Rumination and Affective Outcomes in Women Diagnosed with Breast Cancer

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Statement of Candidate

I certify that the work on my thesis titled "Rumination and affective outcomes in women diagnosed with breast cancer" has not been submitted for any other degree nor has it been submitted as part of the requirements for a degree to any other university or institution other than Macquarie University.

I certify that this thesis is my own work and it has been written by myself. Any help and assistance that I have received has been properly acknowledged within my thesis.

Ethics approval was granted at the following times during the course of the PhD: Study I, on 16th December 2008 (Ethics Reference 5200800602); Study II, on 4th December 2009 (Ethics Reference 5200903703); and Study III and IV, on 12th July 2011 (Ethics Reference 5201401083).

Heather Soo

1/6/18

Date

List of Original Publications

This thesis is based on the following original publications, which are referred to in the text by Roman numbers. Original publications are reproduced with permission from their copyright holders.

I. Soo, H., & Sherman, K. (2014). Rumination as a cognitive process in chronic illness. In M. L. Caltabiano & L. A. Ricciardelli (Eds.), *Applied topics in health psychology* (pp. 405-414). Oxford: Wiley-Blackwell.

II. Soo, H., Sherman, K., & Kangas, M. (2014). Assessing rumination in response to illness: The development and validation of the Multidimensional Rumination in Illness Scale (MRIS). *Journal of Behavioral Medicine, 37*, 793-805. doi: 10.1007/s10865-013-9531-8

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Statement of Contribution by Authors

I. In book chapter I, Heather Soo, alongside co-author Kerry Sherman, was intimately involved with generating the review concept resulting in this publication. Heather Soo was primarily responsible for the underlying literature review. Heather Soo was the primary contributor to preparing the manuscript by generating the first draft, editing the draft to incorporate comments and feedback from co-authors and responding to the book editors' comments and suggestions for revision.

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Date: **17/9/17**

II. In paper II, Heather Soo, alongside co-authors Kerry Sherman and Maria Kangas, was intimately involved with generating the research concept resulting in this publication. Heather Soo was primarily responsible for generating the pilot items for the Multidimensional Rumination in Illness Scale (MRIS), designing the scale factors analysis, reliability and validation studies and collecting the data. Heather Soo was the primary contributor to preparing the manuscript by generating the first draft, editing the draft to incorporate comments and feedback from the co-authors, and responding to journal comments and suggestions for revision.

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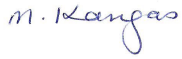
Signature: 

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III. In paper III, Heather Soo, alongside co-author Kerry Sherman was intimately involved in generating the research concept resulting in this publication. Heather Soo was primarily responsible for designing the study and collecting data. Heather Soo was the primary contributor to preparing the manuscript by generating the first draft, and reviewing the draft to incorporate feedback and comments.

Name: Associate Professor Kerry Sherman

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Date: **17/9/17**

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"You must do the thing you think you cannot do. "
~ Eleanor Roosevelt

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When I commenced this thesis, I had no inkling that the area of breast cancer was about to become intensely personal. While preparing this thesis, my mother, my aunt, my cousin and my younger sister, Rebecca, were diagnosed with breast cancer. Rebecca was diagnosed unexpectedly one Tuesday in September 2015 and passed away days later. I would like to dedicate this thesis to the memory of my dear sister Rebecca and to my older brother Paul, who passed away during the same period after a short battle with cancer.

Abstract

Breast cancer entails a series of physical, psychosocial and existential challenges that extend into the survivorship period through late side effects from treatment and the potential for disease recurrence. Consequently, higher levels of depressive and anxious symptoms are experienced along the disease trajectory, although positive change, termed post-traumatic growth, can coexist. Perseverative thinking, specifically rumination, has been linked to the development and maintenance of depression and anxiety in clinically-well populations as well as to post-traumatic growth in the cancer context. With limited research into the pathways by which rumination might exert this dual influence, the overall aim was to increase understanding of how subcomponents of rumination are differentially related to positive and negative psychological outcomes in women diagnosed with breast cancer. Given the complexity of the rumination construct, the absence of a specific measure for the context of illness required the development of the Multidimensional Rumination in Illness Scale (MRIS) as an initial step to achieving this aim. Studies 1 and 2 addressed the development, pilot testing, refinement and validation of the MRIS, with solid psychometric properties being demonstrated. A cross-sectional study of individuals with breast cancer (Study 3) found that brooding rumination was associated with depressive and anxious symptoms whereas both instrumental and intrusive rumination were associated with post-traumatic growth. As timing of rumination can be significant, the longitudinal approach in Study 4 revealed more distinctly how patterns of rumination differentially affect psychological outcomes along the illness trajectory. These findings provide a basis for the enhancement of psychological interventions to minimise distress and optimise post-traumatic growth. While cognitive-behavioural therapy (CBT) approaches have been successful in managing distress, CBT does not specifically address rumination, placing importance on the evaluation of the effectiveness of newer CBT modalities, such as Mindfulness-Based Cognitive Therapy, that target rumination through the addition of disclosure techniques and mindfulness meditation.

Key words: Breast cancer, Depression, Anxiety, Post-traumatic Growth, Rumination

Chapter 1: Introduction and Structure of the Thesis

Any diagnosis of illness has the potential to present a fundamental threat. Consequently, such an event can result in a shattering of the worldview of the individual, the understanding of the world and one's place within it (Calhoun & Tedeschi, 1998a), transforming core beliefs about the self, the world and the future (Green, Epstein, Krupnick, & Rowland, 1997). Psychological adjustment to the diagnosis of illness is the process of adaptation that occurs as an individual manages, learns from, and accommodates multiple changes in their circumstances (Brennan, 2001).

On the pathway to adjustment, it is not surprising that increased levels of psychological distress, most notably depression and anxiety, can be seen in the context of illness (Benedict & Penedo, 2013; Ciechanowski, Katon, & Russo, 2000). The presence of psychological disorders has been linked to a number of adverse outcomes in this setting including an increased burden of symptoms and side effects of treatment (Badger, Braden, & Mishel, 2001), poorer clinical outcomes due to non-adherence to treatment that may ultimately increase mortality (Andersen & diLillo, 2001; Egede, Zeng, & Simpson, 2002; Hjerl et al., 2003; Weihs, Enright, Simmens, & Reiss, 2000), a decreased quality of life (Badger, Braden, Mishel, & Longman, 2004; Grigsby, Anderson, Freedland, Clouse, & Lustman, 2002), and increased health care usage (Lave, Frank, Schulberg, & Kamlet, 1998).

However, psychological outcomes are not always negative, with reports of positive psychological change consequent to the illness experience. Termed post-traumatic growth, a greater sense of self, increased meaning in day-to-day life and increased value in close relationships is commonly seen (Calhoun, Cann, Tedeschi, & McMillan, 2000). In contrast to the negative outcomes associated with psychological distress, post-traumatic growth has been linked to increased well-being, increased positive health behaviours and decreased rates of depression (Stanton, Bower, & Low, 2006). Yet both psychological distress and post-traumatic growth can coexist (Cordova et al., 2007; Schroevers, Helgeson, Sanderman, & Ranchor, 2010).

As both have the potential to influence outcomes in the context of illness, it is important to gain an understanding of the processes which determine their presence in order to identify and intervene early in the case of psychological distress and to facilitate post-traumatic growth processes.

Until recently, when considering psychological outcomes in illness, much attention has been given to cognitive content and the role of maladaptive cognitive patterns (Beck, 1967, 1976). Less attention has been given to the cognitive *style* of processing the health threat posed by an illness diagnosis. Increasingly, consideration is being given to the role of rumination, "the cognitive process of actively thinking about a stressor, the thoughts and feelings it evokes and the implications for one's life and future" (Watkins, 2008, p. 164). Characterised by self-focus and a repetitive and passive deliberation on thoughts (Nolen-Hoeksema, 1991), there is no consensus as to the function and outcomes of rumination; it is regarded as potentially an adaptive, positive coping mechanism, an integral part of a sense-making and problem-solving process, but also as a maladaptive process that increases the likelihood of psychological disorders (Joorman, Dkane, & Gotlib, 2006).

The aim of the present research is to extend existent research on rumination in the clinically well into the context of illness, with a specifc focus on breast cancer. This thesis is organised in four sections as follows.

Section One consists of an introduction of relevant concepts, establishment of a background context, a review of literature relevant to this thesis and a statement of aims. Section One contains two chapters: Chapter 2 provides an overview of the cognitive process of rumination, its role in both positive and negative affective outcomes and explores its potential importance in the context of illness. An abridged version of this chapter has already been published and a copy of the book chapter has been inserted in Appendix B. This has been done with the kind permission of the relevant publishers. Chapter 3 is a systematic review of the rumination measures and their potential for application within the context of illness.

Section Two of the thesis describes the process of the conceptualisation, development and validation testing of the Multidimensional Rumination in Illness Scale (MRIS). Section 2 contains two chapters. Chapter 4 outlines the selection of the pilot items used in the construction of the new scale. Chapter 5 reports on two empirical studies constituting, firstly, the pilot test with exploratory factor analysis and, secondly, the reliability and validation testing, with confirmatory factor analysis, of the MRIS. The manuscript for Chapter 5 has already been published and a copy of the paper has been inserted into the thesis. This has been done with the kind permission of the relevant publishers. The manuscript incorporates its own literature review, reports its own methods, results and discussion in detail and contains the relevant references.

Section Three of the thesis explores the role of rumination and, more specifically, the differential influence of ruminative subtypes in both positive, post-traumatic growth, and negative, depression and anxiety, outcomes in the context of breast cancer. Section Three contains three chapters. As breast cancer is a very specific illness and the rest of the thesis will be examining this specific illness context, Chapter 6 provides a broad overview of the breast cancer experience from diagnosis to survival to provide context for the review of the role of rumination.

Chapters 7 and 8 are empirical investigations of the role of rumination and its subcomponents on psychological outcomes following a diagnosis of breast cancer. One of these manuscripts has already been published and the second is being prepared for journal submission. For the published manuscript, a copy of the paper in journal format has been inserted into the body of the thesis. This has been done with the kind permission of the relevant publisher. Both manuscripts incorporate their own literature review, report their own methods, results and discussion in detail and contain the relevant references.

Section 4 provides a general discussion for the thesis. In Chapter 9, the findings of the empirical studies are reviewed in the larger context of previous research, thus summarising the

content of all Sections One, Two and Three. The discussion also addresses the question of the implications of rumination for clinical practice. In this chapter, the findings from each study are discussed in relation to each other, the existent research and theoretical aspects of rumination. The discussion also addresses the strengths and limitations of the thesis and directions for future research.

Following the discussion, there are eight appendices that contain a glossary of key terms for the thesis (Appendix A), the published version of the rumination chapter (two; Appendix B), the factor loadings for the 41-item Multidimensional Rumination in Illness Scale (Appendix C), the study website (Appendix D), the participant information, consent forms and study questionnaires for the empirical studies (Appendices E to G), ethics approvals (Appendix H) and conference presentations directly related to the thesis research (Appendix I).

Chapter 2: Rumination: Cognitive and Emotional Processing of Illness Threat

'Speak to me as to thy thinking. As thou dost ruminate, and give thy worst of thoughts, the worst of words.'

Shakespeare

Chapter Overview

Models of coping in illness have traditionally highlighted the role of cognitive *content*, whereas increasingly, attention is turning towards the role of cognitive *style*. Rumination, a perseverative style of thinking, has been demonstrated to be a key predictor of depression and, to a lesser extent anxiety, in physically healthy populations. Rumination has also been linked to post-traumatic growth, the perception of positive life change after dealing with a traumatic event, such as the diagnosis of an illness. This chapter explores the potential role of rumination as a causal and maintaining influence on psychological outcomes in the context of physical illness. The specific nature and function of rumination and its application to the illness setting is explored, with current research on rumination in the context of illness reviewed. The role of rumination in the determination of psychological outcomes is delineated, suggesting the potential to address rumination within the framework of psychological intervention to both reduce levels of psychological distress and enhance the potential for post-traumatic growth. Finally, future research directions for rumination in the illness setting are outlined.

Receiving an Illness Diagnosis

The onset of illness and the subsequent receipt of a diagnosis, when it happens, can be sudden and unforeseen, presenting a fundamental threat and creating a series of challenges for the affected individual. Beyond the immediate physical symptomatology and concerns regarding any prognosis, illness can be associated with several emotional and social difficulties, resulting

from a disparity between the ideal self as "healthy" and the "real self", as affected by illness. This can result in major shifts in relationships, personal roles and life goals (Carver, 2005; Park & Fenster, 2004).

As such, an illness diagnosis can 'shatter the world view' of the individual (Janoff-Bulman, 1992), irreversibly disturbing their cognitive schemas of the world and self that facilitate understanding of their life. These schemas typically involve fundamental beliefs about the world as benevolent and meaningful and of the self as worthy (Janoff-Bulman, 1992). An illness diagnosis, as a traumatic event, undermines these core beliefs. Personal vulnerability and fragility is unmasked, the world is exposed as an unpredictable and uncontrollable place and the sense of self-worth is challenged (Calhoun & Tedeschi, 2014; Green et al., 1997; Janoff-Bulman, 1992, 2004), culminating in a state of crisis that induces physical, social and psychological disequilibrium (Moos & Schaefer, 1986).

This conceptual disintegration of the worldview requires resolution as the pre-illness assumptive world no longer holds up post-diagnosis (Janoff-Bulman, 1992). Organismic Valuing Theory (Joseph & Linley, 2005) outlines that illness-related material must either be assimilated into the individual's existing world view or that the individual must change their world view to accommodate the new information. Janoff-Bulman (1992) notes a preference to maintain existent worldviews but the process of assimilation can initiate self-blame in order to facilitate the alignment of illness-related material with the extant world model. Accommodation, however, can entail a positive or negative change to the world view, resulting in either the potential to generate growth or a sense of increased hopelessness and helplessness, remembering that newly formed assumptions can represent negative and threatening concepts (Janoff-Bulman, 1992; Joseph & Linley, 2005). Consistent with Leventhal's self-regulation model (Leventhal, Nerenz, & Steele, 1984), this process of adjustment will be influenced by an individual's perceptions of such changes, but also determined by the selection of behavioural and cognitive

strategies to both moderate and process emotionally-arousing information (Garnefski & Kraaij, 2006; Nolen-Hoeksema, 1991; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008).

Ultimately, while many people adjust to their illness, the psychological impact of illness is often underestimated (Turner & Kelly, 2000). Negative psychological outcomes include depression and anxiety, further exacting adverse impacts on quality of life (QoL; Badger et al., 2004), with the potential for such outcomes inversely related to physical health status (Garnefski, Koopman, & Kraaij, 2009; Li et al., 2015). Conversely, not all psychological outcomes are negatively-orientated with post-traumatic growth, positive psychological change following challenging life circumstances, also reported following an illness diagnosis (Cordova, Cunningham, Carlson, & Andrykowski, 2001; Sears, Stanton, & Danoff-Burg, 2003).

The presence of psychological distress in the illness setting creates the potential for adverse health outcomes, including increased burden of symptoms or side effects from treatment (Badger et al., 2001; Ciechanowski et al., 2000), reduced adherence to treatment (Andersen & DiLillo, 2001; Egede et al., 2002) and poorer clinical outcomes (Hjerl et al., 20003; Weihs et al., 2000). Conversely, post-traumatic growth has been associated with increased well-being and positive health behaviours (Stanton et al., 2006). It is therefore essential to understand the factors that drive these outcomes. Increasing understanding in this way will be an essential first step towards developing interventions to identify individuals at risk of negative psychological outcomes and facilitate the development of more positive outcomes.

The Cognitive Processing of Illness Threat

In the course of psychological adjustment to illness, the way in which individuals think about their diagnosis and their emotional response are key determinants of psychological well-being (DeVellis & Blalock, 1992). Traditionally, the focus has been on cognitive *content*, associated with the role of thinking biases in the development and maintenance of psychological disorders (Abramson, Metalsky, & Alloy, 1989; Beck, 1967, 1976). In this way, the

vulnerability-stress models of depression and anxiety link maladaptive cognitive responses to pessimistic attitudes, personal danger, and a sense of hopelessness (Abramson et al., 1989; Alloy et al., 2000; Beck & Emery, 1985). These patterns have been further extended to explain emotional adjustment to illness (Crane & Martin, 2003; DeVellis & Blalock, 1992), so that individuals who experience these types of thoughts in relation to their illness are more vulnerable to psychological distress (Alloy et al., 1999, 2000; Heijmans, 1999; Helgeson, 1992; Murphy, Dickens, Creed, & Bernstein, 1999). In illness, such thinking processes would initially be activated through the experience of symptoms and associated treatment and, later, through the activation of illness schemas (Soo, Burney, & Basten, 2009).

Self-regulation models highlight the significance of such illness schemas in influencing the way that individuals make sense of, and respond to, illness (Leventhal, Diefenbach, & Leventhal, 1992; Weinman, Petrie, Moss-Morris, & Horne, 1996). These mental representations can be disease-specific and are based on previous knowledge and experiences of illness, thereby including risk encodings, beliefs about aspects of illness such as symptoms associated with the condition (identity), reasons for the condition (causality), anticipated duration (timeline), ability to cure or treat the condition (controllability), and the consequences of the illness (Leventhal et al., 1992). These cognitive domains, together with an emotional representation, formulate the illness experience and serve to direct the processing of subsequent illness-related information, guide the selection of coping procedures and, ultimately, influence adjustment (Heijmans & de Ridder, 1998; Leventhal et al., 1992). Focusing on these concerns has the potential to generate substantial negative cognitive material (Crane & Martin, 2003).

However, whereas negative cognitive content is important in the development and maintenance of psychological disorders in the illness context, less attention has been given to the emotional processing of that content, to cognitive *style* (Bargh & Williams, 2007; Garnefski, Kraaij, & Spinhoven, 2001). Of particular significance is the idea that psychological outcomes are not purely determined by the valence of cognitive content, but by the way in which people

regulate their emotions, and that these are further influenced by the degree to which that content is recursively rehearsed, once made active (Segerstrom, Tsao, Alden, & Craske, 2000).

The Nature of Rumination

Increasingly, in the illness context, attention is being directed towards perseverative thinking, the "repeated or chronic activation of the cognitive representation of one more psychological stressors" (Brosschot, Gerin & Thayer, 2006, p. 114). Commonly seen as a response to stressful life events, perseverative thinking has been frequently reported in the illness setting (Brosschot et al., 2006; Hampton & Frombach, 2000; Horowitz, 1975; Kaasa et al., 1993), with the potential to prolong both psychological and physiological response (Brosschot et al., 2006; Schwartz et al., 2003).

There are many conceptualisations of perseverative thinking that highlight a particular cognitive style, for example, rumination and worry, or a particular function, including cognitive and emotional processing. Rumination, which Martin and Tesser (1996, p. 7) defined as "a class of conscious thoughts that revolve around a common instrumental theme and that recur in the absence of immediate environmental demands requiring the thought", has been receiving increasing attention in relation to illness. In focusing on the cognitive style of rumination, it is important to clearly differentiate rumination from worry, given the documented overlap between processing styles (Watkins, 2008) and a common link to negative affectivity (Roelefs, Huibers, Peeters, & Arntz, 2008). Key points of difference can be drawn in terms of temporal focus, with worry largely forward-focused while rumination tends to be past-focused (Beck, 1967, 1976), and function, where worry distracts from painful material whereas rumination elaborates that material (Hoyer, Gloster, & Herzberg, 2009).

Certainly, there is agreement amongst researchers that rumination entails self-focused, repetitive and deliberative thoughts (Nolen-Hoeksema, 1991), but there is little consensus as to the function and outcomes of rumination. Some regard rumination to be an adaptive, positive

coping mechanism. In this way, rumination is considered a self-regulatory process, a conscious and instrumental behaviour that forms an integral part of the problem-solving process, initiated by failure to make progress towards a goal (Carver & Scheier, 1990; Martin & Tesser, 1989, 1996).

Others view rumination as an intrusive and maladaptive style of thinking, characterised by abstract, evaluative thinking and often in response to mood or situation (Conway, Csank, Holm, & Blake, 2000; Nolen-Hoeksema, 1991; Robinson & Alloy, 2003; Watkins & Teasdale, 2001). Defined further as "the cognitive process of actively thinking about a stressor, the thoughts and feelings it evokes and the implications for one's life and future" (Watkins, 2008, p. 164), rumination has been linked to efforts to more clearly understand emotional responses to illness. In this way, rumination represents a process where "repeated thoughts unexpectedly and automatically dominate our awareness to the point that they become noticeable and bothersome" (Gold & Wegner, 1995, p. 1245), amplifying negative cognitive content, while hindering problem-solving (Joorman et al., 2006; Lyubomirsky, Caldwell, & Nolen Hoeksema, 1998; Lyubomirsky, Kasri, & Zehm, 2003b). Consequently, theories of emotional regulation suggest that individuals who engage in the ineffective strategy of rumination may be more vulnerable to psychological disorders (Joorman, Yoon, & Siemer, 2009; Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008), attracting attention to rumination as a transdiagnostic process, implicit in the onset and maintenance of many psychological disorders (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Ehring & Watkins, 2008; Harvey, Watkins, Mansell, & Shafran, 2004).

Rumination is therefore associated with both constructive (Chan, Ho, Tedeschi, & Leung, 2011; Morris & Shakespeare-Finch, 2011; Stockton, Hunt, & Joseph, 2011) and unconstructive outcomes in the context of illness (Bower, Kemeny, Taylor, & Fahey, 1998; Chan et al., 2011; Crane & Martin, 2003; Edwards, Tang, Wright, & Timberlake, 2011; Meints, Stout, Abplanalp, & Hirsh, 2017; Lu et al., 2014; Soo, Burney, & Basten, 2007), with several models developed to explain the diverse outcomes of rumination in terms of psychological

outcomes.

In the Response Styles approach (Nolen-Hoeksema, 1991), rumination is considered a response to depressed mood, with repetitive and passive thinking about symptoms of depression, the possible causes and consequences of those symptoms (Lyubomirsky & Nolen-Hoeksema, 1995; Nolen-Hoeksema, 1991, 2004). Depressed mood can prime mood-congruent information and activate negative memories, beliefs and expectations (Lyubomirsky et al., 1998; Nolen-Hoeksema et al., 2008; Schwartz & Koenig, 1996). Such cognitions further exacerbate the negative mood, producing a continuous cycle between mood and negative, pessimistic thinking (Watkins, 2008). However, while this model provides an account of unconstructive outcomes in response to rumination, it cannot explain the constructive outcomes, such as post-traumatic growth, often seen in response to negative content (Chan et al., 2011; Stockton et al., 2011). Furthermore, the model is limited by its narrow focus on rumination in response to depressed mood.

Cognitive processing theories position rumination in terms of adjustment to distressing events. Traumatic events, such as represented by an illness diagnosis, often introduce new information that is inconsistent with an individual's worldview, the beliefs and assumptions held about themselves and the world (Janoff-Bulman, 1992). For example, a cancer diagnosis and the subsequent increased sense of personal vulnerability would conflict with existent beliefs that "*bad things don't happen to good people*". The cognitive processing model proposes that any discrepancy between the meaning of a negative event and pre-existing cognitive structures makes it difficult to integrate this new information and that it is this discrepancy that results in distress. The individual needs to work through this discrepancy to achieve resolution (Horowitz, 1975), a process assisted by rumination in the form of repeated intrusions and re-experiencing of the distressing event. In this way, the cognitive process model can explain the onset and maintenance of rumination and is consistent with the consideration of structural elements such as valence of the ruminations. However, a limitation of the model is that it provides no account

for the diverse outcomes of rumination.

Finally, control theory posits that rumination reflects a process of feedback control, where current state and behaviour are compared against individual goals or standards, so-called reference values (Martin & Tesser, 1989, 1996). Similar to cognitive process theory, any discrepancy initiates rumination as a self-regulatory process, a conscious and instrumental behaviour that forms an integral part of the problem-solving process to facilitate progress towards the reference values (Carver & Scheier, 1982, 1990, 1998; Martin & Tesser, 1989, 1996). Accordingly, rumination will continue until either the goal is met or until the individual disengages from and abandons the goal (Martin & Tesser, 1986, 1989). Control theory can be applied to explain both constructive and unconstructive outcomes of rumination. Constructive outcomes follow if rumination resolves the discrepancy, either by facilitating progress towards the goal or by leading to modification or abandonment of the goal (Martin & Tesser, 1989, 1996). However, the outcome will be unconstructive if no progress is made and the goal is not abandoned, with rumination continuing to focus on the discrepancy, exacerbating negative affect (Carver & Scheier, 1990, 1998; Martin & Tesser, 1989, 1996; Pyszczynski, Holt, & Greenberg, 1987).

Control theory can also accommodate both structural approaches to rumination (valence, content) and process approaches (level of construal). Watkins (2008) notes differing levels of abstraction, with the more abstract goals and standards directing more specific, subordinate goals and standards. In this manner, the most abstract goals symbolise the idealised self (e.g., to be healthy), corresponding to higher level construals, whereas the more concrete levels represent the specific actions and behaviours necessary to implement the principles in a particular situation (e.g., remaining in remission from cancer), corresponding to lower level construals. Abstract goals that are more important and meaningful to people and the concrete goals that are linked to these important abstract goals generate higher levels of rumination when not attained (McIntosh et al., 1995; McIntosh & Martin, 1992).

In effect, control theory integrates key elements of the other models. It shares a discrepancy reduction focus with cognitive processing theory. Similarly, for depressive rumination, it has been suggested that the ruminative focus on the causes and consequences of depressed mood is likely to involve focus on unresolved goal discrepancies. For example, the content of experimentally induced rumination is characterised by thinking about unresolved problems (Lyubomirsky et al. 1999). Moreover, depressive rumination is associated with meta-cognitive beliefs that rumination is useful for resolving depression and solving problems, suggesting that depressive rumination is adopted with the intention of resolving goal-based or meaning-related discrepancies (Lyubomirsky & Nolen-Hoeksema, 1993; Papageorgiou & Wells, 2001; Watkins & Barcaia, 2001; Watkins & Moulds, 2005).

Salsman, Segerstrom, Brechting, Carlson and Andrykowski (2009, p. 39) note that "much work remains to further delineate the nature of cognitive processing." Accordingly, the aim of this thesis was to extend earlier work on rumination within the context of illness and under the guidance of the cognitive models to increase understanding of the diverse outcomes of rumination in illness. In this thesis, rumination is viewed specifically as a past-focused, elaborative form of perseverative thinking, whereby an individual actively thinks about illness-related content, the thoughts and feelings illness evokes and its future implications in respect of individual goals and standards (Watkins, 2008).

Rumination as a Maladaptive Process

Much of the research has focused on rumination in respect of negative psychological seqeulae (Calhoun & Tedeschi, 2014), particularly on rumination in response to a depressed mood in physically-well populations (Lyubomirsky & Nolen-Hoeksema, 1993, 1995; Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2013; Muris, Roelofs, Rassin, Franken, & Mayer, 2005; Nolen-Hoeksema & Morrow, 1993; Roelofs et al., 2008). Certainly, the Response Styles Theory (Nolen-Hoeksema, 1991), as the leading model of depressive rumination, interweaves

negative content with the ruminative process to involve thinking specifically about the symptoms, causes, and consequences of depression. Although the associated research largely focused on rumination in response to depression, Nolen-Hoeksema also demonstrated the prevalence of rumination more generally in individuals who experience negative life events (Nolen-Hoeksema, McBride, & Larson, 1997; Nolen-Hoeksema & Morrow, 1991).

In a similar way, in illness, rumination can focus in on the causes and consequences of the diagnosis, amplifying negative thoughts and relevant memories, prolonging distress, developing more detailed risk representations and increasing the general sense of hopelessness (Lyubomirsky et al., 1998; Nolen-Hoeksema et al., 2008; Schwartz & Koenig, 1996). In response to illness, such ruminations might focus on pessimistic explorations for causality, '*What did I do for this happen to me*?', consequences, '*I'll never feel good again*', self-evaluation, '*Why can't I do everything I used to?'* and, more broadly, are likely to centre around the uncontrollable, unpredictable and unchangeable nature of the illness (DeVellis & Blalock, 1992).

However, rumination may also be consciously adopted by an individual as a way of making sense of illness (Calhoun & Tedeschi, 2006), in line with the perception that rumination facilitates problem-solving (Watkins & Baracaia, 2001), yet considerable evidence exists to the contrary in that rumination interferes with attention and the ability to generate alternatives (Lyubomirsky et al., 2003b). It may be that rumination is employed as an emotional regulation strategy that imitates a problem-solving strategy, thus preventing more complex emotional engagement and, paradoxically, acts as an avoidance strategy (Nolen-Hoeksema, 1996). This can result in a decreased sense of control, lower self-efficacy in terms of being able to generate a resolution, consequently intensifying depressive or anxious symptoms (Donaldson & Lam, 2004; Lyubomirsky & Nolen-Hoeksema, 1995; Nolen-Hoeksema et al., 2008). The sense of a failure to generate solutions can then be heightened by negative beliefs about the ruminative process itself. These may relate to the lack of controllability of the process (*"I can't stop*

thinking about my illness"), its intrusiveness ("*I think about my illness when I least expect it"*) or the perceived harmful effects of rumination ("*Thinking about my illness will make me sicker"*). When rumination fails to regulate negative emotions in this way, unsurprisingly, psychological outcomes are likely to be poor (Manne, Glassman, & Du Hamel, 2000; Nolen-Hoeksema, 2000; Tedeschi & Calhoun, 2004).

Psychological distress can significantly influence individual QOL, a construct that relates more broadly to physical, psychological and social well-being (Cella, 1994). While there has been limited research to date, initial studies have demonstrated a negative relationship between rumination and health-related quality of life (Cella, 1994; Garnefski et al., 2009; Kuehner & Buerger, 2005; Li et al., 2015). Considering the increasing chronicity of illness, maintaining a health-related quality of life is considered essential (Li et al., 2015), with further research needed in this area.

Undoubtedly, rumination has garnered a negative undertone. Given that rumination is not universally adaptive, this raises the question of what purpose does it serve for an individual to engage in this process?

The Upside of Rumination

Many individuals report the perception of positive life changes after dealing with personal illness (Bellizzi & Blank, 2006; Bower et al., 2005; Cordova et al., 2001, 2007; Gangstad, Norman, & Barton, 2009; Garnefski, Kraaij, Schroevers, & Somsen, 2008; Ho, Chan, & Ho, 2004; Lechner, Carver, Antoni, Weaver, & Phillips, 2006; Manne et al., 2004; Milam, 2004; Pakenham, 2005; Siegel & Scrimshaw, 2000; Tedeschi & Calhoun, 1995). It is suggested that 40-70% of people who experience a traumatic event will describe at least some positive outcome from their experience (Calhoun & Tedeschi, 1999). More specifically, in the context of illness, 83% of women diagnosed with breast cancer (Sears et al., 2003) and 83% of women

living with HIV/Aids, reported at least one positive change attributed to their illness (Siegel & Schrimshaw, 2000).

This phenomenon is most commonly designated as post-traumatic growth (Tedeschi & Calhoun, 1995), although it is also referred to in the literature as adversarial growth (Linley & Joseph, 2004), benefit-finding (Affleck & Tennen, 1996) and stress-related growth (Park, Cohen, & Murch, 1996). Post-traumatic growth is construed across five domains: personal strength ("*I discovered that I am stronger than I thought I was"*), relating to others ("*I felt a greater closeness to others*"), new possibilities ("*I developed new interests*"), appreciation of life (*"Life can be very unfair but I am appreciative of things"*), and spirituality ("*I have a better understanding of spiritual matters*") (Calhoun & Tedeschi, 2006, 2014). In illness, there can be a redefined sense of self, of personal strength and resilience from having confronted the challenge of ill-health. The experience of illness also often brings change to relationships, some relationships may be lost whereas others are enhanced through a stronger sense of connection and greater intimacy (Calhoun & Tedeschi, 2014). What matters for the individual may also change, from an extrinsic to a more intrinsic focus, with goals that were once considered important now modified or even discarded, parallel to the development of new interests (Calhoun & Tedeschi, 1999, 2014). Finally, spiritual change may reflect a greater overall sense of meaning in life (Calhoun & Tedeschi, 2014).

Calhoun and Tedeschi (1998b, p. 222) noted "a process that we consider central to post-traumatic growth is rumination". With reference to Taylor's (1983) cognitive adaptation theory and aligning with the cognitive processing approach, models of post-traumatic growth have linked rumination to positive psychological outcomes through the repeated experiencing of illness-related information, which then facilitates the integration of relevant information to regain a coherent set of representations of self, while rebuilding the world view (Calhoun & Tedeschi, 2014; Salovey, Mayer, Lee Goldman, Turvey, & Palfai, 1995).

Rumination has been shown to be a common reaction to stressful circumstances, such as the diagnosis of illness, experience of natural disasters or loss of a loved one (Nolen-Hoeksema et al., 1997; Nolen-Hoeksema & Morrow, 1991; Taku, Cann, Tedeschi, & Calhoun, 2009; Werdel & Wicks, 2012). These are events that 'shatter the world view' of the individual (Janoff-Bulman, 1992), necessitating either assimilation or accommodation (Joseph & Linley, 2005). Consequent to such disruption, cognitive processing is considered an essential component of an individual's attempt to adjust to changed personal circumstances, a way of making sense of change and its associated consequences (Greenberg, 2002; Joseph & Linley, 2006; Martin & Tesser, 1996).

In the context of illness, rumination may initially occur as an automatic and unconscious process, characterised by intrusive thoughts to assimilate newly-acquired illness information into existing cognitive structures (Calhoun & Tedeschi, 1998b; Joseph & Linley, 2005). Although experienced as distressing, this intrusive rumination is suggestive of the cognitive processing activity required for the reconstruction of cognitive schemas, forming a basis for potential growth (Greenberg, 1995). This initial processing, directly in the aftermath of the diagnosis, serves to rework illness-related material to arrive at a more integrated understanding (Greenberg, 1995).

With time, rumination may become a conscious choice, more effortful, particularly in the presence of positive beliefs about its value (Papageorgiou & Wells, 2001) and adopted as a self-regulatory process to minimise any emotional distress arising from the diagnosis of illness and associated discrepancies between real and ideal state (Tedeschi & Calhoun, 2004). Rumination is believed to be a means of 'working through' difficulties and generating solutions in line with meta-cognitive beliefs that ruminative processes are effective in solving problems and resolving difficult emotions in response to stressful contexts such as illness ("*Ruminating on my problems helps me focused on the most important things"*) (Papageorgiou & Wells, 2001; Watkins & Baracaia, 2001). Such meta-cognitive beliefs about the benefits of rumination drive a mode of

rumination that can be considered more reflective, "a purposeful turning inwards to engage in cognitive problem solving" (Treynor, Gonzalez, & Nolen-Hoeksema, 2003, p. 256). Therefore, rumination in this sense is associated with developing coping strategies to meet the demands of the illness (*"Thinking about my illness helps me work out what to do to manage it"*) or to find new approaches so that life goals remain achievable (*"I am thinking about how I can get to where I want to be in life"*).

Accordingly, rumination may be considered an instrumental behaviour, whereby there is a deliberate focus on understanding and finding meaning in the illness experience. With the initiation of new goals, beliefs and adaptive behaviours to resolve the perceived disparity between real, or 'unhealthy', versus ideal, or 'healthy', states and to improve health (Martin & Tesser, 1989, 1996; Pyszczynski et al., 1987), rumination comprises a concrete approach aimed at finding solutions to problems that arise out of the illness experience, resulting in accommodation and a revised world view that, ultimately, will be a closer match to reality (Tedeschi & Calhoun, 1995). It is this ruminative process, not the traumatic event itself, that Tedeschi and Calhoun (1995) propose provides the potential for growth, "propelling the individual to a higher level of functioning than that which existed prior to the event" (Linley & Joseph, 2004, p.ll).

Key as the role of rumination is, it is necessary to note that rumination is not the sole determinant of post-traumatic growth in illness. Post-traumatic growth can reflect a complex interplay of clinical, individual and social factors, although the evidence in this respect can be equivocal. However, generally, post-traumatic growth is more likely to occur where the perceived threat is greater (Linley & Joseph, 2004; Stanton et al., 2003), with a positive relationship between perceived life threat and post-traumatic growth reported in breast cancer patients (Cordova et al., 2001). Minimally, it is argued, the illness and its consequences must represent a major loss, sufficient to shatter the existent world view but not so great that it overwhelms the individual's ability to cope, thus impeding growth (Calhoun & Tedeschi, 2001).

Younger individuals (Bower et al., 2005; Widows, Jacobson, Booth-Jones, & Fields, 2005), women (Bellizzi, 2004; Milam, 2004; Tedeschi & Calhoun, 2001) and those with greater levels of social support (Tedeschi & Calhoun, 2004) have also been shown to report more post-traumatic growth.

Ruminative Determinants of Psychological Outcomes

The relationship between post-traumatic distress and post-traumatic growth is not one of mutual exclusivity, with the co-existence of depression, anxiety and growth well-documented (Cordova et al., 2007; Schroevers et al., 2010). Accordingly, it is important to note that reported positive growth does not invalidate the adverse effect and distress that people experience (Linley & Joseph, 2002). Whereas the goal following a traumatic event, such as receiving an illness diagnosis, would be to reduce levels of psychological distress and enhance levels of post-traumatic growth (Calhoun & Tedeschi, 2014), it is not so straightforward. Research relating to the nature of any relationship between these outcomes is equivocal and suggestive of a more complex scenario, with some studies suggesting that growth has the potential to offset distress (Cadell, Regehr, & Hemsworth, 2003; Helgeson, Reynolds, & Tomich, 2006), whereas others fail to demonstrate any relationship between distress and growth (Chan et al., 2011; Cordova et al., 2001, 2007). Moreover, Calhoun and Tedeschi (2014) propose the existence of a curvilinear relationship between distress and growth, reflecting that beyond the minimum level of trauma required to elicit growth, as trauma becomes more excessive, it may overwhelm and ultimately restrict growth levels.

Given the role of rumination in both psychological distress and post-traumatic growth, these contradictory outcomes underline the reality that rumination is a complicated and multifaceted concept, with both adaptive and maladaptive elements that differentially influence cognitive processing, as reflected in the differential outcomes reported for rumination in the literature (Di Schiena, Luminet, & Philippot, 2011; Di Schiena, Luminet, Philippot, & Douilliez,

2012; Hamilton et al., 2011; Siegle, Moore, & Thase, 2004; Watkins & Teasdale, 2004; Watkins, Moberly, & Moulds, 2008).

Any debate about whether rumination is an adaptive or maladaptive process may reflect differences in opinion on its precise definition as certain types of rumination are more likely to facilitate cognitive processing, whereas others will impede it (Joseph, 2000; Siegle et al., 2004). Distinctions have been drawn between rumination as immediate, intrusive processing experienced directly after diagnosis and, later, between the more purposeful reflective or passive brooding ruminative types (Calhoun & Tedeschi, 1998b; Treynor et al., 2003). The active engagement with problem-solving inherent in reflection facilitates restructuring of the world view, potentially leading to post-traumatic growth, whereas brooding is a more passive contemplation of expectations or goals that are not achieved, characterised by anxious or melancholic thought, and therefore, is more associated with depression (Taku et al., 2009; Treynor et al., 2003; Watkins & Teasdale, 2004). The further distinction between evaluative or abstract and experiential rumination outlined in the cognitive control model has important implications, with the former considered more critical in the development of adverse psychological outcomes (Watkins & Teasdale, 2001; Watkins, 2008).

However, as noted, the relationship between rumination, psychological distress and growth is complicated further by the timing of rumination. Whereas the reflective, purposeful elements of rumination are most closely linked with growth, the automatic, intrusive elements seen commonly in the immediacy of an illness diagnosis can also be related to growth as they indicate initial cognitive processing, a working through of the event (Morris, Shakespeare-Finch, Rieck, & Newberry, 2005; Park & Fenster, 2004; Taku et al., 2009). In this context, rumination represents an instantaneous response to the shattered world view, through thinking about the diagnosis and potential consequences, allowing immediate processing of this world view and, ultimately, acting as a precursor to the more deliberate rumination associated with post-traumatic growth (Janoff-Bulman, 2006; Stockton et al., 2011). Yet, if these intrusive

elements persist over extended timeframes, then distress is more likely to follow (Calhoun & Tedeschi, 1999). Thus, recognising both the type of rumination and when it occurs is critical in understanding the cognitive determinants of psychological outcomes to traumatic events (Tedeschi & Calhoun, 2004).

Ruminative *content* may remain important, as shown by the volume of research focusing on rumination in response to the experience of depressed mood (Nolen-Hoeksema, 1991, 2000; Nolen-Hoeksema & Morrow, 1991; Spasojevic & Alloy, 2001), with negatively orientated ruminations linked to psychological distress and positively orientated ruminations linked to post-traumatic growth (Linley & Joseph, 2004; Phelps, Williams, Raichle, Turner, & Ehde, 2008). However, outcomes are also likely to be determined as a function of individual metacognitive beliefs about rumination. While positive beliefs may explain why people initiate and maintain the ruminative process ("*Thinking about my illness helps me understand its cause*"), negative beliefs ("*I exhaust myself thinking about my illness*") may provide a connection to psychopathology (Michael, Halligan, Clark, & Ehlers, 2007).

It is, therefore, critical to account for different styles, timing of, and beliefs about rumination in considering its influence on psychological outcomes (Morris & Shakespeare-Finch, 2011). As there is likely to be a complex interaction of these elements, any examination of rumination in response to illness must carefully consider the influence of all these various aspects of rumination.

Ruminative Research in the Context of Illness

Individuals are also theorised to respond differently cognitively and emotionally to the perceived threat inherent in illness (Miller, 1987). Miller drew a distinction between monitors, individuals who seek out and monitor information about the health threat, and blunters, who tend to distract themselves to blunt the psychological impact of the information (Miller, 1995). In respect of rumination, monitors, being more aware of internal and external threatening cues,

should report more intrusive, ruminative thoughts about their health (Miller, Rodoletz, Mangan, Schroeder, & Sedlacek, 1996), amplifying their perceptions of personal risk (Miller, 1995). However, processing the information in this way can lead to negative psychological and physical health outcomes.

Much of what is currently understood about the role of rumination and psychological outcomes is based on physically-well populations. To date, little is known about how rumination influences outcomes within the context of physical illness, although early studies have demonstrated a role in somatic health including the prolonged activation of cardiovascular, endocrine and immune system with increased levels of leukocytes and other immune system measures (Brosschot et al., 2006; Key, Campbell, Bacon, & Gerin, 2008; Rystedt, Cropley, & Devereux, 2011; Zoccola, Dickerson, & Zaldivar, 2008; Thomsen et al., 2004a). The Perseverative Cognition Hypothesis (Brosschot et al., 2006) explains this connection as originating from a fight or flight action response initiated by the cognitive representation of stressors. Brosschot, Pieper and Thayer (2005, p. 1045) define perseverative thinking as "the repeated or chronic activation of the cognitive representation of stress-related content", incorporating rumination. The resultant physiological responses include increased heart activity, blood pressure and the secretion of catecholamine and cortisol (Lovallo, 2004). However, rumination maintains the duration of exposure to the cognitive representation of the stressor beyond its initial occurrence (Melamed, 1986; Ottaviani et al., 2016; Zoccola & Dickerson, 2012). This prolongs the allostatic load or physical 'wear and tear' of these physiological responses (Brosschot et al., 2006; Key et al., 2008; McEwen, 1998), with negative implications for long-term disease outcomes (Ottoviani et al., 2016).

A systematic review and meta-analyses by Ottaviani et al. (2016) supported activation of cardiovascular, autonomic and endocrine systems. It should be noted, however, that this study focused solely on healthy individuals, excluding psychopathological samples so that the role of rumination in the relationship of stress, psychopathology and health risk remains unclear.

However, the study supports earlier findings related to the influence of rumination on the cardiovascular system, where rumination following a stressful event delayed heart rate and blood pressure recovery (Glynn, Christenfeld, & Gerin, 2002; Key et al., 2008; Roger & Jamieson, 1988). Moreover, a study among undergraduate students who were asked to ruminate on exposure to a prior stressor found an association between increased blood pressure and higher emotional component of the stressor (Glynn et al., 2002).

Similarly, for the endocrine system, studies have linked rumination to increased levels of cortisol, the stress hormone, which reflects an index of activation of the hypothalamic-pituitary-adrenal axis, a neuroendocrine system that regulates many bodily processes (Roger & Najarian, 1998; Rystedt et al., 2011; Zoccola et al., 2008). However, a review of fifteen studies showed findings regarding a relationship between rumination and cortisol to be inconsistent, reflecting variations in the way rumination was conceptualised and assessed, as well as cortisol measured (Zoccola & Dickerson, 2012).

Rumination has been associated with heightened physical sensations and symptoms (Crane & Martin, 2003; Skelton, Loveland, & Yeagley, 1996), poorer health consequences, including the experience of heightened levels of pain (Edwards et al., 2011; Meints et al., 2017; Sullivan & Neish, 1998), primary insomnia, poor quality of sleep (Guastella & Moulds, 2007; Thomsen, Mehlsen, Christensen, & Zachariae, 2003) and activation of the immune system with increased levels of leukocytes and other immune system measures (Thomsen et al., 2004a).

Along with the evidence supporting prolonged physiological states subsequent to rumination, it has also been linked to poorer levels of self-reported health more generally, including increased levels of pain (Edwards et al., 2011; Meints et al., 2017; Sullivan & Neish, 1998), number of health complaints reported and healthcare use (Lok & Bishop, 1999; Thomsen et al., 2004b). In examining the impact of rumination on self-reported health and healthcare use, Thomsen et al. (2004a; 2004b) examined both young and older adult groups. Rumination was found to be of greater significance in terms of health in older adults. Whereas similar

associations existed in the younger group, these were much weaker and of limited significance, suggesting that rumination is likely to be a more significant concern for vulnerable groups. These findings, however, need to be considered against issues involved in using self-report measures and a failure to differentiate outcomes on the basis of specific health concerns (Thomsen et al., 2004a, 2004b). Rumination was also found to impact on illness perceptions, the cognitive and emotional representations employed to make sense of illnesss (Godoy-Izquierdo, Lo´pez-Chicheri, Lo´pez-Torrecillas, Ve´lez, & Godoy, 2007; Petrie, Jago, & Devich, 2007). More optimistic perceptions in terms of control and better emotional outcomes in terms of depression were associated with adaptive rumination, with less optimistic illness perceptions and poor emotional outcomes associated with maladaptive rumination (Lu et al., 2014).

Rumination has also been implicated in delays in seeking medical assistance, which may have important implications in terms of health outcomes (Lyubomirsky, Kasri, Chang, & Chung, 2003a). Lyubomirsky et al. (2003a) studied help-seeking behaviour in two groups: women asked to imagine they had discovered a breast lump and actual breast cancer survivors. In both groups, the women who delayed seeking help the longest tended to be ruminators, possibly due to the consequences of the negative bias inherent in rumination and the associated impairment of concentration, impeding instrumental behaviours such as seeking a medical opinion. This reinforces research demonstrating that individuals who are more likely to ruminate require more time to solve a problem (Ward, Lyubomirsky, Sousa, & Nolen-Hoeksema, 2003).

In relation to psychopathology, rumination in illness is in its infancy, with initial studies echoing similar patterns of influence on depression and anxiety as in studies undertaken in the physically-well, and suggesting that content valence of rumination may remain important (Bower et al., 1998; Chan et al., 2011; Soo et al., 2007). However, some positive outcomes of rumination have been demonstrated (Chan et al., 2011; Morris & Shakespeare-Finch, 2011; Stockton et al., 2011), but the majority of the available evidence suggests a negative effect for rumination in illness (Brosschot et al., 2006; Lyubomirsky et al., 2003b; Soo et al., 2007).

However, these findings are restricted by their correlational nature, small sample sizes and limitations in the physiological data collected (Suchday, Carter, Ewart, Larkin, & Desiderato, 2004). As such, further work is needed to explore the precise influence of rumination on outcomes in the context of illness.

Having a clearer understanding of the pathways between rumination and psychological outcomes, whether in terms of distress or post-traumatic growth, will create the potential to enhance psychological interventions following traumatic events, such as the diagnosis of an illness. To date, given the demonstrated associations between rumination and negative psychological outcomes in physically-well populations (Nolen-Hoeksema, 2000; Spasojevic & Alloy, 2001), therapeutic responses have largely been concerned with approaches to minimise rumination. Cognitive behaviour therapy (CBT) has been used extensively in the context of illness, not only in treatment of psychological distress, but also in relation to health maintenance, including disease management (Turk & Salovey, 1995). CBT is an extremely effective treatment approach, but it appears less effective in managing ruminative processes, suggesting that a sole focus on cognitive *content* may be insufficient. Addressing the cognitive *process* by interrupting the stream of ruminative thoughts is considered to be critical (Ciesla & Roberts, 2007). In this way, individuals at risk of the more negative outcomes from rumination may be able to be identified promptly and ruminative processes targeted in therapy. Additionally, the development of more positive outcomes may be facilitated if the more reflective elements of rumination can be harnessed.

Conclusion

Rumination has been shown to be important in the development of depression and anxiety in physically-well populations (Muris et al., 2005; Nolen-Hoeksema, 1991, 2000; Roelofs et al., 2008), whereas research on rumination in illness remains in its infancy. However, early research in health contexts does suggest that rumination may play a key role in

determining physiological and psychological outcomes. First, rumination has been linked to the activation of cardiovascular, immune and hypothalamus-pituitary-adrenal systems (Brosschot et al., 2006; Key et al., 2008; Rystedt et al., 2011; Zoccola et al. 2008). Nonetheless, as the research findings continue to show inconsistencies, it is essential to further clarify any association and to determine the possible duration of the rumination effect. Second, initial research echoes patterns of influence on depression and anxiety in the clinically well and suggests that content valence of rumination may be important (Brosschot et al., 2006, Lyubomirsky et al., 1993a, Soo et al., 2007). Third, rumination has been linked to post-traumatic growth in several illness populations (Calhoun et al., 2000; Chan et al., 2011; Gangstad et al., 2009).

The presence of increased levels of psychological distress in the setting of illness can have considerable ramifications, not only in respect of adding to the total burden of the illness, but also in respect of poorer clinical outcomes and decreased quality of life (Badger et al., 2001; Badger et al., 2004; Hjerl et al., 2003). Increasing understanding of the role of rumination is therefore critical. However, focusing solely on negative psychological outcomes will provide only a narrow view given the existing evidence of the role of rumination in post-traumatic growth following an illness diagnosis (Bellizzi & Blank, 2006; Chan et al., 2011; Cordova et al., 2001, 2007; Gangstad et al., 2009; Garnefski et al., 2008; Ho et al., 2004; Milam, 2004). Nonetheless, a clearer understanding of the influence of distinct subcomponents and timing of rumination is needed. The experience of post-traumatic growth is not a certainty, nor should the expectancy of such outcome place any additional burden on an individual. There is still some way to go in understanding who does and who does not experience growth. Achieving both goals will expedite the enhancement of psychosocial interventions, both in terms of minimising the potential for psychological distress and to increase the potential for positive change in the post-diagnosis period.

