 (4.44) | 10.05 (3.95) | 9.86 (3.75) |
| Need for Control, M(SD) | 10.55 (3.76) | 9.95 (3.17) | 9.45 (3.27) |
| Cognitive Self Consciousness, M(SD) | 14.47 (4.18) | 13.70 (4.26) | 13.20 (4.43) |
| TCQ | | | |
| Distraction, M(SD) | 15.21 (3.35) | 13.33 (2.77) | 14.17 (2.94) |
| Social Control, M(SD) | 12.71 (2.65) | 12.61 (2.37) | 12.59 (2.19) |
| Worry, M(SD) | 9.59 (2.97) | 9.28 (2.97) | 9.49 (3.09) |
| Punishment, M(SD) | 9.47 (2.75) | 9.03 (2.18) | 8.73 (2.26) |
| Reappraisal, M(SD) | 14.51 (3.53) | 13.96 (3.23) | 13.62 (3.17) |
| DMQ | | | |
| Detachment/Observing Self, M(SD) | 15.69 (4.17) | 16.05 (4.44) | 16.70 (4.47) |
| Meta-Awareness, M(SD) | 11.87 (2.12) | 11.51 (2.12) | 11.42 (2.44) |
| Thought Control, M(SD) | 12.71 (3.03) | 13.19 (2.75) | 13.44 (2.89) |
| Attention Flexibility, M(SD) | 16.43 (3.75) | 16.23 (3.50) | 16.26 (4.26) |
| Cognitive Decentring, M(SD) | 19.54 (2.85) | 19.27 (3.24) | 19.94 (3.45) |

Note: M = Mean; SD = Standard Deviation BRS = Brief Resilience Scale; ICSRLE = Inventory of College Students' Recent Life Experiences; HADS = Hospital Anxiety and Depression Scale; MCQ-30 = Meta-cognitions Questionnaire 30; TCQ = Thought Control Questionnaire; DMQ = Detached Mindfulness Questionnaire

Table 7.2. Correlations Between Predictor Variables at Time 1

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|-----------------|--------------|--------------|-------------|--------------|-------------|--------------|--------------|-------------|-------------|--------------|--------------|-------------|--------------|--------------|--------------|--------------|--------------|
| 1. BRS | -0.28 | -0.48 | -0.19* | -0.57 | -0.13 | -0.32 | -0.23 | -0.01 | -0.20* | -0.34 | -0.27 | -0.04 | 0.3 | 0.19* | 0.20* | 0.59 | 0.43 |
| 2. ICSRLE Total | - | 0.53 | 0.28 | 0.34 | 0.39 | 0.41 | 0.23 | 0.27 | 0.30 | 0.33 | 0.39 | 0.15 | -0.03 | -0.15 | -0.07 | -0.16* | -0.18* |
| 3. HADS Total | | - | 0.22 | 0.62 | 0.28 | 0.37 | 0.31 | 0.02 | 0.20* | 0.32 | 0.26 | 0.09 | -0.13 | -0.13 | -0.30 | -0.46 | 0.27 |
| 4. MCQ- PMC | | | - | 0.33 | 0.24 | 0.39 | 0.37 | 0.08 | 0.17* | 0.28 | 0.30 | 0.10 | -0.08 | 0.06 | -0.12 | -0.10 | 0.00 |
| 5. MCQ- NMC | | | | - | 0.30 | 0.55 | 0.42 | 0.001 | 0.20* | 0.41 | 0.3 | 0.13 | -0.21 | -0.07 | -0.28 | -0.56 | -0.36 |
| 6. MCQ- CC | | | | | - | 0.23 | 0.15 | 0.14 | 0.32 | 0.15 | 0.25 | 0.07 | -0.10 | -0.24 | 0.05 | -0.16* | -0.08 |
| 7. MCQ- NC | | | | | | - | 0.59 | 0.24 | 0.24 | 0.43 | 0.54 | 0.35 | 0.01 | 0.09 | -0.36 | -0.26 | -0.19* |

Note: * p < 0.05; bold = p < 0.01; BRS= Brief Resilience Scale; ICSRLE= Inventory of College Students Recent Life Events; HADS = Hospital Anxiety and Depression Scale; MCQ = Metacognitions Questionnaire-30; MCQ-PMC = MCQ-30 Positive Metacognitive Beliefs; MCQ-NMC = MCQ-30 Negative Metacognitive Beliefs Regarding Uncontrollability and Danger; MCQ-CC = MCQ-30 Cognitive Confidence; MCQ-NC = MCQ-30 Need for Control; MCQ-CSC = MCQ-30 Cognitive Self Consciousness

Table 7.2. Correlations Between Predictor Variables at Time 1 Cont.

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|------------|---|---|---|---|---|---|---|-------|-------------|-------------|-------------|-------------|-------|-------------|--------------|--------------|--------------|
| 8. MCQ-CSC | | | | | | | - | 0.17* | 0.19* | 0.20* | 0.24 | 0.47 | -0.01 | 0.38 | -0.27 | -0.14 | -0.01 |
| 9. TCQ-D | | | | | | | | - | 0.38 | 0.34 | 0.29 | 0.41 | 0.11 | -0.09 | -0.18* | 0.14 | -0.07 |
| 10. TCQ-SC | | | | | | | | | - | 0.37 | 0.39 | 0.19* | -0.11 | -0.12 | -0.06 | -0.12 | -0.09 |
| 11. TCQ-W | | | | | | | | | | - | 0.55 | 0.26 | -0.01 | -0.19* | -0.31 | -0.27 | -0.27 |
| 12. TCQ-P | | | | | | | | | | | - | 0.24 | -0.15 | -0.15 | -0.23 | -0.18 | -0.15 |
| 13. TCQ-R | | | | | | | | | | | | - | 0.11 | 0.22 | -0.09 | 0.05 | 0.08 |
| 14. DMQ-D | | | | | | | | | | | | | - | 0.18* | 0.02 | 0.41 | 0.39 |

Note: * p < 0.05; bold = p < 0.01; MCQ = Metacognitions Questionnaire-30; MCQ-CSC = MCQ-30 Cognitive Self-Consciousness; TCQ = Thought Control Questionnaire; TCQ-D = TCQ Distraction; TCQ-SC = TCQ Social Control; TCQ-W = TCQ Worry; TCQ-P = TCQ Punishment; TCQ-R = TCQ Reappraisal; DMQ = Detached Mindfulness Questionnaire; DMQ-D = DMQ Detachment

Table 7.2. Correlations Between Predictor Variables at Time 1 Cont.

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|------|-------------|-------------|
| 15. DMQ-MA | | | | | | | | | | | | | | - | 0.03 | 0.22 | 0.28 |
| 16. DMQ-TC | | | | | | | | | | | | | | | - | 0.26 | 0.32 |
| 17. DMQ-AF | | | | | | | | | | | | | | | | - | 0.42 |
| 18. DMQ-CD | | | | | | | | | | | | | | | | | - |

Note: * $p < 0.05$; bold = $p < 0.01$; DMQ = Detached Mindfulness Questionnaire; DMQ-MA = DMQ Meta-Awareness; DMQ-TC = DMQ Thought Control; DMQ-AF = DMQ Attention Flexibility; DMQ-CD = DMQ Cognitive Decentering

7.4.2. Predictors of Resilience

To investigate which metacognitive factors (MCQ, DMQ, or TCQ) predicted resilience (BRS), a linear regression was conducted. BRS total score at time 3 was entered as the dependent variable, as this allowed us to test which variables predicted resilience after controlling for gender and daily stress exposure. At step 1, gender was entered using force entry. At step 2, total ICSRLE scores at time 1, 2, and 3 were force entered in order to control for daily stress exposure. At step 3, MCQ, DMQ and TCQ subscales at time 1 were entered using stepwise entry. Tests examining collinearity indicated that multicollinearity was not a concern. A significant regression equation was found, $F(6,143) = 15.89$, $p < 0.001$, with an $R^2 = 0.40$ with two metacognitive factors predictive of resilience: negative metacognitive beliefs about uncontrollability and danger of worry (MCQ) and detachment (DMQ). As highlighted in Table 7.3, increased resilience at time 3 was predicted by low levels of negative metacognitive beliefs about uncontrollability ($B = -0.06$, $p < 0.001$) and danger of worry and by increased detachment ($B = 0.04$, $p = 0.001$) measured two-months earlier. To follow up this finding we re-ran the linear regression entering the individual items from the two significant subscales and re-ran the analyses. The individual items were entered on step 3 of the regression using stepwise entry. Items 2 and 11 from the MCQ negative metacognitive beliefs subscale and item 6 from the DMQ detachment subscale were found to be predictive of resilience, see Table 7.4. The MCQ subscale items were: “*My worrying is dangerous for me*” (item 2) and “*I cannot ignore my worrying thoughts*” (item 11). Item 6 from the DMQ detachment subscale was, “*I can step back from my thoughts and see them as separate from me.*” The significant linear regression, $F(7,142) = 14.08$, $p < 0.001$, with an $R^2 = 0.41$, showed that increased resilience was associated with increased ability to detach from thoughts and see them as separate from oneself ($B = 0.15$, $p = 0.001$), and lower levels of belief that worry is dangerous ($B = -0.12$, $p = 0.04$) and increased ability to ignore worrying thoughts ($B = -0.22$, $p < 0.001$).

Table 7.3. Metacognitive Predictors of Resilience (BRS)

| | | β | t | p |
|-----------------------|-------|---------|-------|---------|
| Step 1 | | | | |
| Gender | | -0.147 | -1.81 | 0.07 |
| R ² change | 0.02 | | | |
| F change | 3.28 | | | 0.07 |
| Step 2 | | | | |
| Gender | | -0.14 | -1.82 | 0.07 |
| ICSRLE T1 | | 0.04 | 0.40 | 0.69 |
| ICSRLE T2 | | -0.05 | -0.39 | 0.70 |
| ICSRLE T3 | | -0.41 | -3.76 | 0.00 |
| R ² change | 0.18 | | | |
| F change | 11.08 | | | < 0.001 |
| Step 3 | | | | |
| Gender | | -0.08 | -1.11 | 0.27 |
| ICSRLE T1 | | 0.14 | 1.43 | 0.16 |
| ICSRLE T2 | | -0.01 | -0.09 | 0.93 |
| ICSRLE T3 | | -0.39 | -3.87 | 0.00 |
| MCQ Neg T1 | | -0.41 | -5.68 | 0.00 |
| R ² change | 0.15 | | | |
| F change | 32.28 | | | < 0.001 |
| Step 4 | | | | |
| Gender | | -0.06 | -0.97 | 0.34 |
| ICSRLE T1 | | 0.13 | 1.43 | 0.15 |
| ICSRLE T2 | | -0.07 | -0.59 | 0.56 |
| ICSRLE T3 | | -0.33 | -3.39 | 0.001 |
| MCQ Neg T1 | | -0.36 | -5.05 | 0.000 |
| DMQ Detachment T1 | | 0.23 | 3.46 | 0.001 |
| R ² change | 0.05 | | | |
| F change | 11.98 | | | 0.001 |

Note: BRS = Brief Resilience Scale; ICSRLE = Inventory of College Students' Recent Life Experiences; MCQ Neg = Meta-cognitions Questionnaire 30 Negative Metacognitive Beliefs Regarding Uncontrollability and Danger; DMQ = Detached Mindfulness Questionnaire; T1, T2, T3 = Time 1, 2, 3 respectively

Table 7.4. MCQ & DMQ Item-Level Predictors of Resilience (BRS)

| | | β | t | p |
|-----------------------|-------|---------|-------|---------|
| Step 1 | | | | |
| Gender | | -0.15 | -1.81 | 0.07 |
| R ² change | 0.02 | | | |
| F change | 3.28 | | | < 0.001 |
| Step 2 | | | | |
| Gender | | -0.14 | -1.82 | 0.07 |
| ICSRLE T1 | | 0.04 | 0.40 | 0.69 |
| ICSRLE T2 | | -0.05 | -0.39 | 0.70 |
| ICSRLE T3 | | -0.41 | -3.76 | 0.00 |
| R ² change | 0.18 | | | |
| F change | 11.08 | | | < 0.001 |
| Step 3 | | | | |
| Gender | | -0.09 | -1.38 | 0.17 |
| ICSRLE T1 | | 0.09 | 1.01 | 0.32 |
| ICSRLE T2 | | -0.004 | -0.04 | 0.97 |
| ICSRLE T3 | | -0.39 | -3.89 | 0.00 |
| MCQ item 11 | | -0.39 | -5.58 | 0.00 |
| R ² change | 0.14 | | | |
| F change | 31.10 | | | < 0.001 |
| Step 4 | | | | |
| Gender | | -0.09 | -1.35 | 0.18 |
| ICSRLE T1 | | 0.10 | 1.08 | 0.28 |
| ICSRLE T2 | | -0.08 | -0.71 | 0.48 |
| ICSRLE T3 | | -0.33 | -3.37 | 0.001 |
| MCQ item 11 | | -0.32 | -4.48 | 0.00 |
| DMQ item 6 | | 0.23 | 3.32 | 0.001 |
| R ² change | 0.05 | | | |
| F change | 11.00 | | | 0.001 |
| Step 5 | | | | |
| Gender | | -0.08 | -1.24 | 0.22 |
| ICSRLE T1 | | 0.14 | 1.48 | 0.14 |
| ICSRLE T2 | | -0.06 | -0.56 | 0.58 |
| ICSRLE T3 | | -0.34 | -3.50 | 0.001 |
| MCQ item 11 | | -0.28 | -3.79 | 0.000 |
| DMQ item 6 | | 0.23 | 3.35 | 0.001 |
| MCQ item 2 | | -0.15 | -2.06 | 0.04 |
| R ² change | 0.02 | | | |
| F change | 4.23 | | | 0.04 |

Note: BRS = Brief Resilience Scale; ICSRLE = Inventory of College Students' Recent Life Experiences; MCQ = Meta-cognitions Questionnaire 30; DMQ = Detached Mindfulness Questionnaire; T1,T2,T3 = Time 1,2,3 respectively

7.4.3. Predictors of Psychological Distress

A final linear regression was conducted to provide some context for the clinical validity of the findings. We analyzed which metacognitive factors (MCQ, TCQ, DMQ) are predictive of psychological distress, as measured by the total score of the HADS. The HADS total score was entered as the dependent variable for the regression. Gender was entered on step 1 using forced entry. Although we aimed to control for psychological distress at time 1, it accounted for too much of the variance and therefore only stress exposure across time was controlled for, therefore, total ICSRLE scores at time 1, 2, and 3 were force entered in order to control for daily stress exposure. At step 3, the metacognitive factors at time 1 (MCQ, DMQ, and TCQ) were entered using stepwise entry. A significant linear regression, $F(5,144) = 25.58$, $p < 0.001$ with an R^2 of 0.47 demonstrated that only one metacognitive factor, the negative metacognitive beliefs subscale of the MCQ, was found to explain a significant amount of the variance in psychological distress, see Table 7.5. The negative metacognitive beliefs subscale at time 1 was predictive of psychological distress at time 3, $B = 0.26$, $p < 0.001$. Thus, the results indicate that individuals with greater negative metacognitive beliefs about uncontrollability and danger are more likely to have greater levels of psychological distress. However, this does not in itself offer data on clinical significance because we do not know if the changes in symptom scores are greater than error of measurement and define the individual as falling in the normal range. We therefore ran follow-up analyses based on a clinical significance classification.

Table 7.5: Predictors of Psychological Distress (HADS)

| | | β | t | <i>p</i> |
|-----------------------|-------|---------|-------|----------|
| Step 1 | | | | |
| Gender | | 0.07 | 0.79 | 0.43 |
| R ² change | 0.004 | | | |
| F change | 0.62 | | | 0.43 |
| Step 2 | | | | |
| Gender | | 0.04 | 0.68 | 0.50 |
| ICSRLE T1 | | 0.03 | 0.30 | 0.78 |
| ICSRLE T2 | | -0.004 | -0.03 | 0.97 |
| ICSRLE T3 | | 0.63 | 6.63 | 0.00 |
| R ² change | 0.41 | | | |
| F change | 33.38 | | | < 0.001 |
| Step 3 | | | | |
| Gender | | 0.005 | 0.09 | 0.93 |
| ICSRLE T1 | | -0.03 | -0.40 | 0.69 |
| ICSRLE T2 | | -0.03 | -0.27 | 0.79 |
| ICSRLE T3 | | 0.61 | 6.76 | 0.00 |
| MCQ Neg T1 | | 0.26 | 4.02 | 0.00 |
| R ² change | 0.06 | | | |
| F change | 16.18 | | | < 0.001 |

Note: BRS = Brief Resilience Scale; ICSRLE = Inventory of College Students' Recent Life Experiences; HADS = Hospital Anxiety and Depression Scale; MCQ Neg = Meta-cognitions Questionnaire 30 Negative Metacognitive Beliefs Regarding Uncontrollability and Danger; T1, T2, T3 = Time 1, 2, 3 respectively:

7.4.4. Reliable Change

Following the calculation of the reliable change index and cut off score, 21 participants were classified as deteriorated, 28 as recovered, and 101 as having made no change.

Individuals who made no change were excluded from the subsequent logistic regression analysis as in this analysis the dependent variable must be dichotomous, thus only two groups were selected.

7.4.5. Predictors of Reliable Change

A logistic regression was conducted in order to examine which metacognitive factors (MCQ, TCQ, or DMQ) could predict (distinguish) between individuals who had reliably recovered versus individuals who had reliably deteriorated on the total score of the HADS

(anxiety and depression symptoms). The outcome variable was deteriorated or recovered (0 or 1, respectively) based on individuals classification of reliable change detailed above. In the first step, gender was included as a control variable and was force entered. In step two, total ICSRLE scores at time 1, 2, and 3 were force entered, in order to control for daily stress exposure. At step 3, MCQ at time 1, TCQ at time 1 and DMQ at time 1 were entered using forward stepwise entry. The final step of the regression was significant, $\chi^2 = 3.75, p = 0.05$, as well as the final overall model which explained 71% of the overall variance (Nagelkerke $R^2 = 0.71, \chi^2(5) = 36.97, p < 0.001$). As indicated in Table 7.6, only one metacognitive factor was found to be predictive of deterioration/recovery, DMQ-detachment subscale, $\chi^2(1) = 3.75, p = 0.05$. The odds ratio for group on the final step indicated that greater detachment was associated with a 1.33 times greater likelihood of recovering from distress. It is important to interpret these results with caution as the analyses were based on the calculation of change scores from time 1 to time 3 and therefore scores may be influenced by a regression to the mean, such that participants may naturally recover from stress.

Table 7.6. Predictors of Recovery From Psychological Distress

| | B(S.E.) | Wald | <i>p</i> | Odds Ratio | 95% CI lower | 95% CI upper |
|------------|-------------|-------|----------|------------|-----------------|-----------------|
| Gender | 0.10 (1.40) | 0.005 | 0.94 | 1.11 | 0.07 | 17.16 |
| ICSRLE | 0.19 (0.07) | 8.29 | 0.004 | 1.21 | 1.06 | 1.37 |
| Total T1 | | | | | | |
| ICSRLE | -0.03 | 0.26 | 0.61 | 0.97 | 0.85 | 1.10 |
| Total T2 | (0.07) | | | | | |
| ICSRLE | -0.21 | 7.95 | 0.005 | 0.81 | 0.71 | 0.94 |
| Total T3 | (0.07) | | | | | |
| DMQ | 0.29 (0.15) | 3.75 | 0.05 | 1.33 | 1.00 | 1.79 |
| Detachment | | | | | | |
| T1 | | | | | | |
| Constant | -0.92 | 0.09 | 0.76 | 0.40 | | |
| | (3.07) | | | | | |

Note: S.E. = Standard Error, ICSRLE = Inventory of College Students' Recent Life Experiences; DMQ = Detached Mindfulness Questionnaire; T1,T2,T3 = Time 1,2,3 respectively

7.4.6. Resilience as a Predictor of Metacognition and Psychological Distress

Up to now we have investigated if metacognition is predictive of resilience, psychological distress, and recovery from psychological distress. In order to evaluate if the reverse relationships hold, such that resilience at time 1 is predictive of metacognition, psychological distress, and recovery from distress, exploratory regression analyses were conducted to investigate these relationships. As these relationships were exploratory here we will summarize the findings. The outputs for the regression analyses can be found in Appendix 16 to 19. Resilience was not found to be predictive of metacognitions (negative metacognitive beliefs about uncontrollability and danger of worry and detachment) after metacognitions at time 1 were controlled for. Only negative metacognitive beliefs about uncontrollability and danger of worry and detachment were used as these were the metacognitions found to be predictive of resilience. Resilience was found to be predictive of psychological distress; however, negative metacognitive beliefs regarding uncontrollability were able to account for an additional 2% of the variance over and above what could be predicted by resilience. Finally, resilience was not found to be able to distinguish between individuals who had reliably recovered versus individuals who had reliably deteriorated on the total score of the HADS.

7.5. Discussion

The aim of the study was to evaluate the metacognitive factors associated with resilience and psychological distress. Two important metacognitive factors were found to predict resilience, negative metacognitive beliefs about uncontrollability and danger of worry (MCQ-30) and DMQ-detachment. More specifically, three items from the MCQ-30 and DMQ emerged in predicting resilience, these were items 2 (“*My worrying is dangerous for me*”) and 11 (“*I cannot ignore my worrying thoughts*”) from the MCQ-30 and item 6 (“*I can step back from my thoughts and see them as separate from me*”) from the DMQ.

Additionally, we examined which metacognitive factors could predict psychological distress and found that the negative metacognitive beliefs subscale of the MCQ-30 was a factor, such that higher negative metacognitive beliefs were associated with greater psychological distress. However, a different predictor emerged for clinically defined recovery (a further index of bouncing back), where the detachment subscale of the DMQ emerged as the predictive factor. Exploratory analyses highlight that these relationships are uni-directional such that metacognitions are predictive of resilience however resilience does not predict metacognition. Although resilience was found to be predictive of psychological distress, this result is unsurprising as resilience is commonly operationalized with respect to the presence or absence of psychological distress. Additionally, metacognition was able to account for additional variance over and above what could be predicted by resilience. Furthermore, resilience was not able to predict clinically defined recovery. Taken together the results of the different analyses confirm the hypothesis that metacognitions are involved in psychological resilience, defined as bouncing back or ‘recovering’ from distress. Notable that these findings emerge when level of stress exposure over the time-course of the study and any effects associated with gender are controlled. The control of these factors increases confidence in a role of the metacognitive predictors specifically. Furthermore, the variance or odds ratio

associated with metacognitions over and above these control variables is substantive, suggesting that metacognitions were more important than intensity of stress exposure in determining resilience in the current sample. The longitudinal nature of the relationships observed is consistent with a causal role of metacognitions on resilience.

These results are in line with previous studies which have demonstrated that negative metacognitive beliefs are associated with psychological disorders including anxiety, depression, and post-traumatic stress disorder (PTSD). Roussis & Wells (2006) investigated the relationship between post-traumatic stress symptoms and metacognitive beliefs and found that post-traumatic stress symptoms were positively associated with negative metacognitive beliefs regarding the uncontrollability and danger of worry. Additionally, Cook et al. (2015b) examined emotional distress following a cancer diagnosis and found that negative metacognitive beliefs regarding uncontrollability and danger were associated with anxiety, depression and PTSD symptoms.

The results highlight that low levels of negative metacognitive beliefs about uncontrollability and danger and high levels of detachment confer an advantage to recovery from stress symptoms; however, the mechanism underlying this association is unclear. The metacognitive model of PTSD (Wells, 2009) may provide one possible explanation. Metacognitive beliefs and detachment are two factors that lay behind an inbuilt process termed the reflexive adaptational process (RAP). The RAP has been hypothesized to occur following a stressful event where it biases an individual's cognition and attention in order to help them develop new coping strategies and patterns of executive control. This process usually occurs without interruption and symptoms subside once it has completed; however, if the CAS interferes with the RAP a return to normal processing is prolonged. As the CAS is associated with increased negative metacognitive beliefs and increased inflexibility of attention, having decreased metacognitive beliefs regarding uncontrollability and danger and increased levels of

detachment may contribute to terminating perseverative processes and allow the mechanisms underlying the RAP to run their course.