The existing body of research provides initial steps towards the development of the conceptualisation of the relationship between rumination and illness, however, this area is largely underdeveloped. Of primary importance will be to learn more about the exact nature of any association between rumination and positive and negative psychological outcomes in illness. In doing so, it will be important to account for the differential effects of the particular components of rumination, inclusive of intrusion, brooding and reflection. It will also be useful to explore how any relationship might vary according to specific health conditions. Such research will require the issues of earlier studies to be addressed with a greater focus on randomised, controlled studies, larger sample sizes and longitudinal research.

Rumination is rapidly developing as a key area of interest in current research. While there has been a significant amount of work done in the area of the role of rumination in psychological disorders in clinically-well populations, this work has yet to be extended to any great extent in the setting of illness. Whereas early studies provide results hinting at the importance of this area, many opportunities for research, with an initial emphasis on defining the precise role of rumination in illness, remain. When this has been achieved, identification of risk factors for rumination specific to illness will become clearer and further exploration of intervention strategies, specific to this unique setting, will be possible.

Chapter 3: Systematic Review of the Assessment of Rumination

Abstract

Reflecting documented relationships in the clinically-well, early studies suggest rumination as a factor in negative psychological outcomes following the diagnosis of physical illness. Yet rumination has also been linked to positive change, termed post-traumatic growth, in this illness context. This suggests a dual influence for rumination that warrants further investigation, but research in this area is challenging as rumination is a complex, multi-faceted concept, with no clear consensus as to its exact nature and with many theories to suggest its function. Accordingly, the current systematic review aimed to explore existent rumination scales with respect to their potential application in the context of physical illness. A comprehensive search of the literature from 1980 to 2014 returned 830 studies, employing 19 distinct scales to assess rumination. This wide range of measures, each addressing a very narrow conceptualisation of rumination, can make the selection of an appropriate measure for research in this area difficult. Combined with the absence of any scales that specifically address rumination in illness, the development of a new scale, recognising the multidimensional nature of rumination and the specific presentation of rumination in illness, is proposed.

The diagnosis of an illness, along with its physiological and psychosocial challenges, is commonly associated with psychological distress, particularly depression, anxiety and reduced quality of life (Garnefski et al., 2009; Li et al., 2015). Yet, post-traumatic growth reflecting positive change has also been reported post-diagnosis (Cordova et al., 2001; Sears et al., 2003). Recent years have seen an increasing focus on rumination, a *style* of thinking characterised by self-focus and a repetitive and passive deliberation on thoughts, as a potential factor underlying the development and maintenance of these psychological states. The role of rumination in depression and anxiety has been well-documented in clinically-well populations (Lyubomirsky & Nolen-Hoeksema, 1993, 1995; Nolen-Hoeksema, 1991; Nolen-Hoeksema, 2000; Nolen-Hoeksema et al., 2008; Smith, Alloy & Abramson, 2006), a finding replicated by early studies in the context of illness (Cordova et al., 2007; Sears et al., 2003; Soo et al., 2007; Thomsen et al., 2004a). A greater volume of work has examined rumination in relation to post-traumatic growth in illness (Calhoun & Tedeschi, 1999; Nightingale, Sher, & Hansen, 2010; Stockton et al., 2011; Tedeschi & Calhoun, 1996). As rumination has been linked to both psychological distress and post-traumatic growth, this suggests that it may influence psychological outcomes in illness through distinct pathways (Chan et al., 2011; Linley & Joseph, 2004). Understanding more about rumination in illness is, therefore, critical in the early identification of those at increased risk of psychological distress and in the facilitation of more positive outcomes. However, many important research questions remain, commencing with further exploration of how rumination exerts its influence in the context of illness.

A key dilemma facing any researcher in rumination lies in the selection of an assessment tool, as rumination is a complex and multifaceted construct. Currently, there exists no consensus as to either the function or outcomes of rumination. The construct of rumination varies according to whether it is considered as: a voluntary or an involuntary response; a state reaction or a stable disposition; and, an adaptive positive coping mechanism or a maladaptive process that increases the likelihood of psychological disorders (Joorman et al., 2006; Luminet, 2004).

Whereas some have viewed rumination purely as an instrumental behaviour, undertaken as a function of goal progress (Martin & Tesser, 1989), others have focused solely on rumination as a maladaptive style of thinking (Lyubomirsky et al., 1998; Nolen-Hoeksema, 1987) where "repeated thoughts unexpectedly and automatically dominate awareness to the point that they become noticeable and bothersome" (Gold & Wegner, 1995, p. 1245).

The number of different theories of rumination is correspondingly reflected in the wide range of self-report measures available that assess a broad variety of cognitive experiences (Luminet, 2004; Siegle et al., 2004). A review of existing measures suggests that several different constructs are represented and that various subcomponents of rumination exist (Martin & Tesser, 1989; Nolen-Hoeksema, 1987; Siegle et al., 2004; Teasdale & Barnard, 1993; Wells & Matthews, 1994). As might be expected, these self-report measures differ considerably, broadly assessing a variety of cognitive experiences but, individually, focused on a narrow, particular sub-component of rumination (Siegle et al., 2004; Smith & Alloy, 2009). With some degree of overlap, the measures can be classified into five broad groups based around orientation of content: response to emotional state; response to a specific event; ruminative processing; as a function of goal discrepancies; and, meta-cognitive beliefs in respect of rumination.

The first grouping of rumination scales concerns rumination in response to an emotional state. Most commonly exemplified by the Ruminative Responses sub-scale of the Responses Style Questionnaire (RRS; Nolen-Hoeksema & Morrow, 1991) with its depressive rumination focus, this group of scales conceptualise rumination as a repetitive pattern of thinking about the causes, consequences, and symptoms of mood (Smith & Alloy, 2009). From this perspective, rumination is considered a stable trait (Nolen-Hoeksema & Davis, 1999), as a maladaptive process that amplifies negative cognitive content and hinders problem-solving (Lyubomirksky et al., 1998; Lyubomirsky et al., 2003b). Similarly, the Rumination on Sadness scale (RSS; Conway et al., 2000) targets rumination in response to the experience of sadness and the

circumstances surrounding that sadness, conceptualising rumination as a negative process in terms of intrusiveness and interference with problem-solving processes (Smith & Alloy, 2009). However, this group also includes scales that address rumination as a cognitive element of an emotional regulation process. Scales such as the Cognitive Emotional Regulation Questionnaire (CERQ; Garnefski et al., 2001) measure the degree to which individuals focus on their emotions and thoughts directly associated with negative events such as an illness diagnosis.

The second class of scales concern rumination in response to a stressful event, a temporary process (Smith & Alloy, 2009). The Stress-Rumination Response Scale (SRRS; Robinson & Alloy, 2001) views rumination as a negative, event-related inference that serves to increase the likelihood of depression (Robinson & Alloy, 2003). The scale assesses the tendency to make negative inferences regarding stressors, the presence of hopelessness cognitions, and active coping or problem-solving strategies. In the illness setting, Fritz (1999) developed the Multidimensional Rumination Questionnaire (MRQ; Fritz, 1999), which assessed three potential subtypes of rumination in response to the experience of a health event, including emotion-focused rumination, searching for meaning of negative experiences, and instrumental rumination. Finally, the Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979) assesses the intrusiveness of thoughts following a distressing event, capturing the process as non-voluntary, difficult to control and interrupting of activities (Horowitz, 1975). Although the Impact of Event Scale is more orientated towards a broad range of trauma experiences than the Multidimensional Rumination Questionnaire, an advantage of both scales is that they have the potential to capture key aspects of ruminative responses to the diagnosis of an illness, such as the degree to which individuals search for meaning and emotion-focused rumination (Fritz, 1999; Horowitz et al., 1979).

The third group includes scales such as The Global Rumination Scale (GRS; McIntosh & Martin, 1992) and the Rumination-Reflection Questionnaire (RRQ; Trapnell & Campbell, 1999), which assess the nature of the repetitive processes underlying rumination, including

frequency, controllability and distractibility of thinking. Unlike the Ruminative Responses Scale, where reflection and brooding were considered subtypes of rumination, Trapnell and Campbell (1999) draw a clear distinction between reflection, "the playful exploring of novel, unique or alternative self-perceptions" (p. 290), and rumination, "the compulsive attending to perceived threats, losses and injustices to the self" (p. 290). In both the Global Rumination Scale and Rumination-Reflection Questionnaire, rumination is again conceptualised in its pathological form.

The fourth classification of rumination scales revolves around a sense of goal discrepancy (Martin, Shrira, & Startup, 2004; Martin, Tesser, & McIntosh, 1993) with rumination regarded as an adaptive, self-regulatory process through which the individual will identify more productive strategies for goal attainment, reexamine whether a goal remains appropriate, and change their way of thinking about behaviour in relation to a goal (Martin et al., 2004). Although positively orientated, this kind of rumination can overlap with other conceptualisations of rumination and still have negative consequences, particularly as rumination continues until a goal is attained or abandoned. Scales in this group can include various dimensional subtypes as outlined by Martin and Tesser (1996), who categorised twelve possible subclasses of rumination, discriminated by the emotional valence of ruminative thoughts, relation to a sense of discrepancy or goal progress and time orientation. These sub-classes ranged from 'working through' (a negative valence, a discrepancy focus, past-orientated), aligning with the idea of trying to come to terms with and resolving a problem, to what Martin and Tesser (1996) labelled 'basking' (a positive valence, attainment focus, present-orientated), the latter linked to a maintenance role in rumination through its action of reconfirming a *lack* of discrepancy. The associated Scott-McIntosh Rumination Scale (SMRS; Scott & McIntosh, 1999) focuses on three dimensions related to goal attainment: emotionality, distraction and motivation.

The final group of rumination scales relates to metacognitive beliefs, which are beliefs about one's ability to monitor and regulate one's thoughts (Watkins & Moulds, 2005). The role of metacognitive beliefs is central to the Self-Regulatory Executive Function (S-REF; Wells & Matthews, 1994) model of affective dysfunction. Positive beliefs such as gaining insight into problems, as measured by the Positive Thoughts about Rumination Scale (PBRS; Papageorgiou & Wells, 2001), have been shown to contribute to the adoption of rumination, whereas negative beliefs, such as a lack of controllability, as measured by the Negative Thoughts about Rumination Scales (NBRS; Papageorgiou, Wells, & Meina, 2003), contribute to the harmfulness of rumination in terms of depression (Papageorgiou & Wells, 2001; Papageorgiou et al., 2003; Smith & Alloy, 2009).

Assessment of rumination is therefore a complex matter, reflected by the availability of a multitude of scales, each presenting a narrow representation of ruminative experience and assessing multiple constructs that differ in their relationship to clinical outcomes (Siegle et al., 2004). The aim of this systematic review was to identify available rumination scales, to evaluate their specific focus and psychometric properties, as similar previous reviews have undertaken (Bartula & Sherman, 2013), and to assess their appropriateness for use in the context of understanding psychological outcomes in illness.

Materials and Methods

Search strategy

A systematic search was made of the relevant literature from 1980 to 2014 utilising the PsycINFO database using the keywords 'rumin*' and 'scale'. The reference lists of each retrieved paper were reviewed for additional resources. The search was limited to empirical studies published in English language, peer-reviewed journals.

Inclusion and exclusion criteria

Inclusion and exclusion criteria are listed in Table 3.1. Where the title or Abstract indicated that the exclusion criteria were met, the study was rejected. Full-text articles were accessed where it was unclear from the title or Abstract whether inclusion criteria were satisfied, with further discussion of any ambiguous studies by the authors prior to inclusion.

Table 1

Study Inclusion and Exclusion Criteria

Criterion	Included	Excluded
Type of study	Original study Quantitative	Review paper Qualitative
Type of scales	Self-report	Other
Population studied	Adult (18 years and older)	Children, adolescents
Study reporting on	Rumination (cognitive process)	Rumination (eating disorder)
		Anger rumination
		Co-rumination
		Grief rumination
		Perseverative thinking

Following PRISMA guidelines, this search strategy resulted in 1,138 papers of potential relevance to this review, and all were obtained in full copy. Each paper was read in full and assessed for relevance to the review regarding the following inclusion criteria: 1) English language publication; 2) primary research paper; 3) research with the cognitive process of rumination as a primary variable; and, 4) available as a full text document.

Scale Evaluation Scoring System

Each rumination scale reviewed was assessed for its psychometric properties based on the original validation study. A score was assigned to each scale indicating the extent to which it

had adequate psychometric properties (see Table 2 for scoring system). Additional points were allocated based on the characteristics of the validation sample, where "1" was given to studies where *n* was greater than or equal to 300 as this is recommended for scale validation (Rouquette & Falissard, 2011) and 0.5 where samples were between 200 and 299. Since scale psychometric properties can depend on the population studied (Streiner & Norman, 1995), "1" was given if the scale was applied in an illness setting. The first author (HS) rated the scales first, followed by the second author (KS). Any disagreements were discussed until an agreement was reached.

Results

Literature search results

The literature search results are presented in Figure 1. Out of the 2,231 citations initially identified, 1,138 met the inclusion criteria, using 19 different scales, 16 specifically designed to assess rumination and three were sub-scales within more general scales of cognitive processing. For the latter, only the psychometric properties of the ruminative sub-scales were reviewed.

Evaluation of rumination scales

The evaluation of rumination scales is presented in Table 3. Where multiple validation studies for the same scale existed, the results were differentiated by assigning a number in their subscript (e.g., n1, n2, denotes sample sizes in two different studies).

Only five scales (27 %) met the criteria of having adequate sample size: Analytic Rumination Scale (Barbic et al., 2014); Anxious Rumination Scale (Rector et al., 2008); Cognitive Emotion Regulation Scale (Garnefski et al., 2011); Ruminative Thoughts Style Questionnaire (Brinker & Dozois, 2009); and, Rumination-Reflection questionnaire (Trapnell & Campbell, 1999).

Table 2
Psychometric Properties of Scales and Scoring Rules for Evaluation

Psychometric property		Definition	Method of assessment	Evaluation criteria	Scoring
Reliability					
	Internal consistency	Extent to which all scale items are measuring the same construct.	Cronbach's α.	.70-.90 (Streiner & Norman, 1995)	"1" ≥ .70 "0" < .70
			Item total correlation.	≥ .40 (Lounsbury, Gibson, & Saudargas, 2006)	"1" ≥ .40 "0" < .40
	Test-rest reliability	Degree of consistency of scores obtained by the same people on two different occasions assuming no real change in the construct has occurred.	Correlation coefficient between scores obtained on two occasions some time apart.	≥ .79 (Aday & Cornelius, 2006)	"1" ≥ .70 "0" < .70
Validity	Content	Extent to which the items in a scale cover the construct adequately.	Based on theory, existing scales, expert opinion, clinical observation, qualitative feedback from professionals, researchers and participants.	N/A	"1": evidence of the measure being based on theory, literature review or examined by patients, professionals and experts in the field
	Criterion	How well the scale relates to the "true value" or a "gold standard" for measuring the construct.	Correlation coefficients between survey and criterion scores.	The higher the correlation, the more valid the instrument. Acceptable values include significant moderate ($r > .30$) to high ($r > .50$) correlations (Aday & Cornelius, 2006; McDowell & Newell, 1996)	"0.5" if the correlation is between .30 and .49 and "1" if the correlation is above .50 between the scale and the "gold standard" measure either taken at the same time (*concurrent*) or in the future (*predictive*)
	Construct	Extent to which hypothesised relationships with similar (*convergent*) or different (*discriminant*) constructs are confirmed.	Correlation coefficient between survey scores and hypothesised variables.	Moderate correlations with similar constructs ≥ .30 (*convergent*) and low correlations < .30 with different constructs (*divergent*) (Dickter, 2006; McDowell & Newell, 1996)	"1": Evidence of convergent validity "1": Evidence of discriminant validity
			Known group comparisons.	Significant differences in scores between known groups	"1": The scale differentiates between known groups
			Factor analysis.	Factor analysis confirms hypothesised structure (McDowell & Newell, 1996)	"1": Factor analysis confirms hypothesised factor structure

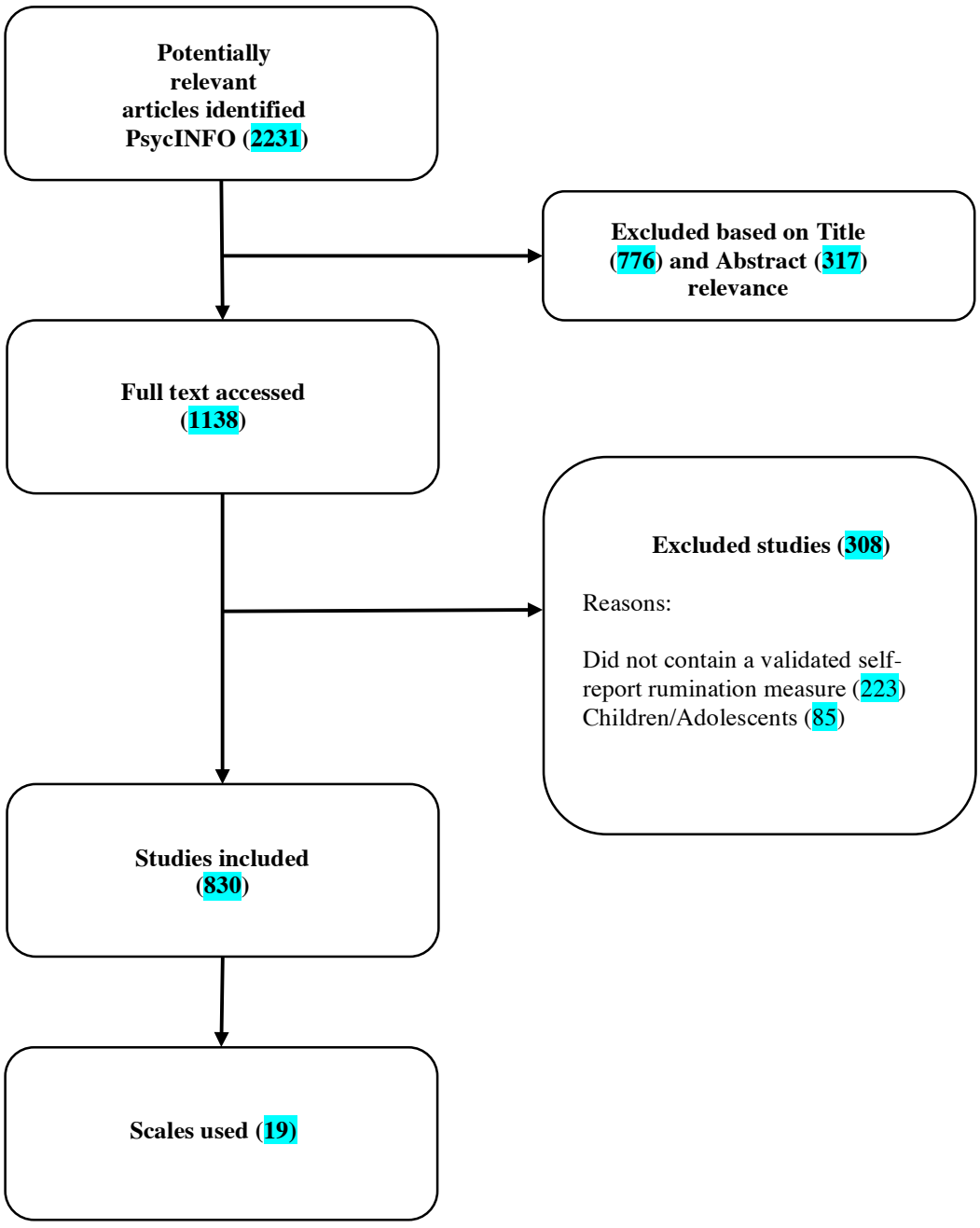

Figure 3.1. Flowchart of the systematic review.

Table 3
Evaluation of Rumination Scales

	Scale (Sub-scale)		Validation sample	Reliability	Content Validity	Criterion Validity	C	D	KG	FA	Score
Emotional											
	Analytic Rumination Questionnaire (ARQ; Barbic et al., 2014) 20 items "*I tried to think through my difficulties.*" *"I thought about what I might have done to avoid these problems."* No health-related studies.	Assessment of analytical rumination, persistent distraction-resistant cognitive analysis in the context of depression to resolve life challenges. Understanding the cause. Understanding the aspects of the problems that need to be solved. Generating possible solutions. Evaluating the advantages and disadvantages of possible solutions.	n_1=579 students n_2=140 students	Cα=.91 T-TR = >.81	EP; LR		✓	✓		✓	
	Score			**2**	**1**		**1**	**1**		**1**	**6**
	Anxious-Rumination Questionnaire (ARQ; Rector et al., 2008) "*How everything would be easier if my mind would just stop racing.*" *"How I can't bear to hear bad news."* Anxious rumination is positively associated with post-event processing (Laposa & Rector, 2011) No health-related studies.	Cognitive reframing: Assesses ruminative response to anxious mood. Anxious control-focused rumination. Anxious coping-focused rumination.	n_1=491 students n_2=282 students	Reframing Cα=.75 Control Cα=.86 Coping Cα=.83	CE; ES		✓	✓	✓	✓	
	Score			**1**	**1**		**1**	**1**	**1**	**1**	**6**

Scale (Sub-scale)		Validation sample	Reliability	Content Validity	Criterion Validity	C	D	KG	FA	Score
The Cognitive Emotional Regulation Questionnaire (CERQ; Garnefski, Kraiij, & Spinhoven, 2001) Rumination sub-scale (4 items) "*I often think about how I feel about what I have experienced.*" "*I dwell upon the feelings the situation has evoked in me.*"	Assesses degree to which individuals focus on their emotions and thoughts directly associated with negative events	n_1= 547 students n_2 = 487 students n_3 = 611 students* n_4 = 301 students*	Cα=.81 Cα=.83 Cα=.83* Cα=.83* T-RT = .63 (5 months)	ES; TD	✓	✓	✓	✓	✓	
Score			**2**	**1**	**1**	**1**	**1**	**1**	**1**	**8**
Emotion Control Questionnaire (ECQ; Roger & Najarian, 1989). ECQ-REH Rehearsal sub-scale (14 items). "*I get worked up just thinking about things that have upset me in the past*" Rumination increases cortisol over time (Roger & Najarian, 1998). **Score**	Rumination as an emotional regulation strategy that may be employed in response to stress or other negative experiences or emotions.	n_1= 244 students n_2 = 86 students	Rehearsal KR-20 = .86 Rehearsal T-RT = .63	TD	✓	✓			✓	
			2	**1**	**1**	**1**			**1**	**6**

Scale (Sub-scale)		Validation sample	Reliability	Content Validity	Criterion Validity	C	D	KG	FA	Score
Response Styles Questionnaire (Nolen-Hoeksema & Morrow, 1991) Ruminative Responses sub-scale 22 items *"I think I won't be able to do my job if I don't snap out of this."* *"I think about how sad I feel."* "*I think about how hard it is to concentrate."* Rumination delays seeking diagnosis for breast cancer symptoms (Lyubomirsky et al., 2006). Rumination moderated negative cognitive inference in Type 2 diabetes to influence depression and anxiety (Soo et al., 2007).	Repetitively thinking about the causes, consequences, and symptoms of current negative affect.	n_I=250	Cα=.89 T-TR = .80 (6 months)			✓	✓	✓	✓	
Score			**2**	**1**		**1**	**1**	**1**	**1**	**8**
Ruminative Responses Scale (Short-Form) (Treynor et al., 2003) 10 items *"Why do I have problems other people don't have?"*			Reflection Cα=.72 T-TR = .60 (6 months) Brooding Cα=.77 T-TR = .62 (6 months)	ES		✓	✓		✓	
Score			**2**	**1**		**1**	**1**		**1**	**6**

	Scale (Sub-scale)		Validation sample	Reliability	Content Validity	Criterion Validity	C	D	KG	FA	Score
	The Rumination on Sadness Scale (RSS; Conway et al., 2000) 13 items *"I have difficulty getting myself to stop thinking about how sad I am."* *"I repeatedly analyse and keep thinking about the reasons for my sadness"* No health-related studies.	Rumination in response to sad mood and the circumstances surrounding the sadness. Intensity and repetitive quality. Difficulty with control. Attempts to understand distress. Lack of instrumental goal orientation.	n_1=220 Students n_2=76 Students	Cα=.91 T-TR = .70 (2-3 weeks)			✓	✓		✓	
	Score			**1**	**1**		**1**	**1**		**1**	**5**
Event	**Impact of Event Scale** (Horowitz, Wilner, & Alvarez, 1979) Intrusion sub-scale. 7 items "*Any reminder brought back feelings about it.*" *"I thought about it when I didn't mean to."*	Intrusive thoughts following exposure to traumatic situations	n_1= 25 students	Cα=.78	CD	✓	✓	✓			
	Score			**1**	**1**	**1**	**1**	**1**			**5**

Scale (Sub-scale)		Validation sample	Reliability	Content Validity	Criterion Validity	C	D	KG	FA	Score
Multidimensional Rumination Questionnaire (MRQ; Fritz, 1999) 27 items *"In the past two weeks, how much have you thought of things you need to change in your life as a result of the event?"* Searching for meaning and instrumental rumination enhance psychological adjustment, with poorer outcomes for emotion-focused rumination, following a first cardiac event (Fritz, 1999)	Rumination in response to a stressful event. Emotion-focused rumination: thinking about symptoms of depression (MRQ-EMOTS) Searching for meaning of negative experiences (MRQ-SRCH) Instrumental rumination: thinking about what can be done to change one's situation in response to negative events (MRQ-INST)		Cα=.74 EMOTS Cα=.84 SEARCH Cα=.89 INST							
Score			**1**							**1**
The Stress-Reactive Rumination Scale (SRRS; Alloy et al., 2000) Negative attributions and inferences sub-scale *"Try to find something positive in the situation or something you've learned."* *"Think about the possibility that things will never get better."*	Rumination in response to a negative life event. Tendency to make negative inferences for life stressors. Focus on hopelessness thoughts (deleted due to low reliability) Focus on active coping strategies (deleted due to low reliability)		Cα=.89 T-TR = .71 (1 month)	ES		✓	✓		✓	
Score			**2**	**1**		**1**	**1**		**1**	**6**

	Scale (Sub-scale)		Validation sample	Reliability	Content Validity	Criterion Validity	C	D	KG	FA	Score
Process	**Global Rumination Scale** (McIntosh & Martin, 1992). 10 items "*I seldom think about things that happened in the past.*"	Measure of trait rumination; Tendency to repetitive thought (frequency, controllability)		T-TR = .78 (2weeks) *personal communication				✓			
	Score			**1**				**1**			**2**
	The Rumination Inventory (Calhoun, Cann, Tedeschi, & McMillan, 2000) Rumination (Then) 7 items Rumination (Now) 7 items			Then Cα=.81 Now Cα=.88							
	Score			**1**							**1**
	The Rumination Scale (Martin et al., 1993) 10 items "*When I have a problem, I think about it a lot of the time.*"	Measures conscious, repetitive, persistent, aversive thoughts									
	Score										

	Scale (Sub-scale)		Validation sample	Reliability	Content Validity	Criterion Validity	C	D	KG	FA	Score
	The Ruminative Thought Style Questionnaire (Brinker & Dozois, 2009) 20 items *"I find myself reliving events again and again."*	Assesses positive, negative and neutral elements of global rumination	n_1=309	Cα=.87 Cα=.89 T-TR = .80 (3 weeks)	EP; TD	✓	✓	✓		✓	
	Score			**2**	**1**	**1**	**1**	**1**		**1**	**7**
	The Rumination-Reflection Questionnaire (Trapnell & Campbell, 1999) 24 items *"I tend to ruminate or dwell over things that happen to me for a really long time afterward."* *"I love to meditate on the nature and meaning of things."*	Assesses ruminative and reflective forms of private self-consciousness	n_1=1137	Rumination Cα=.90 Reflection Cα=.91 T-TR = .80 (3 weeks)	LR;TD	✓	✓	✓		✓	
	Score			**2**	**1**	**1**	**1**	**1**		**1**	**6**
Goal	**Scott McIntosh Rumination Inventory** (SMRI; Scott & McIntosh, 1999) 9 items	Rumination as a function of goal progress Emotionality. Distraction. Motivation.	n_1=73 students n_2=140 students	Cα=.60 Cα=.57	TD	✓	✓		✓	✓	
	Score			**1**	**1**		**1**	**1**		**1**	**5**

	Scale (Sub-scale)		Validation sample	Reliability	Content Validity	Criterion Validity	C	D	KG	FA	Score
Metacognition	**Negative Beliefs about Rumination Scale** (NBRS; Papageorgiou et al., 2003) 13 items *"I cannot stop myself from ruminating."* *"When I ruminate, I can't do anything else."*	Negative metacognitive beliefs regarding uncontrollability and harmfulness associated with rumination practice, including interpersonal and social consequences.		Cα=.80 Cα=.83			✓	✓	✓	✓	
	Score			**1**			**1**	**1**	**1**	**1**	**5**
	Positive Beliefs about Rumination Scale (PBRS; Papageorgiou & Wells, 2001) 9 items *"I need to ruminate about the bad things that have happened in the past to make sense of them."* *"Ruminating about the past helps me to work out how things could have been done better."*	Positive metacognitive beliefs about rumination as a helpful coping strategy		Cα=.89 T-TR = .85 (6 weeks)			✓	✓	✓	✓	
	Score			**1**			**1**	**1**	**1**	**1**	**5**
	The Why Ruminate Scale (Watkins & Baracaia, 2001) 30 items "*I ruminate to try and find the answer to my problems."* "*I ruminate because understanding the past and present is essential to improve things."*	Assesses perceived benefits across of rumination (gain insight, solve problems and reduce discomfort around past negative events)	n_1=55 self-select n_2=81 (Barn)	Cα=93	CE; ES	✓					
	Score			**1**	**1**	**1**					**3**

Note: CD: Clinically derived; EP: Expert panel; ES: Existing scale; LR: Literature review; TD: Theoretically derived; C: Convergent validity; D: Divergent validity; KG: Known-group comparisons; FA: Factor analysis

Nine scales (47.3%) met the reliability criteria, that is, having both adequate internal consistency and temporal stability: Analytic Rumination Scale (Barbic et al., 2014); Cognitive Emotion Regulation Scale (Garnefski et al., 2011); Emotion Control Questionnaire (Roger & Najarian, 1989); Ruminative Responses sub-scale of Response Styles Theory (Nolen-Hoeksema & Morrow, 1991); Rumination Inventory (Calhoun et al., 2000); Rumination on Sadness Scale (Conway et al., 2000); Ruminative Thoughts Style Questionnaire (Brinker & Dozois, 2009); Rumination-Reflection questionnaire (Trapnell & Campbell, 1999); Stress-Reactive Rumination Scale (Robinson & Alloy, 2003); and, Positive Beliefs about Rumination Scale (Papageorgiou & Wells, 2001).

No scales were awarded full scores for their validity but those with the greatest validity evidence included: Ruminative Responses sub-scale of Response Styles Theory (Nolen-Hoeksema & Morrow, 1991) and Cognitive Emotion Regulation Scale (Garnefski et al., 2011).

The overall scores ranged from 1 to 9. The two scales with the highest scores included: Ruminative Responses sub-scale of Response Styles Theory (Nolen-Hoeksema & Morrow, 1991) and Cognitive Emotion Regulation Scale (Garnefski et al., 2011).

Discussion

This review confirmed the existence of a wide selection of scales addressing different aspects of rumination, consistent with several theoretical models of rumination, including goal progression (Martin et al., 1993), depressive rumination (Nolen-Hoeksema, 1991), Stress-Reactive Rumination (Alloy et al., 2001) and Self-Regulatory Executive Function (Wells & Matthews, 1994). However, the review confirmed that very few rumination scales have been applied in the context of illness and that most rumination scales are limited in application due to either the narrowness of their focus or inadequate psychometrics.

Considered the gold standard of ruminative measures, the Ruminative Responses Scale (Nolen-Hoeksema & Morrow, 1991) is the most commonly used scale across all the ruminative

research. Although specifically devised to assess rumination in response to depressed mood, this scale has been extensively applied across a wide range of empirical studies (Ciesla & Roberts, 2007; Nolen-Hoeksema, 2000), with its use supported by robust psychometrics (Luminet, 2004). Such studies extend to the context of illness with demonstrations of increased levels of depressive and anxious symptoms in the presence of diabetes (Soo et al., 2007), poor quality of sleep (Guastella & Moulds, 2007) and delays in seeking diagnosis for breast cancer symptoms (Lyubomirsky et al., 2003a). Other emotion-focused scales such as the Anxious Rumination Questionnaire (Rector et al., 2008) and the Rumination on Sadness Scale (Conway et al., 2000) also demonstrate adequate psychometrics and assess the intensity of negative thoughts, controllability and attempts at understanding the cause of distress (Conway et al., 2000; Smith & Alloy, 2009). However, both scales have a much narrower focus with all items instructing the respondent to think about sadness or anxiety specifically, restricting their potential use as a broader assessment of rumination (Smith & Alloy, 2009). Consequently, these studies have not been used in the context of illness. A more recent scale, the Analytical Rumination Scale (Barbic et al., 2014), examines persistent, cognitive analysis in the context of depression to address life challenges. However, more general items that address understanding the cause, nature of the issue, advantages and disadvantages of potential solutions increase the potential for its wider application (Barbic et al., 2014). Early psychometric evidence for the Analytical Rumination Scale shows good reliability and validity (Barbic et al., 2014), therefore this scale could be promising in the context of illness with further establishment of its psychometric properties.

Scales such as the Cognitive Emotional Regulation Scale (Garnefski et al., 2001) and the Emotion Control Questionnaire (Roger & Najarian, 1989) that incorporate sub-scales to assess rumination as an emotional control strategy face similar limitations. Widely used in rumination studies, including several illness studies as a measure of cognitive coping (Garnefski et al., 2009; Schroevers, Kraiij, & Garnefski, 2008), the Cognitive Emotional Regulation Scale has

demonstrated reliability and validity. However, the rumination sub-scale consists of only four items, focusing on repetitive thinking about wanting to understand what has happened and, therefore, the ruminative focus is restricted. In contrast, the Rehearsal sub-scale of the Emotion Control Questionnaire (Roger & Narajan, 1989) consists of fourteen items, addressing rumination as a maladaptive process in response to emotion. With good psychometrics and broader coverage, it has the potential to assess a broader conceptualisation of rumination (Smith & Alloy, 2009), as evidenced by its use in health studies (Roger & Najarian, 1998), although it overlooks positive aspects of rumination.

The Rumination-Reflection Questionnaire (Trapnell & Campbell, 2004) is the second most commonly-used of the rumination scales, focusing on both ruminative and reflective processing and thus addressing both positive and negative aspects of rumination, aligning with the differential outcomes that have been reported in response to rumination in illness (Calhoun & Tedeschi, 1999; Cordova et al., 2007; Nightingale et al., 2010; Sears et al., 2003; Soo et al., 2007; Stockton et al., 2011; Tedeschi & Calhoun, 1996). The Rumination-Reflection Questionnaire has robust psychometric properties in comparison to similar scales such as the Rumination Inventory (Calhoun et al., 2000) and the Rumination Scale (Martin et al., 1993), which have been used less extensively and are therefore limited in respect of reported psychometrics. These dual focus scales offer a significant advantage over scales such as the Rumination on Sadness Scale (Conway et al., 2000) and the Stress-Reactive Rumination Scale (Robinson & Alloy, 2003), both of which are focused solely on the negative aspects of rumination as a form of preservative thinking and therefore do not have the potential to capture the ruminative elements that may lead to post-traumatic growth subsequent to an illness diagnosis.

As the diagnosis of an illness can be considered a significant stressful event, the benefit of a scale such as the Stress-Reactive Rumination Scale (Robinson & Alloy, 2003), which assesses rumination in response to a stressful event, is that ruminative practice can be

determined before the onset of depressive and anxious symptoms (Robinson & Alloy, 2003). The original form of the scale consisted of three sub-scales: negative inferences, hopelessness and active problem-solving. However, only the negative inference sub-scale has adequate psychometric properties (Robinson & Alloy, 2003), which has limited the use of the scale. The hopelessness sub-scale, in particular, contained several potentially relevant items for the illness context such as "*Think about how hopeless your situation is*" (Soo et al., 2007). Equally, the Metacognitive Rumination Scale (Fritz, 1999) was an attempt to provide a scale specifically targeted towards an illness event but, unfortunately, psychometric properties have not been published for the scale and it has not been used beyond its initial study in the context of coronary heart disease. While rumination in illness can be considered more of a state response, it might also be valuable to consider individual vulnerability to rumination using a trait measure of rumination such as the Global Rumination Scale (McIntosh & Martin, 1992) but its use has also been limited.

Goal progress is an important consideration in illness because personal goals may often need to be abandoned or revised and reconstructed as a consequence of the illness experience. The Scott-McIntosh Rumination Scale (Scott & McIntosh, 1999), with its focus on rumination on a failure to progress goals, while not specifically directed towards the illness context, has the potential to add value in that the scale accounts for emotionality, motivation and distraction. However, this scale has been limited in its use by poor internal consistency (Scott & McIntosh, 1999).

Metacognition, here thinking about rumination and its purpose (Wells, 2000), may be an important determinant of the outcomes of rumination dependent on individual beliefs, and yet it is often omitted from rumination scales (e.g., the Ruminative Responses Scale, the Rumination-Reflection Questionnaire, the Stress-Reactive Rumination Scale). Positive beliefs in terms of advantages that an individual may hold about rumination may lead to the adoption of rumination as a perceived coping strategy in illness, whereas negative beliefs leave an individual vulnerable

to psychological distress once rumination starts (Luminet, 2004). These metacognitive elements are addressed in the Positive Beliefs about Rumination Scale (Papageorgiou & Wells, 2001), the Negative Beliefs about Rumination Scale (Papageorgiou et al., 2003) and the Why Ruminate Scale (Watkins & Baracaia, 2001). The Why Ruminate Scale (Watkins & Barcaia, 2001) examines the perceived benefits of rumination, such as gaining insight, problem-solving and resolving discomfort about past negative events. While all scales have demonstrated reliability and validity, the Why Ruminate Scale has been used less frequently and none of the scales have been used in the context of illness to date.

Studies that have specifically examined the convergence and divergence of rumination measures have found that although the scales tend to overlap on elements such as emotional valence of and motivation for repetitive thought (Segerstrom, Stanton, Alden, & Shortridge, 2003), individual rumination scores varied across scales and between sub-scales, confirming that the scales measure diverse constructs (Segerstrom et al., 2000; Siegle et al., 2004). Where scales have subscales for sub-components of rumination, differentiation is also observed in the subscales, for example, in the Ruminative Responses Scale (short version) and the Reflection-Rumination Scale, which both demonstrate a dichotomisation of rumination as brooding/ruminative and reflective (Trapnell & Campbell, 1999; Treynor et al., 2003). However, when the scales are considered collectively, a high degree of internal consistency between measures suggests a reliable index of rumination (Segerstrom et al., 2000; Siegle et al., 2004). Unfortunately, these comparison studies are somewhat limited due in that they focus on differentiation as opposed to overlap, with the exception of Segerstrom et al. (2003), which provides only a partial answer as to the distinctness of rumination scales. For this reason, in conjunction with the narrow focus of the individual scales, any investigation of rumination needs to not only be precise about the aspect of rumination of interest but should also consider the use of multiple scales if a broader view of rumination is required (Siegle et al., 2004).

A potential concern for any rumination scale, but an issue that is particularly evident in

the emotion-focused scales, is the possibility of contamination through the presence of symptom based items. To illustrate, the Ruminative Response Scale (Nolen-Hoeksema & Morrow, 1991) overlaps ruminative item content with depressive symptoms "*Think about how sad you feel"* and with physical symptoms commonly experienced in illness, "*Think about your feelings of fatigue and achiness*". The former item is also comparable to those commonly found in depression inventories, such as the Beck Depression Inventory (BDI) item, "*I feel sad*" (Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961). For depression following rumination, consideration must be given as to whether any documented relationship between depression and rumination simply reflects the presence of such items (Arnow, Spangler, Klein, & Burns, 2004; Bagby & Parker, 2001; Conway et al., 2000; Kasch, Klein, & Lara, 2001; Roberts, Gilboa, & Gotlib, 1998). Accordingly, depressive content has been removed from the original Ruminative Response Scale (Nolen-Hoeksema & Morrow, 1991), forming two sub-scales: reflection ("*a purposeful turning inward to engage in cognitive problem solving to alleviate depressive symptoms*"), associated with adaptive outcomes, and brooding ("*a passive comparison of the current situation with some unachieved standard*"), the most consistent predictor of depression (Treynor et al., 2003, p. 256). Highly correlated with the full version of the scale, the shorter version retains a high level of internal reliability, yet it is constrained by the small number of items so that further demonstration of reliability and validity is required (Treynor et al., 2003).

Overall, taking into consideration the narrow focus of existing rumination measures, the absence of a measure that specifically accounts for rumination in the context of illness, and the concerns outlined regarding the operationalisation of rumination and symptom contamination, there is a need to develop a new measure specifically focusing on rumination within the context of illness. Although the administration of multiple scales covering different dimensions of rumination has been suggested to capture the full ruminative experience (Siegle et al., 2004), such an approach raises practical issues in terms of imposing a considerable burden on potential

respondents, particularly those who are physically unwell (Stone, Shiffman, Atienza, & Nebeling, 2007).

Underlying the development of any new scale should be a clear working definition of rumination and, for the context of illness, this requires broadening the narrow focus currently existent in available rumination measures. The value of the existent measures is that they provide useful guidance in respect of what may and may not be important for inclusion. While much of the focus in the research has been on rumination as a maladaptive process (Cordova et al., 2007; Nolen-Hoeksema, 1991; Soo et al., 2007), rumination has also been linked to post-traumatic growth in the context of illness (Calhoun & Tedeschi, 1999; Nightingale et al., 2010; Stockton et al., 2011). Therefore, any new scale developed for use in this context must specifically be able to account for both positive and negative orientations of rumination. In acknowledging this, any such new measure in this context should be multidimensional in nature, and account for both multiple general dimensions related to rumination, as well as illness-specific issues (Joorman et al., 2006). Such a multidimensional approach to measuring rumination in illness will need to involve assessment of rumination in terms of the repetitiveness and intrusiveness of the process, the valence (i.e., positive and negative) of content and the level of construal (Segerstrom et al., 2003; Treynor et al., 2003; Watkins, 2008; Watkins et al., 2008), as well as the occurrence, duration, compulsion and difficulty of control of ruminative processes (Horowitz, 1975). In addition, the role of meta-cognitions in rumination (Michael et al., 2007) and central themes underlying individual perception of illness would need to be incorporated (Foa & Kozak, 1986; Teasdale, 1999).

Assessment of rumination is a complex matter, reflected by the availability of a multitude of scales, each presenting a narrow representation of rumination based on one of multiple theoretical models. While there is a lack of consensus in the literature regarding the role and outcomes of rumination, what is evident is that to adequately assess the key elements of rumination, the administration of multiple scales is required (Siegle et al., 2004). When the

focus is on exploring the role and impact of rumination in the context of illness, this raises practical issues in terms of the potential burden placed on the individual. The development of a new scale, specifically designed for use in the setting of illness, is needed to allow the incorporation of all relevant elements of the ruminative process, the inclusion of illness-specific concerns and the ability to address issues inherent in current scales, requiring a clear distinction from related concepts and avoidance of symptom-based contamination.

Chapter 4: Item Construction for the Multidimensional Rumination in Illness Scale

Chapter Overview

A literature review (Chapter 2) has shown rumination to be a complex construct, with a lack of consensus about the nature and role of rumination. Subsequently, a systematic review of measures of rumination (Chapter 3) has highlighted the presence of a multiplicity of scales. Overall, these represent a broad assessment of rumination, however, each individual scale focuses on a narrow representation of rumination. The systematic review also revealed the absence of a scale explicitly for use in the illness setting. Accordingly, this chapter outlines the first step in the development of the Multidimensional Rumination in Illness Scale (MRIS), in respect of the generation of a set of 60 pilot items with the goal of reflecting a comprehensive assessment of rumination, inclusive of illness-specific concerns.

The Development of a Rumination Scale

Rumination, a form of perseverative thinking and, as such, a cognitive processing *style,* has been attracting a lot of attention in respect of its potential role as a transdiagnostic process, active in the onset and maintenance of multiple psychological disorders (Aldao et al., 2010; Ehring & Watkins, 2008; Harvey et al., 2004). In particular, extensive research has shown rumination to be associated with the development of both depression and anxiety in physically-well populations (Manne et al., 2000; Michl et al., 2013; Muris et al., 2005; Nolen-Hoeksema, 2000; Roelofs et al., 2008). Although research has been limited, similar patterns have been demonstrated in the context of illness (Chan et al., 2011; Soo et al., 2007). However, rumination has also been linked to the development of constructive outcomes, specifically post-traumatic growth, following the diagnosis of illness (Chan et al., 2011; Lelorain et al., 2012). Of interest are the pathways by which rumination might exert this dual, and seemingly oppositional, influence, particularly in respect of extending understanding of how subcomponents of

rumination are differentially related to both positive and negative psychological outcomes. In the illness setting, expanding knowledge of the mechanisms involved in the onset and maintenance of depression and anxiety may present the opportunity for both earlier detection of individuals at risk and the enhancement of current interventional practices. Additionally, increasing such understanding may assist in the facilitation of post-traumatic growth.

Accordingly, any ruminative scale needs to be able to capture the elements of rumination that underlie both the constructive and unconstructive outcomes outlined. However, the complexity of the construct of rumination presents a real challenge to researchers. A review of the literature in Chapter 2 showed that rumination, as a construct, is represented by multiple conceptualisations whereby, at one extreme, rumination is considered as an adaptive, positive, coping mechanism initiated and maintained as a self-regulatory process in the context of failure to progress goals (Martin & Tesser, 1989, 1996), while, at the other, rumination is considered an intrusive, maladaptive process of abstract thinking in response to a mood or situation (Conway et al., 2000; Nolen-Hoeksema, 1991; Robinson & Alloy, 2003). Although agreement exists amongst researchers that the ruminative process involves self-focused, passive, repetitive and deliberative thinking (Nolen-Hoeksema, 1991), ultimately, there is no agreement as to the exact function and outcomes of rumination.

The systematic review of rumination measures in Chapter 3 revealed the assessment of rumination to be a complicated matter, with a plethora of scales. Each individual scale reviewed addresses a specific content area of rumination based on one of multiple theoretical models (Siegle et al., 2004; Smith & Alloy, 2009). A comprehensive assessment of rumination therefore requires the administration of multiple scales and, where this assessment takes place in the illness setting, this raises practical issues in terms of the burden placed on the individual (Siegle et al., 2004; Stone et al., 2007). The systematic review also revealed the omission of scales that address rumination in the illness context, noting the Multidimensional Rumination Questionnaire (MRQ; Fritz, 1999) which was developed to assess three potential subtypes of

rumination in response to the experience of a health event. However, the MRQ was never used beyond an initial study and has not had psychometrics published.

Accordingly, the development of a multidimensional scale was proposed to address the core elements of rumination, both positive and negative orientations, while being sensitive to the specific context of illness. This chapter outlines the first stage of the development of the Multidimensional Rumination in Illness Scale (MRIS; Soo et al., 2014) regarding the construction of the pilot items. Given the considerable literature on rumination, a deductive approach was adopted, guided both by the theoretical models of rumination outlined in the literature review of rumination in Chapter 2 and existent measures, systematically reviewed in Chapter 3.

Development of the Conceptual Definition of Rumination

As a latent, abstract construct, rumination is not open to observation and, consequently, item generation is a critical step in the development of a scale if adequate assessment of the construct of interest is to be achieved (DeVellis, 2003). Although the development of a scale is an iterative process, ensuring a well-defined connection to existent theory at item development stage will reduce the likelihood of later issues in respect of content validity (Hinkin, 1995). Consequently, pilot items for the MRIS were grounded in current ruminative theory and their development was guided by existing ruminative measures.

Although multiple conceptualisations of rumination exist, key commonalities of rumination can be seen in a sense of self-focus, of passive, repetitive and deliberative thinking (Nolen-Hoeksema, 1991). Although rumination models incorporate these elements, Response Styles Theory (Nolen-Hoeksema, 1991) specifically focuses on rumination in response to mood, while both cognitive processing and control models concentrate on discrepancy reduction (Watkins, 2008). All three models account for the structural components of valence and content, however, Watkins' (2008) control process model extends on both models by consideration of

level of construal in rumination. In this way, accounting for the commonalities of rumination, while incorporating structural and processing elements, is important in developing a rumination scale that will capture aspects of rumination important in both constructive and unconstructive outcomes.

Valence of thought/content

Although rumination is considered a cognitive *process*, valence, accounting for thought content and the cognitive-affective systems of the individual, is still influential, as evidenced by existent rumination scales that focus on an emotional state, such as the Ruminative Responses scale ("*Analyse recent events to try to understand why you are depressed";* Nolen-Hoeksema & Morrow, 1991), the Rumination on Sadness Scale ("*I have difficulty getting myself to stop thinking about how sad I* am"; RSS; Conway et al., 2000), scales that conceptualise rumination as a cognitive element of an emotional regulation process, including the ruminative sub-scale of the Cognitive Emotional Regulation Questionnaire ("*I often think about how I feel about what I have* experienced"; CERQ, Garnefski et al., 2001) and an event-based negative inference in the Stress-Reactive Rumination Scale ("things like this always happen to me"; SRRS; Robinson & Alloy, 2003).

The Response Styles approach (Nolen-Hoeksema, 1991), as the gold standard of rumination measures, conceptualises rumination as a response to depressed mood, a stable trait exemplified by repetitive and passive thinking about symptoms of depression, the possible causes ("*What am I doing to deserve this?*") and consequences of those symptoms ("*I won't be able to concentrate if I keep feeling this* way"; Lyubomirsky & Nolen-Hoeksema, 1995; Nolen-Hoeksema, 1991, 2004). However, while application to depression may constitute much of the associated research, the prevalence of rumination more generally in individuals who experience negative life events has been adequately demonstrated (Nolen-Hoeksema, McBride, & Larson, 1997; Nolen-Hoeksema & Morrow, 1991).

In illness, valence is an important influence, with more negative content associated with unconstructive outcomes including implications for poorer mental health and increased physical symptoms (Mor & Winquist, 2002; Segerstrom et al., 2003), whereas positive content has been linked to constructive outcomes such as post-traumatic growth (DeVellis & Blalock, 1992; Linley & Joseph, 2004; Phelps et al., 2008). In the context of illness, content-based items for the MRIS therefore need to address the core themes that underlie individual perception of illness, including efforts to understand the nature of illness (""*I think about the seriousness of my illness"*), attempts at causal analysis (*"I think about whether I could have avoided my illness if I had taken better care of myself"*), the consequences of a diagnosis (*"I think about how my illness might make me a burden on others"*), illness-related emotions ("*Thinking makes me feel resentful and angry about my illness*") and self-evaluation ("*I think about how passive and unmotivated I feel"*).

Individuals may also ruminate on the way they think about their illness. Like the concept of meta-cognition, MRIS pilot items also included content-based items of rumination about the consequences of personal experience in thinking about illness, echoing the themes of harm, "*I worry that thinking about my illness might be harmful",* and social stigma*, "I think that people would think negatively about me if they realised how much I think about my illness*" that are assessed in the Negative Beliefs about Rumination Scale (Parageorgiou et al., 2003).

Repetitiveness

The repetitive nature of rumination is considered important for the 'working through' of a perceived discrepancy between real and ideal self (Horowitz, 1986). In the cognitive processing model, Janoff-Bulman (1992) talks of the 'shattered worldview', forming a discrepancy between the meaning of a negative event and pre-existing cognitive structures. Similarly, control theory conceptualises rumination as a self-regulatory process, where current state is compared against reference values (individual goals or standards; Watkins, 2008).

Scales such as the Global Rumination Scale (GRS; McIntosh & Martin, 1992) and the Rumination-Reflection Questionnaire (RRQ; Trapnell & Campbell, 1999) assess key elements of the nature of the repetitive processes underlying rumination, including frequency ("*Often I'm playing back over in my mind how I acted in a past situation*") and controllability ("*Sometimes it is hard for me to shut off thoughts about myself*"). For both models, as a discrepancy is considered to initiate rumination (Carver & Scheier, 1990; Martin & Tesser, 1989, 1996), pilot items need to address the idea of attempts to process any discrepancy, for example, "*No matter how much I think about my illness, I can't think of anything to do that may help my situation*". As a process, rumination facilitates the working through of the discrepancy in the form of repeated intrusions and re-experiencing of the distressing event, with the MRIS pilot items capturing the frequency ("*I often feel the need to be by myself to think about my illness*") and the repetitive nature of cognition, "*Once started, I can spend considerable time thinking about my illness*." Rumination will be maintained until either the goal is met or the individual disengages from the goal (Martin & Tesser, 1986, 1989).

Level of construal

Teasdale (1999) suggests the outcomes from rumination may be determined by a style of processing, with the third element of the control process model focusing on the way in which people attend to content, the level of construal or abstractedness (Watkins, 2008). With regard to disparity, higher levels of construal relate to more conceptual, abstract, evaluative thinking about higher order goals such as the idealised self (e.g., as healthy), whereas lower levels of construal relate to the more concrete goals, grounded in experience, that represent the specific actions and behaviours necessary to implement the higher order goals (e.g., remaining in remission from cancer; Watkins, 2004, 2008). Abstract goals, which are more meaningful to the individual, and associated concrete goals generate higher levels of rumination when not attained (McIntosh et al., 1995; McIntosh & Martin, 1992). Abstract thinking will also be less effective

in

terms of problem-solving because problems will be less elaborated, therefore reducing the facilitation of the generation of alternative solutions and guiding action than more concrete thinking (Watkins, 2008). Teasdale (1999) noted the importance of "why" and "what if" questions, common in the context of illness, because they represent a form of cognitive avoidance that can prevent emotional processing. Accordingly, the pilot items for the scale incorporated more abstract questions, as suggested by Teasdale (1999), including "*I think about why this illness had to happen to me*" and "*I think about what life might have been like if I had not become ill*" but also more concrete examples, such as "*Thinking about my illness helps me work out how to cope"*.

The sub-types of rumination

Beyond the models, various sub-types of rumination are discussed in the literature. Intrusive rumination is considered to represent an automatic process that involves the repetitive thinking outlined in the rumination models, however, this is also accompanied by a sense of invasiveness and perceived lack of controllability (Park, Chiemelski, & Blank, 2010). It incorporates the structural element of rumination, being associated with negative emotions and memories that facilitate access to negative content (Nolen-Hoeksema, Parker, & Larson, 1994; Vickberg, Bovbjerg, DuHamel, Currie, & Redd, 2000). The Impact of Event Scale (Horowitz et al., 1979) assesses subjective distress caused by traumatic events, with an intrusion sub-scale that addresses some core characteristics of intrusive rumination. Accordingly, items were adapted from the intrusion sub-scale ("*I thought about it when I didn't mean to*", "*I had dreams about it*"; IES; Horowitz et al., 1979), remembering that the IES relates to a broader experience of trauma. Pilot items were created to evaluate frequency of rumination on illness ("*Once started, I can spend considerable time thinking about my illness"*), intrusiveness ("*I find myself unexpectedly thinking about my* illness", *"I dream about my illness"*) and the controllability

("*Once I start thinking about my illness, I find it hard to think of other things"*) of ruminative processes.

In contrast, as a more abstract, passive contemplation of the negative aspects of an illness, with an associated failure in progression towards the revision of goals, brooding rumination has been described as representing a failure to disengage from the shattered worldview (Stockton et al., 2011; Treynor et al., 2003). As outlined in the cognitive processing and control processing models, a negative, repetitive fixation on barriers to problem resolution will mean difficulties in achieving any resolution of the perceived discrepancy in current and ideal state (Carver & Scheier, 1981; Hong, 2007; Joorman et al., 2006). Pilot items for the MRIS were created to assess the element of failed goal process, "*I think about the goals I had that I may no longer be able to reach*", the impact of barriers, "*I think that trying new things may be pointless",* and the emotional component of lack of goal progression from the Scott-McIntosh Rumination Inventory (SMRI; Scott & McIntosh, 1999), *"I think about whether I can be happy again"*. The negative lens of brooding rumination was reflected in items that capture a sense of hopelessness, "*My thoughts about my illness seem to bring up negative emotions", "I think about how hopeless my future looks"* and lack of motivation, "*I think about how passive and unmotivated I feel*".

Another sub-type, more abstract in nature, is the idea of rumination as a form of sense making, a "searching for meaning of negative experiences" (Siegle et al., 2004, p. 646). The purpose of rumination here is to examine the causality and implications of a given situation. In this way, searching for insight, making meaning, Watkins (2008) suggests that the outcome is likely to be more constructive. Pilot examples include "*I think about why this illness had to happen to me*" and "*I think about whether I might have done anything to cause my illness.*"

Instrumental rumination, thinking about the practical implications of an event (Fritz, 1999), has some overlap with reflective rumination, the latter defined by Treynor et al. (2003, p. 256) as "a purposeful turning inward to engage in cognitive problem solving to alleviate one's

depressive symptoms". However, while both represent engagement with problem-solving, instrumental rumination aligns with a more concrete processing approach. Trapnell and Campbell (1999) clearly differentiated reflection from rumination as "the playful exploring of novel, unique or alternative self-perceptions" (p. 290), hence the focus in this thesis on instrumental rumination.

In the cognitive processing model, such rumination occurs against a backdrop of the shattered worldview and signifies an attempt to reduce the discrepancy between ideal self, as healthy, and real self, as affected by illness (Janoff-Bulman, 2004; Kolokotroni, Anagnostopoulos, & Tskikkinis, 2014). In the control process model, rumination serves a self-regulatory process that addresses a discrepancy in goals (Martin et al., 2004). The Scott-McIntosh Scale (SMRS; Scott& McIntosh, 1999) assesses goal-related emotionality ("*I become angry when I think about goals that I have not yet reached*"), distraction ("*I rarely become lost in thought*") and motivation ("*When I think about unaccomplished goals from my past, I become inspired to work on reaching them*"), the latter important in terms of the process of "working through". MRIS pilot items were therefore developed to capture this idea of 'working through' for the individual, in terms of generating solutions by considering actions and goals in the light of reconstructing the worldview, for example, "*Thinking about my illness helps me work out what I need to do to regain a sense of normalcy"* but to also reflect the three dimensions ("*Sometimes I become lost in thought about my illness*"; "I think about how hopeless my future looks"; *Thinking about my illness motivates me towards looking after my health*)" inherent in the SMRS.

Motivational items can also represent individuals' rumination about their own experience of thinking about their illness and how it may play a potential role in moving forward, particularly in respect of generating solutions. Accordingly, there was a strong linkage of MRIS pilot items to positive beliefs that may be held about the ruminative process that initiate and maintain rumination (Michael et al., 2007; Papageorgiou & Wells, 2001), with some

overlap with items of the Positive Beliefs about Rumination Scale (PBRS; Papageorgiou & Wells, 2001) in sampling content that addressed positive beliefs about the ruminative process. For example, that thinking about illness is associated with developing coping strategies to meet the demands of the illness, "*Thinking about my illness will help me work out what I need to do to manage it",* mirrored the PBRS item "*I need to ruminate about my problems to find answers for my depression*". These items capture the idea that the thinking process experienced may be beneficial in terms of problem-solving and increasing insight (Lyubomirsky & Nolen-Hoeksema, 1993). As such, instrumental or reflective rumination may be expected to have less maladaptive outcomes. However, positive beliefs, such as "*Thinking about my illness helps me work out how to manage it*", can then make it difficult for individuals to abandon rumination (Wells, 1990).

The ruminative literature therefore supports the idea of rumination as a multidimensional construct with both constructive and unconstructive outcomes (Morris & Shakespeare-Finch, 2011). The MRIS was consequently constructed to ensure comprehensive coverage of rumination as a construct by developing items that would load on one of the four dimensions of instrumental, intrusion, brooding and sense-making rumination as outlined in Table 1.

In developing an item pool that fully captures the experience of rumination, it is important to clearly differentiate from other related constructs (DeVellis, 2003). Accordingly, consideration was given to the construct of worry in creating the pilot test items. As another form of perserverative thinking, there is some overlap with rumination, with both linked to negative affectivity (Roelofs et al., 2008). However, important distinctions can be made temporally, with worry largely forward-focused where rumination tends to be past-orientated (Beck, 1967, 1976), and in terms of function, whereby worry serves to distract from painful material and rumination involves elaboration (Hoyer et al., 2009). Both temporal focus and elaboration over distraction were considered in generating the items for the MRIS. Negative automatic thoughts have also been differentiated from rumination in terms of duration, in that

negative automatic thoughts are brief in comparison to ruminative thoughts that are repetitive and recyclic (Papageorgiou & Wells, 2001). Finally, consideration needed to be given to any potential overlap with measures of post-traumatic growth, specifically the Post-Traumatic Growth Inventory (Tedeschi & Calhoun, 1996), given the positive orientation of some of the pilot items for the MRIS and the potential for criteria contamination. While there was potential overlap on a single item, "*Thinking about my illness helps me focus on what is important to me*" in terms of the PTGI factor of appreciation of life and item "*I changed my priorities about what is important to me*", temporally there is a difference in that the MRIS item reflects an ongoing process, the PTGI item a completed action.

Item Format and Number

Following general guidelines, items were written to be as simple and precise as possible, to address a single issue to reduce the potential for ambiguity (DeVellis, 2003; Harrison & McLaughlin, 1993). The item pool was purposefully over-inclusive and redundant in content based on the premise that approximately only 50% of pilot items will normally be retained in the final scale, as factor analyses will identify weak, unrelated items that can be discarded (Clark & Wilson, 1995). With at least ten items per dimension, this satisfied the minimum number of four to six items suggested as necessary to adequately assess a conceptual dimension in the final scale (Clark & Watson, 1995). The response format adopted for the MRIS was a Likert-type scale, which Comrey (1988) indicated as likely to increase the reliability and stability of a scale. Accordingly, each MRIS pilot item was expressed as a declarative sentence, followed by five-point response option based on frequency ('0' = 'Not at all' to 4 = 'Almost always'). All items were reviewed and critiqued by the authors of the scale before inclusion in research leading to the development of the scale.

Table 1
Description of Rumination in Illness Content Domains

Domain	Rationale
Instrumental *Purposeful turning inwards to engage in cognitive problem-solving, working through to minimise discrepancy between ideal self as healthy and real self with illness.*	Thinking about my illness helps me work out how to cope. Thinking about my illness helps me focus on what is still good in my life. Thinking about my illness is helpful in terms of protecting my health. Thinking helps me work out what I need to do to regain a sense of 'normalcy'. Thinking about my illness helps me work out what I need to do to manage it. Thinking about my illness helps me focus on what is important to me. Thinking about my illness helps me understand its cause. Thinking about my illness motivates me towards looking after my health. I find thinking about what is still good is helpful. Thinking helps me understand my illness.
Brooding *Passive comparison of some unachieved standard.*	I think about the things my illness might stop me doing. I think that no matter what I do now, my life will never get better. I think about whether I can be happy again. I think about what others might think of me. No matter how much I think about my illness, I can't think of anything to do that may help my situation. I think about the goals I had that I may no longer be able to reach. I think about the limitations imposed by my illness. I think about the things I can no longer do.

Domain	Rationale
	My thoughts about my illness seem to bring up negative emotions.
	I think about how my illness may make me a burden on others.
	I think about how I don't feel up to doing anything.
	I think about how hopeless my future looks.
	I think that there is no point trying to do anything about my illness.
Brooding	I think about why I cannot get going with anything.
Passive comparison of some unachieved standard.	I think about whether this illness will stop me doing anything worthwhile.
	I think about how passive and unmotivated I feel.
	I think about how little I can do to improve my situation.
	I think about what life might have been like if I had not become ill.
	I think about the possibility things will never get better.
	Thinking makes me feel resentful and angry about my illness.
	I think that trying new things might be pointless.
Intrusion	Once I start thinking about my illness, I find it hard to think of other things.
Automatic process that involves unexpectedly thinking about an event.	Once started, I can spend considerable time thinking about my illness.
	I dream about my illness.
	I find it impossible not to think about my illness.
	Once I start thinking about my illness, it is difficult to stop.
	I worry that thinking about my illness could be harmful.
	I believe that people would think negatively about me if they realised how much I think about my illness.
	Once I'm thinking about my illness, I can't seem to do anything else.
	I can't seem to control my thinking about my illness.
	I find myself thinking about my illness when I didn't mean to.

Domain	Rationale
	I have trouble sleeping because of thinking about my illness.
	It often takes a real effort to stop myself thinking about my illness.
	I find myself unexpectedly thinking about my illness.
	I exhaust myself thinking about the reasons for my illness.
	Sometimes I become lost in thought about my illness.
	I often feel the need to be by myself to think about my illness.
Sense-making *Efforts to understand the cases and consequences*	I think about why this illness had to happen to me.
	I think about how terrible my illness is.
	I feel that I have to think about my illness to understand it better.
	I think about whether I might have done anything to cause my illness.
	I think about my symptoms and the distress they cause me.
	I think about whether I could have avoided my illness if I'd taken better care of myself.
	I think of how sad my illness makes me feel.
	I think about why I have this problem and other people do not.
	I think about the seriousness of my illness.
	I think about where things went wrong.
	I repeatedly go over possible causes of my illness.
	I think about the impact the illness with have on my life.
	I think about how my life was happier before the illness.

This chapter outlines the initial step of development of a new rumination scale to address this cognitive process in an illness setting. An extensive set of pilot items were developed to assess the ruminative process across four domains: instrumental rumination; brooding rumination; intrusive rumination; and, sense-making rumination. Over-inclusivity and redundancy of items was intended to ensure all relevant content was addressed. As only the first step in scale development, subsequent steps of the development process involving psychometric

analyses were planned to hone understanding of the nature and structure of the ruminative construct as well as identify deficiencies in the initial item pool.

Chapter 5: Asssessing rumination in response to illness:
The development and validation of the Multidimensional Rumination in Illness Scale

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Assessing rumination in response to illness: the development and validation of the Multidimensional Rumination in Illness Scale (MRIS)

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Abstract The cognitive style of rumination extends existing cognitive models of emotional response to illness. In the absence of a specific measure, we developed the Multidimensional Rumination in Illness Scale (MRIS). In Study 1, an initial 60-item pool was tested, followed by confirmation of the factor structure in Study 2. In Study 1 participants ($n = 185$) completed the pilot version of the MRIS, then in Study 2 ($n = 163$) a reduced 41-item model was tested. Study 1: Exploratory factor analysis of a reduced 32-item scale indicated an initial four-factor solution for the MRIS (Intrusion, Brooding, Instrumental, Preventability), with satisfactory internal consistency and stable factor structure across gender. Study 2: Following scale revision, confirmatory factor analysis substantiated the adequacy of a three-factor MRIS structure, and good internal consistency, test-rest reliability, and concurrent and discriminant validity was demonstrated for the MRIS. The MRIS exhibited good psychometric properties in the current sample, providing a comprehensive assessment of the cognitive style of rumination in the context of physical illness.

Keywords Rumination · Scale · Illness · Reliability · Validity

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Introduction

Physical illness not only impacts an individual's physical functioning, but also psychological and social functioning (Talbot and Nouwen, 2000). Elevated levels of depression and anxiety are common sequelae of physical illness (Ciechanowski et al., 2000; Street, 2003). Much of the research concerning factors underlying these psychological outcomes has focused on the role of cognitive *content*, specifically maladaptive cognitive patterns around themes of personal threat, vulnerability and hopelessness (Alloy et al., 2000; Beck, 1967, 1976). However, more recently, attention has moved towards the cognitive *style* of rumination, a repetitive *style* of thinking, and its role in the aetiology and maintenance of depression and anxiety (Lyubomirsky and Nolen-Hoeksema, 1993, 1995; Nolen-Hoeksema, 1991a). While research largely focuses on physically healthy populations, evidence suggests rumination may be important in adjustment to physical illness (Cordova et al., 1995; Sears et al., 2003).

Rumination can be a means of coming to terms with physical illness (Brosschot et al., 2006; Tedeschi and Calhoun, 2004), by thinking about the diagnosis itself, the thoughts and feelings it evokes, and its implications (Bower et al., 1998; Greenberg, 1995). However, the specific role of rumination in adjustment to illness is unclear. Some evidence links rumination to the onset and maintenance of psychological distress (Nolen-Hoeksema and Morrow, 1991; Nolen-Hoeksema et al., 1994), while other evidence suggests a link to perceived positive growth (Calhoun et al., 2000). This differential effect of rumination may be explained by the Martin and Tesser (1989) framework, delineating 12 subclasses of rumination, each discriminated by the emotional valence of ruminative thoughts, temporal orientation and relation to a sense of discrepancy or goal.

Physical illness can force a re-evaluation of life goals, which may result in a disparity between ideal self as 'healthy' and 'real self', as affected by illness. The consequences of rumination as a 'sense-making' process may therefore lead to constructive or unconstructive outcomes, depending on whether the ruminative process facilitates or hinders the resolution of this ideal-real self-discrepancy Watkins (2008). Moreover, the distinction between reflective rumination (purposeful turning inwards with the intention of generating possible solutions to the discrepancy) and brooding rumination (focusing purely on the causes, symptoms and consequences of an illness) may further explain variable outcomes in response to the ruminative process (Treynor et al., 2003; Watkins and Teasdale, 2001).

Several measures of rumination exist, but each focuses on a specific subcomponent of rumination, such as depression and sadness (Siegle et al., 2004), neglecting to address the multidimensional aspects of rumination, particularly in the physical illness context (Luminet, 2004; Siegle et al., 2004). The rumination subscale of the Responses Style Questionnaire (RRRSQ; Nolen-Hoeksema, 1991a), focusing on rumination in response to depressed mood, has been most commonly used. However, the RRRSQ does not capture the degree to which individuals attempt to make sense of a negative event, such as physical illness (Fritz, 1999; Horowitz et al., 1979), and does not incorporate the role of positive (*'Thinking about my illness helps me understand its cause')* and negative (*'I exhaust myself thinking about my illness')* metacognitive beliefs about rumination likely to influence psychological outcomes (Michael et al., 2007).

Given these limitations, the aim of the two current studies was to develop a rumination scale for use specifically in the physical illness context. The Multidimensional Rumination in Illness Scale (MRIS) is a brief, but comprehensive, self-report measure designed to assess ruminative tendencies in adults, specifically in the context of physical illness. The scale accounts for diverse elements of rumination in illness, incorporating subclasses of rumination, particularly brooding and reflection. The goal of Study 1 was to select items to assess generic aspects of rumination, such as the occurrence, intrusion, and controllability of ruminative processes, and illness-specific concerns, including attempts to understand the cause and nature of illness. The MRIS accounts for positive and negative beliefs about rumination in illness, since positive beliefs about potential benefits, such as problem-solving, have been linked to the initiation and maintenance of the ruminative process, whereas negative beliefs in terms of intrusiveness and controllability provide a pathway to psychopathology (Michael et al., 2007; Papageorgiou and Wells, 2003). Study 2 established the psychometric properties of a revised MRIS, through confirmatory factor analysis and validity testing.

In developing the MRIS, limitations of existing scales were addressed. Criterion contamination was addressed by differentiating between rumination as a sign of depression or sadness, versus rumination as a cognitive style—a distinction that has been blurred in existing rumination measures (Bagby et al., 2004, Roberts et al., 1998; Treynor et al., 2003) [e.g., RRRSQ items such as 'Think about how sad you feel' mirror the Beck Depression Inventory (BDI; (Beck et al., 1961)) item, 'I feel sad' (Treynor et al., 2003)]. Similar consideration was given to the presence of items representing physical symptoms commonly experienced in illness [e.g. an item from the RRRSQ, 'Think about your feelings of fatigue and achiness'].

Study 1: Scale construction and preliminary factor analysis

Method

Participants and procedure

Study participants ($N = 185$) who were 18 years or over and diagnosed with a physical condition (i.e., acute/chronic illness and chronic pain conditions) completed the anonymous, online survey in English (151 females, 34 males; median age 18–20 years) following informed consent. Participants included ($n = 68$; 36.8 %) undergraduate psychology students who received course credit towards a research participation requirement, and 117 participants (63.2 %) recruited online from psychological research websites. No incentives for participation were provided to online participants. Ethics approval was obtained from the relevant Australian institutional Human Ethics Review Committee.

Measures

Demographic and clinical characteristics

Information about gender, age, level of education, current physical and psychological diagnoses was collected. Participants specified on which particular physical health condition they would base their survey responses.

The Multidimensional Rumination in Illness Scale (MRIS)

Rumination in response to physical illness was measured by the MRIS. A pool of 60 items was generated following an extensive review of the rumination research literature and existing rumination measures (Conway et al., 2000; Horowitz et al., 1979; Nolen-Hoeksema and Morrow, 1991; Papageorgiou and Wells, 2001; Scott and McIntosh, 1999). Participants were presented with statements

Table 1 Demographic and clinical characteristics of the sample for Study 1 (N = 185)

Variable	*n*	*M*/% (*SD*)	Range
Demographic factors			
Gender (%)			
Male	34	18.4	–
Female	151	82.8	–
Age range, in years (%)			
18–20	63	34.1	–
21–30	38	20.5	–
31–40	20	10.8	–
41–50	22	11.9	–
51–60	26	14.1	–
61 and over	16	8.6	–
Education (%)			
High school	19	10.3	–
Technical college	19	10.3	–
Undergraduate studies	95	51.4	–
Postgraduate studies	52	28.1	–
Location (%)			
Australia	102	55.1	–
Canada	4	2.2	–
Finland	1	.5	–
France	1	.5	–
Spain	1	.5	–
United Kingdom	12	6.5	–
United States	64	34.6	–
Targeted condition (%)			
Allergy	17	9.2	–
Arthritis	9	4.9	–
Autoimmune disease	16	8.6	–
Cancer	9	4.9	–
Cardiovascular disease	6	3.2	–
Chronic pain condition	4	2.2	–
Ear disorder	4	2.2	–
Endocrine disease	15	8.1	
Eye disorder	3	1.6	–
Gastrointestinal disease	15	8.1	–
Genitourinary disease	4	2.2	–
Haematological disorder	8	3.8	–
Infectious disease	3	1.6	–
Spinal/neck condition	2	1.1	–
Musculo-skeletal disorder	11	5.9	–
Neurological disorder	18	9.7	–
Respiratory disease	25	13.5	–
Skin disorder	17	9.2	–
Comorbidities			
No. of physical conditions	185	2.82 (3.56)	1–20
No. of psychological disorders	185	.45 (.77)	1–3
Psychological disorders (%)			
None	128	69.2	–
Adjustment disorder	2	1.1	–
Anxiety	26	14.1	–
Depression	23	12.4	–
Eating disorder	1	.5	–
Health anxiety	3	1.6	–
Panic disorder	3	1.6	–
Phobia	2	1.1	–
Post-traumatic stress	2	1.1	–
Rumination			
Total MRIS score	185	71.58 (39.55)	0–191
Instrumentality	185	11.95 (6.69)	0–32
Intrusion	185	8.82 (8.47)	0–33
Preventability	185	4.41 (3.87)	0–16
Brooding	185	11.98 (7.49)	0–36

describing ways that people think about health conditions. Each statement was rated according to frequency in relation to a current illness using a 5-point Likert-type scale ('0' = 'Not at all' to 4 = 'Almost always') with item scores were summed for a possible range of 0–240, with higher scores representing a greater tendency towards rumination. Individuals could indicate, via an open-ended item, additional ways they thought about their illness.

Data analysis

Analyses were performed using SPSS statistical software, Version 20 (SPSS Inc., 2011), with statistical significance set at $p < .05$. Data were screened for univariate outliers and missing data. With no significant difference in MRIS scores for the two sample sub-groups, descriptive statistics described the sample demographic and clinical characteristics. Exploratory principal axis factor analysis (PFA) was selected to identify underlying common factors that explain the covariances between individual items. PFA was selected due to its recognition of the potential for error in variables, thus providing unbiased and uninflated loadings (Gorsuch, 1990). Factor structures were also analysed by gender given documented gender differences in rumination (Nolen-Hoeksema, 1991b).

Results

Descriptive statistics

The demographic and clinical characteristics of the sample are shown in Table 1. The mean MRIS score was 71.58 (*SD* = 39.55; range 0–191).

Principal axis factor analysis (PFA)

The factorability of the 60 MRIS items was examined. All 60 items correlated at least .3 with one or more items, suggesting satisfactory factorability. The Kaiser–Meyer–Olkin measure of sampling adequacy was .93, above the recommended value of .6 (Tabachnick & Fidell, 2001), and Bartlett's test of sphericity was significant ($\chi^2_{(1770)} = 8728.98$, $p < .01$). Communalities were all above .3, further confirming a common variance among items. PFA was therefore conducted with all 60 items.

The initial analysis of 60 items suggested a nine-factor solution (62.2 % variance), but the scree plot suggested that only the first four factors would have an eigenvalue above 1.0 (Spector, 1992). Parallel analysis (PA), considered to an effective, alternative procedure to confirm the number of factors to retain (Hayton et al. 2004), also suggested a four-factor solution. Consequently, five-, four- and three-factor solutions were examined using Varimax and Oblimin rotations of the factor-loading matrix. A four-factor solution (explaining 54.3 % variance) was preferred due to the insufficient number of primary loadings and difficulty interpreting three- and five-factor solutions. Oblique rotation was most appropriate, allowing obtained factors to be inter-correlated.

The four factors were labeled: 'Instrumentality' ($n = 8$), positive beliefs underlying the initiation and maintenance of rumination (e.g. 'Thinking about my illness helps me understand its cause'); 'Intrusion' ($n = 11$), negative dimensions including duration and lack of controllability (e.g., 'I can't seem to control thinking about my illness); 'Brooding' ($n = 9$), content regarding the experience and consequences of illness (e.g., 'I think about how little I can do to improve my situation'); and, 'Preventability' ($n = 4$), making sense of illness and causality (e.g., 'I think about whether my illness is caused by a poor diet').

In total 28 items were eliminated from the original list as they failed to contribute to a simple factor structure, that is, to meet minimum criteria of having a primary factor loading $\geq .5$ with no cross-loading $>.3$, or represented redundant items (inter-item correlation$>.8$). A PFA of the remaining 32 items with Varimax and Oblimin rotations was repeated, with the four factors explaining 58.4 % of the variance (Intrusion: 37.6 %, Instrumentality: 10.5 %, Preventability: 5.7 %, Brooding: 4.6 %). The Oblimin rotation provided the best-defined factor structure and, with the exception of three items with primary loadings $>.45$ ['I believe that people would think negatively about me if they realised how much I think about my illness' (.49), 'I often feel the need to be by myself to think about my illness' (.45), 'I think that trying new things might be pointless' (.48)], all retained items had primary loadings $>.5$ with no cross-loadings $>.3$. The factor-loading matrix is presented in Table 2, with a moderately strong correlation between Intrusion and Preventability noted, possibly reflecting the negative orientation of the Preventability items.

The reliability coefficients for the whole scale ($\alpha = .94$) and the subscales were high: Brooding ($\alpha = .91$), Instrumentality ($\alpha = .89$), Intrusion ($\alpha = .94$) and Preventability ($\alpha = .87$). Inter-item correlations ranged $< .8$, with one exception ($r = .80$) for items 'Once I start thinking about my illness, I find it hard to think of other things' and 'It often requires a real effort to stop myself thinking about my illness', indicating minimal redundancy of items. The factor correlation matrix is given in Table 3.

Additional areas of thinking in relation to illness were highlighted by 58 participants (31.4 %). These were coded separately by the researchers with an initial agreement rate of 66.4 % and a disagreement rate of 33.6 %. Disagreements were then discussed and resolved before codings were finalised. These included side effects of treatment and illness progression ($n = 32$), fatalism (illness as the work of a higher power or the result of bad luck) ($n = 4$) and isolation ($n = 7$).

Separate gender-specific factor analyses demonstrated similar results to those obtained with the full sample, but gender differences in MRIS total scores were evident (men = 53.2, $SD = 38.24$; women = 75.72, $SD = 38.77$), $F(1,183) = 9.40$, $p < .01$. Gender differences were found for the Brooding (men = 7.97, $SD = 6.79$; women = 12.89, $SD = 7.36$; $F(1,183) = 12.72$, $p < .01$) and Instrumentality (men = 9.38, $SD = 7.21$; women = 12.53, $SD = 6.45$; $F(1, 183) = 6.32$, $p < .05$) subscales. The number of physical illnesses reported was correlated with MRIS total scores ($r = .18$, $p < .05$) and the Brooding ($r = .22$, $p < .01$) and Instrumentality ($r = .15$, $p < .05$) subscales. The mean total MRIS score for those with a comorbid psychological illness 88.91($SD = 40.59$) was higher than for individuals reporting a physical health condition alone 63.86 ($SD = 36.67$), $F(1,183) = 14.78$, $p < .01$. These differences were also found in scores on the Brooding, $F(1,183) = 16.38$, $p < .01$, Instrumentality, $F(1,183) = 4.35$, $p < .01$, and Intrusion $F(1,183) = 13.2$, $p < .01$, subscales, with individuals reporting comorbid psychological conditions scoring higher.

Study 2: Confirmatory factor analysis and validation testing

Method

Participants and procedure

Eligibility criteria, participant recruitment and the ethics approval process were identical to Study 1. In total 138

Table 2 Factor loadings and communalities based on a principal axis factor analysis with oblimin rotation for 32 items from the Multidimensional Rumination in Illness Scale (MRIS) (N = 185)

Item	Factor 1 intrusion	Factor 2 instrumentality	Factor 3 preventability	Factor 4 brooding
Once I start thinking about my illness, I find it hard to think of other things	.86	–	–	–
It often requires a real effort to stop myself thinking about my illness	.86	–	–	–
Once I'm thinking about my illness, I can't seem to do anything else	.86	–	–	–
Sometimes I become lost in thought about my illness	.82	–	–	–
Once started, I can spend considerable time thinking about my illness	.75	–	–	–
I find myself unexpectedly thinking about my illness	.68	–	–	–
I have trouble sleeping because of thinking about my illness	.64	–	–	–
I can't seem to control thinking about my illness	.63	–	–	–
I exhaust myself thinking about the reasons for my illness	.60	–	–	–
I believe that people would think negatively about me if they realised how much I think about my illness	.49	–	–	–
I often feel the need to be by myself to think about my illness	.45	–	–	–
Thinking helps me understand my illness	–	.79	–	–
Thinking about my illness helps me work out what I need to do to manage it	–	.73	–	–
Thinking about my illness helps me focus on what is important to me	–	.71	–	–
Thinking about my illness is helpful in terms of protecting my health	–	.70	–	–
Thinking about my illness helps me work out how to cope	–	.66	–	–
Thinking about my illness helps me focus on what is still good in my life	–	.64	–	–
Thinking about my illness helps me understand its cause	–	.59	–	–
Thinking helps me work out what I need to do to regain a sense of 'normality'	–	.57	–	–
I think about whether I could have avoided my illness if I'd taken better care of myself	–	–	.87	–
I think about whether I might have done anything to cause my illness	–	–	.85	–
I think about where things went wrong	–	–	.67	–
I repeatedly go over possible causes for my illness	–	–	.59	–
I think about the impact the illness will have on my life	–	–	–	.71
I think about the things I can no longer do	–	–	–	.70
I think about what life would have been like if I had not become ill	–	–	–	.70
I think about the things my illness might stop me doing	–	–	–	.69
I think about the seriousness of my illness	–	–	–	.63
I think about the goals I had that I may no longer be able to reach		–	–	.62
I think about how little I can do to improve my situation	–	–	–	.59
I think that no matter what I do now, my life will never get better	–	–	–	.56
I think that trying new things may be pointless	–	–	–	.48

Only loadings >.3 are presented

Table 3 Factor correlation matrix for the pilot test of the Multidimensional Rumination in Illness Scale

	Intrusion	Instrumentality	Preventability	Brooding
Intrusion	1.00	–	–	–
Instrumentality	.21	1.00	–	–
Searching for meaning	.42	.17	1.00	–
Brooding	.60	.25	.30	1.00

females (mean age 36.55, $SD = 15.08$ years) and 25 males (mean age 36.62, $SD = 19.58$ years) were recruited. Participants ($N = 163$) included undergraduate psychology students who received credit towards research participation requirements ($n = 44$, 27.0 %) and individuals ($n = 119$, 73.0 %) recruited via psychological research websites. No incentives for participation were provided to online participants. All participants completed the Study 2 online survey, with a subset ($n = 23$, 13.7 %) participating in a repeat measurement of the MRIS after a 2-week period.

Measures

Demographic and clinical characteristics

Demographic and medical history information was collected for this study using the same items as for Study 1.

Multidimensional Rumination in Illness Scale (MRIS)

Rumination in response to illness was measured by the revised 41-item MRIS following Study 1 piloting. The revised scale, incorporating revisions to existing items to improve readability and nine new items based on areas of thinking in relation to illness highlighted by Study 1 participants, demonstrated high internal consistency ($\alpha = .96$). The nine new items included 'I think about how little control I have over my illness', 'I think about whether my illness may have been caused by stress', 'I think about my symptoms, pain or the side effects of treatment', 'I think about how isolated I feel by my illness', 'I think about whether my illness is the result of poor diet or lack of exercise', 'I think about the prospect of getting sicker or even dying', 'I think about whether I've just been unlucky to get this illness', 'I think about whether it was fate that I got this illness', and 'I think about whether my illness was determined by a higher power'. Two additional items, supplementary to the main scale, were added to examine the connection ('Indicate the extent to which the thoughts that you have been having about your illness have been accompanied by feelings or emotions') and orientation ('Overall, would you say these feelings or emotions tend to be positively or negatively orientated?') of emotion to thoughts about illness.

Ruminative Responses Subscale of the Response Styles Questionnaire (RRRSQ)

Proneness to depressive rumination was measured by the 23-item ruminative responses subscale of the RRSQ (Nolen-Hoeksema & Morrow, 1991) assessing responses to negative mood focused on self, symptoms and consequences of one's mood. In past studies, the scale has demonstrated good internal consistency (Nolen-Hoeksema and Morrow, 1991), test–retest reliability (Nolen-Hoeksema et al., 1994) and validity (Just and Alloy, 1997). The RRRSQ showed high internal consistency in the current study ($\alpha = .94$). This subscale offers the closest available concurrent validation of the MRIS, hence it was predicted that the MRIS total, Intrusion and Brooding subscales would be correlated with the RRRSQ, with the Instrumentality subscale not correlated (divergent validity).

Intrusion Subscale of the Revised Impact of Events Scale (IES-R-I)

Degree of intrusiveness of thoughts about a particular distressing event over the past 7 days was assessed by the 7-item valid and reliable IES-R-I (Weiss and Marmar 1996) ($\alpha = .90$ for the current study). It was anticipated that IES-R-I scores would be positively correlated with MRIS total, Intrusion and Brooding subscale scores (concurrent validity).

Depression, Anxiety and Stress Scale (DASS)

Depressive, anxious and stress symptomatology was assessed with the DASS (Lovibond & Lovibond, 2002), demonstrating adequate reliability and test–retest reliability in past studies (Brown et al., 1997). For each 7-item subscale, participants rated on a 4-point Likert-type scale (0 = 'Did not apply to me at all' to 3 = 'Applied to me very much or most of the time') the extent to which they experienced each state over the previous week. All DASS subscales showed high internal consistency in the current study (Depression $\alpha = .89$, Anxiety $\alpha = .76$, Stress $\alpha = .89$). It was anticipated that all DASS subscales would correlate with the MRIS total and subscale scores (except Instrumentality - discriminant validity), although the relationships for the DASS-D scale would be expected to be strongest given the link between rumination and depression (Nolen-Hoeksema and Morrow, 1991; Nolen-Hoeksema et al., 1994).

Positive Beliefs about Rumination Scale (PBRS)

Degree of belief about rumination as helpful was assessed by the 9-item PBRS (Papageorgiou and Wells, 2001). Participants rated their agreement with each item on a 4-point Likert-type scale (1 = 'Do not agree' to 4 = 'Agree very much'). The PBRS has shown high internal consistency, good test–retest reliability, convergent and discriminant validity in past research (Luminet, 2004; Papageorgiou and Wells, 2001), demonstrating high internal consistency in the current study ($\alpha = .94$). It was expected that the MRIS total and subscale scores would be correlated with the PBRS.

Negative Beliefs about Rumination Scale (NBRS)

The 13-item Negative Beliefs about Rumination Scale (NBRS; Papageorgiou et al., 2003) assessed negative metacognitive beliefs about rumination regarding uncontrollability and harm associated with rumination practice, including interpersonal and social consequences. In Study

2, two items 'Ruminating about my depression could make me kill myself' and 'Ruminating can make me harm myself' were omitted due to ethical considerations related to the online nature of the study. Each item is rated on a 4-point Likert-type scale (1 = 'Do not agree' to 5 = 'Agree very much'). The NBRS has exhibited good reliability and validity in past studies (Luminet, 2004), and demonstrated high internal consistency in the current study (α = .89). It was expected that the MRIS total, Intrusion and Brooding subscale scores of would be correlated with the NBRS (convergent validity).

Big Five Inventory-Neuroticism Scale (BFI-N)

The 8-item Big Five Inventory-Neuroticism Scale (BFI-N; John et al., 2008; John and Srivastava, 1999) is a self-report measure of neuroticism. Each item is rated on a 5-point Likert-type scale (1 = 'Disagree strongly' to 5 = 'Agree strongly'). The BFI-N has shown good internal consistency and test–retest reliability in earlier research (Hampson and Goldberg, 2006; Rammstedt and John 2007), with α = .83 in the current study. As individuals who are higher in neuroticism tend to ruminate more (Nolan et al., 1998; Roberts et al., 1998) it was expected that scores on MRIS total, Intrusion and Brooding subscales would be positively correlated with the BFI-N (convergent validity).

Negative Affect SubScale (Positive and Negative Affect Scale) (PANAS-N; Watson et al., 1988)

The 10-item Negative Affect subscale of the PANAS measured range and degree of negative affective arousal. Sample negative emotions include 'distressed', 'upset' and 'guilty', rated on a 5-point response scale (1 = 'Very slightly' or not at all to 5 = 'Extremely'). The PANAS has exhibited excellent internal consistency and has demonstrated convergent, discriminant, and predictive validity (Waikar and Craske 1997; Watson and Walker, 1996). The PANAS-N showed high internal consistency in the current study (α = .93). It was anticipated that PANAS-N scores should be positively correlated with the MRIS and with Brooding and Intrusion subscale scores given the reciprocal relation between rumination and negative affect (convergent validity).

Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990)

The 16-item valid and reliable PSWQ (Molina and Borkovec, 1994; Meyer et al., 1990) assessed worry. Internal consistency in the current study was high (α = .95). The PSWQ was expected to be correlated with the MRIS, Intrusion, Brooding subscales but to a lesser degree than the MRIS correlation with the RRRSQ, demonstrating discriminant validity.

Data analysis

Analyses were performed using SPSS® statistical software, Version 20 (SPSS Inc., 2011), with statistical significance set at $p < .05$. These data were initially screened for univariate outliers, missing data and violations to the assumptions of multivariate analysis. No data transformations were required. Descriptive statistics described the demographic and clinical characteristics of the sample. A confirmatory factor analysis was conducted through structured equation modeling with Amos software, Version 20 (SPSS Inc., 2011). Maximum Likelihood Estimation (MLE) was used to estimate a revised three-factor model (Intrusion, Instrumentality and Brooding). A decision to test a revised model with Preventability and Intrusion factors collapsed was made on the basis of the high correlation demonstrated between these factors in Study 1, and in the context of additional items generated following Study 1. Individual items were parceled on the basis of unidimensional facets within each factor (Holt, 2004), as parcels are more likely to be normally distributed, meeting the assumptions of MLE methods (Nasser and Wisenbaker, 2003). This procedure may result in lower goodness of fit indices, particularly in smaller sample sizes, as for this study (Floyd and Widaman, 1995; Kishton and Widaman, 1994).

Results

Descriptive statistics

Demographic and clinical characteristics of the sample are shown in Table 4. The mean MRIS score was 52.75 (SD = 27.62; range 3–129). The mean score for the supplementary item 'amount of time thoughts about illness were accompanied by emotions' was 2.95 (SD = 1.16), with higher scores representing a greater presence of emotions when thinking about illness. The mean score for the supplementary item 'positivity versus negativity of those emotions' was 2.42 (SD = 1.09), higher scores representing more positive emotions.

Gender, number of physical illnesses and comorbid psychological conditions

The mean total MRIS score for men was lower (46.52, SD = 20.39) than for women (53.88, SD = 28.65), but not significantly different, $F(1,161) = 1.51$, $p < .22$. Similarly, there were no significant gender differences across any of the

Table 4 Demographic and clinical characteristics of the sample for Study 2 (N = 163)

Variable	n	M/% (SD)	Range
Demographic factors			
Gender (%)			
Male	25	15.3	–
Female	138	84.7	–
Age (years)	163	37.02 (15.81)	18–75
Education, level completed (%)			
High School	44	27.0	–
Technical College	15	9.2	–
Undergraduate studies	47	28.8	–
Postgraduate studies	57	35.0	–
Location (%)			
Australia	94	57.7	–
Austria	1	.6	–
Belgium	1	.6	–
Canada	2	1.2	–
Finland	8	4.9	–
Italy	1	.6	–
Norway	1	.6	–
Singapore	1	.6	–
United Kingdom	13	8.0	–
United States	41	25.2	–
Physical health targeted condition (%)			
Allergy	12	7.4	–
Arthritis	15	9.2	–
Autoimmune disorder	11	6.7	–
Cancer	31	19.0	–
Cardiovascular disorder	4	2.5	–
Endocrine disorder	10	6.1	–
Eye disorder	4	2.5	–
Gastrointestinal disorder	10	6.0	–
Haematological disorder	8	4.9	–
Infectious disorder	6	3.7	–
Musculo-skeletal disorder	28	17.2	–
Neurological disorder	9	5.5	–
Respiratory disorder	6	3.7	–
Skin disorder	3	1.8	–
Other	6	3.7	–
Psychological disorders (%)			
None reported	108	66.3	–
Adjustment disorder	1	.6	–
Anxiety disorder	13	8.0	–
Bipolar disorder	3	1.8	–
Depression	23	14.1	–
Eating disorder	5	3.1	–
Health anxiety	1	.6	–
Obsessive–compulsive	4	2.5	–
Panic disorder	3	1.8	–
Phobia disorder	3	1.8	–
Post-traumatic stress	6	3.7	–
Social phobia	2	1.2	–
Substance disorder	1	.6	–
Comorbidities			
No. of physical conditions	141	3.12 (3.21)	1–15
No. of psychological disorders	48	1.88 (1.73)	1–7
Measures			
MRIS score	163	52.75 (27.62)	3–129
RRRSQ score	157	20.16 (12.47)	0–57
IES-R-I score	155	7.52 (5.84)	0–28
PBRS score	152	16.42 (6.65)	9–36
NBRS score	154	16.90 (6.26)	11–41
PSWQ score	153	48.42 (15.58)	17–77
PANAS-NA score	153	16.18 (7.49)	10–43
BIG5 N score	154	23.03 (6.61)	8–38

MRIS subscales. There was no significant correlation between the number of physical illnesses reported and MRIS total scores or the MRIS subscale scores. However, the mean total MRIS score for those reporting on more severe physical conditions (59.64, $SD = 26.34$) was higher than those reporting on less severe or chronic physical conditions (49.96, $SD = 27.75$), $F(1,161) = 4.19$, $p < .05$. The mean total MRIS score for those without any comorbid psychological conditions (47.30; $SD = 26.46$) was lower than for those with comorbid psychological illness (65.81, $SD = 26.16$), $F(1,161) = 16.69$, $p < .01$. These differences were replicated in scores on the Brooding, $F(1,161) = 19.04$, $p < .01$, and Intrusion, $F(1,161) = 12.02$, $p < .01$, subscales, with individuals reporting comorbid psychological conditions scoring higher.

Confirmatory factor analysis

A confirmatory factor analysis (CFA), using a MLE solution was conducted to test a revised 3-factor MRIS structure (refer to Fig. 1 for the conceptual model tested). The model showed good fit with these data ($[\chi^2(df = 17, N = 163) = 25.81$, $p = .08$, $GFI = .96$, CFI = .99, RMSEA = .06]. All parcels loadings on their respective factor exceeded .79. Table 5 specifies the correlations between the three factors.

Reliability testing

The full-scale MRIS and subscales showed high internal consistency in the current study: full scale ($\alpha = .96$), Intrusion ($\alpha = .94$), Brooding ($\alpha = .92$), and Instrumentality ($\alpha = .86$). Mean MRIS total scores at testing and retesting

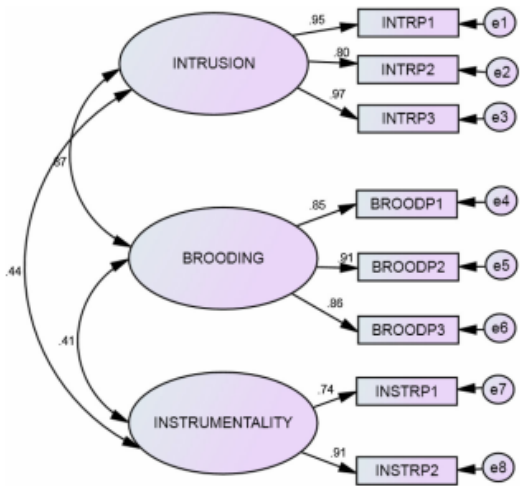

Fig. 1 Path diagrams for the confirmatory factor analysis of the Multidimensional Rumination in Illness Scale. *Note* INTRP1, INTRP2, INTRP3 item parcels for intrusion; BROODP1, BROODP2, BROODP3, items parcels for brooding; INSTRP1, INSTRP2, item parcels for instrumentality

Table 5 Factor correlation matrix for the validation testing of the Multidimensional Rumination in Illness Scale (MRIS)

	Intrusion	Instrumentality	Brooding
Intrusion	1.00	–	–
Instrumentality	.42	1.00	–
Brooding	.78	.37	1.00

Correlations are significant at the $p < .01$ level

were 51.61 ($SD = 30.86$) and 47.26 ($SD = 33.23$), respectively. A repeated measures t test indicated that mean MRIS scores did not change over the 2 weeks period, $t(22) = .89$, $p > 05$. The Pearson product-moment coefficient, $r(23) = .57$, $p < .01$, demonstrated moderate MRIS test–retest reliability. However, this is likely to reflect the fact that the test-reliability data is based on a student sample that typically reported less severe, less chronic illnesses including tonsillitis and influenza, and may also reflect the relatively short-lived nature of the illness on which responses were made. Higher reliability coefficients might reasonably be expected in the context of more severe illnesses (such as cancer and cardiovascular disease).

Validation testing

Inter-correlations among the MRIS, its three factors (Intrusion, Instrumentality, and Brooding) and other scales selected for comparison are presented in Table 6. The

Table 6 Correlations for the MRIS and other measures

Scale/dimension	Mean (*SD*)		*n*	*R*
RRRSQ	20.16 (12.47)	MRIS	157	.61**
		Intrusion	157	.63**
		Brooding	157	.60**
		Instrumentality	157	.13
IES-R-I	7.52 (5.84)	MRIS	155	.56**
		Intrusion	155	.55**
		Brooding	155	.56**
		Instrumentality	155	.16*
PBRS	16.42 (6.65)	MRIS	152	.56**
		Intrusion	152	.56**
		Brooding	152	.49**
		Instrumentality	152	.26**
NBRS	16.90 (6.26)	MRIS	154	.37**
		Intrusion	154	.41**
		Brooding	154	.37
		Instrumentality	154	−.04
DASS-D	8.30 (8.70)	MRIS	159	.48**
		Intrusion	159	.46**
		Brooding	159	.54**
		Instrumentality	159	.02
DASS-A	6.34 (6.63)	MRIS	160	.52**
		Intrusion	160	.56**
		Brooding	160	.44**
		Instrumentality	160	.17**
DASS-S	12.56 (9.08)	MRIS	161	.50**
		Intrusion	161	.54**
		Brooding	161	.46**
		Instrumentality	161	.09
BIG-5-N	23.03 (6.61)	MRIS	154	.36**
		Intrusion	154	.34**
		Brooding	154	.41**
		Instrumentality	154	.02
PANAS-N	16.18 (7.49)	MRIS	153	.42
		Intrusion	153	.43
		Brooding	153	.38
		Instrumentality	153	.11
PSWQ	48.42 (15.58)	MRIS	153	.36**
		Intrusion	153	.32
		Brooding	153	.42
		Instrumentality	153	.01

RRRSQ Ruminative Responses Subscale of the Response Styles Questionnaire; *IES-R-I* Intrusion Subscale of the Revised Impact of Events Scale; *PBRS* Positive Beliefs About Rumination Scale; *NBRS* Negative Beliefs About Rumination Scale; *DASS* Depression, Anxiety and Stress Scale; *BIG-5-N* Big Five Inventory, Neuroticism Subscale; *PANAS-N* Negative subscale of the Positive and Negative Affect Scale; *PSWQ* Penn State Worry Questionnaire; *Correlations are significant at the $p < .05$ level **Correlations are significant at the $p < .01$ level; fluctuations in sample size for subscales of the same measure (e.g. DASS) or for different measures are due to missing values. For all measures, higher scores reflect more of the underlying construct

MRIS correlated positively and significantly with all measures. Demonstrating good concurrent validity in the current sample, the MRIS was most strongly related with the RRSSQ and IES-R-I measures of the same construct. The MRIS also was strongly correlated with the PBRS and, to a lesser extent, the NBRS. As expected, the MRIS displayed good convergent validity, being significantly correlated with the measure of neuroticism, the BFI-N, the PANAS-N and measures of depression, anxiety and stress (DASS-D; DASS-A; DASS-S) in the current study. The MRIS also demonstrated divergent validity in the current sample. As predicted, there was a greater correlation between the MRIS and RRRSQ than between the MRIS and the PSWQ, demonstrating that while rumination may indeed be related, it is not identical to worry.

General discussion: Studies 1 and 2

This paper describes the development, reliability and validation testing of the MRIS, a measure of rumination suitable for use in the context of a physical health condition. Rumination as a construct represents a broad class of thoughts, one that has been difficult to measure with a single inventory (Siegle et al., 2004). While the MRIS has been developed to measure a specific subset of rumination, it is intended to incorporate the multiple facets of rumination that are particularly relevant in the physical illness context.