Some of the limitations from the study should be acknowledged. A majority of the participants were female, which restricts the generalizability of the results. Additionally, the study was conducted with undergraduate students, which also impacts the generalizability of results. Future studies could examine role of metacognition and resilience in different age groups as well as in individuals currently experiencing psychological distress. Future studies could also investigate techniques which aim to improve attention flexibility such as detached mindfulness and the Attention Training Technique (ATT) and their ability to build resilience.

The study provides important evidence for the role of metacognition in resilience. In particular, the study highlights the impact that individual's metacognitive beliefs have and how detachment plays an important role in psychological resilience to stress.

8. Chapter 8: Modelling the Causal Relationship Between Change in Metacognition and Symptom Improvement During Transdiagnostic Group Metacognitive Therapy

Lora Capobianco, David Reeves, Pia Callesen, Carsten Juul, Sisse Find Nielsen, & Adrian Wells

Author Note

Miss Lora Capobianco, School of Psychological Sciences, University of Manchester, Hons BA; Professor David Reeves, Institute of Population Health, University of Manchester, PhD; Mrs Pia Callesen, School of Psychological Sciences, University of Manchester & CEKTOS, Denmark, MSc; Mr Carsten Juul, CEKTOS, Denmark, MSc, Sisse Find Nielsen, Mind Cph, Denmark, MSc & Professor Professor Adrian Wells, School of Psychological Sciences, University of Manchester, & Manchester Mental Health and Social Care NHS Trust, PhD

Corresponding Author: Prof Adrian Wells, University of Manchester, Rawnsley building MRI, Manchester, M13 9WL, UK

Conflicts of Interest and Source of Funding: The study was conducted for partial completion of the first authors PhD, which was supervised by Professor Adrian Wells and funded by the Presidents Doctoral Scholar Award from the University of Manchester. The authors report no conflict of interest.

Submitted to Psychotherapy and Psychosomatics

8.1. Abstract

Background: Metacognitive therapy (MCT) is an effective treatment that aims to modify maladaptive metacognitive beliefs and provide individuals with flexible and alternative ways of relating to mental events, however; little is known about the predictors of change during treatment.

Aims: We investigated if changes in symptoms precede change in metacognition or if change in metacognition precedes changes in symptoms.

Method: 131 Danish outpatients with a range of psychological illnesses participated in 6 weeks of group metacognitive therapy (MCT). The HADS and CAS-1 were administered pre, mid and post treatment. Structural equation modelling was applied to compare the autoregressive model with the two competing models, the CAS-1 (metacognitive beliefs) predicting outcomes on the HADS versus the HADS predicting outcomes on the CAS-1.

Results: Change in metacognition as measured by the CAS-1 better predicted changes in symptoms as measured by the HADS. There was a significant difference in model fit between the autoregressive model and the model in which the changes in the CAS-1 preceded changes in symptoms on the HADS $\Delta\chi^2 = 10.83$, $df = 2$, $p = 0.004$. The results were robust against changes in the assumptions of the structural model and are consistent with metacognitive theory.

Conclusions: Changes in metacognition precede and appear to lead to changes in symptoms. The results add further evidence that therapy focusing on altering what individuals believe about mental events leads to transdiagnostic therapeutic improvement in anxiety and depression.

Keywords: Anxiety; Depression, Metacognitive Therapy, Cognitive Therapy, Therapy Process Research

8.2. Introduction

According to the National Institute for Health and Care Excellence (NICE) guidelines, first line psychological treatment for anxiety and depression disorders is cognitive behavioural therapy (CBT) [NICE, CG113], however, treatment effects are inconsistent with modest long-term recovery rates. In CBT trials for anxiety, recovery rates are between 25-53% at post treatment and 25-56% at follow up, and in depression 40-58% are considered to be recovered at post treatment, while only 25-33% are considered to be recovered at follow up (Dimidjian et al., 2006; Fisher & Durham 1999; Gortner et al., 1998, Roth and Fonagy 1996). Further progress in treatment may be made by basing interventions on a model evaluating the mechanisms that underlie these disorders. One approach that does this is Wells' (2009) metacognitive therapy (MCT), a transdiagnostic treatment grounded in the Self-Regulatory Executive Function (S-REF) model of psychological disorder (Wells & Matthews, 1994, 1996). Unlike CBT, MCT does not focus on challenging the content of individual thoughts; instead patients focus on developing effective ways of reducing the worry and rumination processes that maintain anxiety and emotional distress.

Metacognitive therapy has demonstrable efficacy across psychological disorders. A recent meta-analysis by Normann, van Emmerik, and Morina (2014) evaluated the efficacy of MCT for anxiety and depression, and reported that MCT was highly effective. In comparison to cognitive behavioural therapy (CBT), MCT was found to produce significantly larger treatment effect sizes. MCT targets the difficult to control thinking processes of worry and rumination, and unhelpful coping behaviors that are considered to be universal underlying features that maintain psychological disorder. These factors constitute the cognitive attentional syndrome (CAS), which is derived from an individual's metacognitive beliefs. Metacognitive beliefs are the beliefs that individuals have regarding their cognitions, and strategies for regulating them. In this approach metacognitive beliefs impact the way an individual responds

to negative thoughts (Wells, 2009). Two broad categories of metacognitive beliefs that have been identified are negative metacognitive beliefs and positive metacognitive beliefs. Negative metacognitive beliefs concern the uncontrollability and danger of worry and rumination (e.g. “I cannot control my worrying”), while positive beliefs concern the usefulness of worry, rumination, threat monitoring, and other coping strategies (e.g. “Worrying will keep me safe”).

Metacognitive beliefs have been implicated in emotional distress, in fact negative beliefs about worry concerning uncontrollability and danger have been shown to predict anxiety and depression. Yilmaz, Gençöz, and Wells (2011) investigated the temporal precedence of positive and negative metacognitive beliefs and life stress in the development of anxiety and depression symptoms. Hierarchical regression analyses showed that negative metacognitive beliefs concerning the uncontrollability and danger of worry was a significant positive predictor of subsequent anxiety and depression. Recently, Cook et al. (2015a) investigated metacognitive beliefs in cancer patients at the time of diagnosis and found that they predicted anxiety and depression symptoms 12 months later. Bailey and Wells (2016) showed that metacognitions predicted health anxiety. The two metacognitive beliefs that made independent contributions were beliefs about biased thinking and beliefs that thoughts are uncontrollable.

As previous studies have highlighted that metacognitive beliefs impact on levels of anxiety and depression and because change in metacognitive beliefs is a central recovery mechanism in MCT we set out to evaluate this model of change. The current study investigated if changes in symptoms precede and predict changes in metacognition or alternatively if changes in metacognition precede and predict changes in symptoms as the model would suggest.

8.3. Methods

8.3.1. Participants

A total of 131 Danish outpatients (93 women, 38 men) from the Center for Cognitive Therapy and Supervision (CEKTOS), a Danish outpatient clinic, participated in the study. Ethical approval was not sought for this study as group therapy was offered as part of the clinic's treatment as usual: new patients when they first contacted the clinic were offered the choice of group therapy or individual therapy. All patients that opted to take part in the group therapy were asked to sign a consent form to allow their data to be used in the study. The mean age of the sample was 42.1 years (SD = 12.9, range: 18-69 years). 63 patients were seeking treatment for anxiety, 12 for depression, and 49 for both anxiety and depression. 7 participants did not disclose their primary reason for seeking treatment. 50 participants were taking medication. As there was less than 5% of missing data, mean values were used for imputing missing values.

8.3.2. Procedure

Each patient completed six weeks of group metacognitive therapy based on the Generalized Anxiety Disorder (GAD) model of MCT (Wells, 2005b). There were 16 groups with an average of 8 participants in each. The HADS and CAS-1 were administered at pre, mid and post treatment, with three weeks between questionnaire administration.

8.3.3. Measures

8.3.4. Primary Outcome Measure

Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). The HADS consists of 14 items, with two subscales of seven-item that assess anxiety and depression symptoms. The anxiety subscale includes items such as, “*I feel tense or wound up,*” while the depression subscale includes items such as, “*I feel as if I am slowed down*”. Items are scored using a four-point Likert Scale from 0 to 3, with higher scores indicating greater levels of anxiety and depression. Various studies have provided evidence for a two factor solution (Mykletun, Stordal, & Dahl, 2001; Spinhoven et al., 1995) with both subscales showing good internal consistency, with Cronbachs α of 0.80 for anxiety and 0.81 for depression (Bjelland, Dahl, Haug, & Neckelmann, 2002) . Overall, the HADS has been shown to have good validity and reliability (Herrmann, 1997; Mykletun, Stordal, Dahl, 2001; Zigmond & Snaith, 1983).

8.3.5. Secondary Outcome Measure

Cognitive Attentional Syndrome-1 (CAS-1; Wells, 2009). The CAS-1 is a 16-item measure that assesses the activation of the CAS. The first two items assess the extent to which individuals have been dwelling or worrying on their problems and the amount of time they have been focusing on potential threat. The next six items evaluate use of different coping strategies to deal with negative feelings or thoughts (e.g., avoided situations; used alcohol or drugs). These items are scored using a 0-8 likert scale, where 0 indicates none of the time and 8 indicates all of the time. The final eight items assess an individual’s positive and negative metacognitive beliefs (e.g. “*Worrying helps me cope*”; “*Worrying too much could harm me*”) and are rated on a 0-100 scale, with 0 indicating “*I do not believe this at all*” and 100 indicating “*I am completely convinced this is true*”, response options increase by increments of

10. The CAS-1 has demonstrated good internal consistency (Cronbach's $\alpha = .86$) (Fergus & Bardeen, 2012).

8.3.6. Sample Size

The study employed convenience sampling of new patients as they contacted the clinic. There was no comparator condition. Recruitment took place over the designated nine month period August 2014 to May 2015, during which a total of 131 patients opted to undertake the group therapy.

8.3.7. Analysis Plan and Model Hypotheses

Structural equation modelling was used for analyses as it allows a priori theoretical models to be applied and compared using observed data. A series of 3-wave panel analyses (using data from pre, mid and post treatment) were conducted using SPSS AMOS version 22 to test the longitudinal relationships between symptoms of anxiety and depression and the stated psychological processes. A nested cross-lagged model comparison approach was used as it allows changes in goodness of fit to be assessed as additional paths are added to the model.

We began with a basic auto-regressive model, in which the latent variables have a directional effect only on themselves (Figure 8.1). The auto-regressive model is the simplest model and acts as a baseline against which to compare more complex models. We used a standard formulation of this model, in which the CAS-1 and HADS latent variables are intercorrelated at time 1, and the error terms on these latents are correlated at subsequent time-points. In addition, the errors on the individual variables that model the latents (e.g. anxiety and depression in the case of HADS) are assumed to be correlated across all time-points. Inclusion of correlated errors follows the suggestion by Fornell (1983), in that the inclusion of

correlated errors are theoretically driven. The sample size was relatively small for SEM analysis, therefore to maximize the degrees of freedom for inferential testing we further assumed that the essential structure of the CAS-1 and HADS latent variables did not change over time, by constraining the regression weight and error variance associated with each observed variable to be constant across time (e.g. all three anxiety regression weights and error variances were set equal). We tested the robustness of our results to violations of our assumptions.

8.3.8. Latent Variable Identification

In Structural Equation Modelling (SEM), latent variables allow for the relationships between latent variables and between latent and observed measures to be evaluated (Bollen & Noble, 2011). As latent variables cannot be directly observed, they are modelled by specifying the observed, directly measurable variables that express the underlying construct.

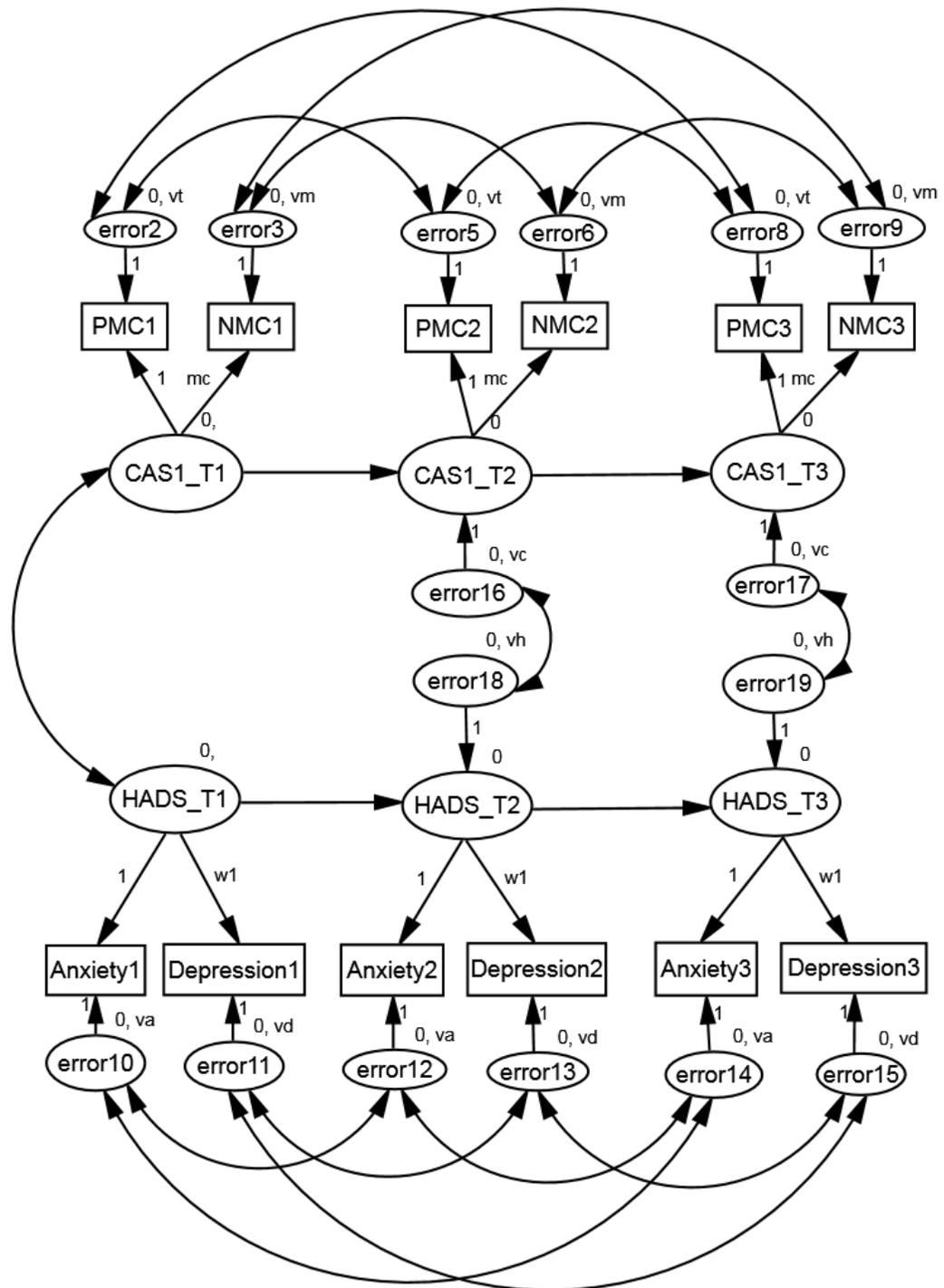
Hospital Anxiety & Depression: The HADS latent variable is modelled using the corresponding subscales of the HADS, anxiety and depression, as suggested by the original psychometric analysis of the scale (Zigmond & Snaith, 1983).

CAS-1: The CAS-1 latent variable is modelled using two observable variables, the positive and negative metacognitive beliefs subscales of the CAS-1. We did not use the other items of the CAS-1 as MCT focuses on modifying these beliefs which are the driving force behind the CAS. Moreover, other CAS-1 items assess symptoms of distress creating overlap with the primary outcome. The positive and negative metacognition scores were generated by summing over the positive and negative metacognitive belief items on the CAS-1 respectively. A factor analysis demonstrated a two factor solution, with positive metacognition variables loading

between 0.34 and 0.67 and negative metacognition variables loading between 0.55 and 0.81.

The variables also demonstrated an acceptable Cronbach's alpha of 0.67 for both subscales.

Figure 8.1. Autoregressive Model (Parsimonious Model), showing structural elements



We tested our hypotheses about the relationship of metacognitive beliefs to anxiety and depression through the sequential addition and testing of specified “cross-lagged” pathways into the autoregressive model. We first compared a model in which the HADS latent variable at time t predicted outcomes on CAS-1 at time $t+1$. Next, we examined a model that added pathways from CAS-1 at time t to HADS at time $t+1$. If adding these pathways in either direction significantly improved the fit of the model to the data, then next step was to assess if fit could be further improved by adding both sets of paths simultaneously.

In order to compare between the nested models the chi squared difference test was used to assess whether the addition of pathways to the auto-regressive model resulted in a statistically significant reduction in the chi squared statistic. The main principle used to assess model fit was that if the additional pathways did not improve model fit then the most parsimonious model was retained. In addition, the RMSEA and CFI statistics were used to examine the extent to which each model could account for the underlying data (Byrne, 2001). Models with RMSEA values below 0.08 were deemed to have a good fit, while those with RMSEA values above 0.10 were regarded as having a poor fit. CFI values above 0.90 were also taken to indicate good fit. The overall model chi squared value was not used as an indication of model fit as its dependence upon sample size makes it unreliable for this purpose (Tanaka, 1987).

8.4. Results

8.4.1. Descriptive Statistics

Table 8.1 gives the mean scores at pre, mid, and post treatment for variables on the CAS-1 and HADS. An analysis of treatment outcome and efficacy is described elsewhere (Callesen et al., in prep) which outlines that treatment was associated with large and significant improvements in anxiety ($d = 1.70$) and depression ($d = 1.31$).

Table 8.1. Mean and Standard Deviation (SD) for observed variables

| | Time 1 (Pre-Treatment) | | | Time 2 (Mid-Treatment) | | | Time 3 (Post-Treatment) | | |
|--------|------------------------|--------|-------|------------------------|--------|-------|-------------------------|-------|-------|
| | N | Mean | SD | N | Mean | SD | N | Mean | SD |
| HADS-A | 131 | 12.80 | 3.59 | 131 | 9.95 | 3.31 | 131 | 6.86 | 3.17 |
| HADS-D | 131 | 9.01 | 4.01 | 131 | 6.74 | 3.62 | 131 | 4.00 | 3.43 |
| NMC | 131 | 204.05 | 78.13 | 131 | 143.21 | 78.56 | 131 | 54.86 | 67.97 |
| PMC | 131 | 184.84 | 68.67 | 131 | 115.34 | 70.32 | 131 | 50.27 | 59.63 |

Note: HADS = Hospital Anxiety and Depression Scale, CAS-I = Cognitive Attentional Syndrome-I, NMC = Negative Metacognitive beliefs, PMC = Positive Metacognitive beliefs
SD = Standard Deviation

8.4.2. Structural Equation Modelling

Table 8.2 provides RMSEA, CFI, and chi square results for all models.

Table 8.2. Comparison of autoregressive and cross-lagged models

| | χ^2 | <i>df</i> | RMSEA | CFI | $\Delta\chi^2$ |
|--|----------|-----------|-------|-------|----------------|
| Cross-lagged (Full Model) | | | | | |
| Baseline (autoregressive model) | 98.13 | 49 | 0.088 | 0.923 | |
| Model 1 (HADS to CAS-I) | 98.12 | 47 | 0.091 | 0.920 | |
| Difference between baseline and Model 1 | | 2 | | | 0.01 |
| Model 2 (CAS-I to HADS) | 87.30 | 47 | 0.081 | 0.937 | |
| Difference between baseline and Model 2 | | 2 | | | 10.83** |
| Model 3 (Cross-lagged pathways in both directions e.g., CAS-I to HADS & HADS to CAS-I) | 86.49 | 45 | 0.084 | 0.935 | |
| Difference between Model 2 and Model 3 | | 2 | | | 0.81 |

Note: RMSEA = Root Mean Square Estimate of Approximation, CFI = Comparative Fit Index, ** = $p < 0.01$

The baseline autoregressive model demonstrated an acceptable degree of fit to the data with a CFI of 0.923 and RMSEA of 0.088 (Figure 8.2). Adding directional arrows from the HADS at time 1 to CAS at time 2 and HADS at time 2 to CAS at time 3 to this model (Figure 8.3) did not significantly improve the goodness of fit ($\Delta\chi^2 = 0.01$, $df = 2$, $p = 0.99$; RMSEA=0.091; CFI=0.092). We then compared a cross-lagged model where the CAS predicts changes in the HADS (Figure 8.4), which produced a significant improvement in the model, $\Delta\chi^2 = 10.83$, $df = 2$, $p = 0.004$, with an RMSEA value of 0.081 and CFI value of 0.937. This is consistent with our hypothesis that changes in the Cognitive Attentional Syndrome predicts changes on symptoms of anxiety and depression. As a final step we examined a model that included cross-lagged pathways in both directions together (Appendix 21). This did not show any improvement over the model with pathways from CAS-1 to HADS alone, $\Delta\chi^2 = 0.80$, $df = 2$, $p = 0.67$, with an RMSEA value of 0.084 and CFI value of 0.935.