Exploratory factor analysis of the initial 60 items of the MRIS demonstrated a clearly interpretable factor structure for a final selection of 32 items, with distinct factors reflecting both adaptive (Instrumentality) and less adaptive (Intrusion, Brooding, Preventability) forms of rumination. Preventability was found to be highly correlated with Intrusion, reflecting the negative orientation of items relating to preventability, representing concern about what could have been done to avoid the illness. This kind of cognitive content is commonly found in intrusive thoughts following trauma (Nightingale et al., 2010) and therefore, consistent with the addition of similar items to the revised scale, the Intrusion and Preventability factors were collapsed for Study 2. In Study 2, the revised three-factor model of rumination was corroborated with confirmatory factor analysis.

While the three MRIS dimensions were consistent with previously identified domains in prior rumination studies (Fritz, 1999; Papageorgiou and Wells, 2001; Treynor et al., 2003), the MRIS differs from other rumination measures in that those previously identified domains are combined into a single measure with a specific application to the context of illness. In this way, while the 'Brooding' dimension mirrors that of scales such as the RRRSQ to capture a sense of gloomy focus on symptoms and feelings, the MRIS dimension also extends to thoughts about the consequences and limitations that may follow an illness diagnosis. The 'Instrumentality' dimension combines elements of both the 'Reflection' domain of the revised RRRSQ (Treynor et al., 2003), and 'Instrumentality' dimension defined by Fritz (1999) as rumination on the 'practical implications of an event' (p. 105) but also incorporates positive meta-cognitions about rumination that may explain the initiation and maintenance of the rumination process (Papageorgiou and Wells, 2001). These two MRIS subscales are arguably more robust than those in the revised RRRSQ (Treynor et al., 2003), consisting of a greater number of items and with a higher demonstrated reliability of each subscale. Finally, the 'Intrusion' dimension integrates the intensity and repetitiveness of rumination with the negative meta-cognition on rumination outlined by Papageorgiou et al. (2003) to include interpersonal consequences of rumination, of particular importance as the illness experience can result in isolation (Fawzy et al., 2001). It also incorporates attempts at understanding one's distress, content that is frequently experienced as intrusive subsequent to trauma (Nightingale et al., 2010).

The observed gender difference in MRIS scores from Study 1, with greater rumination reported among females, reflects previously documented gender differences (Nolen-Hoeksema and Jackson, 2001; Nolen-Hoeksema et al., 1999). Nolen-Hoeksema (1991b) reported that females are more likely to adopt self-focused rumination as a coping strategy, a strategy that has been shown to moderate the gender difference in depression in some studies (Nolen-Hoeksema et al., 1999; Roberts et al., 1998). Although the gender difference was not observed in Study 2, this most likely reflects the under-representation of males in the Study 2 sample.

Initial examination of the MRIS psychometric properties demonstrated excellent internal consistency for the entire scale and each obtained rumination factor, as well as moderate test–retest reliability over a two-week period within the context of the current sample. The MRIS and its factors evidenced good concurrent, convergent and discriminant validity in this sample. Concurrent validity was demonstrated by the strong, positive relationship between the MRIS and other measures of rumination. Importantly, the MRIS was also positively correlated with constructs that are theoretically related to rumination, including positive and negative metacognitive beliefs. Taken together, these results support the psychometric properties and validity of the MRIS among individuals diagnosed with an illness.

The current research is subject to a number of limitations. Some dispute exists over the most appropriate sample size with which factor analysis can be undertaken (Tabachnick and Fidell, 2001; Gorsuch, 1983). However,

this was addressed in the current CFA by parceling items for analysis, an appropriate approach for use with smaller sample sizes (Floyd and Widaman, 1995; Kishton and Widaman 1994). A further limitation relates to heterogeneity as the samples were based on adults diagnosed with a variety of physical health conditions, which may systematically influence responses based on different health experiences; although, conversely, the heterogeneity of the sample may arguably also be a strength of the study, as the MRIS was validated for use across a wide range of physical conditions. The sample is also further limited in respect to demographic characteristics, with an under-representation of males and an over-representation of individuals with higher levels of education. While any association between rumination and education has yet to be determined, a link between gender and rumination has been indicated as underlying gender differences in depression (Nolen-Hoeksema and Jackson, 2001; Nolen-Hoeksema et al., 1999).

Additionally, no consideration was given to the time since diagnosis of the physical health conditions in this study. Finally, the preliminary support for the reliability and validity of the MRIS in this study comes from cross-sectional research and further longitudinal research is needed to demonstrate the utility of the MRIS over time.

In summation, the findings from the two studies suggest the MRIS exhibits excellent reliability and validity in the context of physical illness. The MRIS measures three dimensions of rumination including Intrusion, Brooding, and Instrumentality. This multidimensional nature of the MRIS will facilitate examination of how individual subcomponents of rumination relate to specific psychological outcomes in illness, for while it has been argued that rumination represents an increased vulnerability to psychological distress; it has also been linked to positive outcomes in cancer in the form of post-traumatic growth (Calhoun et al., 2000). Expanding such research to various illness populations will contribute to further understanding of how various groups perceive and process a health threat. Finally, the MRIS has the scope to have utility as a clinical instrument to identify individuals who may have a dispositional tendency to rumination the context of an illness diagnosis and therefore be more vulnerable to developing depression and anxiety, allowing timely provision of appropriate interventions.

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Chapter 6: Breast Cancer

Chapter Overview

Breast cancer is the most commonly diagnosed cancer in women and, despite increasing survival rates, remains one of the primary causes of cancer mortality.

In this chapter, the physical, psychological and social impact of breast cancer along the disease trajectory from diagnosis to the survivorship period is reviewed. With a particular focus on psychological outcomes, both psychological distress and post-traumatic growth are examined in respect of underlying determinants. Given that both can co-exist, rumination, a form of perseverative thinking, is explored as one potential explanation for this dual outcome.

Breast Cancer

Breast cancer is a disease characterised by the uncontrolled and abnormal proliferation of cells within the structures of the breast (Chan, 2006; National Breast Cancer Foundation (NBCF), 2012). Breast cancer is not a homogenous disease and can be differentiated by location, receptivity to hormones and its ability to metastasise. This process involves the spread of cells from the cancer site to other parts of the body to form secondary tumours, thus differentiated as invasive, as opposed to non-invasive, in nature (Chan, 2006; Ogden, 2004). These features can produce a number of diverse outcomes in terms of individual experience of the disease, treatment regimens and, ultimately, survivability (Chan, 2006; Duffy, 2010).

Primary distinctions in breast cancer are made on the basis of location and invasiveness. Lobular carcinoma refers to cancers that develop from the structures within the breast that are responsible for milk production, whereas ductal carcinomas involve the structures of the breast that transport breast milk to the nipple (Chan, 2006). Ductal carcinoma in-situ, the most common form of non-invasive breast cancer, and lobular carcinoma in situ, as non-invasive forms of breast cancer, present significantly better outcomes in terms of cure rate (American

Cancer Society (ACS), 2012a; Ogden, 2004). However, while they do not represent any increased risk of mortality, these diagnoses are associated with a four-fold increase in risk of diagnosis of a subsequent invasive breast cancer, with a recent Australian study showing that of 13,749 women diagnosed with ductal carcinoma in situ between 1995 to 2005, 706 had developed invasive breast cancer in spite of receiving treatment (Australian Institute of Health and Welfare (AIHW) & National Breast and Ovarian Cancer Centre (NBOCC), 2010). A diagnosis of ductal carcinoma in situ therefore warrants treatment with surgery that may be followed with a combination of radiotherapy, the use of high energy x-ray, to destroy cancerous cells, and hormone blocking therapy to deprive cancer cells of oestrogen, the latter dependent on whether the ductal carcinoma in situ is hormone receptor positive (Breast Cancer Network Australia (BCNA), 2010). As lobular carcinoma in situ is generally not considered to be cancer, ongoing surveillance will normally be adopted, although some individuals with lobular carcinoma in situ may choose to undergo bilateral mastectomies in order to minimise any future breast cancer risk (BCNA, 2012a; Chan, 2006).

Another non-invasive breast cancer is Paget's disease, which begins in the milk ducts of the nipple. Paget's disease is rare, accounting for only 1% of breast cancer cases (ACS, 2012a). However, it is usually associated with ductal carcinoma in situ or invasive ductal carcinoma, and surgery in the form of a lumpectomy or mastectomy will often be required (ACS, 2012a; Chan, 2006; Ogden, 2004). The prognosis for Paget's disease will be dependent on whether invasive cancer is involved, in which case the prognosis is poorer (ACS, 2012a).

With the potential to spread to other parts of the body, invasive ductal carcinoma and invasive lobular carcinoma have a poorer prognosis (Ogden, 2004), with relative five-year survival rates of 90% for invasive ductal carcinoma and 92% for invasive lobular carcinoma (AIHW & Cancer Australia (CA), 2012). A much rarer form of invasive breast cancer is inflammatory breast cancer where cancer cells block lymph channels in the breast. Inflammatory breast cancer represents only 1 to 3% of all breast cancers (ACS, 2012a) but is a much more

aggressive form of cancer. Accordingly, it is more likely to have metastasised by the time of diagnosis and has a higher rate of recurrence than other types of breast cancer. The prognosis is therefore much poorer than for other invasive breast cancers with a five-year relative survival rate of only 40% (ACS, 2012a).

A further important distinction is made between hormone-dependent or oestrogen receptor-positive disease and oestrogen receptor-negative disease. The former has a better prognosis and constitutes over 75% of breast cancer cases (Grunfeld, Hunter, Sikka, & Mattal, 2005), while the latter tends to be more aggressive in nature (Duffy, 2010). Moreover, this distinction has important implications in respect of possible treatment. For breast cancers that are hormone receptor-negative, hormone therapy is an ineffective treatment (ACS, 2012a).

Alongside the specific diagnostic label, at diagnosis, a breast cancer will be further defined through the process of staging, a method of outlining the severity of the cancer on the basis of the extent of the primary tumour, and whether the cancer cells have spread to the lymph glands and metastasised, or spread, to the rest of the body (National Cancer Institute (NCI), 2010). Stages range from 0 to IV, with higher stages associated with a lower likelihood of survival (Chan, 2006). Stage 0 generally relates to breast carcinomas in situ, for example, ductal carcinoma in situ, lobular carcinoma in situ, and Paget's disease of the nipple. Stages 1 to 4 are differentiated by size of the tumour and spread to lymph nodes, with Stage 4 characterised as having metastatised to distant parts of the body such as the brain, bones or lung (ACS, 2012b; Cancer Research UK (CRU), 2012). Staging of breast cancer is an important factor in the determination of treatment plans and in assessing relapse risk (NCI, 2010).

Epidemiology

Breast cancer is the most common cancer diagnosed in women and is one of the leading causes of cancer mortality among women (ACS, 2011). Globally, breast cancer accounted for 23% of total new cancer cases and 14% of total cancer deaths in 2008 based on data from the

2008 GLOBOCAN database prepared by the International Agency for Research on Cancer (IARC) (Jemal et al., 2011).

In Australia, more than 13500 women were diagnosed with breast cancer in 2008 (CA, 2012), a rate that is increasing, with the number of new breast cancer cases among Australian women predicted to be 17200 by the year 2020 (AIHW, 2014), reflecting both general population growth and an increasingly ageing population, as well as increases in breast screening practices (AIHW & NBOCC, 2009; NBOCC, 2010). Essentially, one in eight women in Australia will face a breast cancer diagnosis before the age of 85 (CA, 2012).

As a disease process, breast cancer is primarily associated with women, and yet it is important to note that breast cancer can also occur in men, although it is comparatively rare (ACS, 2009). The female to male incidence ratio reported for 2006 was 124:1 (AIHW & NBOCC, 2009). The number of men diagnosed with breast cancer in Australia increased from 61 in to 1982 to 113 in 2008, most commonly with invasive ductal carcinoma, with 26 men dying from breast cancer in 2007 (AIHW & NBOCC, 2009; BCNA, 2012b). Breast cancer occurs more frequently in older women (AIHW & CA, 2012; McPherson, Steel, & Dixon, 2000). While breast cancer can occur in younger women, in Australia, less than 1% of breast cancers are diagnosed in women under 20, less than 1% in women aged 21-29, and 5.2% in women aged 30 to 39 in comparison to 18% in women aged 40 to 49 and 76.4% in women aged over 50 (AIHW & NBOCC, 2012).

As a developed country, the rates of breast cancer in Australia have typically been almost two and half times higher than in developing countries, with a comparative lifetime risk of 10% versus 1% (Chan, 2006). However, this is a situation that has been changing in recent years with rates rapidly increasing in countries where the prevalence of breast cancer has historically been low, including Eastern Europe, the East and South Asia and Africa (Hery, Ferlay, Boniol, & Autier, 2008; Leung et al., 2002; Parkin & Fernandez, 2006; World Health Organisation (WHO), 2013). This development has largely been attributed to lifestyle factors

associated with an increased risk of the development of breast cancer, including nulliparity or low parity (bearing few or no children) (Henderson, Pike, Bernstein, & Ross, 1996), higher dietary fat intake (Cho et al., 2003), and the use of hormone replacement therapy post menopause (Beral, 2003), rather than through hereditary genetic links. This argument is supported by documented increases in incidence in breast cancer for migrants to developed countries (Parkin & Fernandez, 2006). However, these variations in rates may also reflect advanced diagnosis methods, increased public awareness and utilisation of breast screening in the developed world (Agarwal et al., 2009; Coughlin & Ekwueme, 2009).

The Breast Cancer Experience

"Since my diagnosis, everything has changed. Everything feels upside down—I'm no longer the same person, I seem to have no control over my life, and I just don't know what to expect anymore. I want to go back to the person I used to be but I can't."

(Brennan, 2001).

Burney and Fletcher (2013) describe cancer as one of the few illnesses that are both potentially life threatening and potentially curable. This is particularly true of breast cancer. While breast cancer remains one of the leading causes of cancer-related death in Australian women (AIHW & Australian Association of Cancer Registries (AACR), 2010), the risk of dying from breast cancer by the age of 85 has reduced from a 1 in 29 risk in 1989 to a 1 in 37 risk in 2007 (AIHW, 2010). Between 1982-1987 and 2000-2006, the five-year relative survival rate increased from 72.6% to 88.3% (AIHW & NBOCC, 2009). In 2006, it was estimated that there were almost 140,000 women alive who had been diagnosed with cancer in the previous 25 years (AIHW & NBOCC, 2009). Regardless, a breast cancer diagnosis remains traumatic (Andrykowski, Cordova, Studts, & Miller, 1998).

Beyond the physical burden of symptoms, which may include fatigue, weight loss, insomnia and pain (Ancoli-Israel et al., 2006; Breitbart, Park, & Katz, 2010; Fleishman & Chadha, 2010; Savard, Simard, Blanchet, Ivers, & Morin, 2001), a diagnosis of breast cancer often entails fear of disease progression and even death (Magai, Consedine, Neugut, & Hershman, 2007). Moreover, the diagnosis itself is only the first of a series of distinct experiences, each presenting different physical, psychological and existential challenges, across the disease trajectory, many of which may be further accompanied by anxiety and uncertainty for the future (Andrykowski, Lykins, & Floyd, 2008; Cordova & Andrykowski, 2003; Danhauer et al., 2015; Hewitt, Herdman, & Holland, 2004; Lebel, Rosberger, Edgar, & Devins, 2007; Scrignaro, Barni, & Magrin, 2011).

Diagnosis to Treatment

A breast cancer diagnosis can be met with fear and disbelief, particularly where the perception of risk has been low (Hewitt et al., 2004). Yet, in the immediate aftermath of a diagnosis, while still in the process of coming to terms with the diagnosis itself, individuals face the challenge of making complex and, sometimes urgent, decisions regarding treatments, often in the context of limited knowledge and the risk of information overload (Burney & Fletcher, 2013; Hewitt et al., 2004; Rowland & Massie, 2010). This may involve decisions about surgery type (mastectomy or breast conserving surgery), the use of chemotherapy and radiation therapy and of hormonal treatment, where appropriate (Grunfeld et al., 2006; Hewitt et al., 2004; Jansen, Otton, van der Velde, Nortier, & Stiggelbout, 2004). Hewitt et al. (2004) outline the potential for two extreme reactions at this time, a hasty decision driven by a sense of urgency to take care of the cancer or delay as a result of seeking further opinions.

However, while treatment will generally be determined by the type of breast cancer and stage of the tumour (NCI, 2010), it has been demonstrated that, longer term, better psychological outcomes are achieved where women participate in the choice of treatment,

possibly reflecting a greater sense of control and mastery over their disease (Andersen, Bowen, Morea, Stein, & Baker, 2009; Deadman, Leinster, Owens, Dewey, & Slade, 2001). However, this does not apply to all women, with some preferring a more passive role in decision-making in relation to their treatment, thus avoiding the negative affect that may be encountered when considering the potential outcomes of different treatments (Jansen et al., 2004; Luce, 2005).

Breast Cancer Treatments

While a treatment plan may serve to reduce any initial psychological distress, this may then be replaced by concerns about the upcoming treatment itself (Hewitt et al., 2004). The main treatment options for breast cancer include surgery, chemotherapy, radiation and hormonal therapy, although individuals will often receive a combination of treatments, with chemotherapy used pre-surgery to shrink tumours, and post-surgery to minimise chance of cancer recurrence (Chan, 2006; Przezdziecki et al., 2012). Unfortunately, breast cancer treatments can compound the symptom burden of the disease for an extended period, with a number of side effects including pain and physical disfigurement subsequent to surgery (Kadela-Collins et al., 2011), nausea, vomiting and loss of appetite in chemotherapy (Brennan, 2001), and fatigue (Jacobsen et al., 1999). From a psychosocial perspective, loss of libido and sexual function following surgery, chemotherapy, and radiation (Ganz, 2008) and cognitive affects, including problems with attention, concentration and short term memory associated with chemotherapy and adjuvant hormonal therapy can be experienced (Ahles et al., 2002; Donovan et al., 2005; Schagen et al., 2002).

Surgery

Surgery is frequently the first treatment offered in breast cancer, with the aim of eliminating the cancer from the breast (Rowland & Massie, 2010). Surgery can be either breast conserving, where only the cancer itself and a margin of tissue is removed, or it may involve a

mastectomy (complete removal of all breast tissue) (Chan, 2006; Rowland & Massie, 2010). Mastectomy is now performed in less than half the women diagnosed with early stage breast cancer, while the number receiving breast conserving therapy (BCT) is increasing (Lee et al., 2009; Rowland & Massie, 2010). Nonetheless, surgery, whether it involves partial or complete loss, can result in a number of physical and psychological issues including scarring, loss of sensation, lymphedema, a negative self-image and associated loss of sexual desirability (Bartula & Sherman, 2015; Keitel & Koppala, 2000; Przezdziecki et al., 2012; Rowland & Massie, 2010).

Approximately one-third of individuals diagnosed with breast cancer will report psychological distress consequent to changes in body image (Fingeret, Teo, & Epner, 2014; Scott, Halford, & Ward, 2004). Studies have shown that women who undergo BCT experience more positive psychological outcomes in terms of less self-consciousness, a more positive body image and less impact on sexual functioning compared to those individuals who undergo mastectomy (Janni et al., 2001; Kissane et al., 1998; Poulsen, Graversen, Beckman, & Blichert-Toft, 1997). Increasingly, however, breast reconstruction is an option that is being taken post-mastectomy, with 15 to 30% of women electing for reconstruction (Parker, 2004), with the figure closer to 12% across Australia (BCNA, 2010a). Reconstruction may be undertaken at the time of the mastectomy (immediate breast reconstruction), or at a later time (delayed breast reconstruction). The increase in reconstructive surgery may be reflected in recent, longer term follow-ups of breast cancer survivors which have failed to demonstrate any differences in overall quality of life in relation to surgery type (Harcourt et al., 2003; Härtl et al., 2003; Janni et al., 2001; Moyer, 1997; Wilkins et al., 2000).

An additional surgical related issue for breast cancer patients is the surgical removal of lymph nodes, where involvement of the lymph nodes has been demonstrated (Chan, 2006). The removal of lymph nodes can result in lymphoedema, a swelling of soft tissues due to a build up of lymph fluid. Dependent on severity, lymphoedema can affect an individual's ability to

perform daily tasks, can lead to skin changes and breakdown, involve pain, fatigue and an increased risk of infection in the affected areas (ACS, 2006; Australasian Lymphology Association (ALA), 2009), which can impact further on both psychological, social and sexual functioning (McWayne & Heiney, 2005; Winch et al., 2015, 2016).

Chemotherapy

Chemotherapy treatment has potential to create new, or aggravate existing, health issues and to increase awareness of the potential threat to life (Ganz & Stanton, 2012; Rowland & Massie, 2010; Stark & House, 2000). Chemotherapy involves the administration of anti-cancer drugs to kill cancer cells by interfering with the processes required for cancer cell division and is associated with increased survival rates (Ho, 2004). However, it has also been associated with a number of severe side effects due to its non-discriminating nature (Chan, 2006). Chemotherapy can also involve a lengthy treatment regimen that can impact considerably on quality of life (Burney & Fletcher, 2013; Ganz et al., 2004; Rowland & Massie, 2010).

Most patients are aware of the side effects of chemotherapy given that these have been widely reported, often resulting in anticipatory anxiety, which can, in some cases, lead to non-commencement of treatment (Bickell & McEvoy, 2003; Lyman, Dale, & Crawford, 2003; Rowland & Massie, 2010). Side effects can be shorter-term, limited to treatment duration, and may include nausea, vomiting, weight gain, skin and fingernail discolouration, and hair loss (Bower, 2008; Carelle et al., 2002). Although newer anti-emetic medications are now more effective at controlling the nausea and vomiting associated with chemotherapy (Carelle et al., 2002), some individuals will still experience anticipatory nausea and vomiting, often determined by younger age, susceptibility to motion sickness, previous poor control and an increasing number of cycles of treatment (Kamen et al., 2014; Roscoe, Morrow, Aapro, Molassiotis, & Olver, 2011). For some, the hair loss associated with chemotherapy can be particularly distressing because it is a visible, disfiguring reminder of the cancer (NCI, 2010; Rowland &

Massie, 2010).

Longer-term side effects that can persist long after cessation of treatment include fatigue (Bower et al., 2006; Minton & Stone, 2008), pain (Ganz & Stanton, 2012; Wong-Kim & Bloom, 2005) and cognitive issues related to attention, concentration and memory, so-called 'chemo brain' (Ahles et al., 2002; Schagen et al., 2002; Wefel, Lenzi, Theriault, Davis, & Meyers, 2002). However, for the latter, no consistent relationship with specific cognitive domains has been found (Ahles et al., 2002; Ahles, Schagen, & Vardy, 2012) and such concerns are not always associated with performance on neurological testing (Rowland & Massie, 2010). Moreover, chemotherapy can also lead to premature menopause, which can cause considerable physical discomfort in the form of hot flushes, night sweats, and vaginal dryness which can interfere with sexual functioning, all of which can result in considerable psychological distress (Carpenter et al., 1998; Ganz et al., 2004; Schover, 2008). All of these longer-term side effects have been linked to decreased quality of life, the development of psychopathology and functional restrictions (Ganz & Stanton, 2012).

Radiation Therapy

As with chemotherapy, radiation therapy seeks to kill cancer cells but uses high-powered x-rays to directly target cancer cells over a period of weeks (Chon, 2004). Side effects can include fatigue and burning of the skin (Burney & Fletcher, 2013; Hewitt, Greenfield, & Stovall, 2006), but radiation can also increase the risk of lymphoedema when axillary radiation is required (Rowland & Massie, 2010). As outlined earlier, lymphoedema can result in a number of side effects including pain and fatigue, that have the potential to impact on quality of life and lead to the development of psychopathology (McWayne & Heiney, 2005).

Hormonal Therapy

The use of hormonal therapy is used as a preventive approach for breast cancer patients in remission, although it is only applicable to breast cancers that are positive for receptors

(Grunfeld et al., 2005) and its use may be limited by past history of breast cancer, past treatments, age and general health (CA, 2013a). Hormonal therapy works in one of two ways: by changing the levels of female hormones in the body or by stopping cells from being affected by oestrogen (Grunfeld et al., 2005). Hormonal therapy can have good outcomes and is associated with a 50% reduction in the risk of contralateral breast cancer and cancer spread (Early Breast Cancer Trialists Collaborative Group (EBCTCG, 1998). Treatment with hormonal therapy can be for five or more years for maximum benefit (Grunfeld et al., 2005), and has been linked to a number of side effects including increased menopausal symptoms (Grunfeld et al., 2005; Meyerowitz, Desmond, Rowland, Wyatt, & Ganz, 1999), fatigue (Buijs, de Vries, Mourits, & Willemse, 2008), and cognitive effects, primarily related to memory and attention (Buijs et al., 2008; Jenkins, Shilling, Fallowfield, Howell, & Hutton, 2004; Rowland & Massie, 2010). The impact of these effects, combined with a fear of endometrial cancer risk (Hewitt et al., 2006), may result in cessation of therapy (Barron, Connolly, Bennett, Feely, & Kennedy, 2007), with non-adherence rates of 17 to 25% reported (Fink, Gurwitz, Rakowski, Guadagnoli, & Silliman, 2004), and a consequent loss of benefits due to a failure to take the medication at the appropriate therapeutic doses or for the appropriate duration (Grunfeld et al., 2005).

End of treatment

"*After my very last radiation treatment for breast cancer, I lay on a cold steel table hairless and half-dressed, and astonished by the tears streaming down my face. I thought I would feel happy about finally reaching the end of treatment, but instead I was sobbing. At the time, I wasn't sure what emotions I was feeling…Ironically, I also cried because I would not be coming back to that familiar table where I had felt comforted and encouraged. Instead of joyous, I felt lonely, abandoned and terrified.'* (McKinley, 2000)

While the end of treatment might be expected to represent a positive time, this period of transition from treatment to reestablishing of normal life patterns and moving towards survivorship, can be when levels of psychological distress increase (Costanzo et al., 2007; Rowland & Massie, 2010). At this point individuals face a number of challenges, including the perceived loss of a supportive treatment environment (Cordova, 2008; Hewitt et al., 2006), concerns about ongoing monitoring for disease underlying a fear of recurrence (McKinley, 2000; Rowland & Massie, 2010), and a diminished sense of wellbeing subsequent to residual treatment effects (Hewitt et al., 2006; Rowland & Massie, 2010). Moreover, these concerns can be compounded within the individual's social environment in the face of expectations from others that the end of treatment represents a return to "normal" status and pre-diagnosis functioning (Cordova, 2008; Rowland & Massie, 2010).

Survivorship

> *"This is what cancer is about to me, living with possible recurrence.*
> *Cancer is not about two months of treatment and a couple of minor surgeries… I think the hardest thing for women like me who have*
> *found their cancers early and kept their breasts is to believe we*
> *are going to get away with all of this. Am I really going to be okay?"*
>
> (Kahane, 1995).

Improvements in both the diagnosis and treatment of breast cancer have led to greater rates of remission and increased numbers living in the survivorship phase of cancer, a period generally designated as five years post-diagnosis, after which the probability of recurrence declines, although some now recognise survivorship as commencing once active treatment stops (Andersen & DiLillo, 2001; Cameron, 1997; Hewitt et al., 2006; Mehnert & Koch, 2008).

Breast cancer survival rates can be as high as 80%, although these can drop to as low as 40% in low-income countries, reflecting a lack of diagnosis and treatment facilities (Coleman et al., 2008; WHO, 2013). In Australia, in the period 2006-2010, the five-year relative survival rate from breast cancer in females was 89% (AIHW & CA, 2012). At the end of 2008, it was estimated that there were 159,325 Australian women living with a history of breast cancer diagnosis in the previous 27 years (CA, 2013b) and the survival period for most women is lengthening (Rowland & Massie, 2010).

Yet survivorship can be a period of dynamic change, with this time of transition back to 'normal' life in terms of relationships, daily activities and life goals requiring considerable adjustment to changes consequent to the cancer experience (Hewitt et al., 2006). Although some studies comparing breast cancer survivors to healthy women have found few differences in physical and emotional well-being (Cordova et al., 2001), some women continue to experience the aftermath of treatment in terms of persistent side effects or late effects that manifest months or years post-treatment (Deimling, Bowman, Sterns, Wagner, & Kahana, 2006). Baker, Denniston, Smith and West (2005) reported that 67% of individuals continue to experience physical problems, particularly fatigue and loss of strength, 47% report ongoing sleep difficulties and 41% sexual dysfunction. Additionally, for many women, a continuing fear of disease recurrence exists (Hewitt et al., 2006). Baker et al. (2005) reported that more than two thirds of cancer patients surviving one-year post diagnosis were concerned about illness, 60% concerned about recurrence and 58% remained fearful about their future. Both residual side effects and concerns about recurrence can give rise to depression and anxiety, with the latter involving ongoing monitoring, the possibility of further treatment, further physical limitations and even death (Baker et al., 2005; Hewitt et al., 2004; Lebel et al., 2007; Rowland & Massie; 2010; Vickberg, 2003).

Recurrence

The reality is that recurrence remains a real possibility, for while more women are living longer after treatment for breast cancer, the numbers being treated for recurrent local and metastatic disease has grown to about 30 to 40% (Hewitt et al., 2006; Lebel et al., 2007; Yang, Thornton, Shapiro, & Andersen, 2008). Recurrence is associated with another spike in psychological distress, sometimes accompanied by self-blame in terms of causality or in respect of treatment choices made (Deadman et al., 2001; Hewitt et al., 2006), and followed by an overall slower recovery in respect of quality of life (Rowland & Massie, 2010). Women with recurrent breast cancer often report poorer physical functioning and perceived health, more impairment in emotional well-being, more problems in relationships with family and healthcare providers, and less hope compared to disease-free survivors (Northouse et al., 2002; Stanton et al., 2006; Yang et al., 2008). Consequently, significant levels of psychological distress may occur, often intensified in comparison to those experienced at time of diagnosis (Hewitt et al., 2006; Northouse et al., 2002; Yang et al., 2008).

The Psychological Impact of Breast Cancer

When investigating the psychological impact of a breast cancer diagnosis, there has been a focus on psychological distress, in particular, depression and anxiety. As outlined, a breast cancer diagnosis encompasses a number of stressors along the disease trajectory and, therefore, some experience of distress could reasonably be anticipated during the process of adjustment to the diagnosis and the associated threat (Hewitt et al., 2006; Love, 2004). While research shows that distress generally lessens for most women as time from diagnosis increases (Hewitt et al., 2006), persistent side effects and worry of recurrence will maintain levels of distress for others (Love, 2004). Some women will report positive psychological outcomes post-diagnosis, manifesting as enhanced interpersonal relationships, a stronger sense of self and greater sense of purpose to life (Brennan, 2001; Calhoun & Tedeschi, 1999; Cordova et al., 2001; Tomich &

Helgeson, 2002). Therefore, any discussion of the psychological impact of a breast cancer diagnosis needs to account for both positive and negative potential outcomes.

The Prevalence of Depression and Anxiety

While the risk of dying from breast cancer has significantly reduced (AIHW, 2010), breast cancer remains a threatening concept that can undermine assumptions about personal control and predictability, increasing a sense of vulnerability (Green et al., 1997). Psychological distress is, therefore, commonly seen following diagnosis, although the degree of distress can vary from anticipated adjustment issues all the way through to disabling symptoms that satisfy full diagnostic criteria for depression and anxiety (Benedict & Panedo, 2013). Rates of depression and anxiety are commonly reported to be higher than those seen in the general population (Burgess et al., 2005; Den Oudsten, Van Heck, Ven der Steeg, Roukema, & De Vries, 2009; Kissane et al., 2004; Stark & House, 2000), and, in a study by Grabsch et al. (2006), in excess of 40% of women diagnosed with breast cancer were shown to meet *DSM-IV* criteria for a depressive disorder, with 6% meeting the criteria for an anxiety disorder. However, the experience of breast cancer can have a unique and, at times, complex psychological impact (Rowland & Massie, 2010), and prevalence of depression can fluctuate considerably according to a number of individual and clinical factors (Benedict & Panedo, 2013).

Clinical Factors

The evidence for a link to clinical factors is equivocal. Some studies demonstrate increases in psychological disorders in patients undergoing surgery, chemotherapy, radiation therapy and mastectomy (Coates, Glasziou, & McNeil, 1990; Engel et al., 2003; Fallowfield, Hall, McGuire, & Baum, 1990; Kagawa-Singer, Wellisch, & Durvasula, 1997; Moyer & Salovey, 1996; Smith, Gomm, & Dickens, 2003), in the context of more severe disease (Durkin,

Kearney, & O'Siorain, 2003; Lloyd-Williams, Friedman, & Rudd, 2001; Schou, Ekeberg, Ruland, Sandvik, & Karesen, 2004) and cancer pain (Breitbart et al., 2010). Whereas other studies have failed to show any association between psychological distress and disease severity or treatment modality (Bardwell et al., 2006; Burgess et al., 2005; Fann et al., 2008; Kiebert, de haes, & Van de Velde, 1991; Kissane et al., 2004; Wong-Kim & Bloom, 2005). Any relationship between clinical factors and psychological outcomes is multifaceted and subject to change over the course of treatment, with chemotherapy and radiation shown to increase depression and anxiety during, but not following, treatment (Burgess et al., 2005). Comorbidity is also a consideration, with both a prior history of depression and anxiety (Ganz, 2008; Hewitt et al., 2006; Maunsell, Brisson, & Deschenes, 1992) and the presence of comorbid conditions linked to increased psychological distress post-diagnosis (Kissane et al., 1998).

From a more general perspective, time since diagnosis has been associated with fluctuations in reported rates of psychological disorders (Burgess et al., 2005). While an initial peak in psychological distress is usually seen at diagnosis and onset of treatment, this usually reduces over time to reflect similar rates of depression and anxiety to the general population (Bower et al., 2005). Of increasing importance, however, given the increase in survivorship, has been the documented presence of further spikes of depression and anxiety, characterised by an emotional rebound once treatment ends and the challenges inherent in the survivorship phase commence (Andersen & DeLillo, 2001; Andrykowski et al., 2008; Campora, Naso, & Vitullo, 1992; Edgar, Rosberger, & Nowlis, 1992; Newell, Sanson-Fisher, Girgis, & Ackland, 1999). Attaining survivorship status might suggestion a reduction in the risk factors for psychological distress, but this period can also be characterised by a renewed sense of vulnerability, the emergence of many new issues in respect of self-image, body image, disease and treatment effects and a fear of recurrence (Bower et al., 2005; Moyer & Salovey, 1996; Przezdziecki et al., 2012; Tomich & Helgeson, 2002). Vickberg (2003) revealed that over 50% of women reported moderate to strong fears about cancer recurrence as many as seven years post-diagnosis,

although other studies have failed to demonstrate clinically significant levels of distress in the survivor group, possibly reflecting variability in assessment and sampling approaches (Andrykowski et al., 2008; Bloom, Petersen, & Kang, 2007). Moreover, cancer recurrence, should it occur, can cause greater distress than the initial diagnosis (Burgess et al., 2005). Accordingly, the process of psychological adjustment in cancer is a continual process and the prevalence of psychological disorders can actually increase over the timeline from diagnosis (Cella, Peterman, Passik, Jacobsen, & Breithurst, 1998; Cordova et al., 1995; Richardson, 1995).

Individual Factors

"*My breast cancer diagnosis came out of the blue, it was a real shock. A young woman in her 20s or 30s is not thinking about dying. Breast cancer forced me to examine the issue of my mortality. At the time, I would have preferred to be making decisions like 'what movie will I see?' ".*

Laura (BCNA, 2015a)

Age. Age is a primary determinant of psychological outcomes in the context of breast cancer, with a higher prevalence of psychological distress, particularly depression and anxiety, commonly seen in younger women (Burgess et al., 2005; Grabsch et al., 2006; Wong-Kim & Bloom, 2005). Hewitt et al. (2004) outlined that the majority of women are diagnosed past the age of fifty years so that diagnosis at a younger age can be uncommon, unexpected and out of sync with normal life course (Avis, Crawford, & Manuel, 2005). The potential for distress can be further attributed to both disease factors and psychosocial issues subsequent to the diagnosis. Younger women can face a poorer prognosis as the form of breast cancer diagnosed is often more aggressive (Bloom, Stewart, Johnston, & Banks, 2001), likely to be hormone receptor negative, thus limiting treatment options and more likely to reoccur (Klauber-DeMore, 2005).

At a time where attractiveness and fertility are particularly important and where the individual may be in a parental role, career-focused or building new relationships, the sense of loss can be substantial (Avis et al., 2005; Baker et al., 2005; Shaw, Sherman, & Fitness, 2015).

Although the highest rates of psychological distress are seen in younger breast cancer patients, it is not necessarily the case that women at the other end of the age spectrum experience less distress (Rowland & Massie, 2010). Women aged 65 and over may also be experiencing life changes that may compound the challenges posed by a breast cancer diagnosis. These may include the loss of a spouse, the presence of concurrent medical conditions, potential physical impairment, and decreasing financial and social support (Given & Given, 2010; Perkins et al., 2007; Robb et al., 2007; Roth & Modi, 2003; Sammarco, 2003). Additionally, these women can equally be as affected by a perceived loss of femininity, poorer body image and reduced self-esteem as younger women (Rowland & Massie, 2010).

Personality and individual coping style. Psychological response to a breast cancer diagnosis can further be influenced by individual personality and coping style (Carver et al., 1993; Carver, Scheier, & Segerstrom, 2010; Petersen et al., 2008). Carver et al. (2010) distinguished optimism and pessimism based on the orientation of outcome expectancies, so that optimism is associated with positive expectancies, pessimism with negative expectancies. Breast cancer patients who demonstrate dispositional optimism as opposed to dispositional pessimism report better psychological outcomes (Carver et al., 2010; Carver & Scheier, 1993; Epping-Jordan et al., 1999; Stanton & Snider, 1993). This reflects a relationship to different coping styles, namely engagement versus disengagement strategies and problem versus emotion-focused coping (Carver et al., 1993; Schou, Ekeberg, & Ruland, 2005; Scheier, Carver, & Bridges, 2001).

Dispositional optimism has been linked to more adaptive coping styles, in particular to problem-solving coping, which seek to reduce the impact of a stressor by managing its impact (Carver et al., 2010; Lazarus & Folkman, 1984; Zenger, Glaesmer, Hoeckel, & Hinz, 2011).

Optimists may also use emotionally-focused coping, such as acceptance and focusing on the best of situations, for uncontrollable stresses (Scheier & Carver, 1993) and it is this flexibility to apply differential coping strategies in different scenarios that helps increase resilience in an individual with breast cancer (Manuel et al., 2007; Stanton & Snider, 1993).

In comparison, dispositional pessimism is associated with a sense of hopelessness and helplessness, a recognised risk factor for depression (Alloy et al., 2000). Dispositional pessimism is also linked with avoidance coping, which may manifest in denial of the existence of a problem in order to maintain engagement with a worldview that is no longer valid (Carver et al., 2010), accompanied by a lack of active attempts to address any such problem (Carver & Scheier, 1993; Stanton & Snider, 1993). This may inhibit psychological adaptation to changed circumstances, with pessimism, therefore, shown to be a predictor of psychological distress in the context of breast cancer (Schou et al., 2004, 2005; Stanton & Snider, 1993; Zenger et al., 2011).

Social support. The availability of social support has been shown to be a key factor in adjustment to a cancer diagnosis through the facilitation of 'social sharing' of the cancer experience (Boinon et al., 2014; Helgeson & Cohen, 1996; Rodrigue & Park, 1996; Schroevers et al., 2010). In coping with a traumatic event, such as the diagnosis of breast cancer, the response of key social networks including partners, family members and friends can be critical (Werdel & Wicks, 2012). At the time of an increased sense of vulnerability, an increased reliance on others, it has been commonly reported that social networks can be negatively impacted as supports withdraw, influenced both by the stigma of cancer or inability to cope with the diagnosis (Boinon et al., 2014; Helgeson & Cohen, 1996; Lepore, 2001). Such unsupportive social supports may detract from adjustment (Lepore, 2001).

With higher levels of psychological distress associated with inadequate social support (Andrykowski & Cordova, 1998; Boinon et al., 2014), it is not only the number of supports that is influential in determining psychological outcomes but also the type of support offered. Helgeson and Cohen (1996) differentiated between three kinds of support: emotional,

instrumental and informational support. Emotional support, the expression of caring and concern, is considered to be particularly important in terms of buffering against the impact of stress subsequent to diagnosis and in facilitating adaptation (Helgeson & Cohen, 1996). However, the two further types of support can also be beneficial. The provision of information may reduce a sense of vulnerability by increasing a sense of control and involvement in illness management. Similarly, instrumental support, such as assistance with activities of daily living may be helpful. However, instrumental help can also lead to a sense of dependency and therefore undermine self-efficacy (Ganz, 2008; Wortman & Dunkel-Schetter, 1987).

The true nature and level of psychological distress in individuals diagnosed with cancer is likely to be underrepresented (Fallowfield, Ratcliffe, Jenkins, & Saul, 2001; Sharpe et al., 2004). Emotional distress can be rationalised as an appropriate reaction to a cancer diagnosis, and dismissed as non-pathological, both by treatment teams and the cancer patient themselves (Kessler, Lloyd, Lewis, & Gray, 1999; Lloyd-Williams et al., 2001; Sharpe et al., 2004). Some women may be reluctant to pathologise their distress, believing that distress is simply an integral part of the cancer experience and that any concerns about psychological distress might be a distraction, leading to worry that an inability to adopt a positive attitude may undermine the treatment options considered by their clinicians (Fisch, 2004; Love, 2004).

Measurement issues can further limit the accurate diagnosis of psychological distress, possibly reflected in the variations in reported rates of depression and anxiety. This can result from differences in terms of assessment methods used, for example, diagnostic interview compared to self-report measures, but also the crossover of somatic concerns frequently seen in cancer with symptoms assessed in psychological measures. Symptoms such as fatigue, appetite changes and nausea may therefore be inappropriately dismissed through attribution to cancer (Breitbart, 1995; Burgess et al., 2005; Kissane et al., 1998; Love, 2004; Tomich & Helgeson, 2002; Zabora, Britzenhoeszoc, Curbow, Hooker, & Piantodosi, 2001). Consequently, the burden of psychological distress in the context of breast cancer is often greater than anticipated.

Post-Traumatic Growth

> ***"****What I do know is that, it's changed how I see things and a lot of people. I have a greater appreciation for the good people in my life and an even lesser tolerance for others. I realised that my time is precious and you just never know when something unexpected could take what is currently your life away from you or someone you love."*
>
> *Monica* (*The Breast Cancer Site*, 2015).

With the literature largely focusing on the negative psychological outcomes of a breast cancer diagnosis, positive outcomes have commonly been viewed as simply reflecting an absence of psychopathology (Brennan, 2001). More recently, however, greater attention has been paid to the occurrence of positive psychological change subsequent to a cancer diagnosis (Andrykowski et al., 1996; Sears et al., 2003; Stanton et al., 2006). There are several terms describing overlapping concepts of positive change through cognitive restructuring following exposure to trauma including post-traumatic growth (Tedeschi & Calhoun, 1996), stress-related growth (Park et al., 1996), adversarial growth (Joseph & Linley, 2005) and thriving (Abraido-Lanza, Guier, & Colon, 1998).

In post-traumatic growth, this change is considered to be experienced as a consequence of experiencing challenging life events. It has been commonly investigated in the context of a breast cancer diagnosis (Bellizzi et al., 2010; Bower et al., 2005; Calhoun & Tedeschi, 1999; Cann, Calhoun, Tedeschi, & Soloman, 2010; Cordova et al., 2001; Mols, Vingerhoets, Coebergh, & van de Poll-Franse, 2009; Morris & Shakespeare-Finch, 2011; Sears et al., 2003; Tedeschi & Calhoun, 1996), with reports of benefits ranging up to 83% (Sears et al., 2003) among breast cancer patients (Cordova et al., 2007).

Calhoun and Tedeschi (1999) outline that post-traumatic growth tends to occur in three

areas: interpersonal relationships, sense of self and philosophy of life. In individuals diagnosed with breast cancer, a positive change in interpersonal relationships has been reported in terms of increased intimacy and closeness ("*Our relationship now has a depth that I just can't describe. We are bonded in a way that just wasn't the case before it happened"* (Calhoun & Tedeschi, 1999, p. 95, 2006; Sears et al., 2003). Tedeschi and Calhoun (1996) suggest this may reflect an increased sense of vulnerability inherent following a breast cancer diagnosis, potentially leading to increased self-disclosure and use of social support networks. This same sense of vulnerability may also underlie changes to the sense of self, particularly a greater perception of personal strength through management of the challenge of traumatic events ("*I know bad stuff can happen to me but I am much more capable of handling it than I was before"*) (Calhoun & Tedeschi, 1999, p. 14). A breast cancer diagnosis can also involve existential concerns, the facing of mortality (Tallman, 2013). This can lead to changes in life priorities ("*What do I want out of the time I have left?"*), a greater appreciation of everyday things and a rethinking of spiritual beliefs (Tallman, 2013).

Understanding how positive change may occur is important in the consideration of psychological outcomes following a breast cancer diagnosis. A primary explanation relates to the disturbance of the worldview of the individual, that sense of the nature of the world, how it works and one's own place within it (Tedeschi & Calhoun, 1996). Janoff-Bulman (1992) argued that traumatic events, such as a breast cancer diagnosis, shatter this worldview, disrupting core beliefs about the self, the world and the future, the latter being particularly important in the context of cancer where the threat is future-orientated and remains omnipresent (Green et al., 1997). Positive change involves accommodation, the reworking of what is considered to be 'normal', in effect, a construction of a revised worldview in a way that leads to growth (Cordova, 2008; Joseph & Linley, 2008). Moreover, even though the survival rate for breast cancer is improving (AIHW, 2010), a breast cancer diagnosis can involve confronting mortality, which has similarly been linked to post-traumatic growth (Tallman, 2013). In alignment with

existentialist theory, threatening life experiences such as a breast cancer diagnosis have the potential to stimulate positive changes in the context of a shortened life span (Yalom, 1980). In reality, both can lead to the revision of priorities and resetting of goals (Janoff-Bulman, 1992), a re-evaluation of relationships, perhaps as a consequence of an increased dependence on others but also possibly reflecting losses from the social network in the face of rejection from others (Lepore, 2001), and a clearer sense of spirituality (Janoff-Bulman & McPherson, 1997; Tedeschi & Calhoun, 1995).

> *"I often feel like I must be a very negative person when I read of survivors who tell their stories after a breast cancer diagnosis and mention that it has been a positive experience and the wonderful ways that they have been enlightened or motivated to be a better person…I read of many who have overcome so many obstacles – many more than me and with an attitude that I would embrace if I could. I definitely don't want to depress any newly diagnosed women but I wonder if there really is anyone else out there that feels like me?"*
>
> Leanne, (BCNA, 2015b)

However, it cannot be assumed that post-traumatic growth will necessarily follow a diagnosis of breast cancer since assimilation (i.e., incorporation of the traumatic event into the existing world-view with the initiation of self-blame; *"What did I do to bring this on myself"*), as opposed to accommodation, may occur (Joseph & Linley, 2008). Additionally, accommodation need not necessarily occur in a positive direction, with an ensuing sense of hopelessness predisposing to depression (Hefferon & Boniwell, 2011). Both outcomes help to explain why, for some, post-traumatic growth is absent and a sense of vulnerability persists (Hefferon & Boniwell, 2011; Joseph & Linley, 2008).

Post-traumatic growth is also subject to the influence of a number of clinical, individual and social factors (Danhauer et al., 2013; Helgeson et al., 2006; Lechner et al., 2003; Stanton et al., 2006). Clinical factors may include the stage of the cancer and time since diagnosis. In line with existentialist theory (Yalom, 1980), a greater threat should create greater potential for post-traumatic growth due to an associated increased sense of vulnerability (Janoff-Bulman & McPherson, 1997). Time from diagnosis should present greater opportunity for cognitive reconstruction of the shattered world-view (Hefferon & Boniwell, 2011). While there is research to support both hypotheses, with the severity of diagnosis associated with greater post-traumatic growth (Andrykowski et al., 1996; Cordova et al., 2001; Sears et al., 2003) and greater post-traumatic growth demonstrated further out from diagnosis (Andrykowski et al., 1996; Cordova & Andrykowski, 2003; Manne et al., 2004; Sears et al., 2003), in both cases the research is equivocal (Helgeson et al., 2006; Stanton et al., 2006). A more reliable relationship has been demonstrated between *perceived* threat and post-traumatic growth (Cordova et al., 2001; Cordova et al., 2007; Sears et al., 2003). In Cordova et al. (2007), only perceived threat was related to post-traumatic growth, while objective measures of severity such as stage of disease were not. This aligns with stress and coping frameworks (Lazarus & Folkman, 1984) in terms of the importance of subjective appraisal, so the breast cancer diagnosis needs to be appraised as severe by the individual to instigate the cognitive processing that ultimately leads to post-traumatic growth (Morris & Shakespeare-Finch, 2011). In respect of time since diagnosis, findings are limited by the correlational nature of most research, so that the influence of time since diagnosis requires further clarification (Bower et al., 2005; Dekel, Ein-Dor, & Soloman, 2012).

Individual factors may include age (Belllizzi, 2004; Bellizzi & Blank, 2006; Cordova et al., 2001; Tomich & Helgeson, 2002), level of education (Bellizzi & Blank, 2006), degree of social support (Weiss, 2004), socioeconomic status (Danhauer et al., 2013) and personality (Antoni et al., 2001; Linley & Joseph, 2004). For age, greater levels of post-traumatic growth

have been observed in younger individuals. This is thought to reflect the greater possibility of disturbance in worldview, given that breast cancer is often more aggressive and more untimely for this group, thus creating a subsequent potential for greater levels of post-traumatic growth (Cann et al., 2010; Cordova et al., 2007; Linley & Joseph, 2004). For both socioeconomic status and level of education, any increase in post-traumatic growth is thought to represent an increased level of resources from which the individual can draw (Cordova et al., 2007; Morril et al., 2008). For personality, optimism and coping style have been demonstrated to be important (Antoni et al., 2001; Sears et al., 2003). Again, the research in this area is equivocal as less robust relationships have been demonstrated for socio-demographic factors (Cordova et al., 2001, 2007; Sears et al., 2003; Weiss, 2004), with assessment and sampling variability proposed as a possible explanation (Cordova et al., 2007). Ultimately, further research is needed to gain a clear understanding of individual factors that will facilitate the greater benefit from negative life events (Sears et al., 2003).

The Importance of Psychological Outcomes in the Context of Breast Cancer

What is known is that the breast cancer experience is, therefore, not a source of uniformly negative outcomes. Corresponding to the idea of a psychosocial transition (Andrykowski, Brady, & Hunt, 1993; Parkes, 1971), a breast cancer diagnosis requires a reassessment and restructuring of planned goals and priorities in response to the shattered worldview proposed by Janoff-Bulman (1992), a process that can be accompanied by both psychological distress and post-traumatic growth (Cordova, 2008). The presence of psychological distress or post-traumatic growth need not represent mutually exclusive states (Cordova et al., 2007; Schroevers et al., 2010; Stanton et al., 2006), with many individuals recognising some benefit of their cancer, while still conceding the negative aspects (Hefferon & Boniwell, 2011).