Figure 8.2. Parameter estimates for the autoregressive model (standardised coefficients)

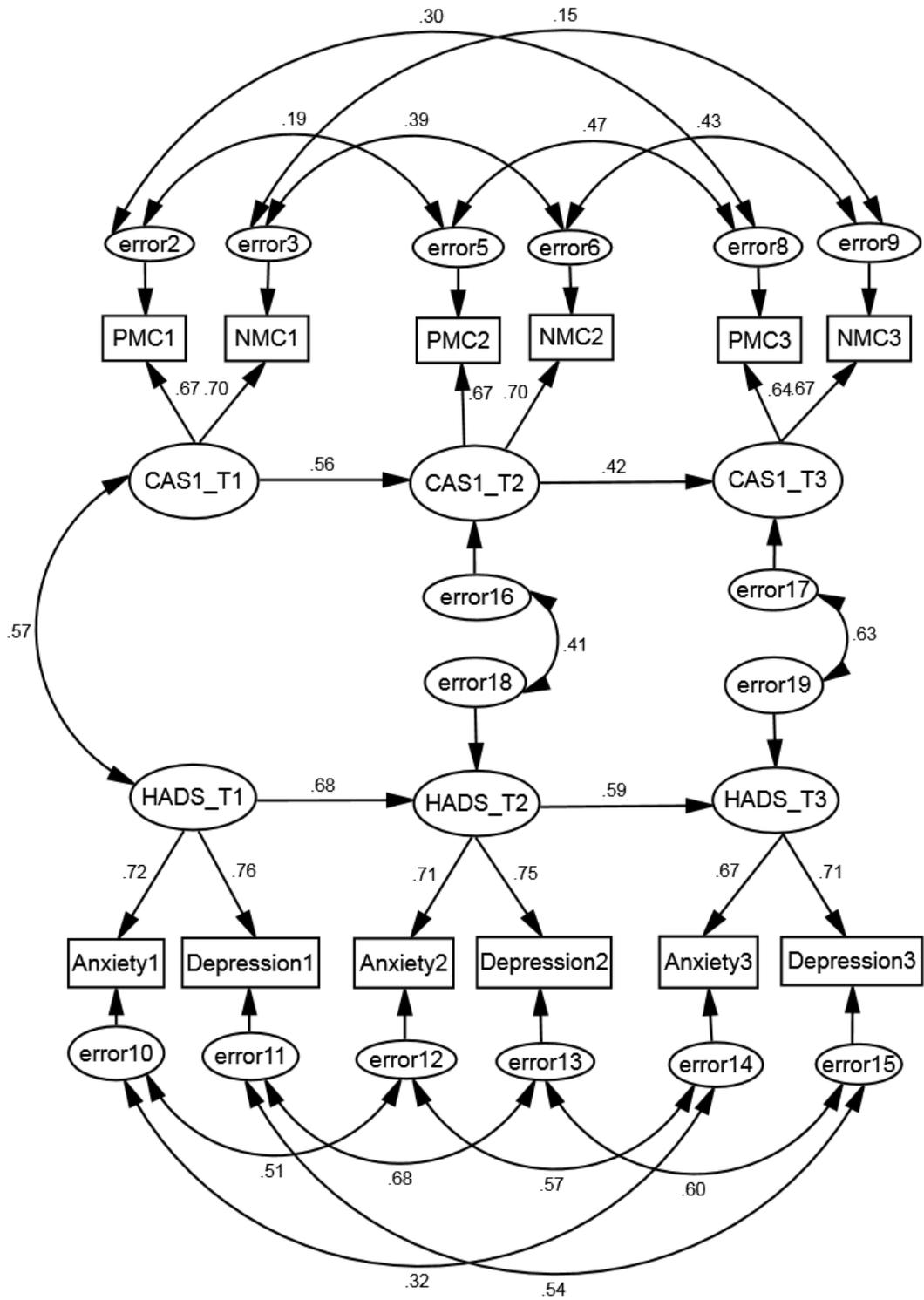
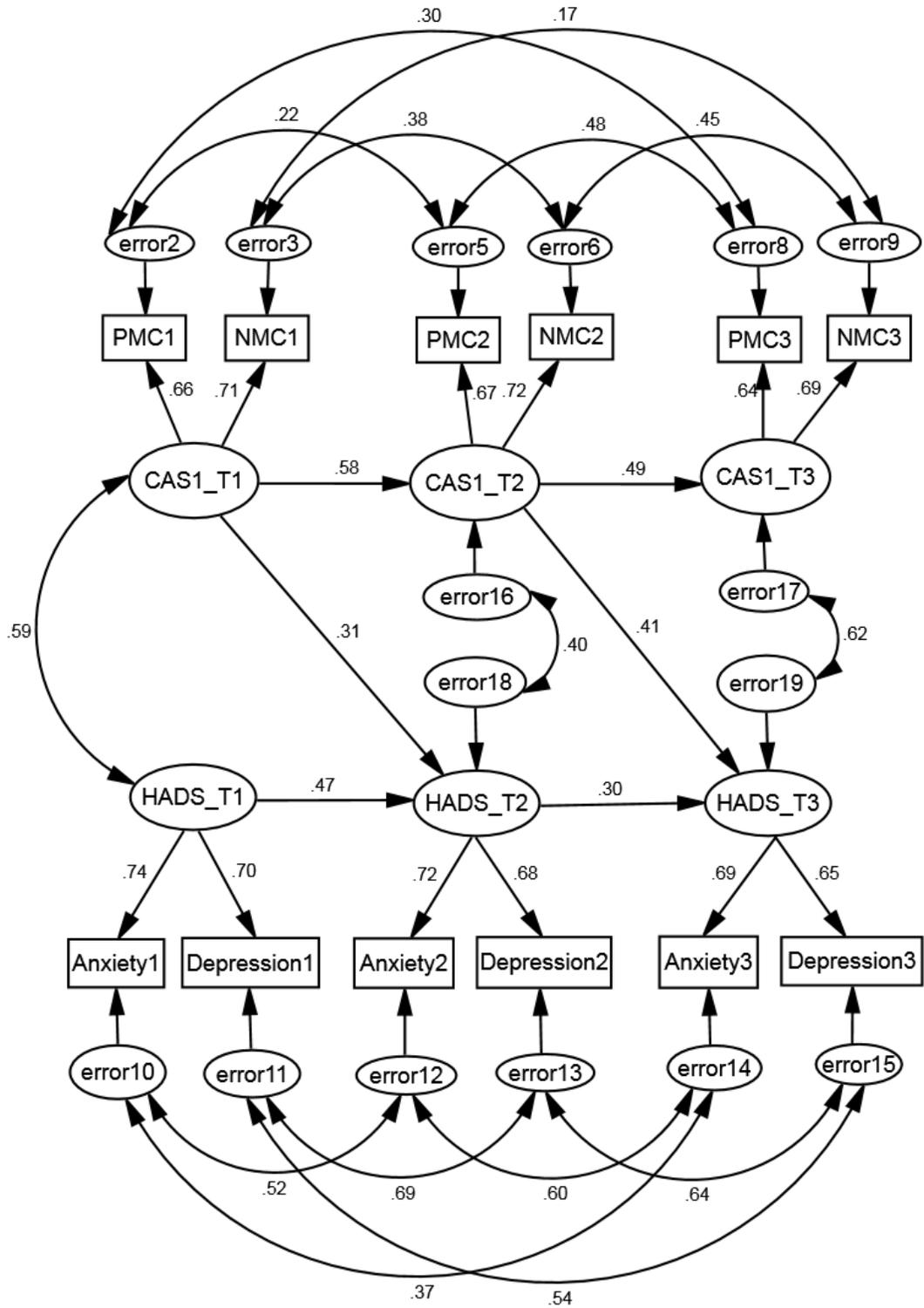


Figure 8.4. Including cross-lagged paths from CAS to HADS, standardised coefficients



8.4.3. Tests of The Structural Model Assumptions

To examine the key assumptions of our structural model, we reanalyzed the initial autoregressive model after: (i) removing the correlated errors across time-points; (ii) relaxing the assumption of equal regression weights over time; and (iii) relaxing the assumption of equal error variances over time. Table 8.3 summarizes the results.

Table 8.3. Tests of model assumptions

| | χ^2 | df | RMSEA | CFI | $\Delta\chi^2$ |
|--|----------|----|-------|------|----------------|
| Autoregressive model (1) | 98.13 | 49 | 0.088 | 0.92 | |
| Removing correlated errors over time | 251.95 | 61 | 0.155 | 0.70 | |
| χ^2 difference (compared to (1)) | | 12 | | | 153.82** |
| Removing equal regression weights | 95.78 | 45 | 0.093 | 0.92 | |
| χ^2 difference (compared to (1)) | | 2 | | | 2.35 |
| Removing equal error variances (2) | 55.61 | 39 | 0.057 | 0.97 | |
| χ^2 difference (compared to (1)) | | 10 | | | 42.52** |
| Cross-lagged model HADS to CAS-I, without equal error variances | 55.15 | 37 | 0.061 | 0.97 | |
| χ^2 difference (compared to (2)) | | 2 | | | 0.46 |
| Cross-lagged model CAS-I to HADS, without equal error variances | 49.42 | 37 | 0.051 | 0.98 | |
| χ^2 difference (compared to (2)) | | 2 | | | 6.19* |

Note: * = $p < 0.05$, ** = $p < 0.01$

Removing the correlated errors greatly increased the overall chi-square ($\Delta\chi^2 = 153.82$, $df = 12$, $p < 0.001$), indicating that these are essential in the model. Allowing the regression weights to vary made very little difference to the chi-square ($\Delta\chi^2 = 2.35$, $df = 2$, $p = 0.31$), supporting the assumption of equality. However, allowing the error variances to differ produced a very substantial drop in both the chi-square value ($\Delta\chi^2 = 42.52$, $df = 10$, $p < 0.001$) and model goodness-of-fit (RMSEA=0.057; CFI=0.97), implying that error variance was not constant over time. This can be explained by the fact that for all four variables (anxiety, depressions, positive metacognitions and negative metacognitions) the variance increased with the mean value (Table 8.1), whilst participant scores on all four variables decreased substantially over the course of the intervention: e.g., for negative cognitions the mean at time

1 was 204.1 and the standard deviation 78.1; whereas at time 3 the mean was 54.9 and the standard deviation 68.0.

In view of this finding, we reran the cross-lagged analysis without the assumption of equal error variances (Table 8.3). The results supported the findings from the primary model, of significant lagged paths from CAS-1 to HADS ($\Delta\chi^2 = 6.19$, $df = 2$, $p = 0.045$), but not the reverse ($\Delta\chi^2 = 0.46$, $df = 2$, $p = 0.79$).

8.5. Discussion

The primary aim of the study was to compare two competing models that address the questions: do changes in metacognition predict changes in symptoms or do changes in symptoms predict changes in metacognition in patients undergoing group metacognitive therapy. Structural equation modelling revealed that changes in individual's metacognitions predicts changes in symptoms. Our results were robust against changes to our key model assumptions, but we did find that error variance on the observed variables depended on the mean and was not constant over time. However, accounting for this in the model did not alter our principal findings.

Our results are consistent with the theoretical basis of metacognitive therapy in which specific metacognitive beliefs are purported to cause or maintain psychological disorder (Wells, 2009). The findings are consistent with previous studies that have found associations between metacognition and changes in symptoms of anxiety, depression, and obsessive-compulsive disorder. Solem, Haland, Vogel, Hansen, and Wells (2009) investigated if metacognitive or cognitive change predicted improvements in symptoms following treatment in patients with obsessive-compulsive disorder and found that changes in metacognition were a better predictor of symptom change than change in beliefs about responsibility and perfectionism. Further to this Solem et al. (2015) investigated the relationship of symptoms of

health anxiety in obsessive–compulsive disorder patients and found that changes in metacognitions were associated with improvement in health anxiety symptoms at post-treatment. The results suggest that interventions that focus on modifying beliefs about mental events and the way individuals regulate responses to them leads to symptom improvement. The results add to and strengthen studies supporting the idea that therapy focusing on challenging metacognition results in a decrease in symptoms of anxiety and depression (Normann, van Emmerik, Morina, 2014; Van der Heiden, Melchior, de Stigter, 2013; Wells, Walton, Lovell, Proctor, 2015).

There are important limitations of this study. The study had a smaller sample size than would generally be recommended for a SEM study, and although there is significant variability in sample size requirements for SEM as indicated by Wolf, Harrington, Clark, & Miller (2013) the results should be interpreted with caution. In addition, replication with a larger sample size is required. However, this is the first known study to prospectively test causal pathways of change in patients during metacognitive therapy and the results are consistent with a directional causal link between change in metacognition leading to improvements in anxiety and depression symptoms.

**9. Chapter 9: Group Metacognitive Therapy versus Mindfulness
Meditation Therapy in a Transdiagnostic Patient Sample: A Feasibility
Study**

Lora Capobianco, Anthony P Morrison & Adrian Wells

Author Note

Miss Lora Capobianco, School of Psychological Sciences, University of Manchester, Hons
BA;

Professor Anthony P. Morrison, School of Psychological Sciences, University of Manchester,
& Greater Manchester West Mental Health Trust, PhD & Professor Adrian Wells, School of
Psychological Sciences, University of Manchester, & Manchester Mental Health and Social
Care NHS Trust, PhD

Conflicts of Interest and Source of Funding: The study was conducted for partial completion
of the first authors PhD, which was supervised by Professor Adrian Wells and funded by the
Presidents Doctoral Scholar Award from the University of Manchester. The authors report no
conflict of interest.

9.1. Abstract

Two new transdiagnostic therapies for treating psychological disorder are Metacognitive Therapy (MCT) and Mindfulness Based Stress Reduction (MBSR). MBSR was designed as a group therapy treatment; while MCT has been primarily investigated in an individual format. As these two approaches have yet to be compared, we aimed to evaluate the acceptability and feasibility of group MCT and MBSR in treating anxiety and depression. We conducted a feasibility trial with 40 participants (aged 19-56), who were randomly assigned to receive either eight weeks of group MCT or MBSR. Follow-up data was collected six months post treatment. The primary outcome was feasibility which included recruitment rates, retention and treatment acceptability. The primary symptom outcome measure was the Hospital Anxiety and Depression Scale (HADS) total score, which provided an overall measure of distress. The secondary symptom outcome measure was the CAS-1. Both treatments were found to be acceptable with low attrition and similar ratings of acceptability. Changes in outcomes were analyzed based on the intention-to-treat principle using ANCOVAs adjusted for medication use. Preliminary analyses revealed that MCT was more effective in treating anxiety and depression in comparison to MBSR (Cohens $d = 1.47$ vs 1.09), and in reducing both positive (Cohens $d = 1.61$ vs 0.56) and negative metacognitive beliefs (Cohens $d = 2.18$ vs. 0.36). These differences were no longer significant at follow up but reliable improvement rates of 65% (MCT) and 28% MBSR suggest the possible superiority of MCT. Both treatments appeared to be feasible and acceptable in treating transdiagnostic samples; however, a larger, definitive trial is required. The limitations and directions for future research are discussed. Trial registration reference number: NCT02096484.

Keywords: Metacognitive Therapy, Mindfulness Based Stress Reduction, Transdiagnostic Treatment, Group Therapy

9.2. Introduction

The co-occurrence of depression and anxiety is common, with more than 75% of patients diagnosed with depression in primary care also having a diagnosable anxiety disorder (Olfson, Fireman, Wiessman, et al., 1997). The most common treatment for anxiety or a mood disorder is cognitive behavioural therapy (CBT); however treatment effects in adults show inconsistent recovery rates. In CBT trials of anxiety, recovery rates range from 25-53% at post treatment and 25-56% at follow-up (Fisher & Durham, 1999). Similarly for depression, only approximately 40-58% of patients are classified as recovered at post treatment, with only 20-30% remaining recovered at 18 month follow up (Dimidjian et al., 2006; Gortner, Gollan, Dobson, & Jacobson, 1998; Roth & Fonagy, 1996). Thus, more effective treatments are required and there is a need to develop interventions that do not require the use of multiple models but that can be delivered transdiagnostically.

One form of treatment which has become increasingly popular over the past few years is Mindfulness meditation which stems from Buddhist practices. Mindfulness has various definitions; however, it is most commonly defined as, “paying attention in a particular way: on purpose, in the present moment, and non-judgmentally” (Kabat-Zinn, 1994, p 4.). Mindfulness-based therapies (MBT) such as mindfulness based stress reduction (MBSR; Kabat-Zinn, 1994) and mindfulness-based cognitive therapy (MBCT; Segal, Williams, & Teasdale, 2002) have been applied to various psychological disorders; however MBCT has been used primarily with depression. Kabat-Zinn et al. (1992) conducted a pilot study to evaluate the effectiveness of MBSR for anxiety disorders and demonstrated a large effect size (Cohens $d = 0.89$) for anxiety symptoms based on the Hamilton rating scale for anxiety from pre to posttreatment. Additionally, Vollestad, Sivertsen, and Nielsen (2011) compared MBSR to a wait-list control in patients with anxiety disorders and found medium effects (Cohens $d = 0.55-0.76$) between groups on measures of anxiety (BAI, PSWQ, STAI-S, STAI-T), similarly

for depression, a medium between-group effect size (Cohens $d = 0.58$) was found on the BDI-II. Hofmann, Sawyer, Witt & Oh (2010) conducted a meta-analysis on the effect of mindfulness-based therapies for anxiety and depression, and found that MBT had a moderate effect in decreasing anxiety symptoms (Hedges' $g = 0.63$) and a moderate effect in decreasing depression symptoms (Hedges' $g = 0.59$) from pre to post treatment. When examining the effectiveness of MBSR on symptom improvement for anxiety and depression, there was a medium effect (Hedges' $g = 0.49$) on symptom improvement for anxiety and a medium effect for symptom improvement for depression (Hedge's $g = 0.55$).

An alternative approach is Metacognitive Therapy (MCT), which is a transdiagnostic treatment based on the self-regulatory executive function model (S-REF; Wells & Matthews, 1994, 1996). According to the S-REF model psychological disorder is maintained by a type of thinking that is called the cognitive attentional syndrome (CAS). The CAS is dominated by thinking styles such as worry, rumination and maladaptive coping behaviors that delay the down-regulation of negative emotion, thus prolonging distress. The CAS is thought to arise from an individual's positive and negative metacognitive beliefs. Positive metacognitive beliefs concern the usefulness of worry, threat monitoring, and unhelpful coping strategies (e.g., "*If I worry I'll be prepared*"), while negative metacognitive beliefs regard the uncontrollability, dangerousness, or importance of thoughts and feelings (e.g., "*I can't control my worry*") (Wells, 2009).

Normann, van Emmerik, and Morina (2014) evaluated the efficacy of MCT in a meta-analysis of studies on anxiety and depression, and reported that MCT was highly effective. It was found that when MCT was compared with CBT a large comparative treatment effect size of 0.97 was found in favor of MCT. Metacognitive therapy was also found to lead to substantial reductions in secondary symptoms of anxiety and depression, which highlights the ability of MCT to reduce co-morbid symptoms related to the primary diagnosis.

More recently, MCT has begun to be evaluated in a group therapy format. van der Heiden, Melchior, and Stinter (2013) evaluated group MCT for individuals with GAD and found very large effect sizes at post treatment based on the Penn State Worry Questionnaire, Cohens $d = 1.86$. Additionally, McEvoy et al. (2015) investigated group MCT in adults suffering from primary or secondary GAD, and found large effect sizes from pre to post treatment on the BDI-II, Cohens $d = 0.86$, and a medium effect size from pre to post treatment on the Beck Anxiety Inventory, Cohens $d = 0.58$. Additionally, based on Jacobson and Truax's (1991) criteria for reliable and clinically significant change, at post-treatment 86% of patients had reliably improved and 74% of patients had recovered. More recently, Dammen, Papageorgiou, and Wells (2015) conducted an uncontrolled trial of group MCT for depression and found that at post treatment all patients could be classified as recovered, and at six-month follow up 91% of patients were classified as recovered based on the Frank et al. (1991) criteria.

The current study investigated the feasibility of delivering MCT and MBSR in a group format consisting of patients with a mixture of anxiety and depression disorders. This is the first time these treatments have been compared as transdiagnostic group interventions. The principal aim was to examine and compare the feasibility and acceptability of both treatments but also explore symptom outcomes with a view to providing preliminary estimates of plausible treatment effects to inform sample sizes for subsequent definitive studies.

9.3. Methods

9.3.1. Study Design

The study was approved by the National Research Ethics Service of the UK's National Health Service (ref 14/NW/1010) and registered with a clinical trial data base (NCT02096484) prior to starting the study. Participants were assessed for suitability using the GAD-7 and PHQ-9 screening measures, and were required to score 5 or greater on one or both measures.

Five was selected as the cut off score as it is indicative of mild anxiety or depression (Kroenke, Spitzer, & Williams, 2001; Spitzer et al., 2006). On the PHQ-9 the MCT group had two participants with mild depression, four with moderate depression, four with moderately severe depression and ten with severe depression, whereas the MBSR condition had eight with moderate depression, six with moderately severe depression, and four with severe depression. For the GAD-7 the MCT group had one participant with mild anxiety, two with moderate anxiety, six with moderately severe anxiety, and eleven with severe anxiety, whereas the MBSR group had five with moderate anxiety, 10 with moderately severe anxiety, and four with severe anxiety. Participants were recruited from a waiting list for the Manchester Mental Health and Social Care NHS Trust as well as from the University of Manchester Counselling services. 10 participants were recruited from the NHS, while 30 were recruited from the University of Manchester counselling services. Patients were excluded if : (1) they reported any suicidality, (2) had a brain injury or neurological insult, (3) were currently engaging in substance abuse, or (4) had bipolar disorder. Additionally, individuals with psychotic symptoms and individuals who could not converse or read English were excluded. All other psychological problems were permitted.

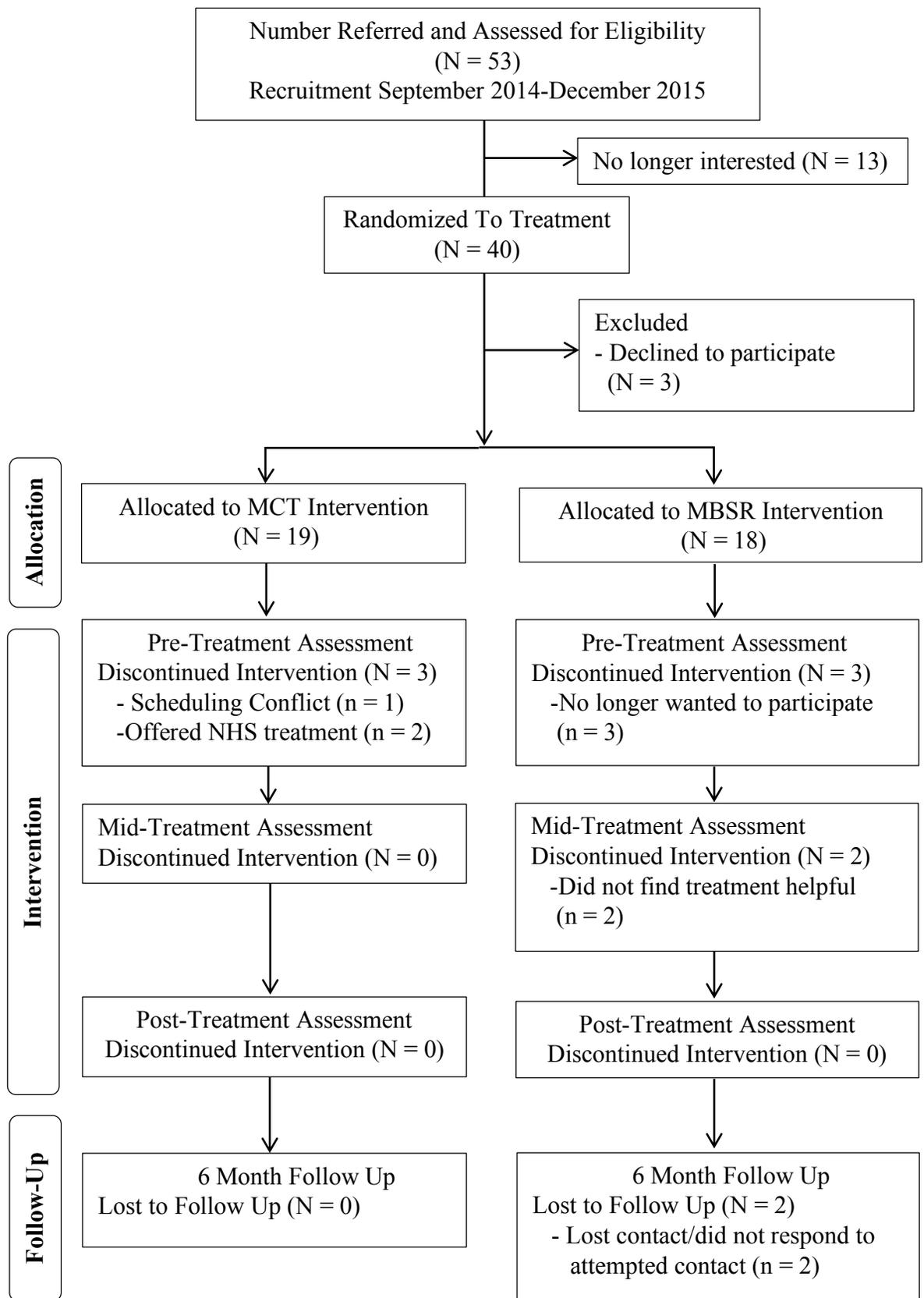
9.3.2. Deviations From Protocol

The study was originally titled as a pilot study however after further review of the sample size a feasibility study was deemed more appropriate. The measures were changed prior to the start of recruitment as the HADS and CAS were shorter measures that measured similar constructs to the STAI, BAI, BDI, and MCQ-30, whilst this change was updated on the clinical trials registry the update occurred after the time it had been implemented.