The literature examining the relationship between psychological distress, particularly depression, and post-traumatic growth is equivocal, with many correlational studies failing to demonstrate any link (Antoni et al., 2001; Baker et al., 2005; Cann et al., 2010; Cordova et al., 2001, 2007; Morris & Shakespeare-Finch, 2011). However, other studies have found increased post-traumatic growth to be linked with lower levels of distress (Helgeson et al., 2006; Ho et al., 2004; Tallman, Altmaier, & Garcia, 2007; Tomich & Helgeson, 2002; Urcuyo, Boyes, Carver, & Antoni, 2005), while others demonstrated that higher levels of distress are associated with greater post-traumatic growth (Bellizzi et al., 2010; Sears et al., 2003; Tomich & Helgeson, 2004). The limited longitudinal research available is equally inconsistent (Carver & Antoni, 2004; Sears et al., 2003; Tomich & Helgeson, 2004). A possible explanation is that the idea of positive growth post-trauma has many different definitions and assessment methods and this, in conjunction with disparity in timings of assessment, might simply be reflected in the variations of finding (Cordova, 2008; Morris & Shakespeare-Finch, 2011). As a relatively new area of research, further research is required to clarify any relationship as the presence of either psychological distress or positive changes post-trauma can have significant consequences (Salsman et al., 2009).

In the context of breast cancer, persistent, untreated psychological distress, that need not necessarily meet the diagnostic criteria for a psychological disorder, has been linked to adverse health outcomes, including increased burden of symptoms or side effects from treatment (Badger et al., 2001), poorer clinical outcomes, including increased mortality (Hjerl et al., 2003; Weihs et al., 2000), and decreased quality of life (Badger et al., 2004). Psychological distress has also been shown to influence adherence to treatment and health behaviours (Andersen & DiLillo, 2001; Andersen, Kiecolt-Glaser, & Glaser, 1994; DiMatteo, Lepper, & Croghan, 2000; Gilbar, 1996). In the context of breast cancer, Colleoni et al. (2000) demonstrated reduced adherence to chemotherapy treatment, with patients diagnosed with depression demonstrating a lower compliance rate of 64.1% compared to 92.2% in patients without a depression diagnosis.

Similarly, studies have shown discontinuation of hormonal therapy in the context of depression from the first year of treatment and increasing over subsequent years, culminating in an adherence rate of 50% by year five, which may limit cancer treatment (Demissie, Silliman, & Lash, 2001; Fink et al., 2004). However, adherence rates can vary considerably due to methodological issues inherent in adherence research, namely a reliance on self-report data, as well as differences in how adherence is defined (Chlebowski & Geller, 2006), meaning that the true extent of the impact on adherence may not be currently known. Increased levels of psychological distress have also been associated with the disruption of positive, protective health behaviours and an increase in health-harming behaviours including smoking, heavy alcohol consumption, poor diet and decreased physical exercise. These behaviours can negatively impact on treatment and increase the risk of other health issues, such as cardiovascular disease and diabetes (Pinto & Trunzo, 2005).

Conversely, post-traumatic growth has been linked to positive well-being, positive health behaviours and lower rates of depression (Stanton et al., 2006). Post-traumatic growth is suggested as performing a buffering role against psychological distress as it facilitates the redefinition of some of the more threatening aspects of a traumatic experience, thereby helping to reduce a sense of vulnerability (Morril et al., 2008). Although post-traumatic growth can be viewed as a positive resource in itself (Morril et al., 2008), post-traumatic growth may also be suggestive of resilience and may be further useful in identifying factors that protect individuals from the negative aspects of a cancer diagnosis and its subsequent treatment (Dunn, Campbell, Penn, Dwyer, & Chambers, 2009).

As distress and post-traumatic growth have the potential for such pervasive effects in the lives of women diagnosed with breast cancer, it is important that factors associated with these outcomes are clearly understood. Such an understanding facilitates the design of interventions targeted to these populations to both identify individuals at particular risk of negative affect and to address the maintenance and enhancement of positive psychological outcomes.

The Potential Influence of Rumination in Breast Cancer

As a traumatic event, a breast cancer diagnosis has the potential to disrupt the way in which an individual views their world (Janoff-Bulman, 1992), requiring accommodation of the trauma into the world-view (Cordova, 2008; Joseph & Linley, 2008). Accordingly, the way in which individuals think about their breast cancer diagnosis is critical in terms of this process (Calhoun & Tedeschi, 1999; Tedeschi & Calhoun, 1995, 2004; Janoff-Bulman, 1992). Park (2009) highlights the importance of cognitive processes post-trauma in respect of making sense and reconstructing basic assumptions because trauma is likely to be irreparable, requiring a different approach to that which might normally be adopted in response to a lesser event.

One common cognitive response to a traumatic event, such as the diagnosis of cancer, can be perseverative thinking (Brosschot et al., 2006). One type of perseverative thinking is rumination, "the cognitive process of actively thinking about a stressor, the thoughts and feelings it evokes and the implications for one's life and future" (Watkins, 2008, p. 164). Rumination has been shown to be a key factor in clinically-well populations underlying psychological distress, specifically depression and anxiety (Lyubomirsky & Nolen-Hoeksema, 1993, 1995; Nolen-Hoeksema, 2000), as well as positive change post-trauma (Calhoun et al., 2000). This finding has been extended to the context of breast cancer, with rumination linked to depression and anxiety (Lam et al., 2013; Steiner, Wagner, Bigatti, & Storniolo, 2014) and post-traumatic growth (Morris & Shakespeare-Finch, 2011; Stockton et al., 2011). This dual influence of rumination on negative affect and post-traumatic growth within breast cancer populations and the fact that both affective states can co-exist, is suggestive that rumination may influence affective outcomes through distinct pathways.

In the literature, rumination has been commonly conceptualised as an intrusive, uncontrollable process (Cordova et al., 2007). However, rumination is a multi-faceted concept, with variations in style, timing and content, all of which are elements demanding careful consideration in determining any relationship to either psychological distress or post-traumatic

growth (Morris & Shakespeare-Finch, 2011). Calhoun and Tedeschi (2006) differentiate between repetitive, intrusive rumination and rumination adopted as a purposeful effort in order to make sense of a situation. Treynor et al. (2003) named these brooding and reflective rumination, respectively.

Intrusive rumination, in particular, involves unbidden images, thoughts or feelings regarding a stressful event or circumstance, such as an individual thinking about their breast cancer diagnosis when they did not mean to. In this way, rumination is an automatic process that is generally uncontrollable, with the potential to continuously draw focus to the traumatic event, namely the breast cancer diagnosis (Park, 2010). Intrusive rumination has also been associated with a negative orientation to memory (Lyubomirsky et al., 1998) and negative emotions (Nolen-Hoeksema et al., 1994; Vickberg et al., 2000), so that the adaptation process may be impacted by past experience with breast cancer, such as the death of a close relative from the disease, and distressing content. Under these circumstances, rumination can increase psychological distress (Morris & Shakespeare-Finch, 2011; Nolen-Hoeksema et al., 1994; Vickberg et al., 2000), with a resultant negative relationship to growth (Cann et al., 2010). Brooding is related to intrusive rumination but involves a more "passive focus on the causes and consequences of traumatic events" (Stockton et al., 2011, p. 85) and is characterised further by a repetitive revisiting of the shattered worldview with an accompanying lack of progression towards any revision of failed goals (Stockton et al., 2011). It is also negatively associated with growth, but the precise impact of either intrusive or brooding rumination can be dependent on timing in relation to the traumatic event (Calhoun & Tedeschi, 2006).

In contrast, in reflective rumination, rumination may be consciously initiated as a sense-making process, to reduce dissonance between an ideal or 'former' self as 'healthy' and the new or 'real' self as affected by the disease (Calhoun & Tedeschi, 1998b, 2006; Linley & Joseph, 2004; Tedeschi & Calhoun, 1995, 2004). As a deliberate process, it allows an individual to think about the trauma in order to form new adaptive schema and to build a new worldview (Calhoun

&

Tedeschi, 2006; Linley & Joseph, 2004). Consequently, reflective rumination is considered to be the foundation upon which post-traumatic growth is built (Calhoun & Tedeschi, 1999; Calhoun et al., 2000; Taku, Calhoun, Cann, & Tedeschi, 2008). The more an individual thinks about their circumstances in this manner, the more likely post-traumatic growth will be experienced (Calhoun et al., 2000; Calhoun & Tedeschi, 1998b; Morris & Shakespeare-Finch, 2011; Stockton et al., 2011; Watkins, 2008). Additionally, beyond the connection to post-traumatic growth, reflective rumination has been protective in terms of reducing distress (Davis, Nolen-Hoeksema, & Larson, 1998).

Beyond ruminative style, timing can be critical. While generally related with negative psychological outcomes, intrusive rumination that immediately follows a stressful event, such as an illness diagnosis, has been considered a precursor to post-traumatic growth (Nightingale et al., 2010). In the immediacy of the event, intrusive rumination is assumed to have a functional role, by reducing distress through making way for engagement and initiation of a sense-making process (Park, 2009; Werdel & Wicks, 2012). At this point, Nightingale et al. (2010) suggest that the more purposeful reflective rumination could actually be counterproductive, in that deliberate attempts to make sense at this early stage may fail, and therefore result in psychological distress (Nightingale et al., 2010). However, when intrusive rumination persists, it can represent the more broody type of rumination outlined by Treynor et al. (2003), signalling an inability to disengage from the breast cancer diagnosis or a failure to engage constructively with the challenge of cancer (Baum, Cohen, & Hall, 1993; Cann et al., 2010).

Linley and Joseph (2004) state that cognition post-trauma can be both negatively orientated, such as thoughts of fear ("*Will I die?"*), anger ("*Why did I deserve to get this?"*), guilt (*"What did I do wrong to get this disease?"*), as well as positively orientated, including thoughts of hope ("*I will get better"*) and gratitude ("*I have such supportive friends"*). This orientation of content can be influential on psychological outcomes post diagnosis, so that more negatively orientated rumination is more likely to lead to psychological distress and more

positively orientated rumination to growth (Calhoun et al., 2000; Chan et al., 2011; Sears et al., 2003; Urcuyo et al., 2005; Watkins, 2008).

Ultimately, any potential relationship of rumination to psychological outcome will be dependent on an interaction of ruminative type, timing and content. Different ruminative styles at different times post-trauma, in combination with orientation of ruminative content, will result in positive psychological outcomes and to the increased likelihood that people will disengage from old world views in a potentially adaptive manner rather than a maladaptive one (Calhoun & Tedeschi, 1998b).

Ruminative Research in Breast Cancer

Research relating to the influence of rumination on psychological outcomes in the specific context of breast cancer remains limited. However, early studies have explored psychological distress (Lam et al., 2013; Li et al., 2015; Steiner et al., 2014) and positive change, post-traumatic growth, following a breast cancer diagnosis (Chan et al., 2011; Morris & Shakespeare-Finch, 2011).

Steiner et al. (2014) demonstrated the importance of content and nature of rumination in the breast cancer setting, finding that breast cancer patients and their partners engage in rumination when faced with harm/loss appraisals, commonly experienced in breast cancer, or when experiencing intrusive thoughts relating to the cancer experience. The extension of the study to include partners was significant because partner depression has been associated with avoidance and distancing behaviours, which can compound the difficulties of the breast cancer experience for the patient (Steiner et al., 2014). For both patients and partners, it was found that harm/loss appraisals directly influenced both depressive rumination and depression, also indirectly influencing depression through depressive rumination. However, intrusive thoughts appeared only to have direct effects on depression for patients (Steiner et al., 2014). While this study showed that rumination may result in depressive symptoms in women with breast cancer and their partners, as a cross-sectional study, causality cannot be determined. Depressed

individuals may engage in depressive rumination, that facilitates access to intrusive thoughts and appraisals of harm/loss, given that rumination has been shown to be both a trigger for intrusive thinking and a coping mechanism in response to intrusive thoughts (Michael et al., 2007).

Li et al. (2015) explored rumination as an emotional regulatory process, examining its influence on quality of life through its role in psychological distress. In survivorship, quality of life is critical (Li et al., 2015) and has been linked to both cancer recurrence and mortality (Epplein et al., 2011). In contrast to the findings from Steiner et al. (2014), Li et al. (2015) found women receiving treatment for Stage I and Stage II breast cancer reported lower levels of rumination. However, it must be noted that participants were receruited within the first month post-diagnosis, which represents the broadest definition of breast cancer survivorship as starting from diagnosis (Morris & Shakespeare-Finch, 2011).

As the sole longitudinal study examining rumination and psychological distress, Lam et al. (2013) identified four trajectories of depression and anxiety in newly diagnosed and newly recurrent advanced breast cancer patients: low stable, delayed, recovery and high stable-recovery. Aligning with studies showing a reduction in psychological distress over time to reflect similar rates of depression and anxiety to the general population (Bower et al., 2005), it was found that most women with advanced breast cancer were resilient to psychological distress in the twelve months following the commencement of adjuvant treatment. However, women that experienced persistent depression and anxiety reported greater levels of cancer-related rumination. Lam et al. also accounted for valence, with rumination in lower-stable depression trajectories related to positive aspects of cancer and high stable-recovering anxiety trajectories related to negative rumination. Again, the women in the study differed from other studies in that they had been diagnosed with advanced breast cancer but this group has been shown not to differ from other breast cancer groups in respect of psychological distress (Kissane et al., 2004). In focusing on psychological distress at the commencement of adjuvant treatment, the study

fails to capture distress at diagnosis and post-treatment. It is also limited by a sample sample size, which may limit the ability to detect less common trajectories (Lam et al., 2013).

In a study of a mixed cancer group, 35% with breast cancer, Morris and Shakespeare-Finch (2011) examined rumination and its relationship to both psychological distress, specifically depression and anxiety, and post-traumatic growth. This study explored the role of content in rumination, so that intrusive rumination and rumination on purpose of life was associated with increased depression and anxiety, while deliberate rumination on the benefits of the cancer experience was associated with post-traumatic growth (Morris & Shakespeare-Finch, 2011). This study highlights the need to consider differential influences of various dimensions of rumination on psychological outcomes. However, an important consideration is that the participants were, on average, three years out from diagnosis, which could influence the findings. Intrusive thinking has been suggested to be beneficial immediately following a traumatic event such as receiving a cancer diagnosis in that it starts the process of sense-making (Calhoun et al., 2000). However, when it persists longer-term, it is more likely to be associated with distress (Park et al., 2010).

Finally, in another study that explored both psychological distress and post-traumatic growth in women with breast cancer, Chan et al. (2011) also demonstrated the importance of thought content and valence in determining the effects of rumination. The study found that greater negative cancer-related rumination, such as thoughts about recurrence, was associated with greater post-traumatic stress symptoms and partially mediated the effect of a negative attentional bias on post-traumatic stress symptoms. Similarly, positive cancer-related rumination was positively related to post-traumatic growth and partially mediated the effects of positive attentional bias. However, as with earlier studies, the cross-sectional nature of the study limits the conclusions that can be made in terms of causality.

The current research supports the idea of a dual influence of rumination in respect of psychological distress and post-traumatic growth within breast cancer populations. The studies by Chan et al. (2011) and Morris and Shakespeare-Finch (2010) demonstrate that both affective states can co-exist, suggesting that rumination may influence affective outcomes through distinct pathways. Together, these early studies on rumination in the context of breast cancer represent preliminary research aimed at increasing understanding of the mechanisms by which rumination influences psychological outcomes in breast cancer survivors. However, the studies address different survivorship groups, resulting in some differences in findings, are mostly cross-sectional, which cannot address issues of causality, reinforcing the need for longitudinal research to gain a greater understanding of impacts along the survivorship trajectory.

Conclusion

Breast cancer is the most commonly diagnosed cancer in women and remains one of the leading causes of cancer mortality in women. While survival rates are increasing, psychological outcomes reflect the fact that a diagnosis of breast cancer remains a traumatic experience, characterised by a series of distinct challenges across the disease trajectory from diagnosis to survivorship. Researchers have tended to focus on psychological distress in response to a breast cancer diagnosis, specifically depression and anxiety. More recently the focus has shifted to understanding positive change post-trauma in the form of post-traumatic growth, the reporting of enhanced relationships, a sense of increased personal strength and greater life purpose.

The psychological impact of breast cancer can, therefore, be quite complex. Both clinical and individual factors have been proposed for the development of psychological distress and post-traumatic growth, with much of the research equivocal. Further research is therefore needed to clarify the mechanisms underlying psychological outcomes.

As both psychological distress and post-traumatic growth can co-exist, attention has recently been directed to rumination, given its documented links to depression, anxiety, and post-traumatic growth. While most of the research has been undertaken in clinically-well populations, early studies of rumination in the context of breast cancer are suggestive of a key role in determining psychological outcomes. The potential influence of rumination is likely to vary according to the nature, time and content of rumination. Therefore, future research needs to expand on the earlier research to account for the differential influence of these elements, thus providing a more comprehensive understanding of the pathways through which rumination might help determine psychological outcomes.

Understanding more about the origins of both negative psychological outcomes and positive change following a breast cancer diagnosis is important in terms of building on existent psychosocial interventions, both to further reduce the experience of distress but also to promote positive psychological experiences in the post-diagnosis period.

Chapter 7: Rumination, psychological distress and post-traumatic growth in women diagnosed with breast cancer

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Rumination, psychological distress and post-traumatic growth in women diagnosed with breast cancer

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Abstract

***Objective*: Rumination, the repetitive and recursive rehearsal of cognitive content, has been linked to depression and anxiety in physically well populations, and to post-traumatic growth (PTG) in physical illness populations. Women diagnosed with breast cancer may experience both psychological distress and PTG. As rumination may influence outcomes through distinct pathways, this study investigated the association of intrusion, brooding and instrumental subcomponents of rumination with psychological distress and PTG in the breast cancer context.**

***Methods*: Women diagnosed with primary breast cancer ($n = 185$), mean age 55.98 years ($SD = 9.26$), completed an online survey including the Multi-dimensional Rumination in Illness Scale, Depression Anxiety and Stress Scales, Post-traumatic Growth Inventory, Medical Outcomes Social Support Survey, demographic and health-related questions.**

***Results*: As predicted, regression analyses indicated that brooding was positively related to depression, anxiety and stress, but was also negatively related to the PTG dimensions of new possibilities and spiritual growth. Partially supporting the study hypotheses, intrusion was positively associated with stress and the PTG of relating to others and new possibilities. As hypothesised, instrumental rumination was positively associated with all five dimensions of PTG.**

***Conclusions*: Rumination is a key consideration in both positive and negative psychological responses of women diagnosed with breast cancer. Associations of specific components of rumination with varying psychological outcomes suggest differential paths by which the specific subcomponents of rumination exert this influence.**

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The most prevalent cancer diagnosis for women worldwide is breast cancer, accounting for approximately 23% of total female cancer cases and 14% of cancer deaths [1]. In Australia, one in eight women will face a breast cancer diagnosis during their lifetime [2]. Mortality rates have decreased in the developed world, primarily because of more effective treatments and early detection programmes [3]. A breast cancer diagnosis nonetheless represents a unique set of physical and psychological threats, whose impact may extend far beyond the immediate period of diagnosis and treatment to many years post-diagnosis, an issue currently receiving more attention in light of increasing survivorship [4]. Such threats include physical symptoms and treatment effects, as well as psychosocial impacts such as changes to bodily appearance, sexual dysfunction and disruption to family, employment, finances and social life [4]. Rates of psychological distress, particularly depression and anxiety, in breast cancer patients are reported to be twice that found in the general female population [5]. The extent of distress can fluctuate according to individual characteristics including age, with younger women at greater risk, and the availability of support, particularly the presence of a partner as a protective factor [5–7]. Although findings have been equivocal, there is some evidence that distress is influenced by disease severity, treatment modality and time since diagnosis, with the greatest distress evident in women with more advanced disease, those requiring extensive treatment, including chemotherapy, and during the months closest to the time of diagnosis and at disease recurrence [7,8]. There is also evidence that rates of psychological distress in this population may be under-reported, as medical personnel are frequently found to overlook distress symptoms in their patients [9].

While psychological distress is highly prevalent, positive psychological changes have also been demonstrated [10–12]. Post-traumatic growth (PTG), a positive psychological change experienced as a result of the struggle with highly challenging life circumstances, has been reported among women diagnosed with breast cancer [10–12]. PTG is characterised by increased compassion, a heightened focus on relationships and a greater appreciation of life [10–12]. Compared with healthy controls, breast cancer survivors have reported higher levels of PTG [11,13], although longitudinal research suggests that these differences may not be maintained in the longer term [14]. PTG appears to reflect overall psychological well-being in breast cancer survivors, with women experiencing greater

PTG also reporting lower psychological distress and less somatisation [13].

Although psychological distress and PTG exist at opposite ends of the spectrum of potential psychological outcomes, they are not mutually exclusive phenomena and have been found to co-occur [12,14]. There is contradictory evidence among breast cancer survivors with some studies indicating that these emotional responses are not related [11,12,15], while other studies report that PTG is related to active cognitive processing [16,17] and may offset distress [17]. The presence of distress or PTG has quite different implications. In the context of breast cancer, depression and anxiety have been linked to increased symptom burden [18], decreased quality of life [18] and poorer clinical outcomes, including increased mortality [19]. Conversely, PTG has been linked to increased resilience, positive well-being and health behaviours [15,16,20]. As distress and PTG have such pervasive effects on women diagnosed with breast cancer, factors associated with these outcomes must be understood. This is a critical step in designing interventions to identify individuals at particular risk of negative psychological outcomes and addressing the enhancement of more positive outcomes.

The cognitive processing of an illness diagnosis plays a key role in adjustment [21], with a focus on the role of cognitive *content* in determining psychological outcomes. Evidence from both cancer and chronic illness populations indicates that maladaptive cognitive responses (e.g. negatively based thoughts about causality—'Why did I get this illness?'; the experience of disease—'I'll never feel well again') increase vulnerability to depression and anxiety [4,22], whereas a focus on positive content, such as seeking beneficial aspects, has been associated with PTG [16].

Increasingly, attention is being given to the role of cognitive processing style on adjustment following a stressful event, particularly rumination, the 'cognitive process of actively thinking about a stressor, the thoughts and feeling it evokes and the implications for one's life and future' [23]. Ruminative processes can be initiated in gaining understanding and resolution to changed circumstances, operating as a self-regulatory function to reduce dissonance between an ideal self as 'healthy' and real self as affected by disease [21,24]. However, when such attention is *passively* focused inwards on the potential causes, meaning and consequences of a stressful event such as illness [25], rumination may lead to depression and anxiety [26]. Limited evidence in the breast cancer context suggests that rumination may be linked both to the development of psychological distress and to PTG [15,16], but studies have generally focused on rumination and PTG as unidimensional constructs.

The evidence that rumination is linked to both psychological distress and PTG, and that both states can co-exist, suggests that rumination may influence psychological outcomes through distinct pathways [15,27]. Rumination manifests in different forms, can incorporate both positive and negative contents and may be either intrusive or self-focused [24]. Specifically, reflective and experiential subtypes of rumination have been distinguished from brooding and evaluative subtypes, with the latter more critical in the development of adverse psychological outcomes [23]. Reflection or instrumental rumination, related to a purposeful self-focus, is considered a more deliberate form of rumination involving an active engagement with problem solving that can reduce levels of depression [28,29]. Meanwhile, brooding, a perseverative, passive focus on negative events or emotions, elusive goals and barriers to progress [28,29], is more of an intrusive process associated with depression [29,30], particularly when that process is related to preventability of an illness, with the potential to lead to self-blame [31]. However, intrusive thought may also trigger purposeful reflection, thus serving as a precursor to PTG [28]. Unfortunately, no investigations to date within the breast cancer context have assessed the influence of specific subcomponents of rumination both on psychological distress and to dimensions of post-traumatic growth.

Given that the key role ruminative processes may have in determining adjustment, understanding how these specific components relate may be critical in developing the most effective psychosocial interventions for this population. As rumination research in the context of illness is limited, any exploration of the role of rumination in psychological outcomes in cancer should account for other factors that have been demonstrated to be influential either directly or indirectly on rumination generally. Socio-demographic characteristics, such as age [32] and social support, have been shown to influence the experience of psychological distress [33] and PTG [14], and clinical characteristics, such as severity of disease and treatment status, have also been shown to influence psychological distress [5,34].

The primary aim of this study was to extend evidence concerning rumination in the context of illness by documenting rumination among women diagnosed with breast cancer and examine the association of specific components of rumination to positive and negative psychological outcomes. It was predicted that the negatively orientated ruminative element of brooding would be associated with depression, anxiety and stress, and the positively oriented ruminative element of instrumentality would be associated with PTG. It was also hypothesised that the ruminative component of intrusion would be related to both negative psychological outcomes and the five dimensions of PTG, reflecting a dual role both as an automatic, invasive, uncontrollable response to trauma [28] and as a trigger to purposeful reflection [35].

Method

Participants and procedure

Participants included 185 females (mean age 55.98 years, SD = 9.26, range 33–77), diagnosed with primary breast cancer and able to complete an online English-language questionnaire. They were recruited through an emailed invitation sent to members of the Breast Cancer Network of Australia and a dedicated study website. All participants completed the anonymous, online survey following informed consent. Ethics approval was obtained from the Macquarie University Human Ethics Review Committee.

Measures

Demographic and clinical characteristics

Participants provided information about age, marital status, level of education, and comorbid physical and psychological diagnoses. Concerning breast cancer diagnosis, participants indicated time since diagnosis, stage at diagnosis, current treatment status and time since completion of treatment, if appropriate.

The Multi-dimensional Rumination in Illness Scale [36]

The 41-item Multi-dimensional Rumination in Illness Scale (MRIS) measures rumination in response to physical illness, consisting of three subscales: intrusion (e.g. 'I can't seem to control thinking about my illness'), brooding (e.g. 'I think that trying new things may be pointless'), instrumentality (e.g 'Thinking about my illness helps me understand its cause'). Participants rated all MRIS items according to frequency in relation to a current illness (5-point Likert-type scale; '0' = 'not at all' to 4 = 'almost always'). Item scores were summed to yield subscale scores with a possible range of 0 to 64 (brooding), 0 to 68 (intrusion), 0 to 32 (instrumentality) and full scale scores from 0 to 164, with higher scores representing a greater tendency towards rumination. Two supplementary items were scored separately from the main scale and indicated the 'amount of time thoughts about illness were accompanied by feelings or emotions' (5-point Likert-type scale; '0' = 'not at all' to 4 = 'almost always') and whether 'these feelings or emotions tend to be more positively or negatively orientated' (5-point Likert-type scale; '0' = 'very negative' to 4 = 'very positive'). Full scales and subscales have demonstrated internal consistency, test–retest reliability and validity [36]. High internal consistency was demonstrated for the full scale (0.94), and the subscales of intrusion (0.90), brooding (0.92) and instrumentality (0.86) in the current study.

Depression, Anxiety and Stress Scales [37]

Depressive, anxious and stress symptomatology was assessed with the Depression, Anxiety and Stress Scales, which has demonstrated adequate reliability and test–retest reliability [38]. For each seven-item subscale, participants rated on a 4-point Likert-type scale (0 = 'did not apply to me at all' to 3 = 'applied to me very much or most of the time') the extent to which they experienced each state over the previous week. All Depression, Anxiety and Stress Scales subscales showed high internal consistency in the current study (depression $\alpha = 0.92$, anxiety $\alpha = 0.79$, stress $\alpha = 0.90$).

The post-traumatic growth inventory [20]

The 21-item post-traumatic growth inventory measured positive changes following adversity across five PTG dimensions: relating to others, new possibilities, personal strength, spiritual change and appreciation of life. Each item was rated along a 6-point Likert-type scale (0 = 'I did not experience this change as a result of my illness' to 5 = 'I experienced this change to a very great degree as a result of my illness'). The scale was scored according to the five subscales, with higher scores demonstrating a greater level of each particular dimension of PTG. The scale is reported to have good reliability and validity [39]. In the current study, high internal consistency was demonstrated for the subscales of relating to others (0.91), new possibilities (0.89), personal strength (0.86), spiritual change (0.74) and appreciation (0.86).

The medical outcomes social support survey [40]

The 19-item medical outcomes social support survey (MOS-SS) measured multiple dimensions of support: emotional/informational, tangible, affectionate and positive social interaction. Each item was rated along a 5-point Likert-type scale (1 = 'none of the time' to 5 = 'all of the time'). The scale was scored according to four subscales, with higher scores demonstrating a greater level of each particular dimension of social support. The scale has established reliability and validity [39]. High internal consistency was demonstrated for the subscales of emotional/informational support (0.96), tangible support (0.91), affectionate support (0.93) and positive social interaction support (0.94) in the current study.

Data analyses

Analyses were performed using SPSS® (SPSS Inc. IBM, Chicago, Illinois, USA), with statistical significance set at $p < 0.05$. Data were screened for univariate outliers, missing data and violations to the assumptions of multivariate analysis. Variables with non-normal distributions were transformed using square-root transformations (depression, anxiety, comorbid psychological conditions). Descriptive statistics were used to describe demographic and clinical characteristics of the sample.

As demographic (e.g. age [32] and level of education [41]), clinical (e.g. time since diagnosis, severity of

disease, treatment status, comorbid medical and psychological conditions [5,34]) and contextual (e.g. availability of social support [14,42]) variables may influence psychological distress and PTG, these variables were considered as potential covariates and assessed using Pearson's correlations (continuous and ordinal variables). Hierarchical regression analysis tested the study hypotheses and established the relative contribution of each variable to the outcomes of interest. Identified covariates, demographic and social support variables, were entered into the model before clinical variables, for which the relationship to psychological outcomes has been more equivocal [8,15].

Results

Demographic and clinical characteristics are presented in Tables 1 and 2. The mean score for the supplementary item, 'amount of time thoughts about illness were accompanied by emotions', was 1.91 ($SD = 0.94$, range 0–4). The mean score for the supplementary item, 'positivity versus negativity of those emotions', was 2.57 ($SD = 1.28$, range 0–4). Mean depression, anxiety and stress scores for the overall sample were within the normal range.

Table 1. Frequencies for demographic and clinical characteristics

Variable		*n*	%
Marital status	Single	19	10.3
	Married/de facto	128	69.2
	Separated/divorced	30	16.2
	Widow/widower	8	4.3
Education	High school	55	29.7
	Technical college	36	19.5
	Undergraduate	41	22.2
	Postgraduate	53	28.6
Time since diagnosis	1–6 months	6	3.3
	7 months–1 year	11	5.9
	1–4 years	68	36.8
	5–10 years	71	38.3
	10 years plus	29	15.7
Stage at diagnosis	Unknown	32	17.3
	1	59	31.9
	2	62	33.5
	3	23	12.4
	4	9	4.9
Breast cancer treatment	In treatment	84	45.4
	Surgery	3	1.6
	Chemotherapy	10	5.4
	Radiation	5	2.7
	Hormonal	78	42.2
Time since completion of treatment	<1 year	30	16.2
	1–2 years	20	10.8
	2–3 years	10	5.4
	3–4 years	18	9.7
	>5 years	40	21.6

Table 2. Mean and standard deviations of demographic and clinical characteristics

Variable	*n*	*M*/% (*SD*)	Range
Age, in years	185	55.98 (9.26)	33–77
Comorbid health conditions	185	1.14 (1.37)	0–8
Comorbid psychological conditions	185	0.24 (0.54)	0–2
Rumination			
Total	185	45.25 (21.76)	6–119
Intrusion	185	14.17 (9.77)	0–54
Brooding	185	17.62 (10.24)	0–48
Instrumentality	185	13.46 (6.40)	0–31
Distress			
Depression	185	4.91 (7.23)	0–36
Anxiety	185	4.46 (5.83)	0–32
Stress	185	9.35 (8.00)	0–40
Post-traumatic growth			
Total	183	48.55 (20.58)	1–84
Relating to others	183	17.14 (7.61)	0–28
New possibilities	183	10.13 (5.91)	0–20
Personal strength	183	9.89 (4.64)	0–16
Spiritual change	183	2.45 (2.61)	0–8
Appreciation of life	183	8.93 (3.24)	0–12
Social support			
Total	183	3.85 (1.00)	1.11–5
Emotional/informational	183	3.85 (1.01)	1.13–5
Tangible	183	3.84 (1.11)	1–5
Affectionate	183	4.15 (1.05)	1–5
Positive social interaction	183	4.04 (0.96)	1.11–5

Correlation coefficients among key study variables are presented in Appendix 1. There were several significant correlations between demographic, emotional/informational social support, clinical predictor variables and the dependent variables of depression, anxiety, stress and the five PTG dimensions. Accordingly, these variables were treated as covariates in subsequent regression analyses as indicated.

Table 3 displays the results of the hierarchical regression analyses to identify the specific components of rumination most strongly associated with each psychological outcome. Both brooding and instrumentality subscales were significantly associated with depression. Only brooding was associated with anxiety. Brooding, intrusion and instrumentality were significant predictors of stress. For PTG, brooding, intrusion and instrumentality were significant predictors of new possibilities, intrusion and instrumentality for relating to others and instrumentality for personal strength and appreciation of life. Brooding and instrumentality predicted spiritual change.

Discussion

This study examined rumination and affective outcomes among women diagnosed with breast cancer. Consistent with earlier research [5], findings confirmed the presence

Table 3. Hierarchical regression analysis of rumination on depression, anxiety, stress and post-traumatic growth ($n = 185$)

Variable	B	Std. beta	t	R^2	Adj. R^2	R^2 Δ
Depression						
Final model $F(10, 172) = 15.38$, $p < 0.01$						
Step 1: social support				0.10	0.08	0.10
MOS-AFFECT	0.07	0.05	0.53			
MOS-EMOT	0.07	0.05	0.42			
MOS-INTERACT	−0.24	−0.15	−1.12			
MOS-TANG	−0.01	−0.01	−0.11			
Step 2: clinical				0.23	0.20	0.13
Comorbid psychological	0.74	0.22	3.73**			
Time since diagnosis	−0.01	−0.02	−0.26			
In treatment	0.37	0.12	1.82			
Step 4: MRIS				0.48	0.45	0.25
MRIS_INTR	0.03	0.18	1.95			
MRIS_BROOD	0.06	0.43	4.60**			
MRIS_INSTR	−0.04	−0.16	−2.68**			
Anxiety						
Final model $F(6, 176 = 10.29$, $p < 0.01)$						
Step 1: social support				0.05	0.04	0.05
MOS-EMOT	0.18	0.13	1.07			
MOS-INTERACT	−0.26	−0.18	−1.48			
Step 2: clinical						
Comorbid psychological	0.51	0.17	2.54*	0.12	0.10	0.06
Step 3: MRIS				0.26	0.23	0.15
MRIS_INTR	0.01	0.06	0.58			
MRIS_BROOD	0.05	0.36	3.31**			
MRIS_INSTR	0.00	0.00	0.04			
Stress						
Final model $F(6, 176 = 16.30$, $p < 0.01)$						
Step 1: social support				0.04	0.03	0.04
MOS-INTERACT	0.21	0.03	0.38			
Step 2: clinical						
Comorbid psychological	4.28	0.24	3.82**	0.16	0.14	0.12
Time since diagnosis	−0.16	−0.07	−1.10			
Step 3: MRIS				0.36	0.34	0.20
MRIS_INTR	0.24	0.29	2.96**			
MRIS_BROOD	0.19	0.25	2.44*			
MRIS_INSTR	−0.29	−0.23	−3.55**			
Post-traumatic growth—relate						
Final model $F(8, 174 = 10.45$, $p < 0.01)$						
Step 1: demographics (education)	−1.08	−0.17	−2.70**	0.02	0.02	0.02
Step 2: social support				0.22	0.19	0.19
MOS-AFFECT	0.66	0.09	0.86			
MOS-EMOT	3.01	0.40	3.30**			
MOS-INTERACT	0.93	0.12	0.80			
MOS-TANG	−1.44	−0.21	−2.22*			
Step 3 MRIS				0.33	0.30	0.11
MRIS_INTR	0.16	0.21	2.02*			
MRIS_BROOD	−0.11	−0.15	−1.42			
MRIS_INSTR	0.36	0.30	4.49**			
Post-traumatic growth—possibility						
Final model $F(8, 174 = 7.53)$						
Step 1: social support				0.06	0.05	0.06
MOS-AFFECT	0.17	0.03	0.28			
MOS-EMOT	1.48	0.25	2.02*			
MOS-INTERACT	−0.14	−0.02	−0.16			
Step 3: clinical variables				0.10	0.07	0.03
In treatment	−0.84	−0.07	−0.94			
Time since diagnosis	0.20	0.12	1.58			

(Continues)

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Table 3. (Continued)

Variable	B	Std. beta	t	R^2	Adj. R^2	R^2 Δ
Step 4: MRIS				0.26	0.22	0.16
MRIS_INTR	0.29	0.47	4.30**			
MRIS_BROOD	−0.25	−0.44	−3.97**			
MRIS_INSTR	0.28	0.30	4.27**			
Post-traumatic growth—strength						
Final model $F(5, 177 = 5.60, p < 0.01)$						
Step 1: social support				0.04	0.03	0.04
MOS-AFFECT	0.36	0.08	0.81			
MOS-EMOT	0.58	0.13	1.23			
Step 2 MRIS				0.14	0.11	0.10
MRIS_INTR	0.07	0.15	1.28			
MRIS_BROOD	−0.06	−0.13	−1.09			
MRIS_INSTR	0.22	0.30	4.04**			
Post-traumatic growth—spiritual						
Final model $F(4, 178 = 3.77, p < 0.01)$						
Step 1: clinical variables						
Comorbid psychological	0.92	0.16	2.14*	0.02	0.02	0.02
Step 2: MRIS				0.08	0.06	0.06
MRIS_INTR	0.06	0.22	1.91			
MRIS_BROOD	−0.08	−0.32	−2.48*			
MRIS_INSTR	0.07	0.18	2.69**			
Post-traumatic growth—appreciation						
Final model $F(6, 176 = 6.29, p < 0.01)$						
Step 1: social support				0.06	0.04	0.06
MOS-AFFECT	0.54	0.18	1.54			
MOS-EMOT	0.52	0.16	1.24			
MOS-INTERACT	−0.40	−0.12	−0.78			
Step 2: MRIS				0.18	0.15	0.12
MRIS_INTR	0.07	0.20	1.77			
MRIS_BROOD	−0.07	−0.22	−1.91			
MRIS_INSTR	0.17	.34	4.67**			

*$p < 0.05$.
**$p < 0.01$.

of depression, anxiety and stress in some breast cancer patients, with at least moderate levels of depressive symptoms reported in 17.3% of participants, anxiety symptoms in 17.8% and stress symptoms in 17.3%. The presence of negative psychological outcomes likely reflects the influence of many physical and psychological challenges [4]. As predicted, there was strong support for the main hypothesis that rumination would be associated with heightened depression, anxiety and stress, with confirmation of a differential relation with individual components of rumination. The negatively orientated dimension of brooding was positively associated with depression, anxiety and stress, consistent with previous research in clinically well populations [30]. Typically, brooding enables sustained processing of problems and associated emotions without progression to action [42]; thus, it perpetuates a relatively negative style of hopelessness and negative outcome expectancies [43]. In this study, intrusion, representing the intensity and repetitiveness of rumination, was associated with stress, that is, chronic non-specific arousal. The lack of a relationship to depression and anxiety may reflect the low levels of psychological distress reported in the overall sample and that feelings and emotions accompanying their ruminations were more positively orientated. However, the relationship to stress may indicate the aversive nature of intrusive thoughts experienced over an extended period of time given that the majority of the sample was more than 1 year out from diagnosis [35].

While all participants reported some degree of PTG, overall mean levels were lower compared to other breast cancer studies [11,12], possibly reflecting cultural differences related to growth that may not be adequately assessed by the post-traumatic growth inventory [44]. For some participants, PTG was in the presence of significant depression, anxiety or stress symptoms, confirming earlier research that psychological distress and PTG are not mutually exclusive entities [12]. For PTG, the subcomponents of instrumental, intrusion and brooding ruminations demonstrated significant relationships, consistent with previous research [45]. As

expected, instrumental rumination was positively associated with all five PTG dimensions. Instrumental, or reflective, rumination represents an active processing of content, both to understand change in circumstances following diagnosis and the initiation of adaptive behaviours to reduce the disparity between real or 'unhealthy' self and ideal or 'healthy' self [21]. Instrumental rumination is likely to be both purposeful and deliberate, working out solutions to issues that arise out of the cancer experience, such as dealing with treatment effects [35].

As hypothesised, intrusion was positively related to PTG, specifically to relating to others and new possibilities when social support was included in the model. The relationship between intrusion and these dimensions is not unexpected, as cognitive processing may represent an attempt to increase understanding of changed personal circumstances, including a revision of goals and priorities [21,24]. The importance of emotional/informational social support reflects the role of social context in PTG, through self-disclosure and the availability of fresh perspectives [39].

Conversely, brooding was negatively associated with the PTG dimensions of new possibilities and spiritual growth when emotional/informational social support was included in the model. Brooding can involve thoughts of what life might have been like if the cancer diagnosis had not occurred and thus interfere with disengagement from a prior worldview, thereby preventing the creation of new goals inherent in personal growth [39]. Rumination has been shown to be a reclusive activity, so that individuals who brood have a lower level of social interaction, reducing the opportunity for new perspectives [46].

In contrast to previous research reporting a positive relationship between psychological distress and PTG [10], the current research found no such relationship. This may reflect that, in spite of a subgroup that demonstrated moderate to high levels of depression, anxiety and stress, more generally, low levels of psychological distress were reported. Participants also reported that feelings and emotions accompanying their ruminations were more positively orientated.

These findings have implications for all women diagnosed with breast cancer. In the period immediately following a stressor, intrusive rumination may act as a starting point for PTG [28], but when sustained over a longer time frame, it has been linked to psychological distress [35]. Intrusion, where excessive, and brooding may indirectly interfere with adherence to recommended treatment and self-care regimens through their influence on negative psychological states, with the potential for adverse health outcomes [18]. Identifying such ruminative processes can therefore highlight individuals at particular risk of negative psychological outcomes through excessive intrusion and brooding, and direct psychological interventions to both minimise these processes and facilitate the adoption of instrumental rumination to promote PTG. While cognitive-behavioural therapy (CBT) has been used successfully within the cancer context in the management of pain and distress [47], CBT does not specifically address rumination. Newer CBT modalities such as mindfulness-based CBT, which target rumination through the addition of disclosure techniques and mindfulness meditation, seem promising, but further evaluation of their effectiveness is warranted [48].

A number of limitations to this study need to be considered. As the study was based on a female-only breast cancer sample, it was not possible to explore the influence of gender, demonstrated to be important in the context of rumination [49], or to generalise the findings to other cancer groups. Consequently, further research is needed to address the impact of rumination in the context of the unique challenges presented by other cancers and illnesses. While the sample was representative of women with breast cancer [50], generalisability is limited in that the sample was based on self-selection over the Internet from a number of community-based breast cancer groups. It is possible that being associated with these community organisations reduces the prevalence of reported rumination given the documented relationship between social support and psychological outcomes [5–7]. Although adopted to ensure a good ratio of cases to independent variables, the use of bivariate correlations to identify variables for the analysis potentially raises the issue of over-specification of the model. Finally, as a cross-sectional study, inferences about causality cannot be made. Future research should extend this work to other cancer and illness groups to facilitate comparisons by gender and between different illness groups. The adoption of a longitudinal approach would also allow for how patterns of rumination might differentially affect psychological outcomes along the trajectory of an illness.

Overall, by examining the differential impacts of the various subcomponents of rumination on distinct dimensions of PTG, these findings have extended prior research that has demonstrated the role of rumination in psychological distress and in PTG [15,27]. In particular, the identification of specific dimensions of rumination involved in promoting negative and positive psychological responses in women diagnosed with breast cancer provides a basis from which psychosocial interventions can be improved to minimise distress and optimise PTG. In addition, the study provided further confirmation for the applicability of the MRIS as a measure of rumination within an oncology population.

Appendix Table I: Pearson correlations among key study variables

	Age	Ptnr	Educ	Stage	Time dx	Compl	Treat	MOS-E	MOS-T	MOS-A	MOS-I	Phys	Psych	Intr	Brood	Instr	DASS-D	DASS-A	DASS-S	PTGI-R	PTGI-P	PTGI-ST	PTGI-SP
Ptnr	−0.07																						
Educ	−0.02	−0.06																					
Stage	−0.04	−0.01	0.18*																				
Time dx	0.34**	0.10	−0.04	0.01																			
Compl	0.20**	0.01	−0.04	−0.19*	.51																		
Treat	−0.24	−0.11	0.01	0.22**	−0.45**	−0.68**																	
MOS-E	0.02	0.20**	0.02	0.01	0.09	−0.02	−0.02																
MOS-T	−0.00	0.25**	0.04	0.08	0.03	−0.12	0.12	0.68**															
MOS-A	−0.04	0.47**	−0.01	0.12	0.07	−0.08	−0.04	0.71**	0.67**														
MOS-I	0.07	0.30**	0.00	0.02	0.08	−0.03	−0.07	0.85**	0.73**	0.80**													
Phys	0.27**	−0.12	0.20**	0.03	−0.04	0.02	−0.01	0.03	−0.01	−0.05	−0.02												
Psych	−0.07	−0.15*	0.11	0.02	0.00	0.09	−0.03	−0.11	−0.12	−0.14	−0.18*	0.16*											
Intr	−0.25**	0.05	−0.03	0.04	−0.16*	0.07	−0.02	−0.31**	−0.22**	−0.22**	−0.32**	−0.06	0.24**										
Brood	−0.22**	0.04	0.04	0.17*	−0.16*	−0.06	0.10	−0.25**	−0.14	−0.19**	−0.27**	−0.03	0.24**	0.78**									
Instr	−0.14	0.03	0.12	0.07	−0.04	−0.03	0.02	0.07	0.02	0.06	0.04	0.00	0.06	0.26**	0.33**								
DASS-D	−0.10	−0.03	−0.05	0.03	−0.17*	−0.03	0.16*	−0.25**	−0.17*	−0.21**	−0.30**	0.08	0.37**	0.56**	0.61**	0.49							
DASS-A	−0.03	0.04	0.01	0.12	−0.10	−0.06	0.09	−0.15*	−0.02	−0.09	−0.22**	0.05	0.29**	0.41**	0.47**	0.15*	0.65**						
DASS-S	−0.05	0.09	0.03	0.07	−0.15*	−0.01	0.08	−0.14	−0.09	−0.07	−0.19**	0.05	0.35**	0.49**	0.46**	−0.06	0.72**	0.54**					
PTGI-R	−0.05	0.05	−0.15*	−0.01	0.08	0.00	−0.03	0.40**	0.18*	0.33**	0.36**	−0.01	−0.05	0.04	−0.01	0.32**	−0.03	0.02	−0.06				
PTGI-P	−0.11	0.03	−0.02	−0.02	0.16*	0.15*	−0.18*	0.25**	0.04	0.20**	0.21**	−0.02	0.04	0.11	−0.06	0.29**	−0.06	−0.04	−0.06	0.74**			
PTGI-ST	−0.14	0.00	−0.10	0.01	0.12	−0.01	−0.01	0.19*	0.04	0.18*	0.12	−0.10	0.06	0.07	0.04	0.31**	−0.02	0.02	−0.03	0.75**	0.72**		
PTGI-SP	0.08	−0.02	−0.01	−0.03	0.09	0.13	−0.09	0.13	−0.07	0.09	0.07	0.01	0.15*	0.06	−0.05	0.15*	−0.05	−0.02	−0.03	0.49**	0.52**	0.47**	
PTGI-A	−0.08	0.07	−0.02	0.04	0.08	0.06	−0.06	0.20**	0.07	0.21**	0.17*	−0.04	−0.05	0.07	0.01	0.34**	0.00	−0.02	−0.10	0.70**	0.68**	0.60**	0.44**

Ptnr, partner; **Educ**, education; **Time dx**, time since diagnosis; **Compl**, time since completed treatment; **Treat**, in treatment; **MOS-E**, medical outcomes social support survey (emotional subscale); **MOS-T**, medical outcomes social support survey (tangible subscale); **MOS-A**, medical outcomes social support survey (affectionate subscale); **MOS-I**, medical outcomes social support survey (positive social interaction subscale); **Phys.**, comorbid physical conditions; **Psych.**, psychological comorbid conditions; **DASS-D**, Depression Anxiety Stress Scale (depression subscale); **DASS-A**, Depression Anxiety Stress Scale (anxiety subscale); **DASS-S**, Depression Anxiety Stress Scale (stress subscale); **PTGI-R**, post-traumatic growth inventory (relating to others subscale); **PTGI-P**, post-traumatic growth inventory (new possibilities subscale); **PTGI-ST**, post-traumatic growth inventory (personal strength subscale); **PTGI-SP**, post-traumatic growth inventory (spirituality subscale); **PTGI-A**, post-traumatic growth inventory (appreciation subscale).

*$p < 0.05$.

**$p < .01$.

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Conflict of interest

No potential conflict of interest reported.

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Chapter 8: The Longitudinal Study of Rumination in Breast Cancer

Abstract

Objective Psychological distress and post-traumatic growth frequently coexist following a breast cancer diagnosis. This longitudinal study examined the role of rumination in psychological outcomes across a 12-month trajectory in breast cancer survivorship.

Methods Women diagnosed with primary breast cancer (*N*=123), completed an online survey on three occasions with 6-month intervals between surveys. Measures included the Multidimensional Rumination in Illness Scale, Depression Anxiety and Stress Scales, Post-traumatic Growth Inventory, and the Medical Outcomes Social Support Survey. Demographic and medical history information were collected at the first time point only.

Results Linear mixed model analyses indicated that changes in brooding rumination predicted change over time in depressive symptoms, and post-traumatic growth for the relating to others and appreciation for life dimensions, while brooding rumination predicted change over time in depressive and anxiety symptoms.

Conclusions These findings demonstrate a causal pathway from rumination to both psychological distress and post-traumatic growth in breast cancer survivors. Future clinical and research should address and monitor these identified risk factors for distress and the enhancement of strengths that may promote post-traumatic growth.

Keywords: Cancer, Oncology, Rumination, Post-Traumatic Growth.

Breast cancer is a leading cause of cancer mortality in women (American Cancer Society [ACS], 2011), yet breast cancer survival rates are increasing in light of advances in diagnosis and treatment (Australian Institute of Health and Welfare [AIHW], 2010). Persistent side effects from treatment and the potential for disease recurrence mean that the physical, psychosocial and existential challenges inherent in such a diagnosis extend into the survivorship period (Andrykowski et al., 2008; Canavarro & da Silva, 2015; Deimling et al., 2006; Hewitt et al., 2006). Psychological distress, particularly depression and anxiety, can commonly ensue (Burgess et al., 2005; Den Oudsten et al., 2009; Kissane et al., 2004; Stark & House, 2000), with rates of clinical and sub-clinical depression ranging from 25 to 65% (Reich, Lesur, & Perdrizet-Chevalier, 2008), as well as diminished quality of life (Rowland & Massie, 2010). However, positive change post-diagnosis, termed post-traumatic growth, has also been documented in up to 83% of breast cancer patients (Sears et al., 2003). Tedeschi and Calhoun (1996) outlined five domains of post-traumatic growth: closer and more meaningful relationships, a greater appreciation for life, the acceptance of new possibilities and priorities, greater personal strength to meet future challenges and enhanced spirituality, with greater change reported in relating to others, personal strength and appreciation of life in the context of breast cancer (Mols et al., 2009; Mystakidou et al., 2007).