9.3.3. Participants

The Consort diagram indicating patient flow is depicted in Figure 9.1. Patients were consecutive referrals to the project of which 40 participants were eligible and randomized to receive either group MCT or MBSR; however, three participants did not begin treatment after being randomized. Of the three non-starters, two of the participants were randomized to the Mindfulness treatment group and one participant was randomized to the Metacognitive therapy group. As these participants did not begin treatment they had no formal assessments and could not be included in the preliminary analyses of treatment efficacy however they were included in the feasibility analyses. Additionally, two participants randomized to the MCT condition were removed from the efficacy analyses because at the first session it became evident that one participant was engaging in substance abuse and could not fully engage in the session and one participant disclosed a recent bipolar diagnosis, therefore meeting the exclusion criteria. However, these participants continued to receive treatment and their data was retained for feasibility analyses but was not included for treatment efficacy analyses. Thus, there were 40 participants (12 males, 28 females) who were included in the feasibility analyses, while 35 participants (10 males, 25 females) were included in analyses regarding treatment efficacy. There were four groups per treatment arm with an average of 4 participants. The average age among participants was 28 years, and a total of 18 participants were taking psychotropic medications (e.g., Pregabalin, Citalopram, Sertraline, Propranolol, Venlafaxine, and Mitrazapine).

Figure 9.1. CONSORT Diagram of Patient Flow



9.3.4. Randomization and Sample Size

Following informed consent, block randomization with minimization was used to ensure that all groups were balanced for gender and their primary reason for seeking treatment, which was either anxiety or depression. Randomization was conducted by a statistician independent to the research team.

We estimated a recruitment target of 40 participants, approximating 20 participants per trial arm. This allowed for a large enough sample size to evaluate feasibility, retention and suitability of outcome measures. Sample size suggestions vary, however between 24 and 50 have been suggested (Julious, 2005; Sim & Lewis, 2012). Browne (1995) has recommended that 30 participants or greater are required in estimating a parameter. Power calculations are not recommended for a feasibility trial (Lancaster et al., 2004).

9.3.5. Measures

9.3.6. Feasibility & Acceptability Outcomes

Feasibility and acceptability were measured as the number of participants recruited, number of dropouts, amount of missing data, the number of sessions attended, and how credible patients found the treatment.

The treatment credibility rating is a 6-item measure that was adapted from Borkovec and Nau (1972). The items are scored on a likert scale ranging from 0 to 8 where 0 indicates not at all and 8 indicates very much. The items assess how credible participants find the treatment. Questions assess how helpful patients find the treatment to be, how helpful the therapist is, and how helpful treatment is in aiding additional symptoms and aspects of their lives.

9.3.7. Primary Symptom Outcome Variable

Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). The HADS is a 14-item measure of anxiety and depression symptoms. The scale uses a 4 item Likert scale with scores ranging from 0 to 3, where higher scores indicate greater levels of anxiety and depression. The HADS anxiety and depression subscales have an optimal cut-off score of ≥ 8 to identify caseness for anxiety and depression, and ≥ 16 to identify caseness for the total scale. The scale demonstrates good validity and reliability (Bjelland, Dahl, Haug, Neckelmann, 2002; Hermann, 1997).

9.3.8. Secondary Outcome Measures

Cognitive Attentional Syndrome-1 (CAS-1; Wells, 2009). The CAS-1 assesses the activation of the CAS. It is a 16-item measure, where the first three items are rated on a Likert scale ranging from 0-8 where 0 indicates none of the time and 8 indicates all of the time. The first two items of the CAS-I measure the extent to which individuals have been dwelling, worrying or focusing on possible threat. The third item assess the extent to which individuals are engaging in specific coping strategies to deal with negative thoughts of events (e.g., tried to control emotions, asked for reassurance). The final item assesses the positive and negative metacognitive beliefs that individuals hold (e.g., “*I cannot control my thoughts*”, “*analysing my problems will help me find answers*”). The CAS-I demonstrates good internal consistency (Cronbach’s $\alpha = 0.86$) (Fergus et al., 2012).

9.3.9. Screening Measures

PHQ-9 (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 is a brief nine item measure designed to diagnose depression in primary care. Participants are asked to score nine depressive symptoms, which correspond to DSM-IV criteria for depression, on a scale from 0

(not at all) to 3 (nearly every day) on nine depressive. Total scores range from 0-27, whereby scores can indicate the presence of either no depression, minimal, mild, moderate, moderately severe, or severe depression. The scale demonstrates good reliability and validity (Cameron, Crawford, Lawton, & Reid, 2008).

GAD-7(Spitzer et al., 2006). The GAD-7 was designed to identify individuals with generalized anxiety disorder in primary care. The seven item measure scores items from 0 (not at all) to 3 (nearly every day) on seven primary symptoms of GAD. Total score range from 0 to 21, with scores indicate mild, moderate or severe anxiety symptoms. The scale demonstrates good internal and test–retest reliability, as well as good convergent and construct validity (Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007).

9.3.10. Interventions

The group treatments were delivered by both LC and AW, with AW leading the MCT group and LC leading the MBSR group. AW is the originator of MCT and LC was trained in MBSR before the study and was supervised throughout. Each treatment followed session by session treatment manuals.

Group MCT followed the generic model and intervention as described in the treatment manual by Wells (2009). We offered 8 weekly sessions of group MCT that were 90 minutes in duration. Sessions focused on a group case formulation, the attention training technique, detached mindfulness, worry-rumination postponement, challenging positive and negative metacognitive beliefs, and creating a personalized plan B whereby patients summarize a more adaptive plan for dealing with negative cognitions in the future.

The MBSR for anxiety disorders protocol from Arch et al. (2013) was used, which is based on MBSR protocols from the University of Massachusetts Center for Mindfulness

(Kabat-Zinn, 1990). The primary difference between the protocol design by Arch et al. (2013) and the protocol outlined by Kabat-Zinn (1990) is the length of homework, the standard 45 minutes of homework practice meditations were shortened to 20-30 minutes. The protocol designed by (Arch et al., 2013) included 10 sessions that lasted 90 minutes and included a 3 hour retreat, however in order to match treatment length between conditions we excluded the 3 hour retreat and session eight, which followed the retreat, from the protocol. We felt this session was the most appropriate to remove as it focused on reviewing the retreat and was primarily focused on furthering yoga practice.

9.3.11. Statistical Analysis Plan

Analyses were conducted in SPSS (version 22) once all follow up data had been collected. Feasibility and acceptability were assessed as the number of participants recruited, number of dropouts, amount of missing data, the number of sessions attended, and how credible patients rated their respective treatment. The credibility rating also includes an item assessing the credibility of the therapist. An Intention to Treat (ITT) analysis was conducted to evaluate treatment efficacy. A last observation carried forward approach was used for missing data from dropouts and for two participants from the MBSR condition that were lost to follow up. Categorical variables were assessed using a Chi-Square test. A univariate ANOVA was used to compare groups on treatment adherence and pre-treatment screening measures (GAD-7 and PHQ-9). Finally, analyses of covariance (ANCOVAs) were used to assess group differences on the HADS and CAS-1 at, post-treatment and 6 month follow up. Medication use, gender, and pre-treatment scores were used as covariates. Between and within group effect sizes were calculated based on Cohen (1988), using the formula $d = (M_1 - M_2) / SD_{\text{pooled}}$, where M_1 is the mean of group 1, M_2 is the mean of group 2 and SD_{pooled} is the pooled standard deviation. We also used the method of Jacobson and Truax (1991) to

determine the proportion of patients in each group showing reliable clinical improvement on the HADS. Improvement rates were calculated rather than recovery rates as recovery requires the calculation of a cut off score based on using criterion a, b, or c outlined by Jacobson and Truax (1991). A cut off score could not be calculated due to the significant difference between groups at pre-treatment which would have resulted in a cut off score that was misrepresentative of our data, therefore only improvement rates were obtained.

9.4. Results

9.4.1. Participant Characteristics

Participants were recruited between September 2014 and December 2015. A total of 40 patients were randomly allocated to the two treatment arms, Table 9.1 depicts the participant characteristics. A one-way ANOVA explored any differences between groups on the screening questionnaires. There was no significant difference between groups on the PHQ-9, $F(1,37) = 3.77$, $p = 0.06$, or GAD-7 $F(1,37) = 3.60$, $p = 0.07$. A chi-square analysis was used to assess differences between groups on gender, age, and medication use. There was no significant difference between groups on gender, $\chi^2(1, N = 35) = 0.011$, $p = 0.92$, or age, $\chi^2(16, N = 35) = 14.79$, $p = 0.54$; however, there was a significant difference between groups on medication use $\chi^2(1, N = 33) = 8.93$, $p = 0.003$. The MCT group had a greater number of patients ($n = 13$, 76%) taking a psychotropic medication than the MBSR group ($n = 5$, 28%).

Table 9.1. Participant Characteristics and Treatment Acceptability Rating

| | MCT (N = 20) | MBSR (N= 20) |
|---|-----------------|-----------------|
| Gender (M:F) | 6:14 | 6:14 |
| PHQ-9 | 15.55 (6.61) | 11.94 (4.77) |
| GAD-7 | 15.15 (4.64) | 12.63 (3.55) |
| Medication Use | 13 | 5 |
| Treatment Acceptability | | |
| Treatment is helpful for individuals with similar disorder | 6.24 (0.83) | 6.17 (1.20) |
| Treatment approach is helpful for you | 5.82 (1.07) | 5.72 (1.13) |
| Therapist is helpful | 6.41 (1.33) | 6.00 (0.77) |
| Recommend Treatment to others | 6.47 (1.62) | 6.56 (1.34) |
| Treatment will help with other problems (e.g., headaches, insomnia) | 5.69 (1.25) | 5.78 (1.11) |
| Treatment will help you lead the life you want to live | 5.53 (0.94) | 5.22 (1.00) |

9.4.2. Feasibility and Acceptability Assessment

The feasibility assessment was based on the total sample (n = 40). All participants, including non-starters and the two MCT participants who met the exclusion criteria, were included in the feasibility analyses.

Seventy three percent (73%) of participants completed treatment. Seven participants (35%) dropped out of the MBSR condition. Of the seven participants, two did not begin treatment after being randomized, while three participants dropped out after the first session stating that they did not think they would find the treatment helpful. Additionally, two

participants dropped out at mid-treatment stating that they felt their anxiety was getting progressively worse and opted to cease treatment.

In the MCT condition 4 participants (20%) dropped out of treatment. As some participants were recruited from a waiting list at the Mental Health and Social Care NHS Trust, two participants were offered treatment via the trust within the first two sessions and opted to pursue that treatment option, while one participant was no longer able to make the sessions due to a scheduling conflict. In addition, one participant did not begin treatment after being randomized to treatment. No patients reported that their anxiety/mood was getting worse.

Retention rates between groups differed by time point. After the first session the MBSR group retained 75% of participants while the MCT group retained 90% of participants, at mid treatment 65% of participants were retained for the MBSR group while the MCT group retained 80% of participants by mid treatment. The MBSR group had 13 participants complete treatment and the MCT group had 16 participants complete treatment. On average participants in the MBSR condition attended 6 out of 8 sessions, while participants in the MCT condition attended 7 out of 8 sessions.

Treatment acceptability ratings for each group are displayed in Table 9.1. Participants were asked to rate six aspects of acceptability and there were no significant differences between groups on any dimension, with both groups finding their respective treatment to be acceptable. There was no difference between groups when asked to rate if they thought that their respective treatment would be helpful for individuals with anxiety, $F(1,33) = 0.04$, $p = 0.846$. Groups also did not differ in their belief that the treatment would be helpful for them, $F(1,33) = 0.07$, $p = 0.787$. Additionally, both groups rated that they believed the therapist and group leaders would be helpful, $F(1,33) = 1.28$, $p = 0.265$. Both the MCT and MBSR groups would recommend their treatment to others, $F(1,33) = 0.03$, $p = 0.867$. Finally, both groups believed that the treatment would help them with other problems such as headaches and

insomnia and that the treatment would help them to lead the life they wanted to live, $F(1,33) = 0.05$, $p = 0.825$ and $F(1,33) = 0.87$, $p = 0.358$, respectively.

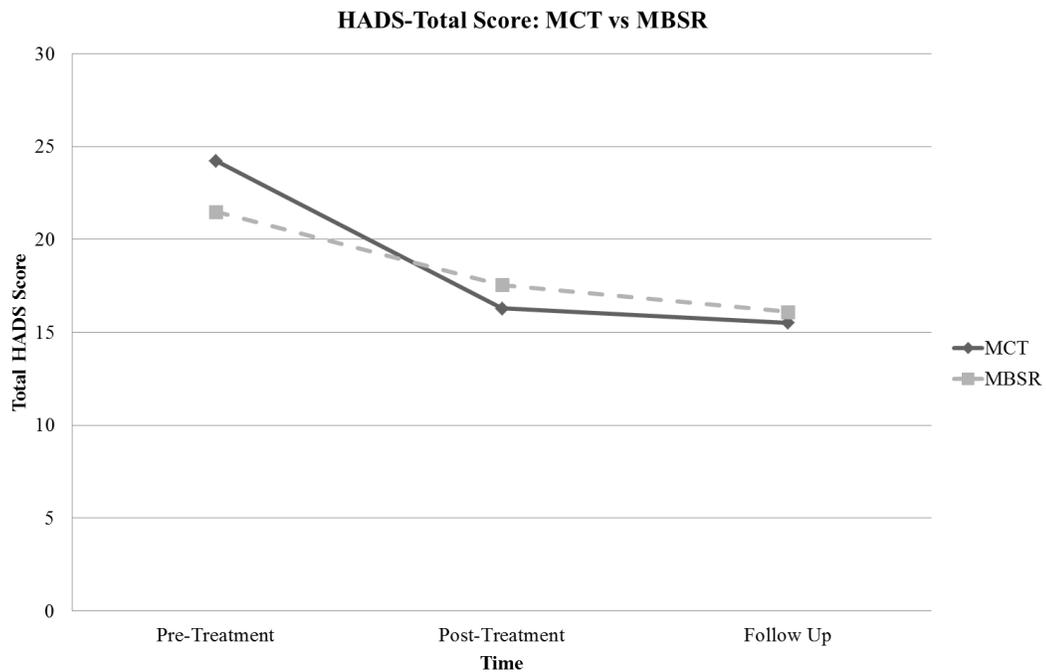
9.4.3. Treatment Efficacy Analyses

Treatment efficacy analyses were based on a total sample size of 35 participants. This excludes the three participants who were randomized to treatment but did not begin treatment, as we do not have pre-treatment data for these participants. Additionally, two participants from the MCT group were not included as they met the exclusion criteria for the trial and this was noted at the first session.

The HADS total score was used for the analyses rather than the subscale scores, as there has been concern that the subscales may not comprehensively assess mood, thus the total score was used as a measure of distress (Hermann, 1997). As there was a significant difference between groups on medication use, $t(31) = -3.39$, $p = 0.002$, which was related to the total HADS score at pre-treatment, $t(33) = -2.10$, $p = 0.04$, we controlled for this in the analysis.

An analysis of covariance (ANCOVA) was conducted to examine differences between groups at post-treatment and follow up. We controlled for medication use, gender, and HADS pre-treatment score. There was a significant difference between groups at post treatment, $F(1,28) = 4.91$, $p = 0.04$, $\eta^2p=0.15$. However, this effect was not maintained at six-month follow up, $F(1,28) = 1.18$, $p = 0.29$, $\eta^2p=0.04$. These results are depicted in Figure 9.2.

Figure 9.2. Mean Total HADS Score: Pre, Post, & 6 Month Follow Up



Effect sizes (Cohen, 1988) were calculated to examine the size of the difference between groups at post treatment and follow up, as well as within groups from pre to post treatment and from pre-treatment to follow up, and are reported in table 9.2. The data showed that MCT was associated with a greater effect than MBSR at post treatment and follow up but caution must be exercised as the sample sizes are small and the MCT group had higher pre-treatment severity.

Table 9.2. Mean and Standard Deviation for Primary and Secondary Outcome Measures and Treatment Effect Sizes

| | MCT (N= 17) | | | MBSR (N = 18) | | |
|---------------------------------|-----------------|-------------------|-------------------|------------------|-------------------|-------------------|
| | HADS Total | CAS-I: PMC | CAS-I: NMC | HADS Total | CAS-I: PMC | CAS-I: NMC |
| Pre-Treatment | 24.24 (3.87) | 220.00 (66.71) | 238.24 (49.65) | 21.50 (3.85) | 217.78 (69.41) | 243.61 (82.03) |
| Post-Treatment | 16.29 (7.13) | 86.47 (95.19) | 90.88 (70.63) | 17.56 (5.18) | 185.83 (68.87) | 192.22 (97.65) |
| 6 Month Follow Up | 15.53 (7.44) | 86.18 (97.20) | 85.59 (85.91) | 16.11 (5.80) | 178.61 (69.74) | 213.89 (82.11) |
| Pre-Post Effect Size | 1.38 | 1.62 | 2.41 | 0.86 | 0.56 | 0.57 |
| Pre-Follow Up Effect Size | 1.47 | 1.61 | 2.18 | 1.09 | 0.56 | 0.36 |

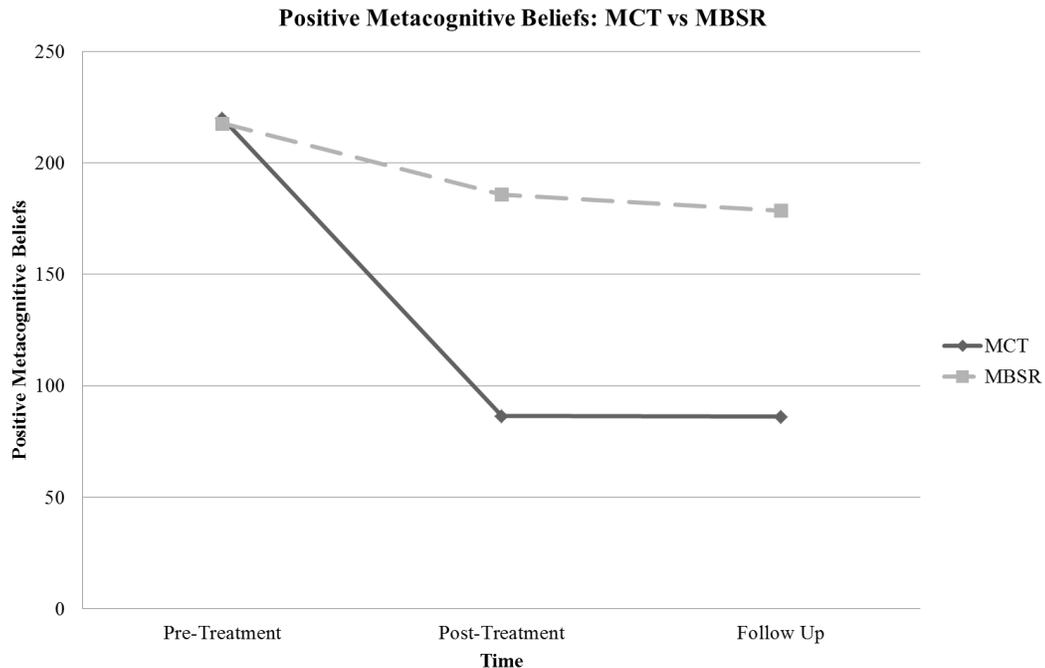
Note: HADS = Hospital Anxiety & Depression Scale, PMC = Positive Metacognitive Beliefs, NMC = Negative Metacognitive Beliefs

Reliable change was calculated on the HADS total score according to Jacobson and Truax (1991), whereby a reliable change was calculated to be six points. In the MCT group, 65% (n = 11) had reliably improved at post treatment, while 35% (n = 6) had not reliably changed. In the MBSR group, 28% (n = 5) had improved, and 72% (n = 13) had not reliably changed. A Chi-square test demonstrated that there was a significant difference between groups, $\chi^2(1, N = 35) = 4.80, p = 0.03$ on number of individuals that had reliably changed. At 6-month follow up, following MCT 71% (n = 12) had improved, while 29% (n = 5) had not reliably changed. The MBSR group had a slight increase in the number of individuals that had improved, 50% (n = 9), however, 50% (n = 9) had also not reliably changed. This difference did not reach statistical significance $\chi^2(1, N = 35) = 1.54, p = 0.21$.

9.4.4. Metacognitive Beliefs

An analysis of covariance (ANCOVA) was conducted to evaluate group differences in positive metacognitive beliefs at post-treatment and follow up. Gender, medication use and pre-treatment positive metacognitive beliefs were controlled for. In evaluating post-treatment positive metacognitive beliefs, there was a significant difference between groups, $F(1,28) = 15.86$, $p < 0.001$, $\eta^2_p = 0.36$. The results were consistent at 6-month follow up as well, $F(1,28) = 11.50$, $p = 0.002$, $\eta^2_p = 0.29$. Figure 9.3 demonstrates the changes between groups over time.

Figure 9.3. Mean Positive Metacognitive Beliefs Score: Pre, Post, & 6 Month Follow Up

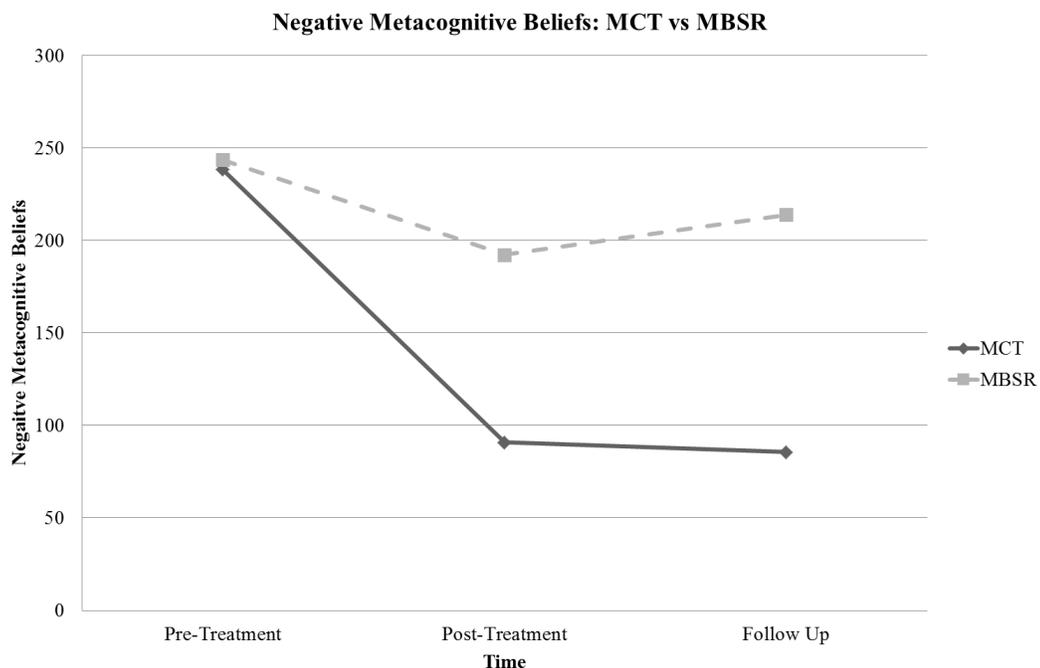


Both between and within group effect sizes were calculated for positive metacognitive beliefs. Within group effect sizes (Table 9.2) demonstrate that MCT produced greater changes in positive metacognitions from pre to post treatment and this pattern was maintained when the within group effect size for pre-treatment and 6 month follow up were calculated, with MCT producing a very large effect, Cohens $d = 1.61$, and MBSR produced a medium effect,

Cohens $d = 0.56$. Additionally, between group effect sizes were calculated at post treatment, where a large effect size was found in favour of MCT, Cohens $d = 1.20$, this effect was maintained at follow up where MCT continued to produce a more favourable change in positive metacognitions, Cohens $d = 1.09$.

An ANCOVA was conducted to examine differences between groups on negative metacognitive beliefs at post-treatment and follow up. Pre-treatment negative metacognitive beliefs, gender, and medication were used as covariates. The ANCOVA demonstrated that there was a significant difference between groups at post-treatment, $F(1,28) = 10.16$, $p = 0.004$, $\eta^2_p = 0.27$. A significant difference between groups was also demonstrated at follow up, $F(1,28) = 21.09$, $p < 0.001$, $\eta^2_p = 0.43$. Figure 9.4 depicts the changes between groups over time. Effect sizes were calculated to examine the size of the effect between groups as well as within groups. Within group effect sizes are reported in table 9.2. The between group effect sizes favour MCT over MBSR. At post treatment the between group effect size favoured MCT, $d = 1.19$ and this was retained at follow up with an effect size of $d = 1.53$.

Figure 9.4. Mean Negative Metacognitive Beliefs Score: Pre, Post, & 6 Month Follow Up



9.5. Discussion

The current study aimed to evaluate the feasibility and acceptability of group MCT and MBSR for trans diagnostic groups. Both interventions were found to be acceptable and feasible treatments, as both groups reported their respective treatment to be acceptable, as demonstrated by similar scores on all items of the treatment credibility measure. Although both groups found the treatment to be acceptable the MBSR group did have a higher drop-out rate than the MCT condition. The MBSR group had 35% of participants drop out while MCT had 20%. Drop outs also differed in their point of treatment termination and reasons for treatment withdrawal. In the MCT condition, patients withdrew within the first two sessions either due to a scheduling conflict with the sessions or because they were offered treatment via the UK health-care system, resulting in the MCT group retaining 80% of participants. In the MBSR condition, most of the individuals that dropped out withdrew after the first session as they did not believe that the treatment would be helpful, while two participants withdrew at mid-treatment stating that they did not feel the treatment was helping to reduce their anxiety and reported that their anxiety was worsening. Dropout rates for the MBSR condition are in line with other studies who have reported rates between 21-44 % (Vollestad et al., 2011; Arch et al, 2013; Shapiro, Astin, Bisop & Cordova, 2005). Dropout rates for group MCT are variable, as previous studies of group MCT have reported no drop outs (Rees & van Koesveld, 2008; Papageorgiou & Wells, 2015; Dammen, Papageorgiou & Wells, 2015). The drop-out rate reported in the current study is similar to that of van der Heiden, Melchior, & Stigter (2013), who reported a 27% dropout rate for group MCT.

One notable difference between the current study and previous studies is the difference in group sizes. Previous trials of MCT have had a mean group size of 6-8 participants (Callesen et al., in prep; van der Heiden, Melchior, & Stinter, 2013), while MBSR groups have 10 or more participants (Kabat-Zinn et al., 1992; Arch et al., 2013; Imel, Baldwin, Bonus &

MacCoon, 2008). The current study had smaller groups of 4-6 participants, however, we do not know if this provides a benefit or disadvantage but the data shows that both treatments would be acceptable and feasible for a definitive trial.

We examined the group effect on levels of psychological distress as measured by the total score of the HADS and controlled for the difference in medication use between groups and baseline HADS score. At post treatment the outcomes favoured MCT over MBSR and this difference persisted at follow-up but by this time they were non-significant. The loss of significance appears to be due to some further improvement in the MBSR group after treatments and a loss of statistical power to detect the difference due to a small sample size.

The number of participants that reliably improved was greater in the MCT condition at post treatment and at follow-up. The effect sizes obtained in the two treatments were favourable in comparison to other studies. Notably, the results for MBSR were greater than those previously reported (Lengacher et al., 2009; Koszycki, Bengler, Shlik, Bradwejn, 2007; Vollestad, Sivertsen, & Nielsen, 2011). In contrast, the effect sizes for MCT were lower than those found in individual or group interventions for specific disorders (Wells & King, 2006; Nordahl, 2009; van der Heiden, Melchior, de Stigter, 2013).

There were significant and large group differences when we compared changes in positive and negative metacognitive beliefs, which favoured MCT. These results are consistent with the Metacognitive model, which aims to decrease metacognitive beliefs. Results are also consistent with previous studies of group MCT (McEvoy et al., 2015; van der Heiden, Melchior, de Stigter, 2013, Callesen et al., in prep), which demonstrated large to very large effect sizes on positive and negative metacognitive beliefs. Thus, the results add to the growing literature that therapy that focuses on altering metacognitive beliefs provides significant therapeutic change.

Results for MBSR are in line with previous trials which have produced significant reductions in anxiety and depression (Kabat-Zinn et al., 1992; Arch et al., 2013; Vollestad, Sivertsen, & Nielsen, 2011). Although MBSR produced changes on levels of psychological distress it only produced small to medium sized changes in metacognition. While MBSR was associated with such changes, it is unclear what the underlying processes are behind this effect. One of the difficulties in interpreting the treatment effects of MBSR is that it is not derived from a psychological model of specific maintenance mechanisms and it currently lacks evidence on how and why therapeutic changes occurs. Hölzel et al. (2011) have argued that mindfulness meditation increases self-focused attention and that this leads to improved emotional awareness and better emotion regulation abilities. Yet, this notion is inconsistent with other researchers who argue that heightened self-focused attention is associated with psychological disorder including social anxiety disorder, generalized anxiety disorder, and panic disorder (Bögels & Mansell, 2004; Clark & Wells, 1995; Mor & Winquist, 2002). Advances in MBSR would benefit from a cohesive model defining the underlying processes that lead to therapeutic change and this would permit more equitable selection of secondary process measures in subsequent comparative studies.

The present study has limitations. First, a diagnostic interview was not used to confirm diagnoses of anxiety or depression; however, this may also be seen as a strength as we had a wide inclusion criteria leading to a possible closer match between our samples and those found in clinical practice. A second limitation is that a last observation carried forward approach was used to account for missing data, which has been criticized (Hamer & Simpson, 2009). Although this approach limited the number of participants that would have been eliminated from the study it is a conservative approach and does not account for any changes in the participant between drop out and end of treatment and follow up. Although multiple imputation is a common approach to handle missing data, this this was not appropriate as the

data was probably not missing at random. A third limitation is that we did not stratify groups for level of distress at intake, which resulted in the MCT condition having a more distressed sample than the MBSR group, which may have influenced the study results. The study had low statistical power and sample size, therefore a definitive trial with adequate sample size is required. In addition, therapists and participants were not blind to treatment which may have introduced bias into the study, thus it is important that future studies incorporate blinding procedures. Finally, data was reliant on the use of self-report measures, which may introduce response bias, thus future research could incorporate qualitative and behavioural assessments.

Both interventions were found to be feasible and acceptable transdiagnostic group treatments. However, there was some preliminary indication that MCT had a higher completion rate. There appeared to be no adverse effects associated with MCT but two patients in the MBSR condition reported a worsening of anxiety that may or may not be attributable to the intervention. MCT appeared to be associated with larger effects and higher clinical response rates but this needs to be substantiated in more definitive studies. The results support further research to examine and compare the effectiveness of these approaches.

10. Chapter 10: Discussion

10.1. Outline of Chapter

This chapter will summarize the main findings of the seven empirical studies in the thesis and synthesize the predominant themes and wider implications of the research. The chapter begins by providing an overview of the main aims and findings from the studies presented previously. Following from this the overarching themes that emerged from the research will be discussed. In addition, the strengths and limitations will be explored. An evaluation of the implications for clinical practice and future directions will be discussed. Finally, the thesis will conclude with a review of how this research has contributed to our understanding of the role that metacognition has across different aspects of stress recovery.

10.2. Overview of Aims and Key Findings

The primary aim of the thesis was to evaluate the role of metacognition in stress and recovery and to address the question is metacognition a determinant. To achieve this, six main aims were set and will be reviewed.

Aim one: Investigate the current literature on the role of metacognition in resilience to stress.

The first aim of the thesis was to conduct a literature review to establish the current state of the literature regarding the role of metacognition in resilience (an aspect of recovery) to stress. The resilience literature has focused on three primary areas: personality, psychological disorder, and coping strategies. The results demonstrated the promising contribution that the S-REF model (Wells & Matthews, 1994, 1996) could make to the field

and that metacognition appears to have a role in resilience. The data highlights that worry and punishment were associated with increased PTSD and stress symptoms, with worry being predictive of long term PTSD. In addition, both positive and negative metacognitive beliefs were found to be positively associated with stress levels. The study noted that there are specific limitations with the current research on resilience. The first is that the field lacks a cohesive definition of what resilience is, which is tied to a further limitation that the research in this area is not based on any underlying theoretical model that would account for the underlying cognitive processes or mechanisms that confer resilience. Instead resilience is commonly defined as a personality characteristic or examined on the basis of protective factors. Although research has examined resilience with respect to the presence or absence of a psychological disorder and the coping strategies that individuals use, research investigating the interaction between these two factors in resilience is limited. There is therefore a gap in the literature which provides a promising avenue whereby the metacognitive model might be used to provide an account of resilience. The model might be useful in this respect as it synthesizes the processes that lead to psychological disorder and it accounts for the specific maladaptive coping strategies that individuals use. The study set the framework for additional studies investigating the association between metacognition, stress, and recovery.

Aim two: Investigate the impact of two self-regulation strategies on psychological and physiological recovery from induced stress.

The second aim was to evaluate how two metacognitive strategies, worry and rumination, impact on recovery from stress, and we hypothesized that worry and rumination would lead to delayed recovery in comparison to distraction on physiological and psychological outcomes. Worry and rumination are characteristic of anxiety and depression, respectively. According to the Metacognitive Model these emotion regulation strategies

prolong distress by facilitating the CAS. Thus, this study is important as it provided empirical evidence for their impact on physiological and psychological measures of distress.

The results indicated that on physiological indices of stress rumination appeared to delay recovery in comparison to distraction, and this effect appeared most prominently 30 minutes into the recovery period; however this was not evidenced on self-report measures. In contrast, on self-report measures the worry condition displayed a delay in recovery immediately following the worry induction; however the rumination manipulation did not appear to impact on self-report negative affect at any phase. This is an important finding as previous studies have not examined the physiological and psychological effects of both of these strategies in the same experimental paradigm. It contributes further evidence in support of the metacognitive model providing evidence for the prediction that metacognitive strategies of worry and rumination delay recovery from stress.

Aim three: Evaluate the impact of metacognitive beliefs on psychological and physiological recovery from induced stress.

The first study demonstrated that one aspect of the CAS, metacognitive strategies (worry and rumination), impacts on psychological and physiological measures of stress. Following from this we manipulated a central dimension of metacognition implicated in the model: metacognitive beliefs. Metacognitive beliefs are an important aspect of metacognition and are one of the driving forces behind the CAS, therefore, we aimed to evaluate the impact that negative metacognitive beliefs, specifically thought importance, has on stress recovery based on psychological and physiological measures. We hypothesized that negative metacognitive beliefs would lead to elevated stress symptoms and/or a delayed recovery from stress. The findings demonstrated that the experimental condition in which beliefs were elevated experienced increased negative affect and decreased levels of positive affect both in

reaction to stress and in recovery from stress. In addition, there was some evidence that enhanced thought importance might increase physiological indices of stress however this difference did not reach statistical significance between groups.

The results provide important implications for the S-REF model, suggesting that metacognitive beliefs impact stress reactions by amplifying and prolonging negative emotions. The results also support the idea that modification of metacognitive beliefs in therapeutic settings may promote emotional recovery.

Aim four: Evaluate the metacognitive predictors of psychological resilience.

Although the literature review conducted in chapter three indicates that metacognition might provide a suitable account of psychological resilience this has not been directly evaluated, therefore, a prospective cohort study was conducted to evaluate the metacognitive predictors of psychological resilience and psychological distress. We hypothesized that metacognitive beliefs would negatively predict resilience while DM would positively predict resilience. Additionally, we hypothesized that these factors would demonstrate similar associations with clinically reliable changes in anxiety and depression. The results indicated that two metacognitive factors: *negative metacognitive beliefs of uncontrollability and danger* and *detachment* were found to be significant predictors of psychological resilience, such that increased negative metacognitive beliefs regarding uncontrollability and danger were negatively associated with resilience while increased detachment was positively associated with resilience. In addition, negative metacognitive beliefs regarding uncontrollability and danger were found to be predictive of increased psychological distress. Further analyses were conducted to evaluate which metacognitive factors could predict individuals who had reliably recovered versus those who had reliably deteriorated on symptoms of anxiety and depression. The variable *detachment* was the key predictor that could distinguish between these groups,

such that individuals with greater detachment were more likely to have reliably recovered from stress over time.

The results provide implications for the metacognitive model highlighting that two metacognitive factors (negative metacognitive beliefs and detachment) are associated with recovery. These findings may help facilitate a further understanding of the reflexive adaptational process (RAP) which is a feature of the metacognitive model of trauma (Wells, 2009). The RAP is an adaptational process that is hypothesized to occur following a stressful event, which aids individuals in developing new coping strategies and patterns of executive control, thus metacognitive beliefs and detachment may contribute to the RAP by aiding in the ability to terminate perseverative processes.

Aim five: Investigated if changes in metacognitive beliefs predict and precede changes in symptoms of psychological distress in individuals receiving group Metacognitive Therapy.

Although MCT (Wells, 2009) is a highly effective psychological therapy based on a theoretical model little is known about predictors of change during treatment, and if changes in symptoms precedes changes in metacognitions or if changes in metacognitions precedes changes in symptoms. Therefore, the study aimed to evaluate this change in a transdiagnostic sample. We hypothesized that change in metacognition would precede changes in symptoms, and the results support the hypothesis, such that changes in metacognition precedes changes in symptoms. This provides important insights for therapeutic treatment indicating that treatment focusing on challenging metacognitions leads to changes in symptoms and supports a move away from symptom management strategies and encourages a move towards metacognitive modification in psychological therapies

Aim six: Evaluate the feasibility of group Metacognitive Therapy in comparison to Mindfulness Meditation therapy in a transdiagnostic sample.

Psychological therapy is an important medium through which stress recovery can occur; however, the pathway through which change occurs might differ between therapies. MBSR and MCT are two psychological therapies for mental disorders with differing treatment aims. Therefore, a feasibility study was conducted to assess the practicality of these treatments and of a future comparative trial along with providing preliminary results regarding treatment efficacy. Both treatments were found to be feasible and acceptable treatments and patients accepted randomization to the study with low levels of drop-out. The effect sizes demonstrated by the MCT group are encouraging and worthy of further study.

The results add to the findings of study six such that therapies that focus on challenging metacognition directly are an effective means of treatment and offer a method of alleviating distress, thereby facilitating recovery.

10.3. General Discussion

Throughout the thesis the role of metacognition in stress and recovery has been evaluated across various settings, populations, and using several parameters of recovery. We operationalized recovery from stress in three ways: recovery from induced stress based on physiological and psychological indices, recovery based on clinically defined recovery, and as the ability to bounce back from naturalistic stress. These varying definitions of recovery were evaluated using both analogue and clinical samples and in therapeutic, naturalistic, and experimental settings. Overall, the results indicate that metacognition plays an important role in stress recovery, and these results will be discussed within the framework of two broad themes: the influence of metacognition on stress recovery in naturalistic and laboratory settings and the underlying mechanism of clinically reliable recovery.

10.3.1. Metacognition and Recovery in Daily and Induced Stress

One of the main principles of the S-REF model is that the CAS is a result of individual's metacognitive beliefs, which directs individual's attention, coping style, and predisposes them to engage in thinking styles such as worry and rumination (Wells & Matthews, 1994; Wells, 2009). In line with this notion, results from the experimental studies highlight that metacognition (metacognitive beliefs and strategies) impacts on recovery from induced stress. In addition, the cross-sectional study highlighted that increased negative metacognitive beliefs are associated with decreased psychological resilience (ability to bounce back from stress) and increased psychological distress (anxiety and depression). Previous studies have highlighted the association between increased negative metacognitive beliefs and anxiety and depression (Yilmaz, Gencöz, & Wells, 2011; Huntley & Fisher, 2016; Halvorsen, et al., 2015), and further studies have noted the association between metacognition (strategies and beliefs) and psychological distress. For example, Cartwright-Hatton and Wells (1997) found that negative metacognitive beliefs were associated with anxiety, worry, and obsessive-compulsive symptoms. These results are further supported by Sica et al. (2007) who also found that negative metacognitive beliefs were associated with worry and also noted that positive metacognitive beliefs were associated with avoidant coping strategies. An interesting observation to emerge from the current studies is that irrespective of the stressor being transient or prolonged, metacognition is associated with the maintenance of stress and impacts on both physiological and psychological dimensions of the recovery process.

10.3.2. Clinically Reliable Recovery: Similarities Among Analogue and Clinical Samples

Recovery, defined as clinically reliable change, may occur through similar pathways in both clinical and non-clinical settings. Studies using clinical samples demonstrate that recovery from psychological distress (anxiety and depression) is predicted by changes in the CAS (e.g., changes in positive and negative metacognitive beliefs) (Dammen, Papageorgiou & Wells, 2015; McEvoy, Erveg-Hurn, Anderson, Campbell, & Nathan, 2015; Papageorgiou & Wells, 2015; Solem et al., 2009; Wells et al., 2015). This is emphasized by the results from study six where structural equation modelling highlighted that changes in the CAS precedes changes in symptoms. In metacognitive therapy, change in metacognitive beliefs is facilitated through techniques such as detached mindfulness and the attention training technique which aim to modify individual's style of cognition resulting in increased flexibility over attention. Preliminary results from the feasibility study highlight that therapy that focuses on producing change by using techniques such as detached mindfulness and attention training results in greater reductions of psychological distress. Interestingly, the cross-sectional study highlighted that psychological resilience was associated with decreased negative metacognitive beliefs regarding uncontrollability and danger and increased detachment. In addition, recovery from psychological distress based on clinically reliable change was predicted by the detachment subscale of the DMQ. Taken together, these results suggest that irrespective of the population, detachment may be an important construct in facilitating recovery. Detached mindfulness is comprised of two components: detachment and mindfulness, whereby detachment refers to abstaining from additional processing associated with a thought and mindfulness refers to being aware of inner thoughts. Research investigating detached mindfulness has only recently begun to emerge, however the results are promising. Caselli, Gemelli, Spada and Wells (2016) compared the effects of detached mindfulness and brief exposure in individuals with alcohol use disorder and asked participants listen to a loop

tape of their alcohol related thoughts. They found that detached mindfulness decreased levels of distress and metacognitive beliefs. Additionally, Ludvik and Boschen (2015) compared the effects of detached mindfulness and cognitive restructuring on compulsive checking. In individuals with OCD one of the most common compulsions is checking behaviour, which subsequently induces stress. Ludvik and Boschen (2015) found that DM and cognitive restructuring produced similar results on all outcomes except for memory detail and confidence, where the DM group was superior. This is an important finding as cognitive confidence can be expressed as negative metacognitive beliefs and therefore DM might be beneficial in reducing such beliefs. These results suggest that detached mindfulness is an effective way of reacting to thoughts and mitigating distress.

10.4. Strengths and Limitations

10.4.1. Key Strengths

The thesis encompasses a number of strengths. In particular it investigated recovery from stress which was operationalized in three different ways using both analogue and clinical populations, and it incorporated a broad range of study designs, measures, and analyses.

One of the key strengths is the use of three definitions and operationalization's of recovery. Overall recovery from stress is a process; however the factors that facilitate this process remain variable. Therefore, in order to examine different aspects of recovery we operationalized it in different ways, allowing for conclusions to be drawn across settings and populations. The first operationalization of recovery was defined as the propensity to decline towards baseline levels as measured by physiological and psychological indices. The use of experimental manipulations allowed for extraneous factors to be controlled for while manipulating the independent variable (metacognition) and testing its impact on recovery.

Next, recovery was defined as the ability to bounce back from stress and evaluated using a prospective cohort study. This allowed for an evaluation of resilience to daily stress, which provided good ecological and external validity of results.

Finally, we defined recovery with respect to clinically reliable change, which is beneficial as it provided clinically meaningful data on recovery rather than relying solely on statistical significance, which does not address the clinical utility of findings. This allowed for the metacognitive factors in clinical recovery to be evaluated. Overall, it was discovered that common metacognitive variables seem to be predictive of recovery as reliable effects were demonstrated across populations (clinical and analogue), setting (experimental, clinical, and naturalistic), and varying definitions of recovery.

The range of methodologies used is also a key strength. Methodologies included experimental and quasi-experimental designs, which incorporated a multi-method approach to data collection assessing both physiological and psychological outcomes. The use of true-experimental as well as longitudinal designs allowed for causality between variables to be tested and for immediate and long term effects to be evaluated. In addition, both clinical and analogue samples were used, which allowed for assessment of any similarities or differences in factors related to recovery to be established across normal and abnormal stress reactions.

As there were a range of methodologies used these subsequently provided different types of data and therefore required the use of different statistical analyses. Each study incorporated a different method of analysis which included multivariate predictive analyses, mediator and moderator analyses, cross-sectional analyses as well as a range of inferential and multivariate statistics. The range of statistical analyses used allowed for a range of hypotheses to be tested.

Overall, the key strengths lie in the use of various methodologies, analyses, populations and settings, providing a diverse evaluation of recovery.

10.4.2. Limitations

Although the studies include a variety of strengths it is important to acknowledge that they are not without their limitations, which must be considered prior to discussing any impacts on clinical practice and future directions for research.

One of the limitations in study 2 (worry and rumination manipulation study) was that the instructions and prompts used to induce these two strategies were not perfectly matched. This resulted in potentially more than one variable being manipulated simultaneously; however, as the aim was to have participants engage in a specific emotion regulation strategy the effect of any other variables being manipulated was likely to be minimal.

One of the limitations of study 3 (metacognitive belief manipulation) lies in participants belief that the EEG was detecting their negative thoughts and that they would hear a noise in response. Some students reported that they tried to test the instructions by having a negative thought and expecting a noise to be heard. The manipulation check aimed to evaluate this by asking participants to rate their belief that the EEG was detecting their negative thoughts and that they would hear a noise. Participants mean belief ratings that they might hear a noise in relation to their negative thoughts or at random (depending on group allocation) was 59% for the experimental condition and 68% for the control condition. When examining individual's belief ratings that their negative thoughts could be detected by the EEG, those in the experimental condition had a mean rating of 69% while the control condition had a mean of 77%. Although the groups had different ratings this difference was not statistically significant and therefore appears to have emerged at random. In order to evaluate if the difference in ratings impacted on the results, the analyses were re-run with the belief ratings added in as covariates which demonstrated that the difference in beliefs did not impact on the results.

In addition, both of the experimental manipulation studies used the PANAS which has been criticized as a measure of affect as it is based on a two factor dimension (positive and negative affect) with each factor including high and low poles (Watson & Tellegen, 1985). Matthews, Jones & Chamberlain (1990) point out that one of the problems with a two-factor solution is that it may be insufficient to account for the variation in items related to arousal or hedonic tone. Although the scale has high and low poles the PANAS has been criticized as it only measures the high poles of positive and negative affect (Nemanick & Munz, 1994); however Watson and Tellegen (1985) argue that only the high end of each dimension represents a state of emotional arousal. Despite these criticisms that PANAS is a widely used self-report measure and whose factor structure has been confirmed as measuring two dimensions (positive and negative affect), and is a suitable scale for non-clinical samples (Crawford & Henry, 2004).

Although one of the strengths of the thesis is that it uses both analogue and clinical samples the majority of the research was conducted using undergraduate students. This makes it difficult to generalize the results to other populations or age groups. Thus, future studies should be conducted to evaluate the effects across different age groups and populations.

The feasibility study has several limitations. The first is that missing data was entered using a last observation carried forward approach (LOCF). Although this approach is widely used it is not without its limitations (Gibbons, Hedeker, & DuToit, 2010; Lavori, Brown, Duan, Gibbons, & Greenhouse, 2008). One of the assumptions of LOCF is that individual's scores remain relatively stable over time, however as individuals had elevated levels of anxiety or depression it is expected that on average and over time their scores, even without treatment would decrease. This trend is called the regression to the mean effect, and by using a LOCF approach this tendency is not accounted for. In order to overcome this, a mixed effects regression model will be used to analyze the data prior to publication. This will allow all three

time points to be analyzed together. This will allow us to investigate if the group differences at post treatment and follow up together are significantly different from baseline. In addition, this approach will increase the power to detect an effect.