Following a breast cancer diagnosis, the experience of psychological distress and post-traumatic growth is not a mutually exclusive experience (Schroevers et al., 2010; Stanton et al., 2003), although, the relationship, if any, between these two constructs remains uncertain (Bower et al., 2005). Some studies report that post-traumatic growth serves to offset psychological distress (Carver & Antoni, 2004; Helgeson et al., 2006), whereas others indicate that these emotional responses are not directly related and remain distinct constructs (Chan et al., 2011; Cordova et al., 2001; Cordova et al., 2007; Soo & Sherman, 2015). Consequently, research is needed to more fully understand the relationship between these variables.

Rumination, "the cognitive process of actively thinking about a stressor, the thoughts and feelings it evokes and the implications for one's life and future" (Watkins, 2008, p. 164), has been suggested as a common mechanism, influencing both psychological distress and rumination through distinct pathways. Rumination has been linked to the development of depression and anxiety (Calmes & Roberts, 2007; Fresco, Frankel, Mennin, Turk, & Heimberg, 2002; Harrington & Blankenship, 2002; Lam et al., 2013; Mor & Winquist, 2002; Morris & Shakespeare-Finch, 2011; Nolen-Hoeksema, 2000; Steiner et al., 2014), to poorer quality of life (QoL; Garnefski et al., 2009; Li et al., 2015) and to post-traumatic growth following a breast cancer diagnosis (Chan et al., 2011; Lelorain, Tessier, Florin, & Bonnaud-Antignac, 2012). Rumination can be both an automatic or a conscious process initiated to reconstruct the 'shattered worldview' after a traumatic experience (Janoff-Bulman, 1992), such as the diagnosis of breast cancer. Diagnosed individuals face psychological challenges from the disruption of their sense of identity, personal beliefs and goals (Bellizzi, Miller, Arora, & Rowland, 2007; Cordova et al., 2007; Knobf, 2007; Mols et al., 2009), with rumination representing attempts to achieve understanding, resolution of changed circumstances and to reduce dissonance between an ideal self as 'healthy' and a real self as affected by disease (Greenberg, 1995). At the same time, ruminating on the fleeting and uncertain nature of life can lead to an enhanced appreciation of life (Janoff-Bulman, 1992).

Rumination is a complex and multifaceted construct, with both adaptive and maladaptive elements (Soo & Sherman, 2013). It is this complexity that explains the seemingly contradictory outcomes of rumination regarding the co-existence of distress and growth (Cordova et al., 2007; Joormann et al., 2006; Schroevers et al., 2010). Distinctions are therefore, drawn between ruminative subtypes: intrusive rumination, instrumental or reflective rumination, and brooding rumination (Treynor et al., 2003).

Intrusive rumination relates to thoughts that come unexpectedly into awareness, may be

uncontrollable, most commonly with a negative valence and a clear linkage to depression (Morris & Shakespeare-Finch, 2011; Starr & Moulds, 2006). Commonplace amongst cancer survivors (Park et al., 2010), intrusive rumination can unrelentingly present reminders of the cancer experience, generating cognitive streams relating to personal threat, individual vulnerability, physical and emotional loss (Bigatti, Steiner, & Miller, 2012; Gallagher, Parle, & Cairns, 2002). These represent the maladaptive cognitive responses that underlie the vulnerability-stress models of depression and anxiety (Alloy et al., 2000; Beck & Emery, 1985; Nolen-Hoeksema, Morrow, & Fredrickson, 1993). However, intrusive rumination is also influential in the development of post-traumatic growth (Calhoun et al., 2000; Soo & Sherman, 2014). When intrusive rumination occurs immediately after the cancer diagnosis, it can represent an automatic attempt to process the trauma of diagnosis, to assimilate and integrate it into the individual's cognitive framework, thus facilitating growth (Calhoun et al., 2000; Matarazzo, 2008). This proposed dual role for intrusive rumination may be a function of timing. In the period immediately following diagnosis, intrusive thoughts may serve as a precursor to post-traumatic growth by eliciting purposeful reflection, because although initially instigated by negative affect, ultimately this leads to effective problem-solving (Treynor et al., 2003). In contrast, when intrusive thoughts continue over time, uncontrolled, the link to psychological distress intensifies, preventing disengagement and sense-making, while compounding any sense of personal helplessness (Janoff-Bulman, 1992; Park et al., 2010).

A failure to disengage also underlies brooding rumination, the perseverative, passive focus on negative events or emotions, unattainable goals and the barriers faced in advancing those goals (Stockton et al., 2011; Treynor et al., 2003). Attending to the negative aspects of a situation, such as a breast cancer diagnosis, and persisting with what now may be unachievable goals in this way, can perpetuate a state of uncertainty and indecision (Ward et al., 2003). Coupled with a negative

relationship to problem-solving (Hong, 2007), the maladaptive nature of brooding rumination prevents the resolution of perceived discrepancies between current and ideal states (Carver & Scheier, 1981). Consequently, brooding rumination has been related to depression both in concurrent and longitudinal analyses of community samples and cancer survivors (Morris & Shakespeare-Finch, 2011; Treynor et al., 2003).

As a more deliberate form that involves active engagement with problem-solving, instrumental rumination has been shown to facilitate post-traumatic growth (Chan et al., 2011; Lelorain et al., 2012; Soo & Sherman, 2015; Stockton et al., 2011; Treynor et al., 2003). Consequently, instrumental rumination is an adaptive process, in which the individual evaluates and reconsiders their worldview to work towards lessening any psychological discomfort (Janoff-Bulman, 2004; Kolokotroni et al., 2014). Instrumental rumination, therefore, works towards closing the gap between the ideal self as "healthy" and the real self as affected by the breast cancer diagnosis by reconstructing the shattered worldview (Janoff-Bulman, 1992; Morris & Shakespeare-Finch, 2011; Stockton et al., 2011; Tedeschi & Calhoun, 2004).

Growth may be seen across all the five domains outlined by Tedeschi and Calhoun (1996). However, few studies have investigated the differential roles of the distinct elements of rumination in relation to the individual dimensions of post-traumatic growth. A cross-sectional study of breast cancer survivors (Soo & Sherman, 2015) found that instrumental rumination was positively related to all dimensions of post-traumatic growth, and intrusive rumination to the relating to others and new possibilities dimensions of post-traumatic growth, consistent with Calhoun et al. (2000) who demonstrated a relationship between intrusive rumination and post-traumatic growth in individuals who had experienced a traumatic event. These studies support the idea of subtle variations in the relationship between rumination and post-traumatic growth which warrants further investigation.

Time since diagnosis has also been shown to be a critical factor for consideration in

psychological outcomes following breast cancer, reflecting the multiple challenges experienced along the disease trajectory (Bussell & Naus, 2010; Danhauer et al., 2013; Tomich & Helgeson, 2002). Over time, depressive and anxious symptoms tend to diminish for most women diagnosed with breast cancer, eventually returning to levels comparable to those seen in the general population (Bower et al., 2005). QoL in survivors following completion of active treatment is also generally high (Ganz et al., 2002). However, it is less clear how post-traumatic growth changes with time. In individuals diagnosed with breast cancer, greater post-traumatic growth has been associated with greater time since diagnosis (Cordova et al., 2001; Mols et al., 2009; Sears et al., 2003), with a meta-analysis suggesting that a minimum of two years is needed for post-traumatic growth to develop (Helgeson et al., 2006). In contrast, one longitudinal study of breast cancer patients reported post-traumatic growth was evident shortly after diagnosis (Manne et al., 2004), while a further longitudinal study failed to find any post-traumatic growth in the first six months following treatment (Scrignaro et al., 2011). Such inconsistencies may reflect changing patterns in rumination over time, particularly in view of the series of challenges faced over the breast cancer trajectory (Andrykowski et al., 2008). With most research being correlational in nature (Chan et al., 2010; Lelorain et al., 2012; Soo & Sherman, 2015; Treynor et al., 2003), longitudinal research is needed to further investigate the changing patterns of the association between rumination, distress and post-traumatic growth.

As the population of breast cancer survivors expands, it is essential to understand the origins of psychological outcomes experienced by this group (Brosschot, 2010; Brunet, McDonough, Hadd, Crocker, & Sabiston, 2010). The aim of this 12-month follow-up prospective study was to assess the relationship between rumination and psychological distress (characterised by depression and anxiety), QoL and the five dimensions of post-traumatic growth (appreciation of life, new possibilities, personal strength, relating to others, spirituality) over time in breast cancer survivors.

It was predicted that depression and anxiety would decrease, and that post-traumatic growth and QoL would increase over time. Further, it was predicted that depression and anxiety would be negatively related to post-traumatic growth. Brooding rumination would be positively related to depression and anxiety, and negatively related to the five dimensions of post-traumatic growth and QoL. Instrumental rumination would be positively associated with the five dimensions of post-traumatic growth and QoL, and negatively related to depression and anxiety. Intrusive rumination would be positively related to depression, anxiety and the five dimensions of post-traumatic growth, and negatively related to QoL.

Method

Participants and procedure

Study participants consisted of 185 females (M_{age} = 55.98, SD_{age} = 9.26, range 33 to 77), diagnosed with primary breast cancer, able to complete an English-language questionnaire and with computer access. Individuals receiving palliative care were excluded from the study. Participants were recruited through an emailed invitation sent to members of the Breast Cancer Network Australia (BCNA), a nationwide breast cancer consumer organisation, and through a dedicated study website (http://mris.com.au/). Participants completed an anonymous, online survey at three time points: Time 1 (T1; entry point), Time 2 (T2; 6 months post-study entry), Time 3 (T3; 12 months post-study entry) following informed consent. Ethics approval was obtained from the Macquarie University Human Research Ethics Committee.

Measures

The Multidimensional Rumination in Illness Scale. (MRIS; Soo, Sherman, & Kangas, 2014). The 41-item MRIS measures rumination in response to physical illness and consists of three sub-scales: Intrusion (e.g., *"I can't seem to control thinking about my illness"*), Brooding (e.g., *"I*

think that trying new things may be pointless"), Instrumentality (e.g., "*Thinking about my illness helps me understand its cause*"). Participants rated all MRIS items according to frequency in relation to a current illness using a 5-point Likert-type scale ('0' = 'Not at all' to 4 = 'Almost always'). Item scores were summed to yield subscale scores with a possible range of 0 to 64 (Brooding), 0 to 68 (Intrusion), 0 to 32 (Instrumentality) and full-scale scores from 0 to 164, with higher scores representing a greater tendency towards rumination. Two supplementary items were scored separately from the main scale and indicated "*Amount of time thoughts about illness were accompanied by feelings or emotion*s" (5-point Likert-type scale; '0' = 'Not at all' to 4 = 'Almost always') and whether "*these feelings or emotions tend to be more positively or negatively orientated"* (5-point Likert-type scale; '0' = 'Very negative' to 4 = 'Very positive'). The MRIS scale has demonstrated internal consistency, test-retest reliability and validity (Soo et al., 2014; Soo & Sherman, 2015). High internal consistency was demonstrated for the full scale (.94), and the subscales of Intrusion (.90), Brooding (.92) and Instrumentality (.86) in the current study.

Depression, Anxiety and Stress Scales (DASS; Lovibond & Lovibond, 1995). Depressive and anxious symptomatology was assessed with the DASS, which has demonstrated good validity, adequate internal consistency and test-retest reliability (Brown et al., 1997). For each 7-item subscale, participants rated on a 4-point Likert-type scale (0 = 'Did not apply to me at all' to 3 = 'Applied to me very much or most of the time') the extent to which they experienced each state over the previous week. Both DASS subscales showed high internal consistency in the current study (Depression α = .92, Anxiety α = .79).

The Post-Traumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). The 21-item PTGI measured reported positive change following adversity across five dimensions: Relating to Others, New Possibilities, Personal Strength, Spiritual Change and Appreciation of Life. Each item

was rated along a six-point Likert-type scale (0 = 'I did not experience this change as a result of my illness' to 5 = 'I experienced this change to a very great degree as a result of my illness'). For the five sub-scale scores, higher scores demonstrate a greater level of post-traumatic growth. The PTGI is reported to have good reliability and validity (Tedeschi & Calhoun, 2004). Cronbach's alpha for the total score has consistently reported in the high range from α = .91 to 0.93 (Anderson & Lopez-Baez, 2008; Bates, Trajstman, & Jackson, 2004; Brunet et al., 2010; Morris et al., 2005). In the current study, high internal consistency was demonstrated for the subscales of relating to others (.91), new possibilities (.89), personal strength (.86), spiritual change (.79) and appreciation (.86).

The Functional Assessment of Cancer Therapy - General (FACT-G; Cella et al., 1993). The 27-item FACT-G assessed quality of life across four sub-scales: physical, social/family, emotional and functional well-being. For this study, only the total rating of quality of life was used. Each item was rated along a 5-point Likert-type scale (0='Not at all' to 4='Very much'). Higher scores on the FACT-G indicate a greater quality of life.

The Medical Outcomes Social Support Survey (MOS-SS; Sherbourne & Stewart, 1991). The 19-item MOS-SS measured multiple dimensions of support: emotional/ informational, tangible, affectionate and positive social interaction, as a potential covariate given the documented relationship between psychological outcomes and social support (Soo & Sherman, 2015). Each item was rated along a 5-point Likert-type scale (1 = 'None of the time' to 5 = 'All of the time'). The scale was scored as a total across all dimensions, with higher scores demonstrating a greater level of social support. The scale has demonstrated reliability and validity (Sherbourne & Stewart, 1991). High internal consistency was demonstrated for the full scale (.97) in the current study.

Demographic and Clinical Characteristics. At study entry, T1, participants provided information about age, marital status, and level of education, as well as any co-morbid physical and

psychological diagnoses. In relation to their breast cancer diagnosis, participants indicated time since diagnosis, stage at diagnosis and current treatment status.

Data analyses

Analyses were performed using SPSS® (SPSS Inc., 2017), with statistical significance set at $p < .05$. Baseline demographic and clinical characteristics of participants who dropped out of the study were compared with those who remained in the study by conducting *t*-tests and chi-square tests.

Guided by the literature, the potential for confounding effects of several variables including the sociodemographic variables of age (Cordova et al., 2001, 2007), education (Bellizzi & Blank, 2006), social support (Soo & Sherman, 2015) and the clinical variables of time since diagnosis (Cordova et al., 2001), comorbid physical and psychological conditions (Aldao et al., 2010) were explored through bivariate correlations. All potential confounding variables were included as covariates, with categorical variables treated as continuous variables, across all subsequent analyses.

Maximum-likelihood linear mixed models tested the effect of rumination components on depression, anxiety, dimensions of post-traumatic growth and QoL. Incomplete data is not unusual in longitudinal research and this analysis retains participants with missing data which increases power and avoids the introduction of bias. The relationship between depression, anxiety and post-traumatic growth was also examined. The moderating effect of intrusive, brooding and instrumental rumination respectively was further explored between time, depression, anxiety and the five dimensions of post-traumatic growth. As intrusive, brooding and instrumental rumination are all continuous variables, significant moderating effects were explored by comparing the scores for depression, anxiety, QoL and the dimensions of post-traumatic growth at each time point against the mean and one standard deviation above and below the mean on the moderating variable.

Results

A total of 272 individuals registered to participate in the study and a final sample of n = 185 remained at baseline for analysis after accounting for individuals who registered but then did not complete the survey (n = 80) and removing incomplete data (n = 7). Following the baseline questionnaire data collection, 52 participants at six-months follow-up were removed as they did not complete the follow-up survey and six were removed for missing data. A further four participants were removed at 12-months due to missing data, leaving 123 participants who completed baseline, then at least one follow-up questionnaire through to 12- months (45% retention; See Figure 1 for a diagram of participant progress through this study). Participant baseline characteristics and between-subject comparisons for participants that completed at least two questionnaires (final sample) and individuals lost to follow-up are displayed in Table 1. A series of t-tests and chi-square analyses revealed that there were no significant differences between the group of participants included in the final sample and the group of participants lost to follow-up.

Identifying covariates. Several clinical variables were identified as covariates to be included across the subsequent mixed model analysis. The variable of comorbid physical conditions was positively related to depression (r = .18, p = .047) and anxiety (r = .19, p = .037), and the variable of comorbid psychological disorders positively related to depression (r = .27, p = .003), anxiety (r = .22, p = .016), and increased spirituality (r = .20, p = .030). Time since diagnosis was negatively related to depression (r = -.26, p = .003) and anxiety (r = -.31, p < .001), and positively related to total post-traumatic growth (r = .20, p = .026), and the new possibilities (r = .23, p = .011) and strength (r = .21, p = .023) subscales of the PTGI.

Of the demographic variables, age was negatively related to personal strength (r = -.19, p = .039) and education level was negatively related to total post-traumatic growth (r = -.19, p = .040)

and relating to others (r = -.23, p = .012). Social support was positively related to QoL (r = .44, p < .001), total post-traumatic growth (r = .29, p = .001), relating to others (r = .41, p < .001), new possibilities (r = .20, p = .026) and appreciation of life (r = .21, p = .020).

Change in depression, anxiety and QoL over time. Descriptive statistics for the psychological distress outcome variables at baseline, 6-months and 12-months are reported in Table 2. Based on Australian adult population norms (Crawford, Cayley, Lovibond, Wilson, & Hartley, 2011), DASS depression scores did not differ from the Australian adult population norm at baseline, t(122) = 0.51, p = .610, 95% CI [-.88, 1.50]; T2 t(108) = 0.32, p = .751, 95% CI [-.97, 1.34], or T3 t(83) = -1.13, p = .264, 95% CI [-1.65, .96]. Similarly, DASS anxiety scores did not differ from the Australian adult population norm at baseline t(618) = 4.27, p < .001, 95% CI [1.19, 3.23], T2, t(108) = 1.18, p = .242, 95% CI [-1.37, .35], or
T3 t(122) = -.85, p = .396, 95% CI [-1.51, .60]. Overall, depression and anxiety scores trended downwards over time, but there was no significant change over time for depression, F(2, 200.76) = 1.74, p = .178, or for anxiety, F(2, 203.97) = 0.07, p = .935. For QoL, scores trended upwards over time, but the change was not significant, F(2, 196.23) = .74, p = .478.

Change in post-traumatic growth over time. Descriptive statistics for the post-traumatic growth outcome variables at baseline, 6-months and 12-months follow-up are reported in Table 2. Overall, there was no significant change over time for any dimension of post- traumatic growth, including: total post-traumatic growth, F(2, 193.27) = 1.69, p = .188; relating to others, F(2, 194.66) = 1.36, p= .258; appreciation of life, F(2, 195.71) = 1.90, p = .153; personal strength, F(2, 193.94) = 0.66, p = .519; new possibilities, F(2, 193.30) = 0.24, p = .784; and, spiritual change, F(2, 193.54) = 1.76, p = .175.

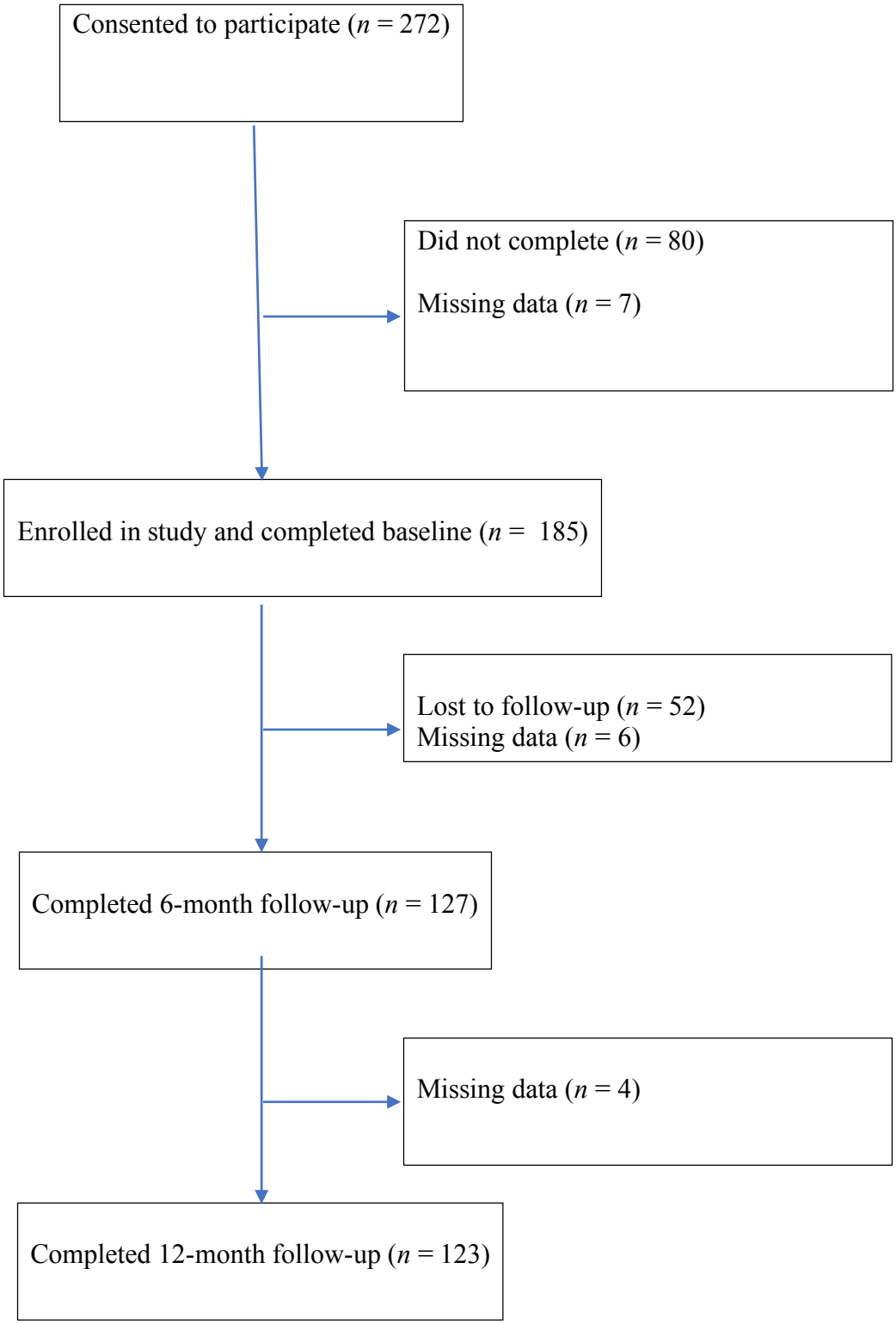

Figure 1. Participant progress through each stage of the study

Table 1
Participant Characteristics at Baseline

Variable	Final sample $n = 123$ *M* (*SD*) or % (n)	Dropouts $n = 61$ *M* (*SD*) or %	Between group comparisons *t* or χ^2, *p*	Association at baseline (*r*)			
				Depression	Anxiety	QOL	PTGI
Age (years)	55.28 (8.34)	57.69 (10.59)	$t(97.98) = 1.56, p = .123$	-.13	-.08	0.17	-0.13
Partnered (%)			$\chi^2 (1, N = 184) = .02, p = .882$	-.06	.02	-0.00	-0.06
No	30.1 (37)	31.1 (19)					
Yes	69.9 (86)	68.9 (42)					
Education (%)			$\chi^2 = (3, N = 184) = 1.93, p = .588$	-.05	-.09	0.05	-.19*
High school	30.1 (37)	29.5 (18)					
Technical school	17.1 (21)	24.6 (15)					
Undergraduate studies	24.4 (30)	18.0 (11)					
Postgraduate studies	28.5 (35)	27.9 (17)					
Social support	7.64 (2.07)	7.80 (1.85)	$t(180) = 0.52, p = .606$	-.13	-.08	.44**	0.29**
Comorbidity							
Physical	0.98 (1.13)	1.46 (1.73)	$t(86.27) = 1.95, p = .054$	.18*	0.19*	-0.06	-0.03
Psychological	0.24 (0.53)	0.26 (0.57)	$t(182) = 0.31, p = .756$	.27**	0.22*	-0.18**	0.14

Variable	Final sample $n = 123$ M (SD) or % (n)	Dropouts $n = 61$ M (SD) or %	Between group comparisons t or χ^2, p	Association at baseline (r)			
				Depression	Anxiety	QOL	PTGI
In treatment (%)			$\chi^2_{(1, N = 184)} = 2.32$, $p = .127$	.16	0.09	-0.27**	-0.04
No	50.4 (62)	62.3 (38)					
Yes	49.6 (61)	37.7 (23)					
Chemotherapy (%)			$\chi2(1, N = 184) = 0.37$, $p = .847$	-.14	-.04	-0.03	.11
No	30.9 (38)	29.5 (18)					
Yes	69.1 (85)	70.5 (43)					
Stage (%)			$\chi^2_{(4, N = 184)} = 2.14$, $p = .710$	.01	-.07	-.16	.03
Unknown	14.6 (18)	23.0 (14)					
1	32.5 (40)	31.1 (19)					
2	35.0 (43)	31.1 (16)					
3	13.0 (16)	11.5 (7)					
4	4.9 (6)	3.3 (2)					
Time since diagnosis	9.64 (3.45)	9.67 (3.46)	$t(182) = 0.06$, $p = .956$	-.26**	-0.31**	0.27**	0.20*

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

Psychological distress as a predictor of post-traumatic growth. Neither depression $F(1, 286.86) = 0.13$, $p = .724$, nor anxiety $F(1, 253.01) = 0.37$, $p = .544$ were significant predictors of total post-traumatic growth. There was also no significant interaction between depression $F(2, 183.19) = 1.07$, $p = .344$, or anxiety $F(2, 185.00) = 0.78$, $p = .459$, with post-traumatic growth over time.

Table 2

Descriptive Statistics and Change Over Time for Rumination, Psychological Distress and Post-traumatic Growth

Variable	Range	Baseline *M* (*SD*)	6 months *M* (*SD*)	12 months *M* (*SD*)	Change over Time *f*	*P*
MRIS	6-117	44.51(21.55)	40.75(20.90)	38.63(21.46)	8.70	>.001
Intrusion	0-50	13.40(9.30)	11.91(9.38)	10.76(8.72)	6.37	.002
Instrumental	1-31	13.66(6.52)	12.94(6.16)	12.27(6.84)	4.81	.009
Brood	0-45	17.46(10.12)	15.91(10.08)	15.58(10.32)	5.05	.007
Emotional	1-5	2.92(0.93)	2.85(.98)	2.77(.93)	1.19	.307
Valence	1-5	3.58(1.27)	3.53(1.28)	3.59(1.27)	0.02	.984
Depression	0-34	4.62(6.67)	4.50(6.07)	3.71(4.85)	1.74	.178
Anxiety	0-20	3.95(4.54)	3.80(4.55)	3.86(4.87)	0.07	.935
QoL	40-108	81.60(14.96)	82.18(14.91)	83.17(13.53)	0.74	.478
Post-traumatic Growth	2-84	47.77(20.43)	47.12(19.83)	45.88(21.80)	1.69	.188
Relate to Others	0-28	16.71(7.71)	16.73(7.12)	16.48(7.82)	1.36	.258
Personal Strength	0-16	9.68(4.76)	9.72(4.80)	9.72(4.84)	0.66	.519
Appreciation of Life	0-12	8.98(3.09)	8.56(3.21)	8.38(3.53)	1.90	.153
New Possibilities	0-20	9.90(5.87)	9.50(5.55)	9.56(5.90)	0.24	.784
Spirituality	0-8	2.5(2.65)	2.61(2.59)	2.26(2.60)	1.76	.175

Rumination as a predictor of distress and post-traumatic growth. Total rumination was a significant predictor of depression $F(1, 261.39) = 37.51$, $p < .001$; anxiety $F(1, 203.71) = 46.01$, $p < .001$; and, QoL $F(1, 246.97) = 72.53$, $p < .001$. Total rumination was also a significant predictor of total post-traumatic growth, $F(1, 281.85) = 17.04$, $p < .001$, and the subscales of greater appreciation for life $F(1, 258.61) = 16.91$, $p < .001$; relating to others $F(1, 267.24) = 20.06$, $p < .001$; spirituality $F(1, 290.49) = 7.28$, $p = .007$; strength $F(1, 268.42) = 6.71$, $p = .010$); and, new possibilities $F(1, 283.78) = 10.44$, $p = .001$.

Intrusive rumination was a significant predictor of depression $F(1, 263.31) = 48.07$, $p < .001$; anxiety $F(1, 205.31) = 45.37$, $p < .001$; and, QoL $F(1, 261.70) = 55.60$, $p < .001$. Intrusive rumination was also a significant predictor of total post-traumatic growth $F(1, 284.76) = 7.54$, $p = .006$; and the subscales of greater appreciation for life $F(1, 263.23) = 6.56$, $p = .011$; relating to others $F(1, 271.62) = 8.80$, $p = .003$; spirituality $F(1, 291.67) = 4.50$, $p = .035$; and, new possibilities $F(1, 285.66) = 6.04$, $p = .015$.

Brooding rumination was a significant predictor of depression $F(1, 254.96) = 47.07$, $p < .000$; anxiety $F(1, 189.07) = 56.43$, $p < .001$; and QoL $F(1, 229.93) = 130.50$, $p < .001$. Brooding rumination was also a significant predictor of total post-traumatic growth $F(1, 280.93) = 5.40$, $p = .021$; and the subscales of greater appreciation for life $F(1, 255.40) = 6.99$, $p = .009$; and relating to others $F(1, 266.30) = 10.72$, $p = .001$.

Instrumental rumination was a significant predictor of total post-traumatic growth $F(1, 290.54) = 31.30$, $p < .001$; and the subscales of greater appreciation for life $F(1, 271.09) = 29.07$, $p <.001$; relating to others $F(1, 282.64) = 23.62$, $p < .000$; new possibilities $F(1, 291.75) = 21.74$, $p < .001$; strength $F(1, 286.25 = 22.57$, $p < .001$; and, spiritual growth $F(1, 289.80) = 8.86$, $p = .003$.

Moderation analyses

Depression. As shown in Table 3, there was a significant interaction between intrusive rumination and depression, $F(2, 186.96) = 8.24$, $p < .001$, such that those with lower intrusive rumination reported lower depression at each time point; although depression scores started to converge by the final follow-up (see Figure 2, part A). There was a significant interaction between brooding rumination and depression, $F(2, 187.97) = 6.00$, $p = .003$, such that those with lower intrusive rumination reported lower depression at each time point; although depression scores started to converge by the final follow-up (see Figure 2, part B).

Anxiety. There was a significant interaction between intrusive rumination and anxiety, $F(2, 194.12) = 4.29$, $p = .015$, such that those with lower intrusive rumination reported lower depression at each time point; although depression scores started to converge by the final follow-up (see Figure 2, part C).

Relate to others. There was evidence of a significant interaction between brooding rumination and relating to others, $F(2, 181.46) = 4.25$, $p = .016$ such that those with lower brooding rumination reported lower relating to others at each time point (see Figure 2, part D).

Appreciation of life. There was evidence of a significant interaction between brooding rumination and appreciation for Life, $F(2, 182.98) = 3.75$, $p = .025$, such that those with lower brooding rumination reported lower relating to others at each time point (see Figure 2, part E).

Table 3

Moderation Analyses

							Post-traumatic Growth											
	Depression		Anxiety		QoL		Total PTG		Relate to Others		Appreciation of Life		Personal Strength		Spirituality		New Possibilities	
Variable	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*
MRIS	5.85	.003**	3.79	.024*	0.84	.435	2.71	.070	2.39	.095	1.29	.277	0.81	.445	0.83	.439	1.59	.207
Intrusion	8.14	>.001**	4.29	.015*	0.59	.556	0.81	.445	0.96	.385	0.08	.924	0.29	.747	0.75	.474	1.09	.338
Instrumental	0.03	.972	0.83	.438	1.79	.171	0.44	.646	0.26	.772	0.26	.775	0.21	.812	1.01	.366	0.65	.525
Brood	6.00	.003**	2.05	.132	0.55	.578	5.02	.008**	4.25	.016*	3.75	.025*	1.23	.294	1.73	.180	2.85	.060

Note. *$p < .05$. **$p < .01$; Moderating effects of rumination, intrusive, instrumental and brooding rumination individually are shown on scores of depression, anxiety, QOL and dimensions of post-traumatic growth.

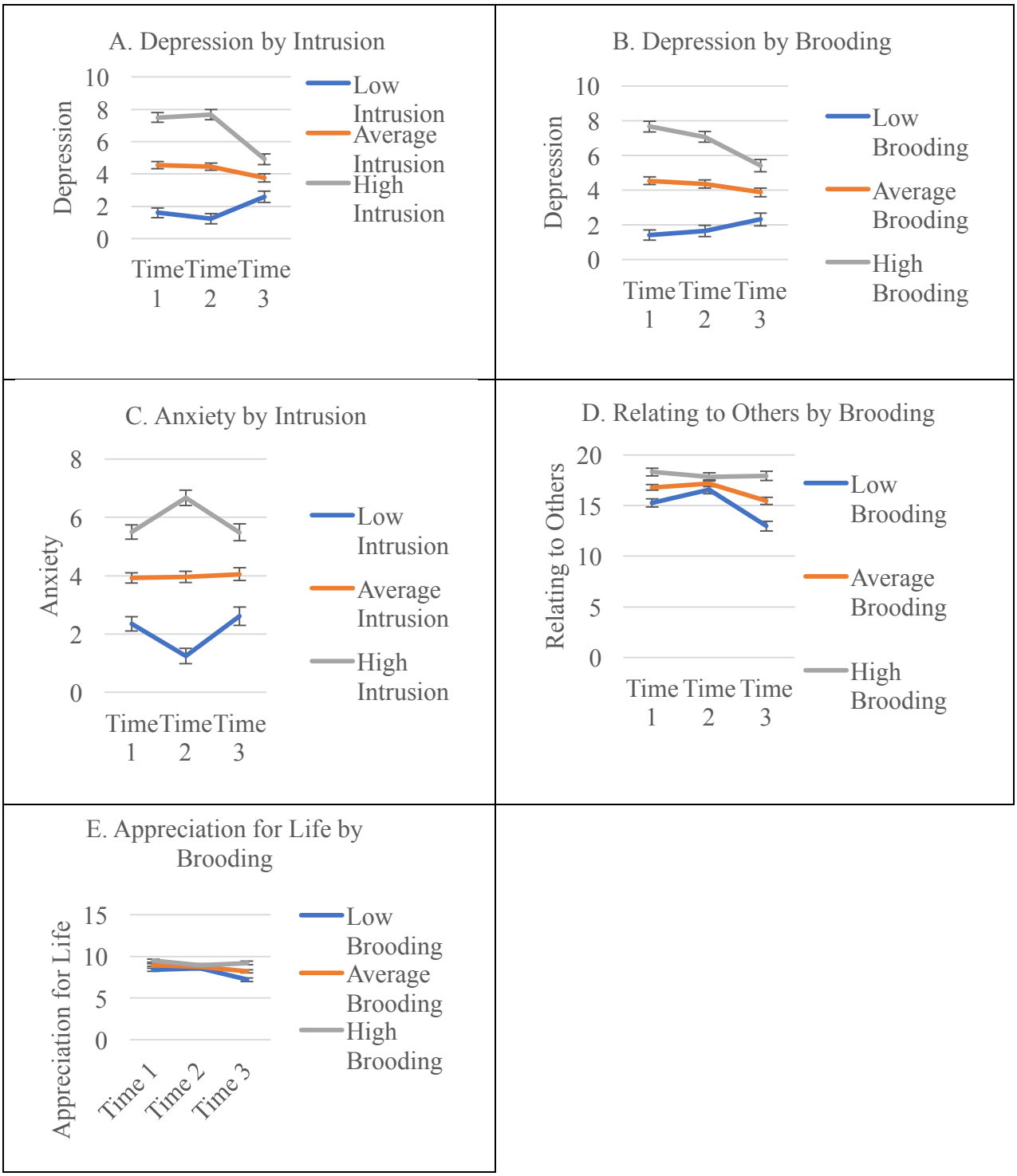

Figure 2. Interaction plots

Note. A. Plot of the interaction between time by intrusion predicting depression, 1 SD below the mean for intrusion, 1 SD below the above for intrusion. B. Plot of the interaction between time by brooding predicting depression, 1 SD below the mean for depression, 1 SD above the mean for depression. C. Plot of the interaction between time by intrusion predicting anxiety, 1 SD below the mean for intrusion, 1 SD below the above for intrusion. D. Plot of the interaction between time by brooding predicting appreciation for life, 1 SD below the mean for brooding, 1 SD below the above for brooding. E. Plot of the interaction between time by brooding predicting relating to others, 1 SD below the mean for brooding, 1 SD below the above for brooding.

Discussion

The current longitudinal study explored the relationship between rumination and the psychological outcomes of depression, anxiety, post-traumatic growth and QoL in women along the trajectory of a breast cancer diagnosis. More specifically, the association of instrumental, brooding and intrusive components of rumination to the five dimensions of post-traumatic growth was examined.

As hypothesised, brooding rumination demonstrated a positive relationship to depressive symptoms over time, with a significant decrease in brooding rumination with time mirrored by a decrease in depressive symptoms. This positive relationship aligned with earlier research in clinical, general cancer and community samples (Joorman et al., 2006; Morris & Shakespeare-Finch, 2011; Treynor et al., 2003). The abstract, passive nature of brooding represents an inability to disengage from the shattered world view (Nolen-Hoeksema et al., 2008; Treynor et al., 2003). Consequently, individuals persist in attending to negative content and memories and remain fixated on the barriers that stand in the way of problem resolution (Joorman et al., 2006), facilitating a sense of hopelessness, a significant risk factor for depression (Alloy et al., 2000).

As hypothesised, there was a significant negative relationship of brooding rumination over time on the post-traumatic domains relating to others and appreciation of life. These findings align with Mystakidou et al. (2007) and Mols et al. (2009), who reported these two domains as those most commonly experienced in terms of post-traumatic growth in cancer patients. Relating to others manifests in enhanced relationships, a sense of increased intimacy and closeness, underlined by a greater sense of freedom in self-disclosure, honesty, and empathy towards others (Calhoun & Tedeschi, 1999). The existential threat inherent in a life-threatening illness such as breast cancer can also result in a greater appreciation of everyday things and a shift in what is important (Calhoun & Tedeschi, 1999).

As predicted, significant changes in intrusive rumination over time were positively related to changes in depression and anxiety, which aligns with the existent research in general cancer and undergraduate samples (Morris & Shakespeare-Finch, 2011; Starr & Moulds, 2006). The role of intrusive rumination in depression and anxiety relate to the sense of uncontrollability and negative focus on the core experiences of vulnerability and loss (Bigatti et al., 2012; Gallagher et al., 2002; Morris & Shakespeare-Finch, 2011), aligning with the vulnerability-stress models of depression and anxiety (Alloy et al., 2000; Beck & Emery, 1985).

A set of hypotheses related to the stability of psychological outcomes over time. Psychological outcomes were found to be uniformly stable across the study period with no statistically significant changes, however, the trends largely supported the predicted patterns. That is, depression and anxiety scores trended downwards, aligning with documented reductions in depression and anxiety over time (Bower et al., 2005). The lack of significant change over time may reflect the low levels of depression and anxiety reported in this sample in conjunction with the reported positive orientation of feelings and emotions accompanying any ruminative activity. Moreover, individuals were asked to self-report depressive and anxious symptoms which may conflict with a commonly held view that emotional distress is essentially an appropriate reaction to a cancer diagnosis (Fisch, 2004; Love, 2004), which may result in under-reporting. QoL scores trended upwards over time as is commonly reported in the cancer literature (Ganz et al., 2002). Contrary to the hypothesis, the trend was for post-traumatic growth to decrease over time, conflicting with studies that demonstrate post-traumatic growth increasing with time from the initiating traumatic event (Cordova et al., 2001, Mols et al., 2009; Sears et al., 2003). However, these studies focus on survivors of less than five years, whereas the mean time from diagnosis for the current sample was nine and a half years, signifying a comparison between early and long-term survivors. This latter group have been largely ignored by post-traumatic growth research to this

point and, consequently, patterns of post-traumatic growth have not yet been empirically established for this group (Brosschot, 2010). Taken together with the low levels of reported psychological distress in the present study, which may not be sufficient to stimulate the growth process, these factors generate a low potential for post-traumatic growth (Bellizzi et al., 2010; Morris & Shakespeare-Finch, 2011; Sears et al., 2003). This stability of psychological outcomes is likely to be a key factor in further non-significant findings from this study.

Whereas brooding rumination remained a significant influence for anxiety, supporting a theorised relationship between the two constructs (Calmes & Roberts, 2007; Nolen-Hoeksema, 2000), there was no significant change in the influence of brooding rumination on anxiety over time, in line with the stability of psychological outcomes in this study. However, this may also reflect the conceptual overlap between brooding rumination and worry, as another perseverative thinking style (Aldao et al., 2010). A distinction has been drawn between the temporal focus of the two constructs, with rumination considered to be past-orientated, while worry is more future-orientated (Brosschot, 2010). In examining rumination within the context of breast cancer, worry may need to be accounted for as a potential confounding factor, as cancer concerns are generally more future-focused, particularly with respect to the potential for disease recurrence (Baker et al., 2005; Rowland & Massie, 2010).

Contrary to the study hypothesis, the negative relationship of brooding rumination over time to the post-traumatic dimensions of personal strength, new possibilities and spiritual domains of post-traumatic growth was not supported. Similarly, although intrusive rumination was associated with all the domains of post-traumatic growth except for strength, there was no significant change in the influence of intrusive rumination on these variables over time. In both cases, this may reflect the stability of the dimensions of post-traumatic growth in this study. Moreover, the research relating to the relationship between intrusive rumination and post-traumatic growth has been

equivocal (Calhoun et al., 2000). Timing may be important, with intrusive rumination considered a precursor for post-traumatic growth only in the immediacy of the traumatic event (Calhoun et al., 2000; Cann et al., 2010; Matarazzo, 2008). However, further studies have demonstrated no relationship between intrusive rumination and post-traumatic growth (Park et al., 2010; Sumalla, Ochoa, & Blanco, 2009). The current sample consists primarily of longer-term survivors, with a mean survival period of more than nine years. Intrusive rumination, should it persist in this sample, would be more likely to represent an inability to progress to the more deliberate processing required for rebuilding the shattered world view and would, therefore, be more likely to be negatively associated with post-traumatic growth (Calhoun & Tedeschi, 2006).

For instrumental rumination, a positive relationship with the five domains of post-traumatic growth and a negative relationship to depressive and anxious symptoms was predicted. Although instrumental rumination was shown to be associated with all domains of post-traumatic growth, there was no significant change in its relationship with any of these variables over time. This conflicts with research that demonstrates a positive relationship between intrusive rumination and post-traumatic growth (Morris & Shakespeare-Finch, 2011; Mystikadou et al., 2007) and fails to align with post-traumatic growth theory that early intrusive rumination serves as a precursor to the more deliberate rumination that underlies growth (Calhoun et al., 2010). Other studies have failed to demonstrate this relationship (Sumalla et al., 2009) in line with the idea that intrusive processing signals that processing is incomplete, and that it is impeding adjustment (Park et al., 2010). Park et al. (2010) also noted that intrusive rumination can vary in intensity, value and content (Park et al., 2010). In these ways, post-traumatic growth may be delayed. Recognising that intrusive rumination is most closely accepted to contribute to post-traumatic growth following on from the triggering event, it must be remembered that the sample for this study was on average nine years out from the breast cancer diagnosis, raising the potential for inaccuracies in recall. Although instrumental

rumination was hypothesised to be negatively related to depression and anxiety, in line with its adaptive and problem-solving nature (Chan et al., 2011; Soo & Sherman, 2015), there was no significant change in its influence on either over time in this study. This is likely to be a consequence of both low levels of depression and anxiety reported and the stability of instrumental rumination over the study duration.

Finally, the hypothesised negative relationships of brooding and intrusive rumination and the positive relationship of instrumental rumination to QoL were not supported. While all rumination types were significantly associated with QoL, aligning with the literature on rumination more generally (Li et al., 2015), there was no significant change in the influence of any of the rumination types on QoL over time, which, again, may reflect the specific nature of the sample as late survivors, the low levels of psychological distress and the stability of psychological outcomes reported in this sample.

A set of hypotheses addressed the relationship of post-traumatic growth with psychological distress. However, a significant relationship between psychological distress and post-traumatic growth was not found, failing to support earlier research that suggested post-traumatic growth would be positively related to psychological distress (Bellizzi et al., 2010; Sears et al., 2003). However, the current findings align with other studies that showed psychological distress and post-traumatic growth to be distinct concepts (Chan et al., 2011; Cordova et al., 2001, 2007). Although the presence of depression and anxiety was confirmed with at least moderate levels of depressive symptoms reported at baseline in 9.8% of participants and anxiety symptoms in 11.4%, the theoretical underpinnings of post-traumatic growth indicate significant disruption to the individual's worldview as a prerequisite for growth (Janoff-Bulman, 1992). A failure to find a relationship may therefore simply reflect the low levels of psychological distress reported, compounded by the late survivorship nature of the current study.

Several limitations in the current study should be considered when evaluating its contribution to the current literature on the influence of rumination on psychological outcomes in the context of breast cancer. Findings must be reviewed in the light of the small size of the sample, the low retention rate and the nature of the sample. The small sample may have limited the ability to find significant events. Attrition is a common problem in longitudinal research, with reported rates of between 30 and 70% (Gustavson, von Soest, Karevold, & Røysamb, 2012). While the online implementation of research may facilitate data collection, attrition rates increase in this context (Hochheimer et al., 2016), which has the potential to threaten validity (Clough-Gorr, Fink, & Silliman, 2008). While the sample was representative of women with breast cancer (AIHW, 2012), the self-selecting nature of the sample from a number of online community-based breast cancer and the nature of the sample as long-term survivors may limit generalisability of the findings.

While the study is valuable in providing some initial information about the experiences of longer-term survivors compared to studies that have largely focused on the first five years' post-diagnosis (Brosschot, 2010), not accounting specifically for the time post diagnosis at the start point may be reflected in inconsistencies in patterns of assessment (Morris & Shakespeare-Finch, 2011). Therefore, future research should account for time from diagnosis at the entry point, separating out the experiences of early (less than one year post-diagnosis), from medium survivors (one to five years) and longer-term survivors (five years and more). Moreover, the exclusive use of self-report measures may mean that results are impacted by the degree of participant self-awareness and level of accurate recall. A related issue is that the measure used to assess depressive and anxious symptoms was not specifically orientated to cancer survivors and may not therefore fully capture the affective experience of a breast cancer diagnosis. Despite these limitations, the findings from this study will add to the previous literature in the field of rumination and post-traumatic growth across the breast cancer trajectory.

As the first longitudinal study to examine relationships between subcomponents of rumination, depressive, anxious symptoms and dimensions of post-traumatic stress, this study makes a unique contribution to understanding the role of rumination in psychological outcomes across the breast cancer trajectory. As such, it presents initial evidence of the need to distinguish between subtypes of rumination and their differential relationship to depression anxiety and dimensions of post-traumatic growth across time.

Chapter 9 General Discussion

Overview of the Chapter

Rumination, a form of perseverative thinking, has been shown to be influential in the determination of positive and negative psychological outcomes, both in clinically-well populations and subsequent to a traumatic event, such as the diagnosis of illness (Chan et al., 2011; Lelorain et al., 2012; Lyubomirsky & Nolen-Hoeksema, 1993, 1995; Michl et al., 2013; Roelofs et al., 2008). While research on rumination in the context of illness is developing, this thesis addresses gaps in the current assessment and understanding of rumination within the context of psychological outcomes in breast cancer. As a complex construct, a literature review of rumination and its potential relationship to both positive and negative psychological outcomes in illness (Chapter 2) provided the theoretical underpinnings for the thesis. Following on from the exploration of the concept, a systematic review of assessment measures for rumination advocated the development of a new measure to address rumination in the specific context of illness (Chapter 3). Consequently, the Multidimensional Rumination in Illness Scale was developed, pilot-tested and subjected to reliability and validation testing (Chapter 5). The role of rumination and its sub-components of brooding, instrumental and intrusive rumination was then explored in a cross-sectional (Chapter 7) and a longitudinal study (Chapter 8) to determine influence on depression, anxiety, stress, QoL and post-traumatic growth in women diagnosed with breast cancer. This section will summarise the key findings from the reviews and the empirical studies, considering the strengths and limitations of the research. Implications for future research and clinical practice will be discussed.

Ruminative Processing in Illness

A comprehensive literature review (Chapter 2) identified that there is no single conceptualisation of rumination, and, consequently, several models of rumination were explored. Although commonalties may exist in respect of a self-focus and passive, repetitive, deliberative thinking (Nolen-Hoeksema, 1991), a dual dimensional conceptualisation of rumination exists, whereby rumination is considered as both an adaptive, conscious and instrumental behaviour (Carver & Scheier, 1990; Martin & Tesser, 1989; 1996), and a maladaptive, unconscious and intrusive process, characterised by abstract, evaluative thinking, often in response to mood or circumstances (Conway et al., 2000; Joorman et al., 2006; Nolen-Hoeksema, 1991; Watkins & Teasdale, 2001). Rumination can therefore be associated with both constructive (Chan et al., 2011; Morris & Shakespeare-Finch, 2011; Stockton et al., 2011) and unconstructive outcomes in illness (Bower et al., 1998; Chan et al., 2011; Crane & Martin, 2003; Edwards et al., 2011; Meints et al., 2017; Lu et al., 2014; Soo et al., 2007).

Models such as the Response Styles approach (Nolen-Hoeksema,1991) and cognitive processing theories (Janoff-Bulman, 1992) offer valuable insight into the role of rumination in influencing psychological outcomes. However, with a narrow focus in respect of rumination as a response to depressed mood, the Responses Styles approach (Nolen-Hoeksema, 1991) is only able to account for unconstructive outcomes in response to rumination. Similarly, cognitive processing theories (Janoff-Bulman, 1992), where rumination is a process of working through to resolve discrepancies between the meaning of negative events and an individual's pre-existing cognitive structures, is more growth-orientated (Watkins, 2008). In contrast, control theory addresses both constructive and unconstructive outcomes by conceiving rumination as a process of feedback control, where current state is compared against individually-held goals or standards (Martin & Tesser, 1989, 1996). Like cognitive processing theories, control theory shares a discrepancy

reduction approach, so that when rumination resolves any discrepancy by facilitating goal progress, modification or abandonment, the outcome is constructive (Martin & Tesser, 1989; 1996). Where no progress is made but the goal is not changed or abandoned, continuing rumination exacerbates negative affect, resulting in unconstructive outcomes (Carver & Scheier, 1990, 1998; Martin & Tesser, 1989, 1996; Pyszczynski et al., 1987). The level of construal is also important with the most abstract goals, the higher level construals, symbolising the ideal self (e.g., as healthy), and the more concrete levels, the lower levels, representing specific actions and behaviours necessary to implement the abstract goals in a particular situation (e.g., remaining in remission from cancer; Watkins, 2008). It is the abstract goals that are more meaningful to individuals and the associated concrete goals that drive higher levels of rumination when not attained (McIntosh et al., 1995; McIntosh & Martin, 1992).

Incorporating both structural approaches to rumination (valence, content) and process approaches (level of construal), control theory has informed the conceptualisation of rumination within this thesis. Accordingly, rumination has been viewed specifically as a past-focused, elaborative form of perseverative thinking, whereby an individual actively thinks about illness-related content, the thoughts and feelings illness evokes and its future implications in respect of individual goals and standards (Watkins, 2008).

The experience of illness can necessitate the rethinking of personal goals, social and occupational roles and relationships (Park & Fenster, 2004). Individual beliefs about personal invulnerability, the predictability of what happens and the ability to control what does happen often needs revision following the diagnosis of an illness (Calhoun & Tedeschi, 2014; Green et al., 1997). Janoff-Bulman (1992) talks of the shattered worldview, which either necessitates the assimilation of illness-related material into the existent worldview or reconstruction of the worldview to accommodate new information to attain adjustment to changed circumstances (Joseph & Linley,

2005). As an integral part of this process, rumination can direct attention to the illness, associated thoughts and feelings (Watkins, 2008), the nature and implications of which formed the foundations of this thesis.

In considering the dual pathway of rumination in psychological outcomes, progression to a state of assimilation or accommodation has the potential to generate psychological distress when rumination is experienced as intrusive, uncontrollable, and is directed towards causality, particularly self-blame, and potential negative consequences of the illness (Park et al., 2010). In this way, rumination can impede attentional focus and obstruct problem-solving, preventing a more complex emotional engagement with aspects of the illness and fueling negative thoughts, heightening distress and a sense of hopelessness (Donaldson & Lam, 2004; Lyubomirsky et al., 1998; Lyubomirsky et al., 2003b; Nolen-Hoeksema, 1996; Nolen-Hoeksema et al., 2008; Schwartz & Koenig, 1996).

Conversely, accommodation can generate positive change or post-traumatic growth, an outcome commonly seen following illness (Cordova et al., 2001, 2007; Gangstad et al., 2009; Garnefski et al., 2008; Ho et al., 2004; Lechner et al., 2006; Pakenham, 2005; Siegel & Scrimshaw, 2000). In this context, rumination, is understood as a more deliberate process, a sense-making process that facilitates the reconstruction of the worldview (Calhoun & Tedeschi, 2006; Greenberg, 2002; Linley & Joseph, 2004; Martin & Tesser, 1996). Calhoun and Tedeschi (1999) outlined five domains of growth that might ensue: a redefined sense of self, of personal strength and resilience (personal strength), closer relationships (relating to others), a greater meaning in life (appreciation of life), of increased spirituality (spirituality) and revised goals (new possibilities) (Calhoun & Tedeschi, 1999, 2014).

The literature review further revealed the complexity of rumination in the presence of subtypes of rumination. Particular forms of rumination are more likely to facilitate a positive

outcome, whereas others will hinder it by preventing disengagement from the shattered worldview (Joseph, 2000; Siegle et al., 2004). A passive contemplation of failed expectations or goals, brooding rumination is characterised by anxious or negatively-orientated thought and is therefore associated with psychological distress (Treynor et al., 2003; Watkins & Teasdale, 2004). Intrusive rumination, considered an automatic, unconscious and uncontrollable process, is also linked to depression and anxiety (Calhoun & Tedeschi, 2006). However, when intrusive rumination is experienced directly after diagnosis, it can represent early cognitive processing towards rebuilding cognitive schemas (Greenberg, 1995). In this manner, it lays the footing for post-traumatic growth and serves as a precursor to the purposeful rumination more commonly associated with post-traumatic growth (Janoff-Bulman, 2006; Stockton et al., 2011). Conversely, where intrusive rumination persists, negative psychological outcomes are more likely to follow (Calhoun & Tedeschi, 1999). Finally, and most closely linked with post-traumatic growth, is instrumental rumination, the more deliberate form of rumination, associated with working through issues and generating solutions, thereby constructing a revised world view that forms a closer approximation to any new reality (Tedeschi & Calhoun, 1995). Thus, it became apparent that both type and timing of rumination are critical considerations (Tedeschi & Calhoun, 2004).

Ruminative *content* may remain important, with negatively orientated content associated with psychological distress and positively orientated material related to post-traumatic growth (Linley & Joseph, 2004; Phelps et al., 2008). However, beliefs about the rumination process itself can also be key. Positive metacognitive beliefs about helpfulness and working through may explain why people adopt the ruminative process, negative metacognitive beliefs about controllability and harmfulness may provide a connection to psychopathology (Michael et al., 2007).

Assessing Rumination

The existence of ruminative models and accompanying subtypes of rumination has resulted in an extensive array of self-report measures, which necessitates a clear working definition of the elements of rumination that are of interest. A systematic review (Chapter 3) of the relevant literature highlighted the presence of five classes of ruminative measures based on content: response to emotional state; response to a specific event; ruminative processing; rumination as a function of goal discrepancies; and, meta-cognitive beliefs about rumination. Collectively, these measures provide a comprehensive assessment of rumination but, taken individually, have a narrow focus on a sub-component of rumination (Siegle et al., 2004; Smith & Alloy, 2009). Few of the reviewed scales have been applied in the context of illness, while a single scale, the Metacognitive Rumination Scale (Fritz, 1999), targeted an illness event. However, psychometric properties for this scale have never been published and it has not been used beyond an initial study in the context of coronary heart disease.

All five classes of tests have significance in the context of illness. Event-based scales capture negative inferences about the diagnosis as an event, the presence of hopelessness and active coping strategies, as well as the automatic, invasive and uncontrollable nature of post-event rumination. Although emotion-focused scales evaluate feelings and negative thoughts in response to a specific mood, the Ruminative Responses Scale (Nolen-Hoeksema & Morrow, 1991), considered the gold-standard test, has been widely used in the illness context (Guastella & Moulds, 2007; Soo et al., 2007). More general measures of rumination distinguish between reflection, the more purposeful rumination associated with post-traumatic growth, and brooding, the more passive rumination associated with depression and anxiety (Treynor et al., 2003). Goal-focused measures examine the emotionality, distraction and motivation regarding goal attainment and revision (Scott

& McIntosh, 1999). Finally, assessment of metacognitive beliefs addresses the adoption of rumination as a sense-making process and its maintenance through thoughts about its lack of controllability and harmfulness (Papageorgiou & Wells, 2001; Parageorgiou et al., 2003).

Beyond the narrow focus and limited incidence of use in the context of illness for most scales, the review revealed several other issues that need to be considered when considering use of the rumination scales, particularly in the context of illness. A significant issue is contamination by the inclusion of symptom-based items, as is particularly evident in the emotion-focused scales (e.g., Ruminative Response Scale; Nolen-Hoeksema & Morrow, 1991). Several other scales are also limited in respect of a small number of items that restrict ability to assess the ruminative experience. Further still, other scales have problematic psychometrics, including a lack of internal consistency and negative inferences, (Robinson & Alloy, 2003).

In conjunction with the ruminative literature review, the systemic review of existent measures of rumination informed the development of a clear working definition of rumination within the context of illness to generate a more inclusive measure. Given the suggested framework of rumination as a pathway to both negative psychological outcomes as well as to post-traumatic growth (Joorman et al., 2006), any new scale developed had to specifically be able to account for both orientations. Additionally, such a measure had to address general dimensions related to rumination, including the repetitiveness and intrusiveness of the process, the content and the level of construal (Segerstrom et al., 2003; Treynor et al., 2003; Watkins, 2008; Watkins et al., 2008), as well as the occurrence, duration, compulsion and difficulty of control of ruminative processes (Horowitz, 1975). It also needed to be able to address central themes underlying individual perception of illness.

The prevalence of a multitude of rumination scales, each addressing a narrow focus, presents a challenge to the rumination researcher and has the potential to place an undue burden on

research participants, given that multiple scales need to be administered to adequately assess the ruminative experience. This, along with the lack of a specific measure for use in the context of illness, resulted in a proposed multidimensional approach, incorporating illness-specific concerns, that formed the focus on the development of the Multidimensional Rumination in Illness Scale (Chapter 4; Soo & Sherman, 2015).

The Development of the Multidimensional Rumination in Illness Scale

Studies 1 and 2 (Chapter 4) reported on the development and pilot test of items, refinement and validation of the Multidimensional Rumination in Illness Scale (MRIS; Soo et al., 2014), a measure of rumination for use in the context of a physical health condition. Study 1 entailed the generation of an initial 60-item pool based on an extensive literature review of rumination and existing rumination models and scales (Conway et al., 2000; Horowitz et al., 1979; Nolen-Hoeksema & Morrow, 1991; Janoff-Bulman, 1992; Martin & Tesser, 1989, 1996; Papageorgiou & Wells, 2001; Scott & McIntosh, 1999). Items were selected to incorporate structural elements defined in the cognitive processing, Responses Styles and control theories of rumination, so that content nature (e.g., nature of the illness, '*I think about the seriousness of my* illness') and valence were accounted for (e.g., negative beliefs about rumination, '*I worry that thinking about my illness might be harmful'*). Moreover, chosen items also needed to account for level of construal (Watkins, 2008) in line with control theory, with more abstract items presenting higher levels of construal ("*I think about why this illness had to happen to me*") and more concrete items representing lower levels of construal (""*Thinking about my illness helps me work out how to cope"* ").

Further items were selected to evaluate broad facets of rumination, including frequency ('*Once started, I can spend considerable time thinking about my illness'*), intrusiveness ('*I find myself unexpectedly thinking about my* illness') and controllability ('*Once I start thinking about my*

illness, I find it hard to think of other things') of ruminative processes, as well as illness-specific concerns, such as attempts to understand the cause ('*I think about whether I could have avoided my illness if I had taken better care of myself'*), and impact of illness (*'I think about how my illness may make me a burden on others'*). Given the documented role of meta-cognitive beliefs to both the onset and maintenance of rumination (Michael et al., 2007), items also addressed positive and negative thoughts about rumination ('*Thinking helps me work out what I need to do to regain a sense of* normalcy').

Exploratory factor analysis of the initial 60 items of the MRIS in Study 1 established a clearly interpretable factor structure for a final selection of 32 items, with distinct factors representing adaptive (instrumentality) and non-adaptive (intrusion, brooding, preventability) forms of rumination. Twenty-eight items were discarded due to redundancy or for failing to contribute to a simple factor and the intrusion and preventability factors were collapsed as they were highly correlated. A revised scale of 41 items represented revisions to existing items to enhance readability and nine new items based on areas of thinking in relation to illness suggested by Study 1 participants. This scale was subjected to a confirmatory factor analysis in Study 2. Two additional items, supplementary to the main scale, were added to examine the connection of thinking to emotion and the orientation of emotion to thoughts about illness.

Study 2 firmly established the presence of the three dimensions, which underlie the structure of the MRIS. Intrusive, instrumental and brooding rumination align with previously identified domains in rumination (Fritz, 1999; Papageorgiou & Wells, 2001; Treynor et al., 2003). The brooding dimension connects with a revised Responses Style Questionnaire (Treynor et al., 2003) in capturing a melancholic focus on symptoms, extending that focus to include consequences and limitations following on from an illness diagnosis. Parallels can also be drawn between the reflection dimension from the revised Responses Style Questionnaire and the instrumental

dimension, which encapsulates the similarly-named dimension from Fritz (1999), whereby practical considerations of illness and problem-solving considerations are addressed. However, the MRIS instrumental dimension also incorporates positive meta-cognition, recognised as important in its potential to explain the initiation and maintenance of the ruminative process (Papageorgiou & Wells, 2001). The brooding and intrusive rumination sub-scales address the issues of the revised Ruminative Responses Style questionnaire (Treynor et al., 2003) by the inclusion of a greater number of items and higher demonstrated reliability of each sub-scale (Soo et al., 2014). The final dimension, intrusion, integrates the intensity and repetitiveness of rumination, common following trauma as an automatic process of sense-making (Nightingale et al., 2010). Negative meta-cognition regarding controllability and potential for harm is included but extended with the interpersonal consequences of rumination, considered particularly important as both the illness experience and rumination itself are often connected with isolation (Fawzy et al., 2001; Nolen-Hoeksema & Davis, 1999).

Although rumination models incorporate these elements, Response Styles Theory (Nolen-Hoeksema, 1991) specifically focuses on rumination in response to mood, while both cognitive processing and control models concentrate on discrepancy reduction (Watkins, 2008). All three models account for the structural components of valence and content, however, Watkins' (2008) control process model extends on both models by consideration of level of construal in rumination. In this way, accounting for the commonalities of rumination, while incorporating structural and processing elements, is important in developing a rumination scale that will capture aspects of rumination important in both constructive and unconstructive outcomes.

The Relationship of Rumination to Psychological Distress in Breast Cancer

In examining the role of rumination in the context of an illness, beyond having a clear

concept of rumination, it is also important to have a solid understanding of the challenges faced following a diagnosis. Chapter 5 reviewed the breast cancer experience as a context for the exploration of rumination. Breast cancer is characterised by a series of distinct physical, psychological and existential challenges that follow diagnosis. Persistent side effects and fears of recurrence ensure such challenges persist into the survivorship period (Andrykowski et al., 2008; Cordova & Andrykowski, 2003; Lebel et al., 2007). Predictably, depression and anxiety are common consequences (Burgess et al., 2005; Den Oudsten et al., 2009; Grabsch et al., 2006), while some women will report positive psychological outcomes post-diagnosis, manifesting as enhanced interpersonal relationships, a stronger sense of self and greater sense of purpose to life (Calhoun & Tedeschi, 1999; Cordova et al., 2001; Tomich & Helgeson, 2004).

A cross-sectional study of women diagnosed with breast cancer, Study 3 (Chapter 5) explored the role of rumination in relation to both positive and negative psychological outcomes, specifically, depression, anxiety, stress, and the five dimensions of post-traumatic growth. This study extended earlier ruminative research (e.g., Chan et al., 2011; Lelorain et al., 2012) by looking at the dual dimensions of psychological outcomes and the influence of the ruminative subtypes, namely intrusion, brooding and instrumental rumination. All study participants reported some degree of post-traumatic growth, some in the presence of significant depression, anxiety or stress symptoms, aligning with the position that psychological distress and post-traumatic growth are not mutually exclusive entities (Cordova et al., 2007; Schroevers et al., 2010; Stanton et al., 2006).

Brooding rumination was found to be positively associated with depression, anxiety and stress, aligning with existent research (Treynor et al., 2003; Watkins & Teasdale, 2004). Additionally, brooding was found to be negatively related to the post-traumatic growth dimensions of new possibilities and spiritual growth, but, interestingly, only when social support was included in the model. Intrusive rumination, embodying intensity, repetitiveness and controllability of

thought, was positively related to stress and to the post-traumatic growth dimensions of relating to others and new possibilities, again, only when social support was included in the model. The relationship of intrusive rumination and dimensions of post-traumatic growth supported earlier research (Calhoun et al., 2000; Soo & Sherman, 2014). Instrumental rumination, the active processing of content to understand changed circumstances and the initiation of adaptive thinking to reduce disparity between real and ideal self, was positively related to all dimensions of post-traumatic growth, consistent with earlier research (Chan et al., 2011; Lelorain et al., 2012; Soo & Sherman, 2015).

Considering the limitations inherent in correlational research and acknowledging the importance of timing of rumination, psychological outcomes along the breast cancer trajectory were further examined in a longitudinal study (Study 4). Women diagnosed with breast cancer self-reported on depression, anxiety, post-traumatic growth and QoL at three time points over a one-year period. A longitudinal study is interested in change *over time*. In this particular study, while rumination and its sub-components decreased significantly over the study period, there was no significant change observed in levels of psychological distress, QoL and dimensions of post-traumatic growth. General trends, however, did align with earlier research that shows depression and anxiety decreasing and QoL increasing *over time* following a breast cancer diagnosis (Bower et al., 2005). In contrast, although post-traumatic growth has been shown to increase with time out from the traumatic event (Cordova et al., 2001; Mols et al., 2009; Sears et al., 2003), the trend was for levels to marginally decrease in this study. This may reflect the nature of the sample which was dominated by longer-term survivors with a mean time from diagnosis of more than nine years, whereas prior research has generally focused on survivors of less than five years. Late survivors have been largely overlooked and, consequently, any patterns of post-traumatic growth have not yet been established for this group (Brosschot, 2010).

Significant findings from this longitudinal study in respect of the influence of rumination *over time* were restricted to brooding and intrusive rumination. Decreases in brooding and intrusive rumination *over time* resulted in a decrease in depressive symptoms and a decrease in anxiety symptoms for intrusive rumination only. These findings align with earlier research demonstrating a positive relationship between rumination and psychological distress (Morris & Shakespeare-Finch, 2011; Nolen-Hoeksema, 2000; Soo & Sherman, 2015; Starr & Moulds, 2006). Brooding rumination was also a significant influence *over time* on the post-traumatic domains relating to others and appreciation of life, the domains most commonly reported in the context of breast cancer (Mystakidou et al., 2007). Contrary to studies that report post-traumatic growth increasing *over time* (Cordova et al., 2001; Sears et al., 2003), as levels of brooding rumination decreased, post-traumatic growth in these two domains also decreased, again, reflecting the nature of sample.

The low levels of depression and anxiety reported in this study, in conjunction with the reported positive orientation of feelings and emotions accompanying any ruminative activity, were likely to limit the findings. This issue was potentially compounded by the commonly-held view that emotional distress is an appropriate reaction to a cancer diagnosis (Fisch, 2004; Love, 2004), which may result in under-reporting. Additionally, low levels of reported anxiety might reflect the conceptual overlap that exists between rumination and worry (Aldao et al., 2010). A distinction has been drawn between the temporal focus of the two constructs, with rumination considered to be past-orientated, whereas worry is more future-orientated (Brosschot, 2010). This could be particularly in thinking about cancer in the trauma context, as contrary to the more common focus on past events, individuals diagnosed with cancer are very much concerned with the future and what it might hold in terms of recurrence (Baker et al., 2005; Rowland & Massie, 2010).

The observed decrease in post-traumatic growth *over time* conflicted with studies that

demonstrate post-traumatic growth increasing with time from the initiating traumatic event (Cordova et al., 2001, Mols et al., 2009; Sears et al., 2003). This may also reflect the low levels of reported psychological distress, in that they may be insufficient to stimulate the growth process (Bellizzi et al., 2010; Morris & Shakespeare-Finch, 2011; Sears et al., 2003). The stability of psychological outcomes is likely to be the key factor in further non-significant findings from this study.

Nevertheless, despite the stability of the sample in terms of psychological outcomes in Study 4, evidence was provided for the differential influence of ruminative sub-components. Brooding and intrusive rumination were significant predictors of depression and anxiety, aligning with Study 3 and supporting a theorised relationship between these ruminative elements (Calmes & Roberts, 2007; Nolen-Hoeksema, 2000). Brooding rumination was for a significant predictor of appreciation of life and relating to others; these are in contrast to the domains identified in Study 3 that were associated with brooding rumination. Intrusive rumination, as per Study 3, was related to all post-traumatic domains, except for personal strength and instrumental rumination to all domains of post-traumatic growth. Brooding and intrusive rumination significantly influenced QoL, aligning with the literature on rumination more generally (Li et al., 2015).

The relationship between psychological distress and post-traumatic growth has received great research focus; the research is, however, equivocal. Some studies have reported that the relationship between these two constructs is negatively orientated (Bellizzi et al., 2010; Sears et al., 2003), whereas others report that psychological distress and post-traumatic growth are distinct concepts (Chan et al., 2011; Cordova et al., 2001, 2007). Although moderate levels of depressive and anxious symptoms were reported alongside some degree of post-traumatic growth in a subset of participants in both Studies 3 and 4, no relationship between these two constructs and post-traumatic growth was demonstrated. This further supports the conceptualisation of psychological

distress and post-traumatic growth as distinct entities. However, due consideration must be given to the requirement of significant disruption to the individual worldview as a prerequisite for growth (Janoff-Bulman, 1992), suggesting that the lack of a relationship may simply reflect the low levels of psychological distress reported in the sample of breast cancer survivors investigated in these studies. Both studies clearly demonstrate that rumination is influential in both positive and negative outcomes after a breast cancer diagnosis. Moreover, they establish that specific sub-components of rumination have varying relationships to negative and positive psychological outcomes, providing further confirmation for the proposition of a dual pathway for rumination in this respect.

Studies 3 and 4 also confirmed the role of brooding rumination regarding negative psychological outcomes. The most important finding was that changes *over time* in brooding rumination was differentially related to depression (Study 4), with a significant decrease in brooding rumination mirrored by a decrease in depressive symptoms. This positive relationship is commonly reported in clinical, general cancer and community samples (Joorman et al., 2006; Morris & Shakespeare-Finch, 2011; Treynor et al., 2003) and aligns with the reported reduction in rates of depression and anxiety to reflect population norms with greater time out from diagnosis (Bower et al., 2005). The positive relationships of brooding rumination with depression, anxiety, stress (Study 3 only) and negative relationship to QoL reported in these studies was as expected.

Study 4 revealed that changes in brooding rumination *over time* influenced the post-traumatic dimensions of relating to others and appreciation of life only. A negative relationship had been anticipated for brooding rumination with post-traumatic growth across all domains, but these dimensions of post-traumatic growth decreased as brooding rumination decreased. The significance of these two domains is not surprising as relating to others and appreciation of life are the most commonly reported areas of post-traumatic growth following breast cancer (Mols et al., 2009).

Taken together, the findings of Studies 3 and 4 demonstrate a dual role for intrusive rumination in respect of psychological outcomes following a breast cancer diagnosis. First, it was demonstrated that changes in intrusive rumination *over time* influence depression and anxiety, with decreases in intrusive rumination paralleled by decreases in depression and anxiety. In this context, the role of intrusive rumination reflects the uncontrollability of the process and a focus on negative material, largely related to the core experiences of vulnerability and loss (Bigatti et al., 2012; Gallagher et al., 2002; Morris & Shakespeare-Finch, 2011). Intrusion, here, may signal that processing is incomplete and that this is impeding adjustment (Park et al., 2010).

In its second role, intrusive rumination influenced all the domains of post-traumatic growth, except for strength (Study 4 only), and QoL, however, there was no significant change in the influence of intrusive rumination on these variables *over time*. The research relating to intrusive rumination and post-traumatic growth has been equivocal (Calhoun et al., 2000). Changes over time would normally be expected regarding the influence of intrusive rumination because it is perceived to facilitate post-traumatic growth in the immediate aftermath of a traumatic event. However, it can become problematic if continued longer-term and when the individual fails to progress to the more deliberate rumination that underlies growth (Calhoun et al., 2010). Since both studies consisted of longer-term breast cancer survivors, with a mean time from diagnosis in excess of nine years, the patterns of post-traumatic group may not align well with earlier studies that have tended to focus on individuals with five years or less since diagnosis.

Both Studies 3 and 4 demonstrated an influence of instrumental rumination for all of the post-traumatic dimensions, as expected given the deliberate, sense-making nature of instrumental rumination (Janoff-Bulman, 2004; Kolokotroni et al., 2014), aligning with the research showing its influence in facilitating post-traumatic growth (Chan et al., 2011; Lelorain et al., 2012; Soo & Sherman, 2015; Stockton et al., 2011; Treynor et al., 2003). However, instrumental rumination did

not influence post-traumatic growth differently *over time*. This most likely reflects the stability of the sample in terms of post-traumatic growth and the nature of the sample, both in terms of survivorship and low overall levels of distress reported, as previously discussed.

Strengths and Limitations of the Thesis

The studies that form this thesis make several important contributions to the ruminative literature. First, they extend the existent research on rumination into the context of illness. There has been considerable research concerning rumination and negative psychological outcomes, particularly in relation to depressive rumination (Michl et al., 2013; Muris et al., 2005; Nolen-Hoeksema & Morrow, 1993), however, research in physically-unwell populations is in its early stages (Bower et al., 1998; Chan et al., 2011; Soo et al., 2007; Soo & Sherman, 2015). Moreover, although there is a growing research body on the role of rumination in post-traumatic growth in the context of illness (Calhoun & Tedeschi, 2014; Salovey et al., 1995), there are still many questions that remain unanswered. Accordingly, in this thesis, increasing the understanding of the role that rumination, and particularly its subtypes, can play in illness with regard to psychological outcomes will serve to inform interventions that look to minimise psychological distress and maximise growth potential.

Second, the understanding of the construct of rumination was clarified through an extensive literature review, resulting in the acknowledgement of the presence of subtypes of rumination and the dual role of rumination in the determination of psychological outcomes. This broadens the conceptualisation of rumination in its application to the illness context. While research on rumination in illness is at an early stage, this thesis adds to the literature by examining both positive and negative psychological outcomes simultaneously, and by further exploring the different

relationships between subtypes of rumination, negative psychological outcomes and the five dimensions of post-traumatic growth.

Reported levels of both psychological distress and post-traumatic growth were low in the studies that form the core of this thesis, yet the findings nonetheless provided confirmatory evidence for the role of rumination in influencing both positive and negative psychological outcomes after a breast cancer diagnosis. As an initial exploration of the relationships between individual facets of rumination and psychological outcomes, the findings from both studies provide early evidence for a relationship (Study 3) and a causal pathway (Study 4). The studies demonstrate that instrumental, brooding and intrusive rumination differentially influence depression, anxiety, stress, QoL and the five dimensions of post-traumatic growth, a finding that is tempered with the understanding that further research will be required to establish the nature of such relationships further.

Finally, the development of the Multidimensional Rumination Scale (Soo et al., 2014) has provided an instrument that systematically addresses rumination in the illness context. Developed within a framework suggested from a comprehensive literature review of rumination and a systematic review of existing rumination measures, the newly developed scale encompasses general elements of the ruminative process, coverage of specific subtypes of rumination in respect of brooding, intrusive and instrumental rumination, meta-cognition about rumination and illness-specific concerns. Study 2 demonstrated excellent internal consistency and test-retest reliability for the MRIS and its sub-scales, further confirmed in Studies 3 and 4, along with good concurrent, convergent and discriminant validity.

In interpreting these findings, several limitations need to be considered. The first class of limitations relates to issues concerning the nature of the samples for studies 3 and 4. While the samples were representative of women with breast cancer (Australian Institute of Health and

Welfare, 2012), the generalisability of these findings is limited by the focus on a female-only breast cancer sample, which was self-selected over the Internet from several community-based breast cancer groups. Given the documented role of social support in psychological outcomes, it is possible that being associated with such groups might unduly influence both levels of rumination and psychological outcomes reported (Burgess et al., 2005; Wong-Kim & Bloom, 2005). Future research should therefore extend this work to other cancer and illness groups to facilitate comparisons between different illness groups and by gender, particularly given documented gender differences in rumination (Nolen-Hoeksema & Jackson, 2001; Nolen-Hoeksema et al., 1999).

The second class of limitations relates to the assessment of rumination and psychological outcomes. The exclusive use of self-report measures may mean that results are unduly influenced by the level of participant self-awareness and accurate recall. This can be further impacted by a commonly-held perception by patients that some experience of psychological distress might be reasonably expected following a breast cancer diagnosis (Fisch, 2004; Love, 2004). These studies used the Depression, Anxiety, Stress Scale (Lovibond & Lovibond, 1995) to assess depressive, anxious and stress symptoms, a general psychological distress measure which may not have adequately captured concerns specific to the affective experience of a breast cancer diagnosis. Extending the current research beyond a purely quantitative approach, using in-depth interviews, may provide greater insight into rumination in the context of breast cancer.

The timing of rumination in relation to diagnosis has been noted to be of importance (Calhoun et al., 2000, Cann et al., 2010). The samples in the studies of this thesis represent long-term survivors, with a mean time past diagnosis of greater than nine years. As a group that has been largely overlooked in the research to date, with most studies focused on the first five years' post-diagnosis (Brosschot, 2010), this study provides some initial information on patterns of rumination in long-term survivorship. However, while time from diagnosis was controlled for statistically in

studies 3 and 4, it would be preferable to track changes in rumination over time in a group of individuals affected by breast cancer who are homogeneous with respect to time since diagnosis at the study entry point. This may avoid inconsistencies in patterns of assessment (Morris & Shakespeare-Finch, 2011). Accordingly, future research should account for time from diagnosis at the entry point, separating out the experiences of early (less than one year post-diagnosis), from medium survivors (one to five years) and longer-term survivors (five years and more).

Notwithstanding these limitations, the findings from these studies add to the previous literature in the fields of rumination, psychological distress and post-traumatic growth. Both Studies 3 and 4 provide evidence of the need to distinguish between subtypes of rumination and their differing relationship to depression, anxiety and the five dimensions of post-traumatic growth. As one of the first programs of research to explore these very specific relationships, the longitudinal study makes a unique contribution to understanding the role of rumination in psychological outcomes across the breast cancer trajectory.

Clinical Implications

By clarifying the pathways between rumination and psychological outcomes, the findings of this thesis have implications for the provision of psychological support to individuals with breast cancer to minimise psychological distress and facilitate post-traumatic growth. Most commonly, the focus of interventions in the breast cancer context has been solely on the recognition and amelioration of psychological symptoms, behavioural and emotional concerns (Seligman & Csikszentmihalyi, 2000; Tedeschi & Kilmer, 2005). Beyond the role of intervention in negative psychological outcomes, a focus on post-traumatic growth has the potential to facilitate a more positive psychological perspective in interventional practices to encourage growth (Calhoun & Tedeschi, 1999; Tedeschi & Calhoun, 1995, 2004). Interventions that encourage post-traumatic

growth may be able to improve outcomes, since individuals who experience post-traumatic growth tend to adapt to illness more successfully, report better subjective physical and mental health, lower symptoms of distress, as well as healthier behaviours and greater adherence to treatment (Helgeson et al., 2006; Sawyer, Ayers, & Field, 2010).

To date, given the well-established associations between rumination and negative psychological outcomes in physically-well populations (Nolen-Hoeksema, 2000; Spasojevic & Alloy, 2001), therapeutic interventions have largely been concerned with approaches to *minimise* rumination. Cognitive behaviour therapy has been used extensively in the context of illness, not only in the treatment of psychological distress, but also in relation to health maintenance, including disease management (Turk & Salovey, 1993). As a cognitive process, it might be expected that rumination would be particularly responsive to cognitive-behavioural therapy approaches. However, although cognitive-behavioural therapy is an extremely effective treatment approach, it appears less successful in managing the flow of negative thoughts inherent in the ruminative process. CBT has been shown to be less effective in treating depression in high ruminators compared to low ruminators (Ciesla & Roberts, 2007; Schmaling, Dimidjian, Katon, & Sullivan, 2002). Watkins (2010) indicates that thought challenging inherent in CBT can only be successful if it catches the start of the ruminative chain, stopping the process. If it does not, each thought will be followed by a "yes, but..." thought that maintains the process. Thought challenging can also trigger rumination, where the individual then starts a chain of thinking about why they had not been able to address the thought before, what the meaning might be (Watkins, 2010). This suggests that a sole focus on cognitive *content* may be insufficient and that addressing the cognitive *process*, by interrupting the ruminative flow, is therefore critical (Ciesla & Roberts, 2007).

At the most basic level, distraction has been used to break the ruminative cycle. This might involve being more sociable or undertaking pleasurable activities. Research, however, suggests that

distraction only has limited use, as it tends to extend the avoidance inherent in rumination and prompts recurrence, rather than remediation, of negative affect (Watkins & Teasdale, 2004). This has led to the development of a "third wave" of CBT, as exemplified by Mindfulness-Based Cognitive Therapy (MBCT; Segal, Williams, & Teasdale, 2002), Rumination-Focused CBT (RFCBT; Watkins, 2016) and Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999), which focus on changing the process and sequence of thinking (Watson, 2010).

MBCT and ACT combine present-focused cognitive-behavioural techniques with mindfulness practices, an emphasis on direct intuitive experience and acceptance, whereby thoughts and feelings are observed without judgement, elaboration, or reaction (Kabat-Zinn, 2003). Mindfulness meditation allows for the recognition and interruption of ruminative thinking patterns, facilitating the self-regulation of emotional states and resulting in enhanced psychological wellbeing (Segal et al., 2002). Accordingly, both MBCT and ACT shift the individual from the brooding ruminative style, outlined by Treynor et al. (2003), associated with psychological distress to a more reflective style associated with post-traumatic growth.

MBCT is based on the mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990) program used extensively in health settings with demonstrated benefits in patients with cancer, as well as chronic pain, fibromyalgia and cardiovascular disease (Grossman, Niemann, Schmidt, & Wallach, 2004). Reported benefits include reductions in rumination, depression and reported medical symptoms (Bishop et al., 2004; Carmody, Reed, Kristeller, & Merriam, 2008; Foley, Baillie, Huxter, Price, & Sinclair, 2010; Kenny & Williams, 2007; Ma & Teasdale, 2004; Surawy, Roberts, & Silver, 2005; Teasdale et al., 2000). Equally, ACT has also proven effective with a diverse range of medical conditions including cancer, chronic pain and diabetes (Arch & Mitchell, 2015; Dahl & Lundgren, 2006; Gregg, Callahan, Hayes, & Glenn-Lawson, 2007).

While studies are suggestive of the benefits of mindfulness practice, findings are weakened by several methodological issues including a lack of randomised controlled studies, sample size considerations, concomitant use of additional program elements and concerns about actual compliance to mindfulness practice (Baer & Krietemeyer, 2006; Bishop et al., 2004). Additionally, the situation is complicated by a lack of distinction between rumination and associated constructs such as worry and the fact that the individual facets of rumination are often overlooked. This is reflected in inconsistent findings with Ramel, Goldin, Carmona, and McQuaid (2004) demonstrating that mindfulness produced a significant reduction in reflection but not in brooding. This is not surprising given that brooding represents a more analytical rather than experiential form of rumination (Watkins & Teasdale, 2001), which would align more closely with the "here and now" that forms the core of mindfulness techniques.

In line with control theory of rumination, RFCBT accounts for constructive rumination, characterised by concrete, process-focused and specific thinking, and unconstructive rumination, characterised by abstract, evaluative thinking (Treynor et al., 2003; Watkins & Baracaia, 2002; Watkins & Moulds, 2005; Watkins & Teasdale, 2001). In recognising these diverse outcomes from rumination, RFCBT aims to help inidividuals switch from unconstructive to constructive rumination using functional analysis, experiential and imagery exercises, and behavioural experiments. Functional analysis examines the situational context of rumination, its antecedents and consequences, to recognise that it can be both helpful or unhelpful (Watkins, 2016). However, supporting evidence for RFCBT is limited to date. While preliminary research has demonstrated that RFCBT is beneficial in targeting rumination in the treatment of depression (Watkins et al., 2007; Watkins et al., 2011; Topper, Emmelkamp, Watkins, & Ehring, 2014), no studies exist in the context of illness.

As an alternative approach, metacognitive therapy (MCT; Wells, 2000) considers rumination as related to cognitive attentional syndrome (CAS), in which attention is focused on internal and external sources of threat and negative information as a coping strategy (Wells & Papageorgiou, 2004). CAS is linked to metacognitions that highlight rumination as problematic, "*I can't seem to control my thinking about my illness*", but also positive beliefs, such as "*Thinking about my illness helps me work out how to manage it*", which then make it difficult for individuals to abandon rumination. MCT approaches rumination as a problem, addressing it by increasing cognitive control through attentional training treatment (ATT; Wells, 1990), challenging metacognitive beliefs and modifying negative beliefs about emotion that lead to self-focus (Wells & Papageorgiou, 2004). Preliminary studies have demonstrated the efficacy of MCT in depression and anxiety (Wells et al., 2007) but research has not, yet, been extended to the context of illness.

The discussion so far adopts a conventional approach in that cognitive processes and behaviours that may lead to negative psychological outcomes are addressed (Roekpe, 2015). However, with increased understanding of the mechanisms of rumination comes the potential to channel the more reflective elements into the optimisation of post-traumatic growth. While research has clearly demonstrated the development of growth following a traumatic event (Tedeschi & Kilmer, 2005; Tedeschi & McNally, 2011), growth consequent to therapy is rarely measured. However, a meta-analysis by Roepke (2015) examined the use of disclosure or CBT based interventions in respect of positive psychological outcomes.

Deliberate cognitive processing has been associated with post-traumatic growth through increasing engagement with changed circumstances (Cann et al., 2010; Calhoun & Tedeschi, 2006; Greenberg, 2002). Expressive writing or disclosure is thought to free up emotional processing and facilitate greater understanding by getting the individual to write about their feelings (Pennebaker, 1989). However, findings have been mixed. Although the study was limited by the lack of a control

group, Park, Cohen and Murch (1996) demonstrated that expressive writing increases growth in women with breast cancer. Similarly, a self-compassionate writing intervention was shown to reduce negative affect in breast cancer survivors (Przezdziecki & Sherman, 2014). However, other studies have failed to detect any changes (Averill, 2007), with a meta-anlysis by Frattaroli (2006) suggesting that further research in needed.

As well as being relevant in terms of reducing distress, cognitive restructuring approaches within the CBT framework can be used to elicit growth through modification of inaccurate beliefs about the self ("*Now that I am sick, I can no longer do anything"*) and the world with more positive beliefs ("*There are still plenty of things I can do"*) (Janoff-Bulman, 1989; Tedeschi & Calhoun, 2004). Some of the skill building elements of CBT including building social support, sharing vulnerable information with others, engaging in meaningful activities, mindfulness and using coping skills may also facilitate growth (Bower & Segerstrom, 2004). Research is limited to date but growth has been demonstrated in cancer patients (Antoni et al., 2001, 2006; Cruess et al., 2001; Heinrichs et al., 2012; Knaevelsrud, Liedl, & Maercker, 2010; McGregor et al., 2004; Penedo et al., 2006).

While Roepke (2015) suggests interventions promote post-traumatic growth, none of the interventions used in studies were specifically designed to target post-traumatic growth as the primary outcome. Most focused on reducing distress and, while some of the interventions showed larger effects than others, the factors that increase effectiveness remain unclear.

In terms of clinical implications, a final caveat is added by Tedeschi and Kilmer (2005) regarding the significance of maintaining awareness that psychological distress and post-traumatic growth are not mutually exclusive experiences, with psychological distress likely to persist in parallel to the development of post-traumatic growth. Additionally, post-traumatic growth should never be considered a given or be expected to occur across all five domains identified. Accordingly,

it is critical in formulating interventions that individuals should never be burdened with the expectation of growth (Tedeschi & Belvins, 2015).

Theoretical Implications

Taken together, the studies underlying this thesis confirm the presence of a relationship between rumination and both constructive and unconstructive psychological outcomes in the context of breast cancer. The findings align with earlier studies that demonstrate the co-existence of psychological distress and post-traumatic growth (Schroevers et al., 2010; Stanton et al., 2003), so that rumination serves as a dual pathway to psychological distress and post-traumatic growth. In recognition of this dual pathway, the findings lend support to the discrepancy approach common to control theory (Schroevers et al., 2010; Stanton et al., 2003) and cognitive process theory (Janoff-Bulman, 1992) in the context of adjustment to breast cancer. Traumatic events, such as a breast cancer diagnosis, present new information that may be inconsistent with the individual worldview, those beliefs and assumptions about self (Janoff-Bulman, 1992). A perceived discrepancy between ideal self as "healthy" and real self as "sick", will kick-start the ruminative process to elaborate the new material and that process will be maintained until the discrepancy is resolved or until the individual disengages from the goal (Martin & Tesser, 1986, 1989).

Further aligned with the control process model, the findings provide initial support for the level of construal element of the control process model by demonstrating differential relationships to outcomes based on sub-types of rumination. Watkins (2004, 2008) indicates that higher levels of construal or abstractedness generate higher levels of rumination because they reduce the creation of alternative solutions or the initiation of action necessary to reduce a discrepancy. In this way, the evaluative thinking seen in brooding rumination, a passive contemplation of the negative aspects of an illness, has been associated in this thesis with greater levels of depression and anxiety, reflecting

a passive contemplation of the negative aspects of an illness, a fixation on the barriers to problem resolution (Joorman et al. 2006), and an associated inability to disengage from the shattered world view (Nolen-Hoeksema et al., 2008; Treynor et al., 2003). Lower levels of construal, characterised by more concrete thinking, generate lower levels of rumination because they present the specific actions or behaviours necessary to resolve any discrepancy (Watkins, 2004, 2008). In this way, instrumental rumination, thinking about the practical implications of an event (Fritz, 1999), provides a cognitive problem-solving approach to reduce the discrepancy, resulting in more constructive outcomes, including positive change or post-traumatic growth as demonstrated in this thesis.

However, the control theory model also recognises the structural components of rumination, highlighted in the Responses Styles and cognitive processing models, as important. The examination of sub-components of rumination in this thesis included intrusive rumination, a more automatic process that incorporates these structural elements, being associated with negative emotions and memories that prime access to negative content (Nolen-Hoeksema et al., 1994; Vickberg et al., 2000). In this way, intrusive rumination can limit the more deliberate processing required for resolving a discrepancy. However, the influence of intrusive rumination has been theorised to vary according to a temporal relation to a traumatic event, being perceived as a precursor to more constructive outcomes, such as posttraumatic growth, in the period immediately following a traumatic event (Calhoun et al., 2000; Cann et al., 2010). However, when intrusive rumination persists over a longer time period, uncontrolled, the link to psychological distress intensifies, preventing disengagement and sense-making, while compounding any sense of personal helplessness (Janoff-Bulman, 1992; Park et al., 2010) as demonstrated in this thesis.

This thesis provides support for the control and cognitive processing theories in respect of the role of discrepancy resolution following a trauamatic event, such as receiving a breast cancer

diagnosis through initial exploration of sub-types of rumination and their role in constructive and unconstructive outcomes. Similary, the thesis demonstrates the importance of the structure elements of rumination (content and valence) and provides early evidence of the necessarity to further explore temporal changes in the different elements of rumination over the breast cancer trajectory.

Research Implications

This thesis represents an initial exploration of these relationships in respect of specific facets of rumination and the five dimensions of post-traumatic growth. As such, further research is needed to advance understanding of the complex construct of rumination and its influence on adjustment in illness.

Given the focus on rumination in the context of breast cancer in this thesis, the studies explored rumination in an extremely homogenous group. Future research might extend this this work to other cancer and illness groups to determine how the relationships between rumination and psychological outcomes might vary considering the different challenges presented by other medical conditions.

The studies in this thesis focused on late survivors, with a mean time from diagnosis of more than nine years. This contrasts with most studies (e.g., Cordova et al., 2001, Mols et al., 2009; Sears et al., 2003), which focus on the first five years' post cancer diagnosis. Yet it is apparent from the present research that there is a temporal element to the relationship between rumination and psychological outcomes, in that the influence of rumination may vary depending on proximity to traumatic event (e.g., diagnosis of breast cancer). For example, intrusive rumination can serve as precursor to growth in the aftermath of a diagnosis but become problematic when it continues unabated longer-term (Calhoun et al., 2010). Therefore, future research should consider separating out the experiences of early (less than one year post-diagnosis), from medium survivors (one to five

years) and longer-term survivors (five years and more) to further examine patterns of rumination across the breast cancer trajectory.

As noted, understanding these patterns may guide intervention. Currently, research into psychological therapies targeting rumination in respect of psychological distress is at an early stage, particularly in the context of illness. Although the initial evidence is encouraging (Arch & Mitchell, 2015; Gregg et al., 2007; Suraway et al., 2005), one limitation is a lack of comparison studies to existing therapies, such as cognitive-behavioural therapy, that have been extensively used in the context of illness (Turk & Salovey, 1993). Further investigation in this way would clearly illustrate any potential benefit of incorporating rumination as a target in interventions.

Conclusion

This thesis addressed rumination and its role in positive and negative psychological outcomes in the context of breast cancer. Extending the research on rumination from physically-well populations into the context of illness is critical because its presence in positive and negative psychological outcomes suggests that it may be the underlying mechanism for a dual pathway to adjustment outcomes in response to illness. This thesis further extended the ruminative research in this context by exploring the differential impacts of facets of rumination in respect to both negative outcomes, depression, anxiety and stress, as well as the five domains of post-traumatic growth.

Accordingly, this thesis sought to identify the specific dimensions of rumination involved in the promotion of positive and negative outcomes in women diagnosed with breast cancer in both correlational and longitudinal research. In assessing rumination, the studies used the newly developed Multidimensional Rumination in Illness Scale (MRIS), specifically developed in response to a lack of measures of rumination designed for use in the context of illness and to

provide a comprehensive measure of key elements of the ruminative process applicable to illness without the requirement to administer a battery of tests.

Although findings were limited by the psychological stability of the sample, the relationship between rumination, markers of psychological distress and post-traumatic growth were clearly demonstrated, aligning with existent research, both in clinically-well and illness populations. More specifically, differential relationships of individual facets of rumination were observed in respect of the various psychological outcomes.

Understanding influences on psychological outcomes allows for the development of appropriate interventions to minimise distress and maximise growth. The presence of increased levels of psychological distress adds to the total burden of the illness and reduces QoL. Identifying factors, such as rumination, that may facilitate growth moves away from the traditional problem-focus of interventions, with better outcomes in terms of subjective physical and mental health. However, caution must be exercised in respect of placing undue expectations on the individual because post-traumatic growth is not a universal experience. Currently, few interventions in the context of breast cancer specifically address rumination,

Rumination has become a key area of interest in current research, with the significant amount of work undertaken in the area of the role of rumination in psychological disorders in clinically-well populations now being extended to the setting of illness. While early studies, as reported in this thesis, demonstrate the importance of this area and the complexity of the ruminative construct, many opportunities for further research exist.

Appendix A. Glossary

Acceptance and commitment therapy: An empirically based psychological intervention that uses acceptance and mindfulness, together with commitment and behaviour change strategies, to increase psychological flexibility. Psychological flexibility means contacting the present moment fully as a conscious human being, and based on what the situation affords, changing or persisting in behaviour in the service of chosen values (Hayes, n.d.)

Accommodation: As part of the sense-making process post-trauma, the existent worldview is altered to maximise the fit between old and new schema (Janoff-Bulman, 1992).

Adjuvant therapy: Additional treatment following the primary treatment to increase the chance of remission. This might include chemotherapy, hormonal therapy or radiotherapy to kill any remaining cancer cells (Cancer Australia, 2017).

Advanced cancer: Cancer that has metastasised from the site of origin to other organs (Cancer Australia, 2017).

Adversarial growth: Positive change following a struggle with adversity where such change increases the individual's level of functioning over than that which existed before the adverse event (Linley & Joseph, 2004).

Appreciation of life (post-traumatic growth): A dimension of post-traumatic growth that may be experienced post-trauma in the experience of greater appreciation of the value of everyday things, with greater meaning being found in intrinsically important priorities (e.g., spending time with one's children) and less importance being attached to extrinsic priorities (e.g., making lots of money) (Calhoun & Tedeschi, 2014).

Assimilation: As part of the sense-making process post-trauma, changes are made to the incoming information post-trauma so that it fits well with the existing worldview (Janoff-Bulman, 1992).

Benefit finding: Benefit finding is the reported positive life change resulting from the struggle with a challenging life event such as illness (Riley, 2013).

Benign: Benign tumours are not cancerous and do not invade tissue or spread to other parts of the body (National Institute of Cancer (NCI), n.d.).

Body image: A multifaceted construct that includes an individual's cognitions, emotions and behaviours associated with their body and its functioning (Fingeret et al., 2014).

Breast cancer: Breast cancer is a disease characterised by the uncontrolled and abnormal proliferation of cells within the structures of the breast, differentiated by location, receptivity to hormones and its ability to metastasise (Chan, 2006).

Breast conserving therapy: Surgical removal of the cancer itself with a margin of tissue only (Chan, 2006).

Brooding rumination: A form of perserverative thinking that focuses solely on the causes, symptoms and consequences of distress (Treynor et al., 2003). Examples of brooding are thinking thoughts such as "*Why do I have problems other people don't have*" or "*Why can't I handle things better*?"

Cancer: This is a general term for disease in which abnormal cells divide without control. Cancer cells can invade nearby tissues and can spread through the bloodstream and lymphatic system to other parts of the body (Cancer Australia, 2017).

Carcinoma in situ: Cancer that only involves the cells where it began and which has not spread to other tissues (Cancer Australia, 2017).

Chemo brain: Cognitive issues related to attention, concentration and memory consequent to chemotherapy treatment (Ahles et al., 2002)

Chemotherapy: Chemotherapy is the administration of anti-cancer drugs to slow or kill cancer cells by interfering with the processes required for cancer cell division (Ho, 2004).

Cognitive adaptation theory: The adjustment process, in response to threatening events, involves a search for meaning in the experience, an attempt to regain mastery and to restire self-esteem. Successful adjustment will depend on the ability to sustain and modify illusions that protect any present threat and future setback (Shelley, 1983).

Cognitive attentional syndrome: Inflexible and recurrent thinking, such as rumination and worry, adopted based on positive metacognitive beliefs about their use, along with threat monitoring and behaviours that fail to modify dysfunctional self-belief (Fergus, Valentiner, McGrath, Gier-Longsway, & Jencius, 2013; Wells & Papageorgiou, 2004).

Depressive rumination: Depressive rumination is characterised rumination focused on symptoms of depression and the possible causes and consequences of those symptoms (Nolen-Hoeksema, 1991).

Ductal carcinoma: A type of breast cancer that involves the structures of the breast that transport breast milk to the nipple (Chan, 2004).

Expressive writing: Personal, uncensored form of writing on personal experiences, developed by Pennebaker (Pennebaker, 1989).

Hormone blocking therapy: Some breast cancers are affected by female hormones. Most hormonal therapies work by decreasing the amount of oestrogen and/or progesterone in the body or by stopping the cancer cells from obtaining these hormones. Hormonal therapies are considered if pathology results have indicated the presence of hormone receptors on the cancer cells. Hormonal therapies are systemic treatments and may be used in conjunction with surgery, radiation and chemotherapy (National Breast Cancer Centre, 2007).

Inflammatory breast cancer: A rare form of invasive breast cancer where cancer cells block lymph channels in the breast. A much more aggressive form of cancer, it is likely to have metastasised by the time of diagnosis and has a higher rate of recurrence than other types of breast cancer (ACS, 2012a).

Instrumental rumination: Instrumental rumination is characterised by "thinking about what can be done to change one's sit1uation" (Siegle et al., 2004), for example, thinking about how to solve any problems caused by the traumatic event.

Intrusive rumination: Intrusive rumination is considered an automatic process that involves unexpectedly thinking about an event, with a sense of invasiveness and perceived lack of controllability (Park, 2010).

Lobular carcinoma: A type of breast cancer that develops from the structures within the breast that are responsible for milk production (Chan, 2004).

Lumpectomy: Surgery to remove a breast cancer with a margin of normal tissue, but not the breast itself (NCI, n.d.).

Lymph gland/node: Bean-shaped collections of lymph cells across the lympathic system that have a role in immune system function (Cancer Australia, 2017).

Lymphoedema: The removal of lymph nodes can result in lymphoedema, a swelling of soft tissues due to a build up of lymph fluid. Dependent on severity, lymphoedema can affect an individual's ability to perform daily tasks, can lead to skin changes and breakdown, involve pain, fatigue and an increased risk of infection in the affected areas (ACS, 2006; Australasian Lymphology Association (ALA), 2009), which can impact further on psychological, sexual and social functioning.