The second limitation in this study is that there was no control group used, the study involved the comparison of two active treatments. Although both treatments were associated with improvement we do not know how MBSR compares to a placebo or a control group where we could control for non-specific factors such as meeting in a group. The results suggest that MCT is efficacious in treating a transdiagnostic sample as the outcome was superior to MBSR, however with the lack of a control group the same conclusions cannot be drawn regarding the MBSR group, who might have improved spontaneously, simply with the passage of time. In addition, the study not only had a small sample size but as the groups were transdiagnostic it poses problems with respect to generalizability of results and replicability, as it will be difficult to obtain a similar combination of participants. Alternatively, the use of transdiagnostic groups is advantageous as it provides good ecological validity, as in clinics patients often do not have diagnoses such as anxiety or depression alone, in fact these are likely to be comorbid or exist alongside another disorder.

Long-term follow up data was not possible to collect within the frame of this study; as such follow up data was only collected for 6 months post treatment. Thus, the long term effects of both treatments and how long treatment effects persist remains unclear.

Finally, the discrepancy between therapists may have posed a bias in treatment. In the MCT groups, MCT was delivered by the originator of the treatment while MBSR was delivered by the author whose experience with therapy delivery is limited. However, when examining participant's scores on treatment credibility both groups had similar ratings on all items including: how much they believed the therapist would help them, that the treatment approach would be beneficial, and in recommending the treatment to a friend. This therefore

suggests that the differences between therapists are minimal. In fact, when treatment effect sizes between MBSR delivered in the feasibility study and other studies of MBSR (Ramel, Goldin, Carmona, & McQuaid, 2004; Reibel, Greeson, Brainard, & Rosenzweig, 2001; Vøllestad, Sivertsen, & Nielsen, 2011) were compared, MBSR delivered in the feasibility study here outperformed other studies where MBSR was delivered by a more experienced therapist (e.g., Arch et al, 2013).

10.5. Implications for Clinical Practice

10.5.1. Challenging Metacognitive Beliefs

Metacognitive therapy (Wells, 2009) is based on a transdiagnostic theory (S-REF model). According to the S-REF model (Wells and Matthews, 1994) the cognitive attentional syndrome (CAS), a transdiagnostic thinking style, leads to emotional distress. The CAS is driven by individual's metacognitive beliefs which lead individuals to engage in repetitive negative self-referent processing such as worry and rumination, threat monitoring, and negative coping strategies. One of the predictions of the metacognitive model is that as it is based on transdiagnostic metacognitions.

As such, metacognitive beliefs have been associated with a variety of psychological disorders including depression, anxiety, OCD, and psychosis as well as with heightened emotional distress in physical health populations such as Parkinson's disease, chronic fatigue, and cancer (Papageorgiou & Wells, 2001; Huntley & Fisher, 2016; Spada, Mohiyeddini, & Wells, 2008; Yilmaz, Gencöz & Wells, 2008; Morrison & Wells, 2003; Allot et al., 2005; Maher-Edwards et al., 2001; Cook et al., 2015b), supporting the prediction that metacognitive beliefs are common across disorders.

Given that metacognitive beliefs are common across disorders leading individuals to engage in styles of thinking that prolong distress, therapy that focuses on challenging such

beliefs and processes may be more beneficial than those that focus on challenging the content of individual's thoughts.

Various studies investigating metacognitive therapy have highlighted that modifying metacognitive beliefs is associated with a reduction in psychological distress. (Wells, Fisher, Myers, Wheatley, Patel, & Brewin, 2012; Papageorgiou & Wells, 2015; Bailey & Wells, 2014; Wells, Walton, Lovell, & Proctor, 2015; Hutton, Morrison, Wardle & Wells, 2014). Often in clinical settings patients present with comorbid disorders and more recently MCT has begun to be evaluated in such patients. Hjemdal et al. (2016) evaluated individuals with severe major depressive disorder and a comorbid psychiatric disorder and found that following 10 sessions of MCT none of the patients met the diagnostic criteria for major depressive disorder and only 2 patients still fulfilled the criteria for a co-morbid diagnosis of avoidant personality disorder. In addition, preliminary findings from the feasibility study reported in chapter 9, provides support that group metacognitive therapy is effective in treating transdiagnostic samples, as at post treatment 65% of participants in MCT were improved and at follow up this was 71%.

Study 6 further supports the Metacognitive model by providing evidence that in a transdiagnostic sample change in metacognitive beliefs precedes changes in symptoms, therefore therapies that focus on modifying metacognitive beliefs provide a pathway to changes in symptoms of psychological distress.

These results contrast with approaches such as cognitive behavioural therapy (CBT) which posits that emotional disorders can be differentiated on the basis of thought content and aims to challenge that negative automatic thought content (Clark & Beck, 1989; Beck & Perkins, 2001). Thus, modification of metacognitive beliefs appears to provides an alternative and beneficial avenue through which symptoms of psychological disorder can be addressed.

10.5.2. Detached Mindfulness and Treatment

Chapter 7 highlighted that detached mindfulness appears to be associated with an individual's stress response, such that increased detachment is associated with decreased distress. Detached mindfulness (DM; Wells & Matthews, 1994; 1996) is comprised of two components, mindfulness and detachment, and it is the component of detachment which is a unique feature of DM and distinguishes it the most from the meditation literature. The inclusion of detachment in DM supports a multifaceted view of mindfulness and delivers an aspect of mindfulness that the meditation literature has not considered. For example, in MBSR the aim is to pay attention to the present moment non-judgmentally, focusing on cultivating increased awareness (Kabat-Zinn, 1994). In this view, the focus is on being aware of the present moment and of thoughts, therefore detachment (defined as not reacting thoughts) is not emphasized. Indeed, after observing distressing thoughts the individual practicing MBSR is asked to use the breath as an anchor to bring attention back to the present moment. This can be seen as reacting to thoughts rather than detaching from them.

Focusing on the aspect of detachment may prove to be important in developing new treatment techniques. Currently, in MCT the Attention Training Technique (ATT; Wells, 1990) and DM techniques (Wells, 2005a) help to facilitate detachment. The ATT aims to reduce self-focused attention and increase attentional flexibility and control, thereby increasing individual's ability to detach from the CAS and return to normal flexible processing (Wells, 1990). DM also aims to develop flexible control over attention and thinking styles, however unlike the ATT, DM focuses on developing meta-awareness and disengaging from perseverative processing and further appraisals of inner thoughts or events. One of the aims of DM is to help individuals move from processing in the object mode, where thoughts are associated with facts, to the metacognitive mode, where thoughts are seen simply as events in the mind that do not require an immediate response. The detachment component of DM is one

of the key aspects in disengaging from the CAS and developing the ability to suspend processing or coping efforts in reaction to mental events. In MCT, DM is facilitated through the use of metaphors or tasks such as the free association task or tiger task. Recently, DM has been investigated as a stand-alone technique, where it has demonstrated significant benefits. Gkika and Wells (2015) compared detached mindfulness with thought evaluation as a means of coping with negative thoughts in individuals who were socially anxious. The results demonstrated the DM was associated with greater reductions in anticipatory processing, negative beliefs and focusing on the observer perspective self-image, however both techniques were equivalent on reductions in anxiety. In addition, Caselli, Gemelli, Spada and Wells (2016) found that DM was associated with significant decreases in distress in patients with alcohol use disorder who were exposed to a loop tape of their alcohol related thoughts. These results indicate that DM may be a beneficial technique in alleviating psychological distress.

Other techniques in MCT such as the ATT also help to facilitate disengagement from threat or internal responses. Various studies have shown that it has benefits as a stand alone treatment across a variety of psychological disorders including anxiety, traumatic stress, depression, panic disorder, hypochondriasis and schizophrenia (Callinan et al., 2014; Fergus et al., 2014; Nassif & Wells, 2014; Papageorgiou & Wells, 1998, 2000; Valmaggia et al., 2007; Wells, 1990). Recently, Knowles, Foden, El-Deredy, and Wells (2016) conducted a systematic review of the ATT and found that the ATT produced large to medium between group effect sizes in comparison to control groups. Whereby the ATT provided greater reductions in negative affect ($d = 0.73$) and self focused attention (range: $d = 1.21-1.23$) and greater increases in attention flexibility (range: $d = 0.45-0.90$) (Knowles et al., 2016). In addition, the ATT has also been investigated in children's ability to delay gratification (Mischel & Ebbesen, 1970), which is an important self-control skill that has been associated with greater success and better mental health later in life (Mischel et al., 2011). Murray, Theakston and Wells

(2016) found that children who received the ATT were 2.64 times more likely to delay gratification than children in the no-intervention control condition.

Taken together these results complement those of other studies and show that irrespective of population, attentional detachment and control are related to decreased negative affect and stress, and may have the potential to increase resilience. Detachment is an important component and has significant implications for the development of future treatment techniques. In fact, future research may investigate the use of DM and the ATT as an inoculation for vulnerable groups.

10.6. Future Research

Although future research areas have been suggested throughout the thesis as part of studies 1-7 the following section will expand further on some key areas for future studies.

10.6.1. A Definitive Trial: Group Metacognitive Therapy versus Mindfulness Based Stress Reduction

The feasibility study outlined in chapter 9 showed that both MCT and MBSR are feasible to deliver in a transdiagnostic group. However, a larger more definitive trial is required to further establish effects on treatment efficacy and overcome some of the limitations associated with the feasibility study.

First, participants should be screened using a structured clinical interview to confirm diagnoses and ensure that they meet the inclusion criteria, such that they do not have the presence of suicidality, substance abuse, bipolar disorder, or psychotic symptoms. This would also ensure that when randomizing participants to trial arms there is adequate balance between groups for primary disorder (anxiety, depression, or both). In addition, patients should also be randomized on the basis of disorder severity in order to ensure balance between groups.

Although the feasibility study did not include medication as one of the stratification variables, medication use significantly differed between groups, and should therefore be controlled for in a future definitive study. In addition, gender should be retained as a stratification variable in order to control for gender differences.

The feasibility study did not include a control group; instead it compared two active treatment groups. Therefore, in order to control for extraneous factors such as meeting in a group and spontaneous remission, a control group should be included in future studies.

Finally, the study was limited by a small sample size and absence of long term follow up (e.g., follow up beyond 6 months post treatment). However, the feasibility study could be used to inform a sample size calculation for a definitive trial.

A definitive trial would pose a variety of benefits. It would allow for treatment effects to be assessed as MCT and MBSR have not been compared in a transdiagnostic sample. In addition, few studies on MBSR have reported results on how many participants improve or recover following treatment; instead they focus on reporting effect sizes, which lacks clinical significance. Therefore, a definitive trial would be able to shed light on how many participants improve or recover following treatment rather than simply reporting the magnitude of change.

10.6.2. Quantifying Recovery: How Long Does It Take To Recover From Stress

The strategies that individuals use to recover from stress impact both physiological and psychological indices. Future studies could improve upon the worry and rumination manipulation in various ways. The first would be to further develop the instructions and experimental prompts used to ensure that the conditions are more closely matched, as one of the limitations of the prompts is that their focus varied. For example, one of the worry prompts was, “*What if you were unable to maintain an intelligent conversation in public?*” There was no corresponding or similar prompt in the rumination group where a prompt focused on social-

evaluative performance. In addition, to evaluate the extent to which individuals were engaging in their assigned emotion regulation strategy independent raters could be used to rate individuals responses to the prompts (e.g. Hilt & Pollak, 2013). Finally, it is evident (study 2) that even after 30 minutes had elapsed participants had still not recovered on physiological indices which poses the question, how long does it take to recover from stress? Further analyses on the recovery period should be conducted to establish a clearer pattern of recovery and what happens over a longer time course. This could be achieved by more frequent sampling during the recovery period and by extending the recovery period beyond 30 minutes.

10.6.3. A Further Manipulation of Metacognitive Beliefs

Manipulation of metacognitive beliefs allows for further investigation of the impact that they have on psychological and physiological outcomes. As evidence by study 3, the negative metacognitive belief of *thought importance* impacted on individual's reaction and recovery from stress; however the question regarding the generalizability of this effect to other domains of negative metacognitive beliefs remains. Future studies are needed to investigate this. The instructions for the study will require revisions based on the metacognitive belief being manipulated. For example, if the aim is to manipulate danger metacognitions adjustments will need to be made so that the thoughts the EEG is said to be recording concern the dangerousness of thoughts. Inducing danger metacognitions is not as simple as inducing beliefs of thought importance and therefore, may require a type of induction similar to that use in Myer and Wells (2013) prior to the fake EEG.

10.7. Conclusions

The research presented provides important findings on the role of metacognition in stress and recovery. Two aspects of metacognition that are directly implicated in the maintenance of the CAS (metacognitive beliefs and worry and rumination) were found to impact on stress recovery across settings. Specifically, worry and rumination were found to impede recovery from stress on psychological and physiological indices. Additionally, metacognitive beliefs were found to not only effect psychological recovery from stress but they were also predictive of psychological distress (anxiety and depression) and of psychological resilience. Although these aspects of metacognition were found to maintain distress, detachment, the antithesis of the CAS was positively associated with resilience. These associations provide important implications for treatment of psychological disorder, whereby challenging metacognitive beliefs and increasing individual's detachment decreases individuals distress and increases psychological resilience. Further to this the thesis has provided preliminary evidence for the role of metacognition in recovery, such that the Metacognitive model may provide a more cohesive understanding for the processes underlying psychological resilience. The work conducted within this thesis provides a foundation for future investigations regarding the role of metacognition in stress and recovery.

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Appendices

Appendix 1. University of Manchester Ethical Approval Study 2



Faculty of Medical and
Human Sciences
The University of
Manchester
Oxford Road
Manchester M13 9PT

+44(0)161 306 0100
www.manchester.ac.uk

Secretary to Research Ethics Committee 1

*Email: Katy.boyle@manchester.ac.uk
Phone : 0161 275 1360*

Miss Lora Copabianco
PhD Student
School of Psychological Sciences
University of Manchester

Lora.copobianco@postgrad.manchester.ac.uk

ref: ethics/13290

29 January 2014

Dear Miss Copabianco

Research Ethics Committee 1

Capobianco, Wells: The effect of rumination and worry on cortisol recovery from induced stress (ref 13290)

I write to confirm that the amendments to the ethics application form, participant information sheet, questionnaire, provision of a second consent form for students to complete once the deception has been revealed, revisions to the Demographics and Health and PANAS questionnaires and the provision of the cue card prompts, satisfy the concerns of the Committee and that the above project therefore has ethical approval.

The general conditions remain as stated in the letter of 13th January 2014.

Finally, I would be grateful if you could complete and return the attached form at the end of the project or by January 2015, whichever is earlier. When completing this form, please reference your project as:

"Capobianco, Wells: The effect of rumination and worry on cortisol recovery from induced stress (ref 13290)"

We hope that your research goes well,

Yours sincerely,

Katy Boyle
Secretary to University Research Ethics Committee

Appendix 2. Participant Information Sheet Study 2



The University of Manchester

The Effect of Rumination and Worry on Cortisol Recovery from Induced Stress

Participant Information Sheet

You are being invited to take part in a research study as part of a PhD. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish. Please ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

Who will conduct the research?

Lora Capobianco
PhD Student in Clinical Psychology
University of Manchester
Zochonis Building, 2nd Floor

Brunswick Street

Manchester M13 9PL

Dr. Adrian Wells
Professor of Clinical and Experimental
Psychopathology University of Manchester
School of Psychological Sciences Division of
Clinical Psychology
Rawnsley Building MRI
Manchester M13 9WL

What is the aim of the research?

The intention of the study is to examine participants' psychological and biological reaction to different mood states, including relaxation and stress. In addition, we are interested in looking at the effects of two emotion regulation strategies (rumination and worry).

What would I be asked to do if I took part?

Participants will be asked to watch a nature video, to complete a brief speech and math task in front of the student investigator, to provide saliva samples by rolling a small cotton swab in their mouth, provide heart rate measurements by means of a heart rate monitor, and to complete several questionnaires assessing personal information (e.g., race/ethnicity, medical conditions, medication use), their mood, feelings, and thoughts. The risks in the study are minimal. You may feel uncomfortable answering questions in the questionnaires. Your responses to these questionnaires are anonymous; however, you are able to skip any questions that you would prefer not to answer and still receive credit for the experiment. You may also feel minor boredom or stress during portions of the task. Risks of anything further than temporary discomfort would be rare. However, you can choose to withdraw from the study for any reason and still receive your participations credits.

How is confidentiality maintained?

Your participation in this study is confidential. Any paper questionnaires completed during the study will be placed into an envelope which you will seal at the end of the study. This

individually. Your data will not be examined individually and your data will not include any personally identifying information.” Your name will not be linked to any of your data or responses. Instead, each participant will be assigned a unique study ID number, and your data will only be examined in aggregate using this ID number. Your responses, saliva samples, and other data will only be able to be identified by your participant ID number that will be assigned to you. No personally identifying information will be stored or linked in any way to study ID numbers. Given the importance of maintaining your confidentiality, we will not look at your individual questionnaire responses, and are therefore will be unable to respond to any distress that you might report in them. Instead, at the end of the session, we will give you information about places, such as the University of Manchester Counselling Service and community hotlines, that you should contact if you experience anxiety, depression, thoughts of self-harm, or distress for any reason. Any paper-and-pencil information that you provide will be kept in a locked cabinet, which is only accessible to the members of the research team. Any information that is kept on a computer will be password protected. All of the saliva samples will be de-identified. Meaning that each saliva sample will be labeled with only participants' ID number (the same number assigned to the rest of their data) and the date/time the sample was taken. Thus, no identifying information will be associated with the sample. Once the study has been completed an archive of the data (without any identifying information) will be maintained at the Rawnsley Building in Manchester. Dr. Wells will maintain custody of the data. Data will be kept for 10 years after the final contact with each participant. Only the student investigator and faculty supervisors will have access to the data.

What happens if I do not want to take part or if I change my mind?

Your participation in this study is voluntary. If you choose to be part of the study you can decide to withdraw at any time. You can withdraw from the study even after signing the consent form and at any point during the study. Should you choose to withdraw from the study you will still receive credit for the experiment. In cases of withdrawal, any data that you have provided will be destroyed. You may withdraw from the study up until approximately June 2014. Your decision regarding your participation in the study will not affect your standing at the University of Manchester.

Will my data be used again in other studies?

Yes, by consenting to the study we will use your data in an additional study.

Will I be paid for participating in the research?

As a participant you will receive 8.0 credits (1 credit per 15 minutes) for your participation.

What is the duration of the experiment?

The experiment will last approximately 2 hours in length.

Where will the research be conducted?

The research will be conducted in the Zochonis building.

Will the outcomes of the research be published?

The study is expected to be completed by June 2014. If you would like a brief summary of the study results please advise the investigator on how you would like them communicated to you.

What if something goes wrong?

This study has been reviewed and received ethics clearance through the University Research Ethics Committee (UREC). If there are any issues regarding this research that you would prefer not to discuss with members of the research team please contact the Research Practice and Governance Co-ordinator by either writing to 'The Research Practice and Governance Co-ordinator, Research Office, Christie Building, The University of Manchester, Oxford Road, Manchester M13 9PL', by emailing: Research.complaints@manchester.ac.uk, or by telephoning 0161 275 7583 or 275 8093.

Questions about the study?

If you have questions or require further information concerning the study itself, please contact:

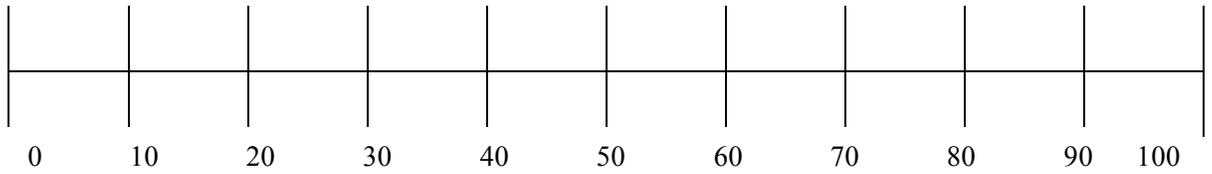
- Dr. Adrian Wells
+44 (0)161 276 5399
adrian.wells@manchester.ac.uk
- Lora Capobianco
lora.capobianco@postgrad.manchester.ac.uk

Appendix 3. Visual Analogue Scale used in Study 2

Visual Analogue Scale

Rate how well you stayed on task.

Where 0 indicates you did not stay on task and 100 indicating you stayed on task the whole time.



Appendix 4. Worry and Rumination Prompts used in Study 2

| Worry Prompts | Rumination Prompts |
|---|---|
| <p>Instructions: Think about the possible negative outcomes and try to solve each question.</p> <ol style="list-style-type: none">1. What if other people made judgments about you?2. What if you experience health problems?3. What if you were unable to maintain an intelligent conversation in public?4. What if you were unable to maintain your current lifestyle (standard of living)?5. What if you appeared inadequate?6. What if things go wrong at university?7. What if you became ill during your midterms and/or final exams?8. What if things don't workout well in the future?9. What if you were unable to get good grades? | <p>Instructions: Think about how you've felt and try to solve each question.</p> <ol style="list-style-type: none">1. Why am I feeling helpless?2. Why am I not the kind of student that I would like to be?3. Why am I feeling the level of motivation I feel right now?4. Why haven't I achieved my best grades?5. Why am I sad right now?6. Why do I have negative feelings?7. Why have I missed out on certain opportunities in my life?8. Why am I feeling hopeful/hopeless?9. Why do I think the tasks went negatively? |

Appendix 5. University of Manchester Ethical Approval Study 3

The University
of Manchester

MANCHESTER
1824

**Secretary to Research Ethics Committees
Room 2.004 John Owens Building**

Tel: 0161 275 2206/2046
Fax: 0161 275 5697
Email: timothy.stibbs@manchester.ac.uk

Compliance and Risk Office
University of Manchester
Oxford Road
Manchester, M13 9PL

Ref: *ethics/14351*

Dr Adrian Wells,
School of Psychological Sciences,
Department of Clinical Psychology,
Rawnsley Building,
Manchester Royal Infirmary.

12th November 2014

Dear Dr Wells,

Research Ethics Committee 4

[Capobianco: The Effect of Thought Importance on Stress (ref 14351, re-submission of 14322)]

I write to thank you and Miss Capobianco for coming to meet the Committee on 29th October 2014 and to confirm that it gave the above research project, after the submission of amendments / clarifications, a favourable ethical opinion.

This approval is effective for a period of five years and if the project continues beyond that period it must be submitted for review. It is the Committee's practice to warn investigators that they should not depart from the agreed protocol without seeking the approval of the Committee, as any significant deviation could invalidate the insurance arrangements and constitute research misconduct. We also ask that any information sheet should carry a University logo or other indication of where it came from, and that, in accordance with University policy, any data carrying personal identifiers must be encrypted when not held on a university computer or kept as a hard copy in a location which is accessible only to those involved with the research.

Finally, I would be grateful if you could complete and return the attached form at the end of the project or by the end of September 2015.

We hope the research goes well.

Yours sincerely,



Dr Deborah Bentley
Secretary to University Research Ethics Committee 4

Appendix 6. Participant Information Sheet Study 3



The University of Manchester

The Effect of Thought Importance on Stress

Participant Information Sheet

You are being invited to take part in a research study as part of a PhD. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish. Please ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

Who will conduct the research?

Lora Capobianco
PhD Student in Clinical Psychology
University of Manchester
Zochonis Building, 2nd Floor

Brunswick Street

Manchester M13 9PL

Dr. Adrian Wells
Professor of Clinical and Experimental
Psychopathology University of Manchester
School of Psychological Sciences Division of
Clinical Psychology
Rawnsley Building MRI
Manchester M13 9WL

What is the aim of the research?

The intention of the study is to examine your mental and physical response to stress. We aim to investigate how thought importance impacts your response to stress.

What would I be asked to do if I took part?

You will be asked to wear an EEG cap, watch a relaxing nature video, to complete a brief speech and math task in front of the student investigator, to complete several questionnaires assessing personal information (e.g., race/ethnicity), your mood, feelings, and thoughts, and to provide skin conductance measurements by means of a galvanic skin response monitor. The galvanic skin response monitor measures your sweat response. You will be asked to wear two sweat sensors at the bottom of your index and ring fingers on your non-dominant hand, this is painless and you will not feel anything. As the questionnaires assess personal information, you may feel uncomfortable answering questions in the questionnaires. Your responses to these questionnaires are anonymous; however, you are able to skip any questions that you would prefer not to answer and still receive credit for the experiment. You may also feel minor boredom or stress during portions of the task. However, you can choose to withdraw from the study without providing a reason and still receive your participations credits.

How is confidentiality maintained?

Your participation in this study is confidential. Any paper questionnaires completed during

envelope will only be opened at the time of data entry in large, aggregate batches, not individually. Your data will not be examined individually and your data will not include any personally identifying information.” Your name will not be linked to any of your data or responses. Instead, each participant will be assigned a unique study ID number, and your data will only be examined in aggregate using this ID number. Your self-report responses, galvanic skin response data, and other data will only be able to be identified by your participant ID number that will be assigned to you. No personally identifying information will be stored or linked in any way to study ID numbers. Given the importance of maintaining your confidentiality, we will not look at your individual questionnaire responses, and are therefore unable to respond to any distress that you might report in them. Instead, at the end of the session, we will give you information about places, such as the University of Manchester Counselling Service and community hotlines, that you should contact if you experience anxiety, depression, thoughts of self-harm, or distress for any reason. Any paper-and-pencil information that you provide will be kept in a locked cabinet, which is only accessible to the members of the research team. Any information that is kept on a computer will be password protected. Once the study has been completed an archive of the data (without any identifying information) will be maintained at the Rawnsley Building in Manchester. Dr. Wells will maintain custody of the data. Data will be kept for 10 years after the final contact with each participant. Only the student investigator and faculty supervisors will have access to the data.

What happens if I do not want to take part or if I change my mind?

Your participation in this study is voluntary. If you choose to be part of the study you can decide to withdraw at any time. You can withdraw from the study even after signing the consent form and at any point during the study. Should you choose to withdraw from the study you will still receive credit for the experiment. In cases of withdrawal, any data that you have provided will be destroyed. You may withdraw from the study up until approximately March 2015. Your decision regarding your participation in the study will not affect your standing at the University of Manchester.

Will my data be used again in other studies?

No, your data will not be used in other studies.

Will I benefit from the study?

This study will allow us to have a better understanding of reactions to stress, and will help to develop more accurate cognitive models and help to create better clinical interventions. As a participant you will gain intellectual benefits of participating in a psychology based study and receive information that will provide knowledge of psychological reactions to stress.

Will I be paid for participating in the research?

As a participant you will receive 8.0 credits (1 credit per 15 minutes) for your participation.

What is the duration of the experiment?

The experiment will last approximately 2 hours in length.

Where will the research be conducted?

The research will be conducted in the Zochonis building.

Will the outcomes of the research be published?

The study is expected to be completed by March 2015. If you would like a brief summary of the study results please advise the investigator on how you would like them communicated to you.

What if something goes wrong?

This study has been reviewed and received ethics clearance through the University Research Ethics Committee (UREC). If there are any issues regarding this research that you would prefer not to discuss with members of the research team please contact the Research Practice and Governance Co-ordinator by either writing to 'The Research Practice and Governance Co-ordinator, Research Office, Christie Building, The University of Manchester, Oxford Road, Manchester M13 9PL', by emailing: Research.complaints@manchester.ac.uk, or by telephoning 0161 275 7583 or 275 8093.

Questions about the study?

If you have questions or require further information concerning the study itself, please contact:

- Dr. Adrian Wells
+44 (0)161 276 5399
adrian.wells@manchester.ac.uk
- Lora Capobianco
lora.capobianco@postgrad.manchester.ac.uk

Appendix 7. Visual Analogue Scale used in Study 3

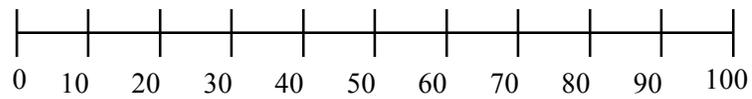
Visual Analogue Scale

How many negative thoughts did you have? _____

How much discomfort did you feel as a whole?

None

Most discomfort I
could have



Appendix 8. Manipulation Check used in Study 3

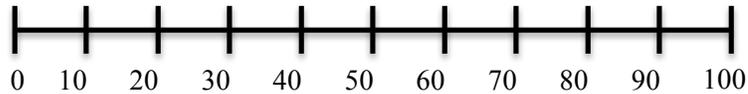
Manipulation Check EEG Paradigm

1. **Experimental Group:**

How much did you believe that you might hear an unpleasant noise during the experiment caused by your thoughts?

Did not believe at all

Completely convinced
this was true

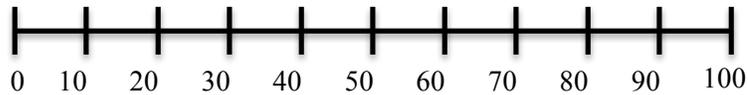


2. **Control Group:**

How much did you believe that you might hear an unpleasant noise randomly during the experiment?

Did not believe at
all

Completely convinced
this was true



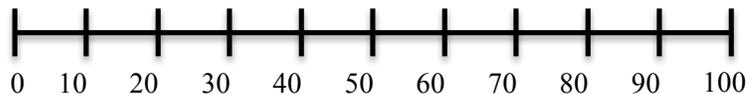
Both Groups:

3. **How many stress related thoughts did you have?** _____

4. **How much discomfort did you feel as a whole?**

None

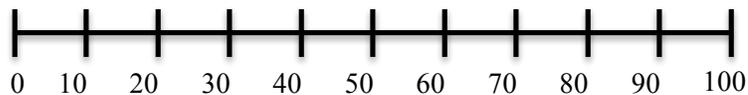
Most discomfort I
could have



5. How much did you believe that the EEG would pick up your mental reactions to stress?

Did not believe at all

Completely convinced
this was true



Appendix 9. University of Manchester Ethical Approval Studies 4 & 5

The University
of Manchester

MANCHESTER
1824

Faculty of Medical and Human Sciences
The University of Manchester
Oxford Road
Manchester M13 9PT

+44(0)161 306 0100
www.manchester.ac.uk

Secretary to Research Ethics Committee 1

Email: katy.boyle@manchester.ac.uk

Phone : 0161 275 1360

Ref: *ethics/15286*

Miss Capobianco
PhD Student
School of Psychological Sciences

lora.capobianco@postgrad.manchester.ac.uk

15 July 2015

Dear Miss Capobianco, Professor Wells,

Study title: Ref 15286: A prospective Cohort Study of Psychological Predictors of Bounce Back from Stress

Research Ethics Committee 1

Thank you for attending the University Research Ethics Committee 1 that took place on 2nd July 2015 to discuss the above study. I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form and supporting documentation, as submitted to and approved by the Committee.

This approval is effective for a period of five years. If the project continues beyond that period an application for amendment must be submitted for review. Likewise, any proposed changes to the way the research is conducted must be approved via the amendment process (see below). Failure to do so could invalidate the insurance and constitute research misconduct.

You are reminded that, in accordance with University policy, any data carrying personal identifiers must be encrypted when not held on a secure university computer or kept securely as a hard copy in a location which is accessible only to those involved with the research.

Reporting Requirements:

You are required to report to us the following:

1. [Amendments](#)
2. [Breaches and adverse events](#)
3. [Notification of Progress/End of the Study](#)

Feedback

It is our aim to provide a timely and efficient service that ensures transparent, professional and proportionate ethical review of research with consistent outcomes, which is supported by clear, accessible guidance and training for applicants and committees. In order to assist us with our aim, we would be grateful if you would

Appendix 10. Participant Information Sheet Studies 4 & 5



Resilience: A prospective Cohort Study of Psychological Predictors of Bounce Back From Stress?

Participant Information Sheet

You are being invited to take part in a research study as part of a PhD. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish. Please ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

Who will conduct the research?

Lora Capobianco
PhD Student in Clinical Psychology
University of Manchester
Zochonis Building, 2nd Floor

Brunswick Street

Manchester M13 9PL

Prof. Adrian Wells
Professor of Clinical and Experimental
Psychopathology University of Manchester
School of Psychological Sciences Division of
Clinical Psychology
Rawnsley Building MRI
Manchester M13 9WL

What is the aim of the research?

We are interested in examining how individuals respond to stress and what factors make individuals more resilient to stress.

What would I be asked to do if I took part?

If you choose to take part you will be asked to complete nine questionnaires three times over an 8 week period. The questionnaires assess information regarding your mood, feelings, thoughts, and previous trauma history. Please note that if you do feel uncomfortable answering any questions you may leave them blank. You will be sent a link by the student investigator at 4 week intervals, prompting you to complete the questionnaire battery. The questionnaires will take approximately 20 minutes to complete each time.

How is confidentiality maintained?

The data will be collected using an online survey software called Select Surveys. Your self-report responses will only be able to be identified by your participant ID number that you will create based on the month you were born and your house number. Participant ID numbers, your email, and questionnaire responses will be stored in a password encrypted file, which will be stored on a University of Manchester computer at the Rawnsley Building. Any information that is kept on a computer will be password protected. Once the study has been completed an archive of the data (without any identifying information) will be maintained at the Rawnsley Building in Manchester. Dr. Wells will maintain custody of the data. Data will be kept for 10 years after the final contact with each participant. Only the student investigator and faculty supervisors will have access to the data.

What happens if I do not want to take part or if I change my mind?

Your participation in this study is voluntary. If you choose to be part of the study you can decide to withdraw at any time. You can withdraw from the study even after signing the consent form and at any point during the study. In cases of withdrawal, any data that you have provided will be destroyed. You may withdraw from the study up until approximately March 2016, after this time you may not withdraw from the study as the data will be unidentifiable. Your decision regarding your participation in the study will not affect your standing at the University of Manchester

Will I be paid for participating in the research?

As a participant you will be entered into a prize draw for a £50 Amazon voucher, once you have completed all three parts of the study. If you are a psychology student you will receive 6 credits once you have completed all three parts of the study.

What is the duration of the research?

You will be asked to complete nine questionnaires. It will take approximately 30 minutes to complete all nine questionnaires. You will complete these questionnaires again 4 and 8 weeks after the first time you complete the questionnaires. The primary investigator will contact you when you need to complete part 2 and 3.

Where will the research be conducted?

You can complete the questionnaires online at a location that is convenient for you.

Will the outcomes of the research be published?

The study is expected to be completed by March 2016. If you would like a brief summary of the study results please opt in by selecting the check box when you begin the online questionnaire battery. If you opt in your email address will be retained to contact you with the study results. Your email address will be kept in a password encrypted file, which will be stored on a University of Manchester computer at the Rawnsley Building.

Who has reviewed the research project?

What if something goes wrong?

In the event that you become distressed from completing the questionnaires please contact the student investigator, Lora Capobianco, who will enact distress protocol for the study.

If you would like to make a complaint regarding the study please contact the student investigator Lora Capobianco at the above contact information. If the situation has not been resolved after contacting the student investigator please contact Prof. Adrian Wells at the contact information above. Finally, if a further complaint needs to be made please contact the central research office at the contact information listed below.

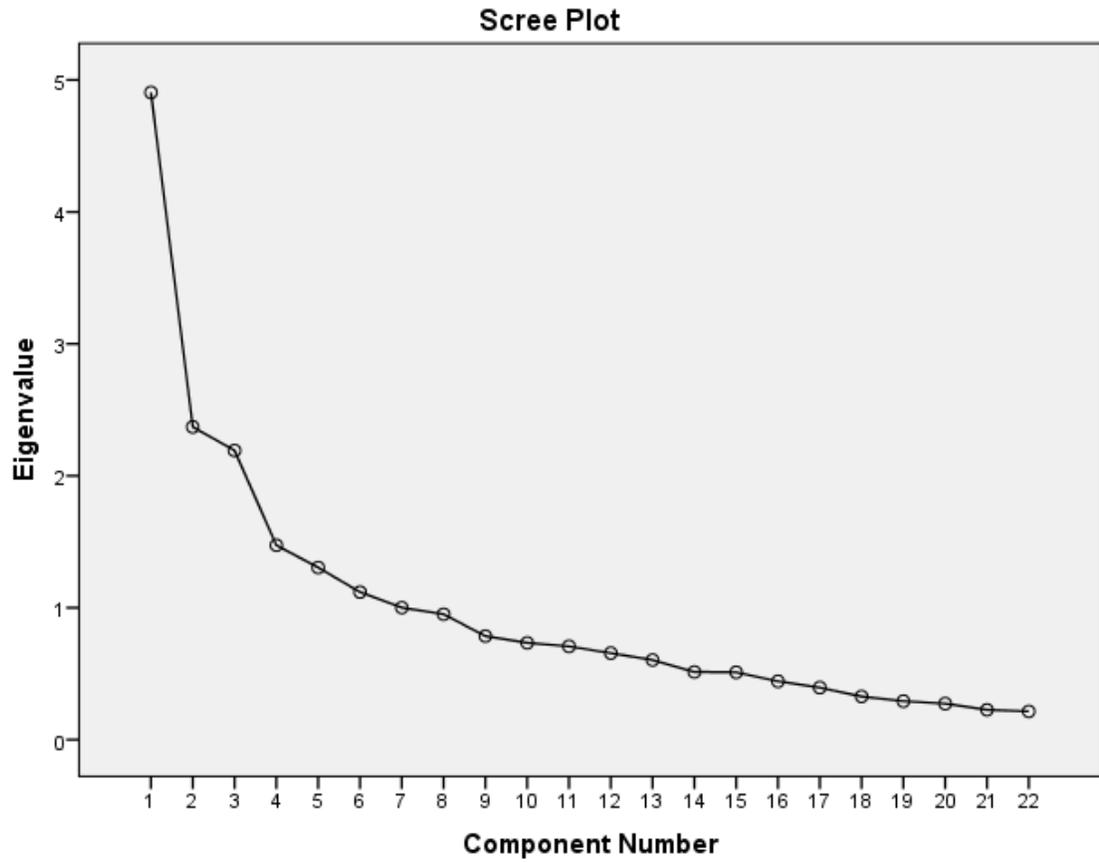
This study has been reviewed and received ethics clearance through the University Research Ethics Committee (UREC). If there are any issues regarding this research that you would prefer not to discuss with members of the research team, please contact the Research Governance and Integrity Team by either writing to 'The Research Governance and Integrity Manager, Research Office, Christie Building, The University of Manchester, Oxford Road, Manchester M13 9PL', by emailing: Research.Complaints@manchester.ac.uk, or by telephoning 0161 275 7583 or 275 8093.

Contact for further information

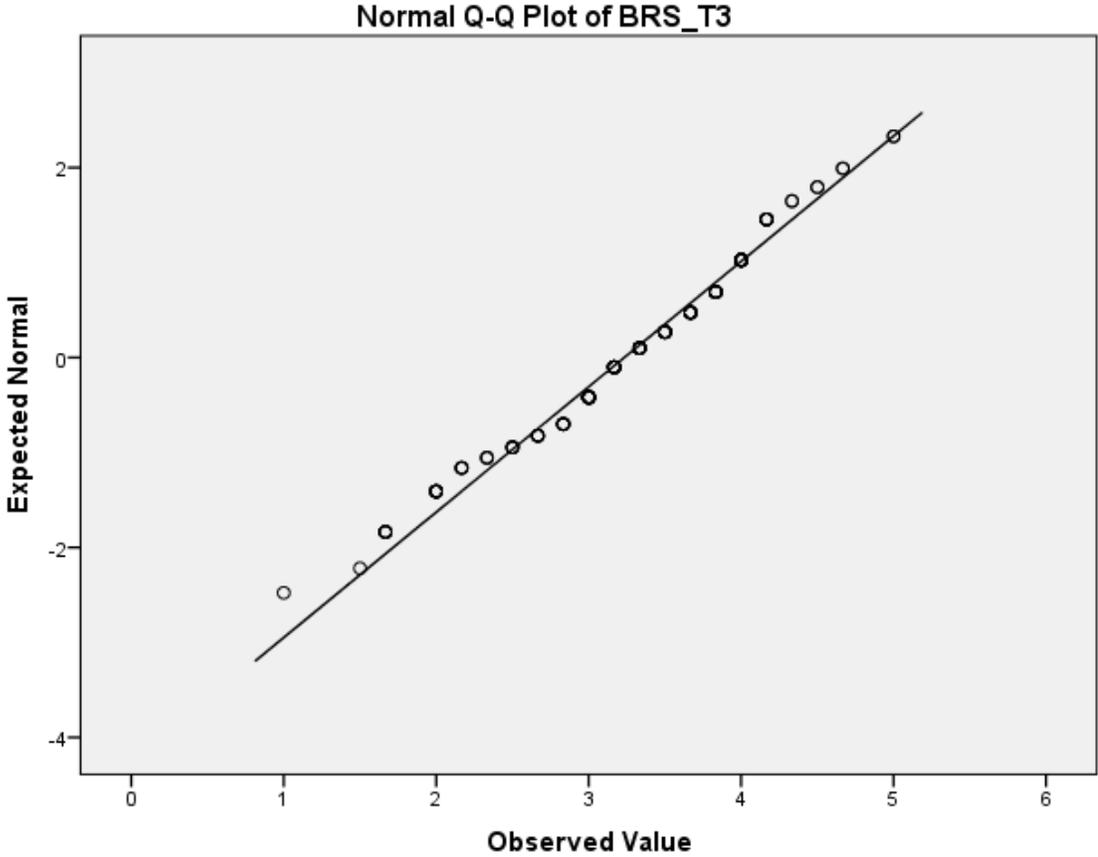
If you have questions or require further information concerning the study itself, please contact:

- Prof. Adrian Wells
+44 (0)161 276 5399
adrian.wells@manchester.ac.uk
- Lora Capobianco
lora.capobianco@postgrad.manchester.ac.uk

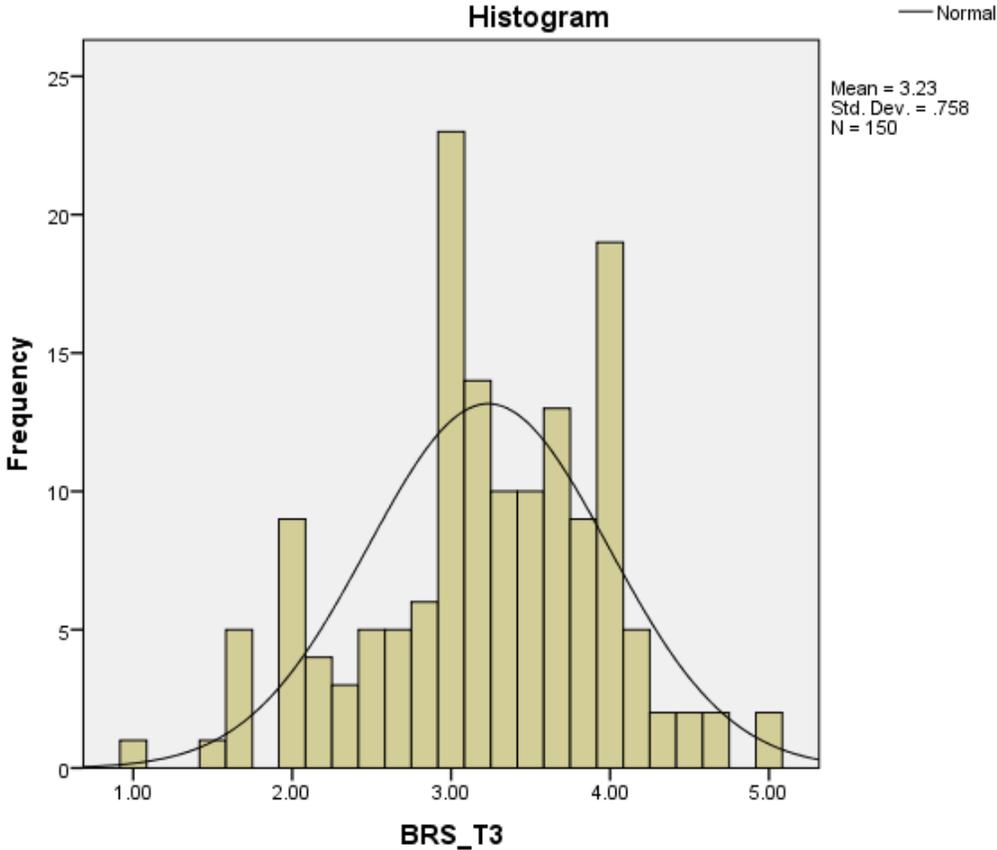
Appendix 11. Scree Plot Study 4



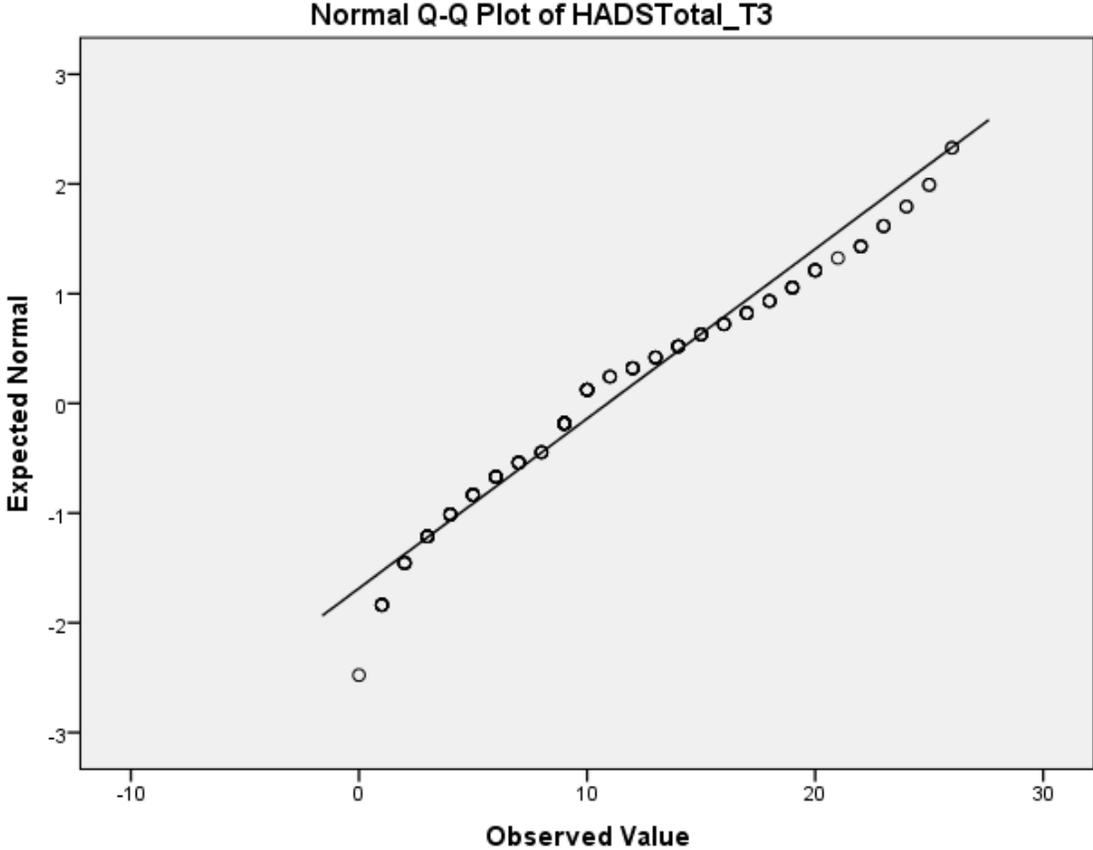
Appendix 12. Normality Q-Q Plot of the Brief Resilience Scale at Time 3



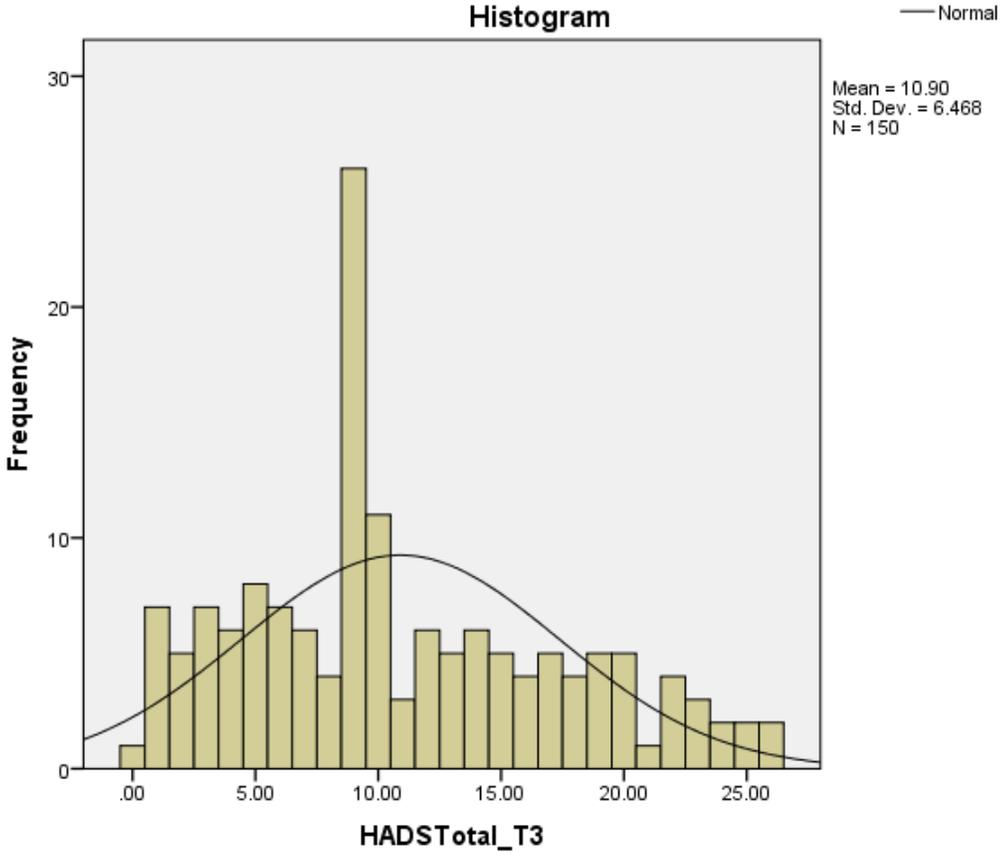
Appendix 13. Histogram Plot of the Brief Resilience Scale at Time 3



Appendix 14. Normality Q-Q Plot of the Hospital Anxiety and Depression Scale at Time 3



Appendix 15. Histogram Plot of the Hospital Anxiety and Depression Scale at Time 3



Appendix 16. Resilience as a Predictor of DMQ-Detachment at Time 3

| | | β | t | p |
|-----------------------|-------|---------|-------|---------|
| Step 1 | | | | |
| Gender | | -0.11 | -1.28 | 0.20 |
| R ² change | 0.01 | | | |
| F change | 1.64 | | | 0.20 |
| Step 2 | | | | |
| Gender | | -0.10 | -1.19 | 0.24 |
| ICSRLE T1 | | -0.07 | -0.60 | 0.55 |
| ICSRLE T2 | | 0.06 | 0.43 | 0.67 |
| ICSRLE T3 | | -0.15 | -1.23 | 0.22 |
| R ² change | 0.02 | | | |
| F change | 1.15 | | | 0.33 |
| Step 3 | | | | |
| Gender | | -0.03 | -0.43 | 0.67 |
| ICSRLE T1 | | -0.01 | -0.15 | 0.88 |
| ICSRLE T2 | | -0.04 | -0.34 | 0.73 |
| ICSRLE T3 | | -0.004 | -0.04 | 0.97 |
| MCQ Neg T1 | | -0.17 | -2.28 | 0.02 |
| DMQ Detachment T1 | | 0.53 | 7.64 | < 0.001 |
| R ² change | 0.33 | | | |
| F change | 36.99 | | | < 0.001 |
| Step 4 | | | | |
| Gender | | -0.01 | -0.19 | 0.85 |
| ICSRLE T1 | | -0.01 | -0.09 | 0.93 |
| ICSRLE T2 | | -0.05 | -0.40 | 0.69 |
| ICSRLE T3 | | 0.02 | 0.18 | 0.86 |
| MCQ Neg T1 | | -0.11 | -1.34 | 0.18 |
| DMQ Detachment T1 | | 0.51 | 7.06 | < 0.001 |
| BRS T1 | | 0.12 | 1.43 | 0.15 |
| R ² change | 0.01 | | | |
| F change | 2.06 | | | 0.15 |

Note: BRS = Brief Resilience Scale; ICSRLE = Inventory of College Students' Recent Life Experiences; MCQ Neg = Meta-cognitions Questionnaire-30 Negative Metacognitive Beliefs Regarding Uncontrollability and Danger; DMQ = Detached Mindfulness Questionnaire; T1, T2, T3 = Time 1, 2, 3 respectively

Appendix 17. Resilience as a Predictor of MCQ-Negative Metacognitive Beliefs at Time 3

| | | β | t | p |
|-----------------------|-------|---------|-------|---------|
| Step 1 | | | | |
| Gender | | 0.04 | 0.51 | 0.61 |
| R ² change | 0.002 | | | |
| F change | 0.26 | | | 0.61 |
| Step 2 | | | | |
| Gender | | 0.02 | 0.34 | 0.74 |
| ICSRLE T1 | | 0.02 | 0.15 | 0.88 |
| ICSRLE T2 | | 0.04 | 0.35 | 0.73 |
| ICSRLE T3 | | 0.46 | 4.32 | < 0.001 |
| R ² change | 0.25 | | | |
| F change | 16.15 | | | < 0.001 |
| Step 3 | | | | |
| Gender | | -0.05 | 0.82 | 0.42 |
| ICSRLE T1 | | -0.10 | -1.12 | 0.27 |
| ICSRLE T2 | | 0.01 | 0.13 | 0.90 |
| ICSRLE T3 | | 0.41 | 4.46 | < 0.001 |
| MCQ Neg T1 | | 0.48 | 7.06 | < 0.001 |
| DMQ Detachment T1 | | -0.07 | -1.07 | 0.29 |
| R ² change | 0.21 | | | |
| F change | 28.28 | | | < 0.001 |
| Step 4 | | | | |
| Gender | | -0.05 | -0.80 | 0.42 |
| ICSRLE T1 | | -0.10 | -1.11 | 0.27 |
| ICSRLE T2 | | 0.01 | 0.13 | 0.90 |
| ICSRLE T3 | | 0.41 | 4.39 | < 0.001 |
| MCQ Neg T1 | | 0.48 | 6.20 | < 0.001 |
| DMQ Detachment T1 | | -0.07 | -1.03 | 0.31 |
| BRS T3 | | -0.001 | -0.01 | 0.99 |
| R ² change | 0.00 | | | |
| F change | 0.00 | | | 0.99 |

Note: BRS = Brief Resilience Scale; ICSRLE = Inventory of College Students' Recent Life Experiences; MCQ Neg = Meta-cognitions Questionnaire-30 Negative Metacognitive Beliefs Regarding Uncontrollability and Danger; DMQ = Detached Mindfulness Questionnaire; T1, T2, T3 = Time 1, 2, 3 respectively

Appendix 18. Resilience as a Predictor of Psychological Distress (HADS at Time 3)

| | | β | t | p |
|-----------------------|-------|---------|-------|---------|
| Step 1 | | | | |
| Gender | | 0.07 | 0.79 | 0.43 |
| R ² change | 0.004 | | | |
| F change | 0.62 | | | 0.43 |
| Step 2 | | | | |
| Gender | | 0.04 | 0.68 | 0.50 |
| ICSRLE T1 | | 0.03 | 0.30 | 0.77 |
| ICSRLE T2 | | -0.004 | -0.03 | 0.97 |
| ICSRLE T3 | | 0.63 | 6.63 | < 0.001 |
| R ² change | 0.41 | | | |
| F change | 33.38 | | | < 0.001 |
| Step 3 | | | | |
| Gender | | -0.012 | -0.20 | 0.84 |
| ICSRLE T1 | | -0.012 | -0.15 | 0.88 |
| ICSRLE T2 | | 0.01 | 0.11 | 0.92 |
| ICSRLE T3 | | 0.56 | 6.08 | < 0.001 |
| BRS T1 | | -0.26 | -3.91 | < 0.001 |
| R ² change | 0.06 | | | |
| F change | 15.29 | | | < 0.001 |
| Step 4 | | | | |
| Gender | | -0.02 | -0.30 | 0.76 |
| ICSRLE T1 | | -0.04 | -0.47 | 0.64 |
| ICSRLE T2 | | -0.01 | -0.11 | 0.92 |
| ICSRLE T3 | | 0.57 | 6.30 | < 0.001 |
| BRS T1 | | -0.17 | -2.22 | 0.03 |
| MCQ Neg T1 | | 0.18 | 2.40 | 0.02 |
| R ² change | 0.02 | | | |
| F change | 5.76 | | | 0.02 |

Note: BRS = Brief Resilience Scale; ICSRLE = Inventory of College Students' Recent Life Experiences; MCQ Neg = Meta-cognitions Questionnaire-30 Negative Metacognitive Beliefs Regarding Uncontrollability and Danger; T1, T2, T3 = Time 1, 2, 3 respectively

Appendix 19. Resilience as a Predictor of Recovery From Psychological Distress (HADS)

| | B(S.E.) | Wald | <i>p</i> | Odds Ratio | 95% CI lower | 95% CI upper |
|----------|-------------|-------|----------|------------|-----------------|-----------------|
| Gender | 0.60(1.17) | 0.27 | 0.61 | 1.83 | 0.19 | 17.91 |
| ICSRLE | 0.19(0.06) | 10.34 | 0.001 | 1.21 | 1.08 | 1.36 |
| Total T1 | | | | | | |
| ICSRLE | -0.03(0.06) | 0.23 | 0.63 | 0.97 | 0.87 | 1.09 |
| Total T2 | | | | | | |
| ICSRLE | -0.18(0.07) | 7316 | 0.007 | 0.84 | 0.74 | 0.95 |
| Total T3 | | | | | | |
| BRS T1 | 1.09(0.78) | 1.94 | 0.16 | 2.96 | 0.64 | 13.61 |
| Constant | -3.12(4.01) | 0.61 | 0.45 | 0.04 | | |

Note: S.E. = Standard Error, ICSRLE = Inventory of College Students' Recent Life Experiences; BRS = Brief Resilience Scale; T1,T2,T3 = Time 1,2,3 respectively

Appendix 20. Data Release Form Study 6

Brug af scoringsark til forskning

Deltager ID: _____

Metakognitiv terapi er en forholdsvis ny metode og der er derfor brug for mere forskning for at kunne dokumentere effekten yderligere. Du bliver hermed bedt om at frigive dine spørgeskema-scoringer til brug i en forskningsartikel, der har til hensigt at måle effekten af vores metakognitive grupper. Din deltagelse i denne undersøgelse vil blive behandlet 100% fortroligt. Dine data vil ikke blive undersøgt individuelt og vil ikke indeholde nogen personligt identificerbare informationer. Dit navn vil ikke blive knyttet til nogle af dine data eller svar. I stedet vil hver deltager blive tildelt et unikt ID-nummer, og dine data vil kun blive undersøgt samlet ved hjælp af dette id-nummer. Dine selvrapporteringssvar vil kun kunne identificeres vha. dit deltager ID-nummer. Ingen personligt identificerbare oplysninger vil blive gemt eller linket til dig på nogen måde.

Enhver oplysning vil blive holdt i et aflåst skab, som kun er tilgængelig for medlemmerne af forskerholdet. Alle oplysninger, der opbevares på en computer, vil blive beskyttet med adgangskode. CEKTOS vil opbevare data i 10 år efter behandlingen. Kun undersøgelseslederen fra CEKTOS vil have adgang til data.

Dit valg til at frigive dine scoringer er helt frivillig og hvis du vælger at være en del af undersøgelsen, kan du altid ombestemme dig og beslutte at trække på et hvilket som helst tidspunkt. Hvis du vælger at trække sig fra undersøgelsen bedes du kontakte Pia Callesen pia.callesen@cektos.dk og alle scoringer, som du måtte have givet, vil blive destrueret. Du kan trække fra undersøgelsen indtil August 2016. Din beslutning vedrørende din deltagelse i undersøgelsen vil ikke påvirke din behandling på CEKTOS på nogen måde.

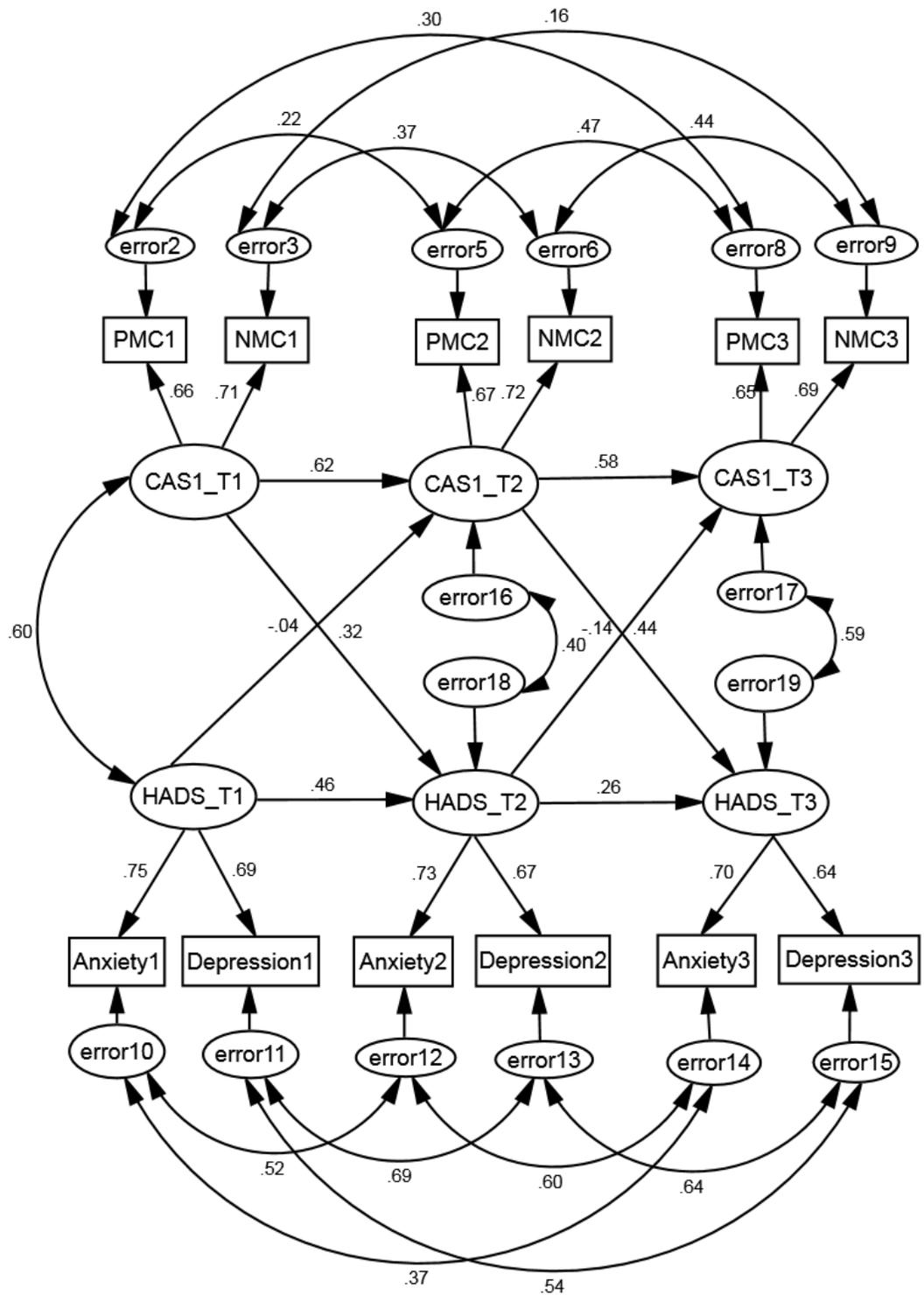
Anfør nedenfor, hvis du ønsker at frigive dine data:

Jeg vil gerne frigive mine data til tidsskriftpublikation

Jeg ønsker ikke at frigive mine data til tidsskriftpublikation

underskrift

Appendix 21. Cross Lagged Pathways in Both Directions, CAS to HADS and HADS to CAS, standardised coefficients



Appendix 22. NHS Ethical Approval Study 7



Health Research Authority

National Research Ethics Service

NRES Committee North West - Greater Manchester Central

3rd Floor
Barlow House
4 Minshull Street
Manchester
M1 3DZ

Telephone: 0161 625 7825
Fax: 0161 625 7299

01 July 2014

Professor Adrian Wells
Professor of Clinical & Experimental Psychopathology
University of Manchester
Rawnsley Building
Manchester Royal Infirmary
Oxford Road
Manchester
M23 9LT

Dear Professor Wells

Study title: A Comparison of Metacognitive Group Therapy versus Mindfulness Meditation Group Therapy in Generalized Anxiety Disorder
REC reference: 14/NW/1010
IRAS project ID: 145073

Thank you for your letter responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to make a request to postpone publication, please contact the REC Manager, Mrs Kath Osborne, nrescommittee.northwest-gmcentral@nhs.net.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised subject to the conditions specified below.

Appendix 23. Participant Information Sheet Study 7

Participant Information Sheet

A Comparison of Metacognitive Group Therapy versus Mindfulness Meditation Group Therapy in Generalized Anxiety Disorder

We would like to invite you to take part in our research study, which forms part of a PhD. Before you decide we would like you to understand why the research is being done and what it would involve for you. Please take the time to read the following information carefully and discuss it with others if you wish. Please ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

Who will conduct the research?

Lora Capobianco
lora.capobianco@postgrad.manchester.ac.uk
PhD Student in Clinical Psychology
University of Manchester
Zochonis Building, 2nd Floor
Brunswick Street
Manchester M13 9PL

James Thompson
james.thompson-
7@postgrad.manchester.ac.uk
Trainee Clinical Psychologist
University of Manchester
Zochonis Building, 2nd Floor
Brunswick Street
Manchester M13 9PL

Professor Adrian Wells
Professor of Clinical and Experimental Psychopathology University of Manchester
School of Psychological Sciences Division of Clinical Psychology
Rawnsley Building MRI
Manchester M13 9WL

What is the purpose of the research?

The purpose of the study is to compare two types of group treatment for anxiety, to see which works best. We will be comparing two group therapies: Group metacognitive therapy and group mindfulness meditation therapy.

Why have I been invited?

You have been invited to take part in the trial because your clinician has identified you to be a suitable candidate and you are on the waiting list. We are inviting all individuals who appear that they might benefit from taking part in the trial.

Do I have to take part?

It is up to you to decide to join the study. If you agree to take part, you will then be asked to sign a consent form. You are free to withdraw at any time, without giving a reason. This would not affect the standard of care you receive or your position on the waitlist, however; you may decide after treatment that there is no need to continue on the waiting list.

What would I be asked to do if I took part?

Participants will be asked to take part in one of the two types of group treatment. Participants will be randomly placed in either group metacognitive therapy or group meditation therapy. Each group will be a small group of 4 to 6 people. The risks in the study are minimal. It is possible that you may feel uncomfortable answering certain questions in the questionnaires. Your responses to these questionnaires are anonymous (no one reading them will know your name unless you choose for them to) and you are also able to skip any questions that you would prefer not to answer. Additionally, group treatment sessions will be audio recorded and reviewed by the primary investigator for supervision purposes. The primary investigator will review the audio recording to insure that the study investigators are following the study protocol. The audio recording will be deleted once the primary investigator has reviewed the tapes. You can choose to withdraw from the study for any reason, at any time.

What happens if I do not want to take part or if I change my mind?

Your participation in this study is voluntary. If you choose to be part of the study you can decide to withdraw at any time. You can withdraw from the study even after signing the consent form and at any point during the study. In cases of withdrawal, any data that you have provided will be destroyed. Your decision regarding your participation in the study will not affect your treatment from your general practitioner (GP) or your treatment as a patient in the NHS.

Will I be paid or reimbursed for my participation?

No. Your participation in the trial is completely voluntary.

What are the possible disadvantages and risks of taking part?

Participants may feel a slight discomfort or embarrassment in participating in a group treatment setting. However, these treatments do not require you to share any sensitive or personal information therefore discomfort will be kept to a minimum. This will be no greater than routine clinical practice within the NHS. The therapists are trained recognize and minimize any experiences as part of both therapeutic options.

What are the possible benefits of taking part?

We cannot promise the study will help you but the information we get from this study will help improve the treatment of people with anxiety and mood related problems.

How is confidentiality maintained?

Your participation in this study is confidential. This means your name will not be linked to any of your data or responses. Each person taking part will be assigned a unique study ID number, and your answers will only be examined in using this ID number, rather than your name. No personally identifying information will be stored or linked in any way to study ID numbers. Any paper-and-pencil information that you provide will be kept in a locked cabinet, which is only available to the members of the research team. Any information that is kept on a computer will be password protected. Once the study has been completed an archive of the data (without any identifying personal information) will be maintained at the Rawnsley Building in Manchester. Audio recordings will be deleted once they have been reviewed by Professor Adrian Wells. The audio recordings are taken to insure that the study investigators are following study protocol. There will be no way of identifying you from this data. Professor Adrian Wells will maintain the data. Data will be kept for 5 years after the final contact with each participant. Only the student investigators and faculty supervisors will have access to the data.

Will my general practitioner/family doctor (GP) be informed of my participation in the trial?

Yes. Your general practitioner/ family doctor (GP) will receive a letter informing them of your participation in the trial.

What will happen if I lose the capacity to consent during the study?

Should you lose the capacity to consent during the study you will be withdrawn from the study. Additionally, all identifiable data linked to your participation will be removed; however, any data that is not identifiable may be retained by the research team.

What happens when the research study stops?

Once you have completed all the treatment sessions you will be asked to complete follow up questionnaires at 6 months and 12 months after study completion. Your participation in the trial does not affect your position on the waiting list.

Will my data be used again in other studies?

No.

How long will the study last?

The study will last around 8 weeks. You will need to attend 8 sessions of group treatment lasting one hour in length. After the treatment has finished, you will be contacted via post at 6 months and 12 months. The follow up will require you to complete 3 questionnaires about your symptoms after having finished the treatment.

What if relevant new information becomes available?

Sometimes new information about the treatment being studied becomes available during the trial. If this happens, the study investigator will inform you of the information and discuss whether you should continue in the study. If you decide not to carry on, the study investigator will make arrangements for your care to continue, and withdrawal from the study will not impact your care with the NHS or your position on the waiting list.

Where will the research be conducted?

The research will be conducted in the Rawnsley building. This is located on the site of Manchester Royal Infirmary on Oxford Road, Manchester.

Will the outcomes of the research be published?

The study is expected to be completed by September 2015. If you would like a brief summary of the study results please advise the investigator on how you would like them communicated to you. (by post or email)

What if something goes wrong?

If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions. If they are unable to resolve your concern or you wish to make a complaint regarding the study, please contact a University Research Practice and Governance Co-ordinator on 0161 275 7583 or 0161 275 8093 or by email to research.complaints@manchester.ac.uk.

Who has reviewed this study?

All research in the NHS is looked at by independent groups of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given favorable opinion by the University of Manchester Research Ethics Committee and NHS Research Ethics Committee.

Questions about the study?

If you have questions or require further information concerning the study itself, please contact:

- Prof. Adrian Wells
+44 (0)161 276 5399
adrian.wells@manchester.ac.uk
- James Thompson
james.thompson-7@postgrad.manchester.ac.uk
- Lora Capobianco
lora.capobianco@postgrad.manchester.ac.uk