Mastectomy: The surgical removal of all breast tissue (Chan, 2006).

Metacognition/metacognitive beliefs: Thinking about thinking. These can be positively orientated, for example, "*thinking helps me work out what to do next"* or negatively-orientated, "*I think too much about my illness"*.

Metastasise: This refers to the spread of cells from the cancer site to other parts of the body to form secondary tumours, thus differentiated as invasive, as opposed to non-invasive, in nature (Chan, 2006; Ogden, 2004).

Mindfulness: An emphasis on direct intuitive experience and acceptance, whereby thoughts and feelings are observed without judgement, elaboration, or reaction (Kabat-Zinn, 2003)

Mindfulness-Based Cognitive Therapy: This therapeutic approaches combines present-focused cognitive-behavioural techniques with mindfulness practices to shift the individual from the brooding ruminative style associated with psychological distress to a more reflective style associated with post-traumatic growth.

New possibilities (post-traumatic growth): New possibilities is a dimension of post-traumatic growth that reflects the new possibilities and interests that might emerge for an individual post-event/experience (Calhoun & Tedeschi, 2014).

Organismic Valuing Theory: Organismic Valuing Theory is a model of adaptation to threatening events that is grounded in the person-centred meta-theoretical position that individuals are motivated towards growth, examining the relationship between appraisal processes and personality/assumptive worlds (Joseph & Linley, 2008).

Paget's disease: Non-invasive breast cancer is Paget's disease, which begins in the milk ducts of the nipple. Paget's disease is rare, accounting for only 1% of breast cancer cases (ACS, 2012a).

Perseverative thinking: Perseverative thinking is "the repeated or chronic activation of the cognitive representation of one or more psychological stressors" and is hypothesized to be a core feature of worry, rumination, and other forms of RT (Brosschot et al., 2006; Brosschot et al., 2005; Pieper & Brosschot, 2005).

Post-traumatic growth: Positive change commonly experienced following a traumatic event. It can involve a greater sense of self, increased meaning in day-to-day life and increased value in close relationships is commonly seen (Calhoun, Cann, Tedeschi, & McMillan, 2000).

Quality of life (QoL): Overall appraisal of situation and subjective sense of well-being, include symptoms, side effects from treatment, functional capacilty, social and occupational functioning (Cancer Australia, 2017).

Radiation therapy: Radiation therapy seeks to kill cancer cells but uses high-powered x-rays to directly target cancer cells over a period of weeks (Chon, 2004). Side effects can include fatigue and burning of the skin (Burney & Fletcher, 2013; Hewitt, Greenfield, & Stovall, 2006), but radiation can also increase the risk of lymphoedema when axillary radiation is required (Rowland & Massie, 2010).

Reflection: Reflection is characterised as contemplation that is neutrally valenced and engaged in as an attempt to solve problems (Treynor et al., 2003). An example of reflection is analysing recent events to try to understand reasons for depressed mood.

Relating to others (post-traumatic growth): A dimension of post-traumatic growth that reflects the positive changes in relationships (greater closeness, intimacy, empathy for others, freedom to be oneself) commonly reported following a traumatic event (Calhoun & Tedeschi, 2014**).**

Remission: Remission relates to a period during which symptoms of cancer disappear, with a complete remission representing a situation where there is no evidence of active disease (Cancer Australia BM).

Reflective rumination: "A purposeful turning inwards to engage in cognitive problem-solving" (Treynor et al.,2003, p. 245)

Rumination: A form of perserverative thinking, "the cognitive process of actively thinking about a stressor, the thoughts and feelings it evokes and the implications for one's life and future" (Watkins, 2008, p. 164).

Side effects: The unintended side effects of a drug or treatment (Cancer Australia, 2017).

Social support: Social support consists of a network of people who provide emotional caring and concern, and reinforcement of a sense of personal worth and value. However, social support can also include practical assistance, information, guidance, feedback and validation of the individual's stressful experiences and coping choices (Cancer Australia, 2017).

Spirituality (post-traumatic growth): A dimension of post-traumatic growth reflecting a greater sense of purpose and meaning in life, greater satisfaction, and perhaps clarity with the answers given to the fundamental existential questions (Calhoun & Tedeschi, 2014).

Staging: Method of outlining the severity of the cancer on the basis of the extent of the primary tumour and whether the cancer cells have spread to the lymph glands and metastasised to the rest of the body (National Cancer Institute, 2010).

Strength (post-traumatic growth): A dimension of post-traumatic growth, strength relates to a change in the perception of self as someone who has faced a traumatic event, has experienced the world as dangerous and unpredictable and yet survived. "*I am more vulnerable than I thought but much stronger than I ever imagined"* (Calhoun & Tedeschi, 2014, p. 5).

Surgery: Surgery is frequently the first treatment offered in breast cancer, with the aim of eliminating the cancer from the breast (Rowland & Massie, 2010). Surgery can be either breast conserving, where only the cancer itself and a margin of tissue is removed, or it may involve a mastectomy (complete removal of all breast tissue) (Chan, 2006; Rowland & Massie, 2010).

Survivorship: In cancer, survivorship focuses on the health and life of a person with cancer beyond the diagnosis and treatment phases. It is a period traditionally designated as five years post-diagnosis, after which the probability of recurrence declines (Andersen & DiLillo, 2001; Cameron, 1997; Hewitt et al., 2006; Mehnert & Koch, 2008), although some consider survivorship to start once active treatment is completed.

Tamoxifen: This is a drug that blocks the effects of oestrogen in cancer cells and is a treatment for oestrogen-receptive and progesterone-receptive cancers (Cancer Australia, 2017).

Tumour: An abnormal growth of tissue. It may be localised (benign) or invade adjacent tissues (malignant) or distant tissues (metastatitic) (Cancer Australia, 2017)

Vulnerability-Stress Model: Maladaptive attitudes are hypothesised to interact with negative events to increase levels of depressive symptoms (Hankin, Abramson, Miller, & Haeffel, 2004).

Worldview: The worldview relates to the individual sense of how the world is, how it works and their own place within it (Tedeschi & Calhoun, 1996).

Appendix B. Rumination as a cognitive process

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Rumination as a Cognitive Process in Chronic Illness

Heather Soo and Kerry Sherman

Cognitive models of coping in illness have traditionally highlighted the role of maladaptive cognitive *content*, yet increasingly attention is turning towards the role of cognitive *style*. Rumination, a repetitive style of thinking, has been demonstrated to be a key predictor of depression and, to a lesser extent, anxiety, in nonclinical populations. Current research on rumination in illness suggests that rumination may be important in physical, affective, and behavioral outcomes. Extending cognitive models to incorporate cognitive style will provide an additional mechanism to identify individuals at particular risk of developing psychological distress and will also facilitate the development of appropriately targeted interventions. The quotations used throughout the chapter are drawn from the first author's clinical experience.

Thinking about Illness

"The night I received my diagnosis, my mind was in turmoil. I couldn't stop thinking about what had been said, turning every single sentence over and over in my head, almost as if, in doing so, the world would suddenly shift and make complete sense once again . . . ." (Jayne, 43, diagnosed with systemic lupus erythematosus)

The diagnosis of a chronic illness, such as diabetes or cardiovascular disease, presents a fundamental threat to the individual. Beyond concerns about potential health outcomes, the diagnosis forces consideration of how this change of health status sits with the individual's current self-concept. Diagnosis may lead to contemplation of life plans and goals, and, when there's a disparity between the ideal self as "healthy" and the real self (as affected by illness), the individual will engage in a sense-making process to try to understand their illness and its effect on them personally. Thinking about illness in this way entails processing of both cognitive and emotional context

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(Leventhal *et al.*, 1980) and has been found to result in increased levels of psychological distress, particularly anxiety and depression (Moldin *et al.*, 1993). However, not all outcomes are necessarily negative, with reports of positive psychological change, posttraumatic growth, which results from finding increased meaning in day-to-day life and increased value in close relationships (Calhoun *et al.*, 2000).

Until recently, focus has been on cognitive content and the role of maladaptive cognitive patterns when considering psychological outcomes in illness (Beck, 1967, 1976). The formation of illness schema, with elements relating to risk encodings, and beliefs about such aspects as symptoms associated with the condition (identity), reasons for the condition (causality), anticipated duration (timeline), ability to cure or treat the condition (controllability), and the consequences of the illness, are regarded as key determinants of responses to health threats in numerous models of health and illness including the common-sense model (CSM; Leventhal *et al.*, 1980), the cognitive-social health information processing model (C-SHIP; Miller, 1980), and self-regulation theory (SRT; Carver & Scheier, 1981). Focus on these concerns potentially provides substantial negative cognitive material (Crane & Martin, 2003).

Less attention has been given to the *emotional* processing of the health threat posed by the diagnosis of chronic illness, even though the mutual relationship of cognition and affect is widely acknowledged (Bargh & Williams, 2007). Increasing attention is being given to the role of rumination, "the cognitive process of actively thinking about a stressor, the thoughts and feelings it evokes and the implications for one's life and future," in an effort to understand the role of emotional responses to illness (Watkins, 2008, p. 164). Characterized by self-focus and a repetitive and passive deliberation on thoughts, there is no consensus as to the function and outcomes of rumination; it is regarded as potentially an adaptive, positive coping mechanism, and an integral part of the problem solving process, but it can also be a maladaptive process that increases the likelihood of psychological disorders (Joorman *et al.*, 2006).

Rumination, a Maladaptive Process?

"I believed that thinking about my illness would help me work out how best to manage the diabetes and to find alternative ways to achieve what I want in life . . . ." (Erica, 31, diagnosed with Type 1 diabetes)

Given that rumination is not universally adaptive, what purpose does it serve for an individual to engage in this process? Rumination is a common reaction to stressful circumstances, such as diagnosis of illness, experience of natural disasters, or loss of a loved one (Nolen-Hoeksema *et al.*, 1997; Nolen-Hoeksema & Morrow, 1991). Its use may be a conscious choice, adopted as a self-regulatory process to minimize emotional distress arising from a threatening or traumatic event (Tedeschi & Calhoun, 2004), or an unconscious process, invariably experienced in a negative manner as intrusive or uncontrollable: "I can't seem to stop thinking about my illness" or "I think about my illness when I least expect it."

Where rumination is consciously chosen as a coping strategy, it is typically based on the belief that it is a means of "working through" difficulties. Hence, in this instance, rumination is an instrumental behavior, whereby there is a focus on understanding the illness experience and initiation of adaptive behaviors to help resolve perceived disparity between real, or "unhealthy," versus ideal, or "healthy," states (Martin & Tesser, 1989, 1996). Thinking about illness in this way

entails a concrete approach aimed at finding solutions to problems that arise out of the illness experience. It is a form of reflection, "a purposeful turning inwards to engage in cognitive problem solving" (Treynor *et al.*, 2003, p. 256). Therefore, rumination in this sense relates to developing coping strategies to meet the demands of the illness, "Thinking about my diabetes helps me work out what to do to manage it," or to finding new approaches so that life goals remain achievable, "I am thinking about how I can get to where I want to be in life."

Although the process of rumination can have a facilitatory effect on coping processes, it may also prove maladaptive if the inherent self-focus is more abstract and evaluative rather than experiential, or brooding, characterized by anxious or melancholic thought, as opposed to reflective and contemplative in nature (Treynor *et al.*, 2003; Watkins & Teasdale, 2004). If rumination causes an individual to focus their thinking on the causes, symptoms, and consequences of an illness diagnosis, any associated negative affect may be amplified and more extensive and detailed risk representations developed, with the potential to further increase psychological distress (Lyubomirsky *et al.*, 1998). Additionally, the individual may find him or herself making negative comparisons of self: "What's wrong with me that I got sick?," or of current self and past self, "Why can't I do everything I used to do?"

> "There are times when I get lost in thought about HIV . . . I find myself focusing on the negative aspects. This worries me as I notice my mood spiralling downwards when I think like this . . . . It can be so hard to stop even when I want to . . . ." (Jonathan, 47, diagnosed with HIV)

The debate about whether rumination is an adaptive or maladaptive process may reflect differences of opinion on its precise definition. There is evidence that ruminative processes are useful for solving problems and resolving difficult emotions (Watkins & Baracaia, 2001). Conversely, evidence exists that rumination is negatively related to problem solving through its interference with attention and ability to generate alternatives (Lyubomirsky *et al.*, 2003b). It may be that rumination is an emotional regulation strategy that masquerades as a problem solving strategy: rumination prevents more complex emotional engagement and, paradoxically, acts as an avoidance strategy (Nolen-Hoeksema, 1996). When a failure to generate solutions is further compounded by negative beliefs about rumination, in terms of lack of controllability, "I can't stop thinking about my illness," or the perceived harmful effects of rumination, "Thinking about my illness will make me sicker," psychological outcomes are likely to be poor.

These contradictory views underline the reality that rumination is a complex and multifaceted concept, with both adaptive and maladaptive elements duly reflected in the differential outcomes reported for rumination in the literature. The distinction between subtypes, reflection and experiential versus brooding and evaluative, has important implications, with the latter considered more critical in the development of adverse psychological outcomes (Watkins & Teasdale, 2001). Ruminative content may remain important, as shown by the volume of research focusing on rumination in response to the experience of depressed mood (Nolen-Hoeksema, 1991, 2000; Nolen-Hoeksema & Morrow, 1991; Spasojevic & Alloy, 2001), but psychological outcomes are also likely to be a function of individual metacognitive beliefs about rumination. While positive beliefs may explain why people initiate and maintain the ruminative process ("Thinking about my illness helps me understand its cause"), negative beliefs ("I exhaust myself thinking about my illness") may provide a connection to psychopathology (Michael *et al.*, 2007). As there is likely to be a

complex interplay of these elements, any examination of rumination in response to illness must carefully consider the influence of all these various subcomponents of rumination.

Rumination and Health Outcomes

"While thinking about chronic fatigue is useful, I can't help but feel the sadness and anxiety all over again." (John, 24, diagnosed with chronic fatigue syndrome)

Much of what we understand about the role of rumination and psychological outcomes is based on the general population; very little is currently known about how rumination influences the physical and psychological outcomes of individuals with chronic illness. In general, rumination has been linked to poorer health consequences including the experience of heightened levels of pain (Sullivan & Neish, 1998), primary insomnia and poor quality of sleep (Guastella & Moulds, 2007; Thomsen *et al.*, 2003), and activation of the immune system with increased levels of leukocytes and other immune system measures (Thomsen *et al.*, 2004b).

In line with the view that rumination is adaptive, some argue that it reduces stress, but the majority of evidence suggests the contrary that it helps to prolong bodily responses associated with emotion (Brosschot *et al.*, 2006). Rumination has been shown to delay heart rate and blood pressure recovery following the experience of stressful events (Glynn *et al.*, 2002; Roger & Jamieson, 1988). In individuals who find hard to regulate emotional response, rumination is thought to reactivate the cardiovascular system by mentally recreating an earlier stress reaction, even though the originating stressor may no longer exist (Melamed, 1986). A study among undergraduate students who were asked to recall exposure to a prior stressor found an association between increased blood pressure and higher emotional component of the stressor (Glynn *et al.*, 2002). Similarly, Roger and Najarian (1998) linked rumination to increased levels of cortisol, the stress hormone, which reflects an index of activation of the hypothalamic-pituitary-adrenal axis, a neuroendocrine system that regulates many bodily processes. While the research is largely correlational, it is, nonetheless, suggestive that ruminative tendencies may have a detrimental impact on physiological health through increased experience of stress.

Along with the evidence supporting negative physiological states, rumination has been linked to poorer levels of self-reported health, including increased levels of stress, number of health complaints reported, and healthcare use (Lok & Bishop, 1999; Thomsen *et al.*, 2004a). In examining the impact of rumination on self-reported health and healthcare use, Thomsen *et al.* (2004a, 2004b) examined both young and older groups. Rumination was found to be of greater significance to the health of older adults. While similar associations existed in the younger group, these were much weaker and of limited significance, suggesting that rumination is likely to be a more significant concern for vulnerable groups. These findings were limited by the use of self-report measures and a failure to differentiate outcomes on the basis of specific health concerns (Thomsen *et al.*, 2004a, 2004b). Rumination has also been implicated in delays in seeking medical assistance, which may have important implications in terms of health outcomes (Lyubomirsky *et al.*, 2003a). Lyubomirsky *et al.* (2003a) studied help-seeking behavior in two groups: women were asked to imagine they had discovered a breast lump and actual breast cancer survivors. In both groups, the women who delayed seeking help the longest tended to be ruminators. Lyubormirsky *et al.* (2003a) ascribed the delay to the consequences of the negative bias inherent in rumination and the associated impairment of concentration, impeding instrumental behaviors such as seeking a

medical opinion. This reinforces research that shows individuals who are more likely to ruminate require more time to solve a problem (Ward *et al.*, 2003).

Research on rumination in illness is in its infancy. While there has been some investigation of physiological and behavioral outcomes as described previously, the research on psychological outcomes remains limited, although initial studies echo similar patterns of influence on depression and anxiety as in studies undertaken in the clinically well and suggest that content valence of rumination may be important (Bower *et al.*, 1998; Chan *et al.*, 2010; Soo *et al.*, 2007). While positive outcomes of rumination have been demonstrated (Chan *et al.*), the majority of the available evidence suggests a negative effect for rumination in illness (Brosschot *et al.*, 2006, Lyubomirsky *et al.*, 2003a; Soo *et al.*, 2007). However, the findings of many of the studies are restricted by their correlational nature, small sample sizes, and limitations in the physiological data collected (Suchday *et al.*, 2004). As such, further work is needed to explore the precise influence of rumination on outcomes in the context of illness.

Breaking the Ruminative Cycle

"I find it hard to stop thinking about my illness. I try and keep busy, try and distract myself but, more often than not, thoughts break through . . . ." (Rebecca, 42, diagnosed with multiple sclerosis)

Given the demonstrated associations between rumination and psychological outcomes in clinically well populations (Nolen-Hoeksema, 2000; Spasojevic & Alloy, 2001), therapeutic responses have largely been concerned with approaches to minimize rumination. Cognitive behavior therapy (CBT) has been used extensively in the setting of illness, not only in treatment of psychological distress but also in relation to health maintenance, including disease management (Turk & Salovey, 1993). While CBT is considered to be an extremely effective treatment approach, it appears to be less effective in managing ruminative processes, suggesting that a sole focus on cognitive *content* may be insufficient. Addressing the cognitive *process*, in particular by interrupting the stream of ruminative thoughts, is considered to be critical (Ciesla & Roberts, 2007).

At the most basic level, distraction has been used to break the ruminative cycle. This might involve being more social or undertaking pleasurable activities. Research, however, suggests that distraction has only limited use in rumination, with distraction criticized as extending the cognitive avoidance inherent in rumination and prompting recurrence rather than remediation of negative affect (Watkins & Teasdale, 2004). Watkins (2010) linked the ineffectiveness of distraction to the chaining of thoughts seen in rumination, where one negative thought is followed by another; for example, "This illness leaves me no energy for anything," "I'll never be able to achieve what I wanted to," and "I'll never do anything worthwhile again." Watkins argued, therefore, that distraction would only be successful if it caught the initial thought in a ruminative chain.

This has led to the development of a "third wave" of CBT, as exemplified by mindfulness-based cognitive therapy (MBCT; Segal *et al.*, 2002) and acceptance and commitment therapy (ACT; Hayes *et al.*, 1999). Both share the combination of present-focused cognitive-behavioral techniques with the use of mindfulness practices, an emphasis on direct intuitive experience and acceptance, whereby thoughts and feelings are observed without judgment, elaboration, or reaction (Kabat-Zinn, 2003).

Interventions such as MBCT focus on "changing awareness of, and relationship to, thoughts, feelings and bodily sensations" (Segal *et al.*, 2002, p. 54), as opposed to attempting to change content of thoughts about illness. Mindfulness facilitates decentering or defusion, detachment from the meaning of thoughts about illness, so they are experienced as naturally occurring internal events. For example, in chronic illness, individuals learn to recognize the different sensations of their illness and, in doing so, may notice that sometimes no sensations exist or that sensations experienced are neutral, thereby promoting acceptance. Thoughts such as "I can't take any more of this" are simply noted and let go without further processing. In this way, the pitfalls associated with rumination are averted (Bishop *et al.*, 2004).

Segal *et al.* (2002) claim that repeated mindfulness meditation allows for the recognition and interruption of recurrent thinking patterns, facilitating the self-regulation of emotional states and resulting in enhanced psychological wellbeing. In this manner, mindfulness addresses the rumination problem by shifting the individual from the maladaptive evaluative self-focus to the experiential approach outlined by Watkins and Teasdale (2004), from the brooding ruminative style outlined by Treynor *et al.* (2003) associated with psychological distress to a more reflective style.

> "Mindfulness has helped me to let go of some of future concerns I had in relation to my illness, to allow me to focus on what is important for me right now. . . ." (John, 35, diagnosed with hepatitis C)

Both MBCT (Segal *et al.*, 2002) and ACT (Hayes *et al.*, 1999) promote cognitive distancing in conjunction with the acceptance of experiences for what they are. MBCT is based on the mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990) program used extensively in health settings with demonstrated benefits in patients with a broad range of chronic disorders including chronic pain, fibromyalgia, cancer, and cardiovascular disease (Grossman *et al.*, 2004). Reported benefits include reductions in rumination, psychological distress, and reported medical symptoms (Bishop *et al.*, 2004; Carmody *et al.*, 2008). Similarly, MBCT has been shown to reduce symptoms and relapse rates in individuals with a history of depression and anxiety (Kenny & Williams, 2007), with some initial evidence to suggest that MBCT can be beneficial in the treatment of psychological stress secondary to health issues such as chronic fatigue and cancer (Foley *et al.*, 2010; Surawy *et al.*, 2005). Equally, ACT has also proven effective with a diverse range of medical conditions including chronic pain and diabetes (Dahl & Lundgren, 2006; Gregg *et al.*, 2007).

The research on MBCT and ACT is in its early days and it is premature to make conclusions about effectiveness in the management of rumination in illness. While studies are suggestive of benefits of mindfulness practice, findings are weakened by a number of methodological issues including a lack of randomized controlled studies, sample size considerations, concomitant use of additional program elements, and concerns about actual compliance to mindfulness practice (Baer & Krietemeyer, 2006; Bishop *et al.*, 2004). Additionally, the situation is complicated by a lack of distinction between rumination and associated constructs such as worry and the fact that rumination is often considered as a single entity, with subcomponents of brooding and reflection overlooked. This is reflected in inconsistent findings with Ramel *et al.* (2004) demonstrating that mindfulness produced a significant reduction in reflection but not in brooding. This is not surprising given that brooding represents a more analytical rather than experiential form of

rumination, which would align more closely with the "here and now" that forms the core of mindfulness techniques.

Thinking about Thinking

An alternative approach, metacognitive therapy (MCT; Wells, 2000), considers rumination as one of several repetitive thinking styles related to cognitive attentional syndrome (CAS), in which attention is focused on internal and external sources of threat and negative information as a coping strategy (Wells & Papageorgiou, 2004). CAS is linked to metacognitions that determine thinking processes. Negative beliefs about rumination, such as "I can't seem to control my thinking about my illness" or "I find myself thinking about my illness when I least expect it," highlight rumination as problematic. Positive beliefs, such as "Thinking about my illness helps me work out how to manage it," make it difficult for individuals to abandon rumination. MCT introduces the idea of rumination as a problem and facilitates abandonment of the cognitive process, increases cognitive control through attentional training treatment (ATT; Wells, 1990), challenges metacognitive beliefs, and modifies negative beliefs about emotion that lead to self-focus (Wells & Papageorgiou, 2004). Preliminary studies have demonstrated the efficacy of MCT in depression and anxiety (Wells *et al.*, 2007) but research has not, as yet, been extended to the setting of chronic illness.

Ruminating on the Future

Rumination has been demonstrated to be important in the development of depression and anxiety in clinically well populations. Early research on rumination in health contexts suggests that rumination may play an important role in determining health outcomes. First, rumination has been linked to the activation of cardiovascular, immune, and hypothalamus-pituitary-adrenal systems and it will be important to clarify any association and to determine the possible duration of the rumination effect. Second, rumination has a documented role in psychological disorders in clinically well populations. Initial research suggests that these findings are likely to be equally significant within the context of illness. The presence of increased levels of psychological distress in the setting of illness can have considerable ramifications, not only in respect of adding to the total burden of the illness, but also in respect of adherence to treatment regimens, decreased quality of life, and increased healthcare utilization. If the association between rumination and psychological outcomes is replicated in the context of illness, this will provide an additional mechanism for identifying individuals at particular risk and facilitate the provision of an early and appropriate intervention.

While the existent research provides initial steps towards the development of a conceptualization of the relationship between rumination and illness, this area is largely underdeveloped. It will be of primary importance to learn more about the exact nature of any association between rumination and physiological, psychological, and behavioral outcomes in illness. In doing so, it will be important to account for the differential effects of the particular components of rumination, such as brooding and reflection. It will also be useful to explore how any relationship might vary according to specific health conditions. Such research will require the issues of earlier studies to be addressed with a greater focus on randomized controlled studies, larger sample sizes, and longitudinal research.

Rumination is rapidly developing as a key area of interest in current research. Whereas there has been a significant amount of work done in the area of the role of rumination in psychological

disorders in clinically well populations, this work has yet to be extended to any great extent in the setting of illness. Early studies provided results hinting at the importance of this area, but many opportunities for research, with an initial emphasis on defining the precise role of rumination in illness, remain. When this has been achieved, identification of risk factors for rumination specific to illness will become clearer and further exploration of intervention strategies, specific to this unique setting, will be possible.

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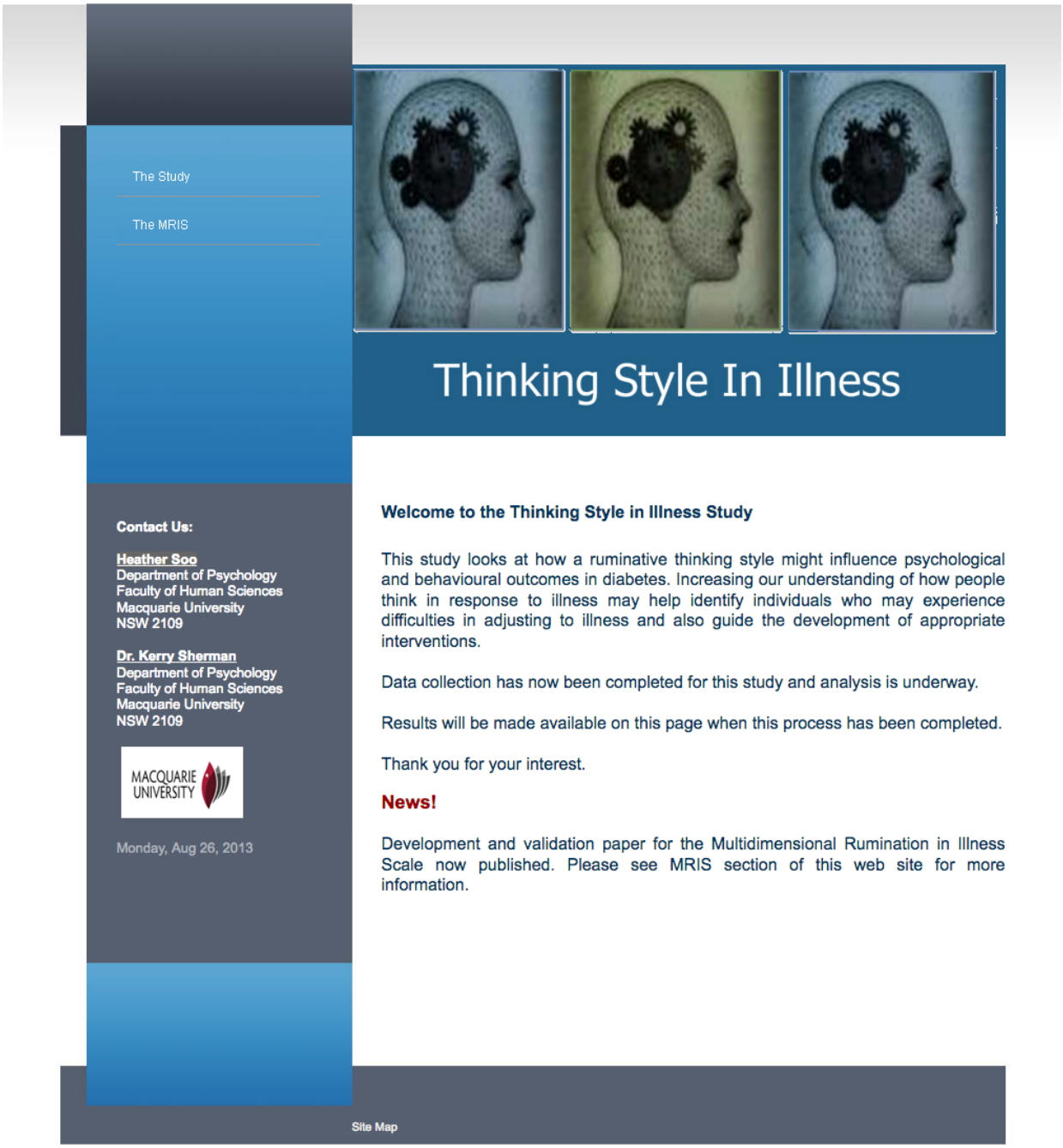
Appendix C. Factors loadings for the 41-item MRIS

Table 1
*Factor Loadings Based on a Principal Axis Factor Analysis with Oblimin Rotation for 41 Items from the Multidimensional Rumination in Illness Scale (MRIS) (*N = *284)*

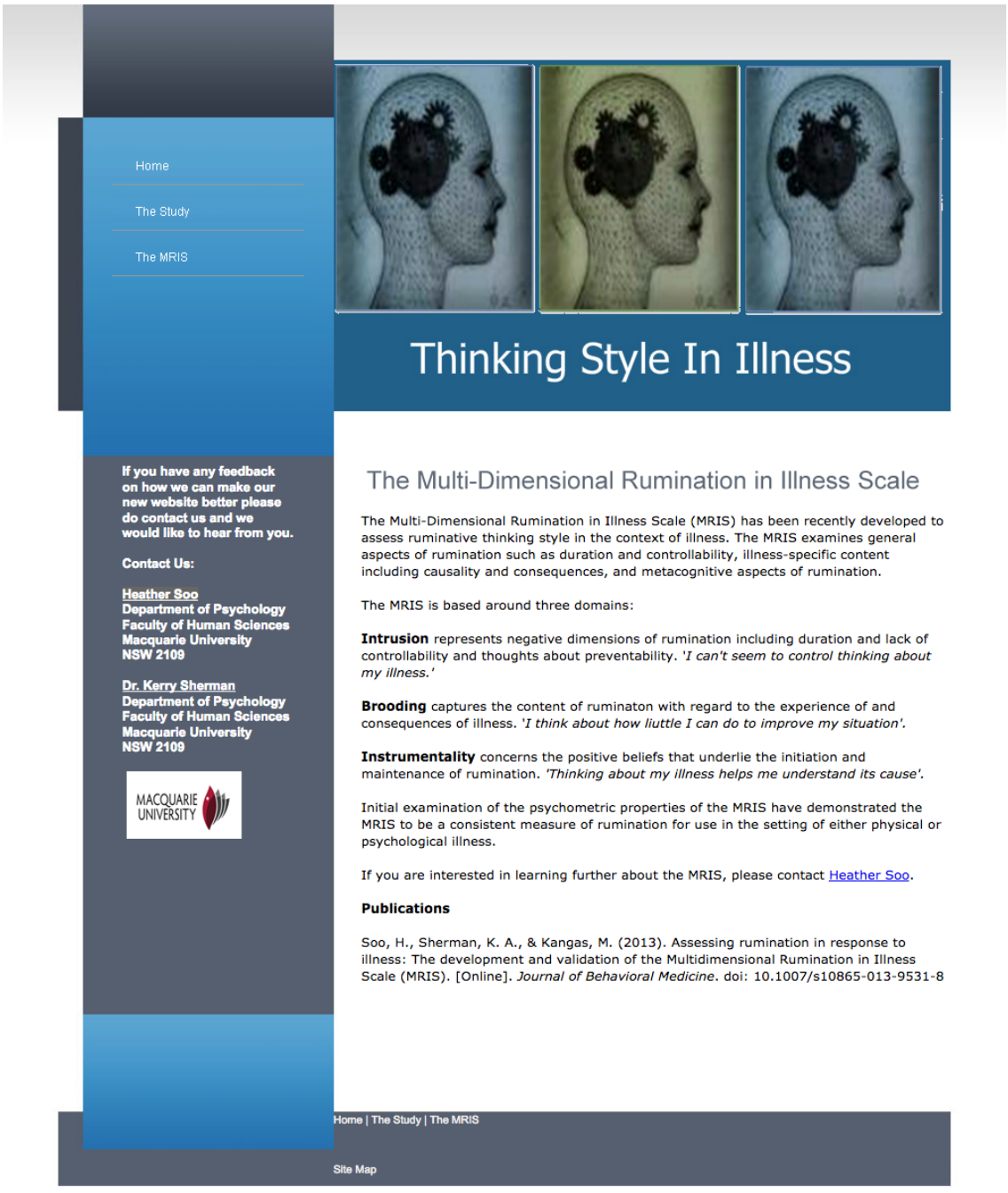
Item	1	2	3	4
I think about what life would be life if I had not become ill	.76			
I think about the impact the illness will have on my life	.76			
I think about the limitations imposed by my illness	.74			
I think about the things I can no longer do	.73			
I think about the goals I may no longer be able to reach	.67			
I think about how little I can do to improve my situation	.65			
I think about the seriousness of my illness	.60			
I think about the possibility things will never get better	.58			
No matter how much I think about my illness, I can't think of anything to do that might help my situation	.58			
I think that trying new things may be pointless	.47			
Thinking about my illness helps me work out what I need to do to manage it		.78		
Thinking helps me understand my illness		.78		
Thinking about my illness is helpful in terms of protecting my health		.73		
Thinking about my illness helps me focus on what is important to me		.72		
Thinking helps me work out what I need to do to regain a sense of 'normalcy'		.65		
Thinking about my illness helps me work out how to cope		.64		
Thinking about my illness helps me understand its cause		.62		
Thinking about my illness helps me focus on what is still good in my life		.59		
I think about whether I could have avoided my illness if I'd taken better care of myself			.91	
I think about whether I might have done anything to cause my illness			.78	
I think about where things went wrong			.54	
I repeatedly go over possible causes of my illness			.52	
Sometimes I become lost in thought about my illness				-.87
Once I start thinking about my illness, I find it hard to think of other things				-.83
Once started, I can spend considerable time thinking about my illness				-.80
It often requires a real effort to stop myself thinking about my illness				-.80
I have trouble sleeping because of thinking about my illness				-.71
I find myself unexpectedly thinking about my illness				-.70
I believe that people would think negatively about me if they realised how much I think about my illness				-.65
I can't seem to control my thinking about my illness				-.63
I exhaust myself thinking about the reasons for my illness				-.62
Cronbach's Alpha	.92	.89	.86	.89

Note. Factors 1 = Brooding, 2 = Instrumentality, 3 = Searching for meaning, 4 = Intrusiveness

Appendix D. Thinking Style in Illness Website



http://www.mris.com.au


Home
The Study
The MRIS
Thinking Style In Illness
If you have any feedback on how we can make our new website better please do contact us and we would like to hear from you.
Contact Us:
Heather Soo
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MACQUARIE UNIVERSITY
The Multi-Dimensional Rumination in Illness Scale
The Multi-Dimensional Rumination in Illness Scale (MRIS) has been recently developed to assess ruminative thinking style in the context of illness. The MRIS examines general aspects of rumination such as duration and controllability, illness-specific content including causality and consequences, and metacognitive aspects of rumination.
The MRIS is based around three domains:
Intrusion represents negative dimensions of rumination including duration and lack of controllability and thoughts about preventability. 'I can't seem to control thinking about my illness.'
Brooding captures the content of ruminaton with regard to the experience of and consequences of illness. 'I think about how liuttle I can do to improve my situation'.
Instrumentality concerns the positive beliefs that underlie the initiation and maintenance of rumination. 'Thinking about my illness helps me understand its cause'.
Initial examination of the psychometric properties of the MRIS have demonstrated the MRIS to be a consistent measure of rumination for use in the setting of either physical or psychological illness.
If you are interested in learning further about the MRIS, please contact Heather Soo.
Publications
Soo, H., Sherman, K. A., & Kangas, M. (2013). Assessing rumination in response to illness: The development and validation of the Multidimensional Rumination in Illness Scale (MRIS). [Online]. Journal of Behavioral Medicine. doi: 10.1007/s10865-013-9531-8
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Site Map

Appendix E: Empirical Study I: Pilot

MACQUARIE UNIVERSITY

PARTICIPANT INFORMATION

Title of Project

Thinking Style in Illness.

About the study

You are invited to participate in the pilot test of a new scale relating to thinking style in the context of illness. Yours answers are extremely valuable and will help identify what questions are most appropriate to ask in this context.

This study is being conducted by Heather Soo ✉, a student at Macquarie University, Sydney, to meet the requirements for the degree of Doctor of Philosophy (Psychology) under the supervision of Dr. Kerry Sherman ✉, Senior Lecturer, Department of Psychology, contact [61 2] 9850 6874, and Dr. Maria Kangas ✉ Senior Lecturer, Department of Psychology, contact [61 2] 9850 8599.

What will happen on the study?

If you decide to participate in the study, you will be asked to complete a questionnaire about personal characteristics, health, feelings and thoughts about illness. It is estimated that the questionnaire will take approximately 20 minutes to complete.

Are there any risks?

There are no known risks associated with this study. However, answering questions about illness may be distressing for some people. If you have any concerns as a result of completing this survey, please contact your physician. You may also contact Lifeline (Australia) on 13 11 14, The Samaritans, (U. K.), 08457 90 90 90, The Samaritans (Republic of Ireland) 1850 60 90 90 or check Befrienders.com for a local resource if outside these listed areas.

Confidentiality

Any information or personal details gathered in the course of the study are confidential. Only the researchers will have access to your personal information. No individual will be identified in the publication of the results. The process of storing the questionnaires and data will comply with regulations set by Macquarie University, Australia.

Voluntary Participation

If you decide to participate, you are free to withdraw from further participation in the research at any time without having to give a reason and without consequence.

Complaints

The ethical aspects of this study have been approved by the Macquarie University Ethics Review Committee (Human Subjects). If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through its Secretary (telephone [61 – country code] (02) 9850 7854; email ethics@mq.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Contact details

Thank you in advance for your time and assistance in this research study. If you have any queries about the research, please contact Heather Soo (✉) on 0412 155208.

Informed Consent

Please note that you must be 18 years or older to complete this survey. Please answer all questions and remember that there are no right or wrong answers.

I confirm that I am 18 years of age or older. I give my informed consent to participate in this study, knowing I can choose to withdraw at any time without penalty. I am aware of the purpose of the study and that there are no known or expected discomforts or risks associated with my participation. To ensure the quality of the responses, I will only participate once in this study.

DEMOGRAPHIC INFORMATION

Please answer all questions by clicking on the response box and selecting the appropriate answer.

Gender	*Click to choose*
Age	*Click to choose*
Level of education	*Click to choose*
Location	*Click to choose*
Current health status	*Click to choose*
Diagnosed physical conditions	*Click to choose*
	Click to choose
	Click to choose
	Click to choose
	Click to choose
Diagnosed psychological disorders	*Click to choose*
	Click to choose
	Click to choose
	Click to choose
Other	

The next section will ask a number of questions about the way you think about illness. Please click on the response box below or use the free text box to indicate which particular illness you will be basing your responses on.

Physical condition *Click to choose*

Other

THINKING ABOUT ILLNESS

The list of statements below describes ways in which people think about illness. For each item, please indicate how applicable each statement would be for you during a time of when you have experienced illness.

	Not at all	Rarely	Some-times	Often	Almost always
Once I start thinking about my illness, it is difficult to stop.	☐	☐	☐	☐	☐
I think about why this illness had to happen to me.	☐	☐	☐	☐	☐
Thinking about my illness helps me work out how to cope.	☐	☐	☐	☐	☐
I think about how terrible my illness is.	☐	☐	☐	☐	☐
Thinking about my illness helps me focus on what is still good in my life.	☐	☐	☐	☐	☐
I think about the things my illness might stop me doing.	☐	☐	☐	☐	☐
I think that no matter what I do now, my life will never get better.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
I worry that thinking about my illness could be harmful.	☐	☐	☐	☐	☐
I feel that I have to think about my illness to understand it better.	☐	☐	☐	☐	☐
I believe that people would think negatively about me if they realised how much I think about my illness.	☐	☐	☐	☐	☐
I think about whether I might have done anything to cause my illness.	☐	☐	☐	☐	☐
I think about whether I can be happy again.	☐	☐	☐	☐	☐
I think about what others might think of me.	☐	☐	☐	☐	☐
No matter how much I think about my illness, I can't think of anything to do that may help my situation.	☐	☐	☐	☐	☐
I think about the goals I had that I may no longer be able to reach.	☐	☐	☐	☐	☐
Thinking about my illness is helpful in terms of protecting my health.	☐	☐	☐	☐	☐
I think about the things I can no longer do.	☐	☐	☐	☐	☐
Thinking helps me work out what I need to do to regain a sense of 'normalcy'.	☐	☐	☐	☐	☐
I think about my symptoms and the distress they cause me.	☐	☐	☐	☐	☐
Thinking makes me feel resentful and angry about my illness.	☐	☐	☐	☐	☐
Once I'm thinking about my illness, I can't seem to do anything else.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
I can't seem to control my thinking about my illness.	☐	☐	☐	☐	☐
Thinking about my illness helps me work out what I need to do to manage it.	☐	☐	☐	☐	☐
I think about the limitations imposed by my illness.	☐	☐	☐	☐	☐
I think that trying new things may be pointless.	☐	☐	☐	☐	☐
I find myself thinking about my illness when I didn't mean to.	☐	☐	☐	☐	☐
My thoughts about my illness seem to bring up negative emotions.	☐	☐	☐	☐	☐
I have trouble sleeping because of thinking about my illness.	☐	☐	☐	☐	☐
Thinking about my illness helps me focus on what is important to me.	☐	☐	☐	☐	☐
I think about whether I could have avoided my illness if I'd taken better care of myself.	☐	☐	☐	☐	☐
It often requires a real effort to stop myself thinking about my illness.	☐	☐	☐	☐	☐
I think about how my illness may make me a burden on others.	☐	☐	☐	☐	☐
I think about how I don't feel up to doing anything.	☐	☐	☐	☐	☐
Thinking about my illness helps me understand its cause.	☐	☐	☐	☐	☐
I think about how hopeless my future looks.	☐	☐	☐	☐	☐
I think that there is no point trying to do anything about my illness.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
I find myself unexpectedly thinking about my illness.	☐	☐	☐	☐	☐
I think about why I cannot get going with anything.	☐	☐	☐	☐	☐
I exhaust myself thinking about the reasons for my illness.	☐	☐	☐	☐	☐
I think of how sad my illness makes me feel.	☐	☐	☐	☐	☐
Sometimes I become lost in thought about my illness.	☐	☐	☐	☐	☐
Thinking about my illness motivates me towards looking after my health.	☐	☐	☐	☐	☐
I find it impossible not to think about my illness.	☐	☐	☐	☐	☐
I often feel the need to be by myself to think about my illness.	☐	☐	☐	☐	☐
Thinking helps me understand my illness.	☐	☐	☐	☐	☐
I think about why I have this problem and other people do not.	☐	☐	☐	☐	☐
Once I start thinking about my illness, I find it hard to think of other things.	☐	☐	☐	☐	☐
I think about whether this illness will stop me doing anything worthwhile.	☐	☐	☐	☐	☐
Once started, I can spend considerable time thinking about my illness.	☐	☐	☐	☐	☐
I repeatedly go over possible causes of my illness.	☐	☐	☐	☐	☐
I find thinking about what is still good is helpful.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
I think about how passive and unmotivated I feel.	☐	☐	☐	☐	☐
I think about what life would be like if I had not become ill.	☐	☐	☐	☐	☐
I think about the seriousness of my illness.	☐	☐	☐	☐	☐
I dream about my illness	☐	☐	☐	☐	☐
I think about where things went wrong.	☐	☐	☐	☐	☐
I think about the impact the illness with have on my life	☐	☐	☐	☐	☐
I think about how little I can do to improve my situation.	☐	☐	☐	☐	☐
I think about how my life was happier before the illness.	☐	☐	☐	☐	☐
I think about the possibility things will never get better.	☐	☐	☐	☐	☐

Please indicate if there are any additional areas of your illness that you think about a lot.

If you have any questions regarding this survey or would like to receive general feedback regarding the outcome of this pilot study, please contact Heather Soo, ✉.

If you have any concerns as a result of completing this survey, please consult your physician. You may also contact Lifeline (Australia) on 13 11 14, The Samaritans, (U. K.), 08457 90 90 90, The Samaritans (Republic of Ireland) 1850 60 90 90 or check Befrienders.com for a local resource if outside these listed areas.

Submit survey Reset form

Appendix F. Empirical Study II: Validation of the MRIS

MACQUARIE UNIVERSITY

PARTICIPANT INFORMATION

Title of Project

Thinking Style in Illness.

About the study

You are invited to participate in the validation and reliability testing of a new scale relating to thinking style in the context of illness.

This study is being conducted by Heather Soo ✉, a student at Macquarie University, Sydney, to meet the requirements for the degree of Doctor of Philosophy (Psychology) under the supervision of Dr. Kerry Sherman ✉, Senior Lecturer, Department of Psychology, contact [61 2] 9850 6874, and Dr. Maria Kangas ✉ Senior Lecturer, Department of Psychology, contact [61 2] 9850 8599.

What will happen on the study?

If you decide to participate in the study, you will be asked to complete a series of questionnaires about personal characteristics, health, feelings and thoughts about illness. It is estimate that the questionnaires will take approximately 30 minutes to complete.

Are there any risks?

There are no known risks associated with this study. However, answering questions about illness may be distressing for some people. If you have any concerns as a result of completing this survey, please contact your physician. You may also contact Lifeline (Australia) on 13 11 14, The Samaritans, (U. K.), 08457 90 90 90, The Samaritans (Republic of Ireland) 1850 60 90 90 or check Befrienders.com for a local resource if outside these listed areas.

Confidentiality

Any information or personal details gathered in the course of the study are confidential. Only the researchers will have access to your personal information. No individual will be identified in the publication of the results. The process of storing the questionnaires and data will comply with regulations set by Macquarie University, Australia.

Voluntary Participation

If you decide to participate, you are free to withdraw from further participation in the research at any time without having to give a reason and without consequence.

Complaints

The ethical aspects of this study have been approved by the Macquarie University Ethics Review Committee (Human Subjects). If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through its Secretary (telephone [61 – country code] (02) 9850 7854; email ethics@mq.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Contact details

Thank you in advance for your time and assistance in this research study. If you have any queries about the research, please contact Heather Soo (✉) on 0412 155208.

Informed Consent

Please note that you must be 18 years or older to complete this survey. Please answer all questions and remember that there are no right or wrong answers.

I confirm that I am 18 years of age or older. I give my informed consent to participate in this study, knowing I can choose to withdraw at any time without penalty. I am aware of the purpose of the study and that there are no known or expected discomforts or risks associated with my participation. To ensure the quality of the responses, I will only participate once in this study.

I agree to participate

Gender

Age

Location

Level of education completed

Currently diagnosed physical conditions. Hold down the CTRL key to select more than one option.

None
Acne
Addison's disease
Allergy
Alopecia
Amnesia
Anaemia
Angina
Arthritis
Asthma

Currently diagnosed psychological conditions. Hold down the CTRL key to select more than one option.

None
Adjustment disorder
ADD/ADHD
Anxiety
Aspergers/Autism
Bipolar disorder
Body dysmorphic disorder
Conduct disorder
Depression
Disruptive behaviour disorder

Other current conditions diagnosed by not available in the physical/psychological conditions drop down boxes above

The next section will ask a number of questions about the way you think about illness.

Please select ONE condition below or use the free text box to indicate which particular physical condition you will base your responses on.

Select OTHER and use OTHER CONDITION box to specify condition if not available from the drop-down list.

Other condition diagnosed not available in the drop-down box above

The Multidimensional Rumination in Illness Scale

	Not at all	Rarely	Some-times	Often	Almost always
Sometimes I become lost in thought about my illness.	☐	☐	☐	☐	☐
I think about the goals I may no longer be able to reach.	☐	☐	☐	☐	☐
I think about how little control I have over my illness.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
I think about whether my illness may have been caused by stress.	☐	☐	☐	☐	☐
Thinking about my illness helps me focus on what is still good in my life.	☐	☐	☐	☐	☐
I find that I can spend considerable time thinking about my illness.	☐	☐	☐	☐	☐
I think about my symptoms, pain or the side effects of treatment.	☐	☐	☐	☐	☐
Thinking about my illness helps me understand its cause.	☐	☐	☐	☐	☐
I think about where things went wrong.	☐	☐	☐	☐	☐
I can't seem to control my thinking about my illness.	☐	☐	☐	☐	☐
I think that trying new things might be pointless.	☐	☐	☐	☐	☐
I think about how little I can do to improve my situation.	☐	☐	☐	☐	☐
I am always thinking about what may have caused my illness.	☐	☐	☐	☐	☐
I exhaust myself thinking about the reasons for my illness.	☐	☐	☐	☐	☐
The time I spend thinking about my illness adds to my sense of isolation.	☐	☐	☐	☐	☐
Thinking about my illness is helpful in terms of protecting my health.	☐	☐	☐	☐	☐
I think about how serious my illness is.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost Always
I think that no matter what I do now, my life will never get better.	☐	☐	☐	☐	☐
I have trouble sleeping because of thinking about my illness.	☐	☐	☐	☐	☐
I think about things I can no longer do.	☐	☐	☐	☐	☐
I think about being unable to cope with the things I have to do.	☐	☐	☐	☐	☐
I think about whether my illness is the result of poor diet or lack of exercise.	☐	☐	☐	☐	☐
I think about the prospect of getting sicker or even dying.	☐	☐	☐	☐	☐
Thinking about my illness helps me focus on what is important to me.	☐	☐	☐	☐	☐
Once I start thinking about my illness, I find it hard to think about other things.	☐	☐	☐	☐	☐
I think about whether I've just been unlucky to get this illness.	☐	☐	☐	☐	☐
I think about what I could have done in the past to cause my illness.	☐	☐	☐	☐	☐
I believe that people would think badly of me if they knew how much I think about my illness.	☐	☐	☐	☐	☐
I find myself thinking about my illness when I least expect it.	☐	☐	☐	☐	☐
I think about the impact illness will have on my life.	☐	☐	☐	☐	☐ I
I think about what life would be like if I had not become ill.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
I think about what life would be like if I had not become ill.	☐	☐	☐	☐	☐
Thinking about my illness helps me work out what I need to do to regain a sense of normality.	☐	☐	☐	☐	☐
Thinking helps me understand my illness.	☐	☐	☐	☐	☐
I think about whether it was fate that I got this illness.	☐	☐	☐	☐	☐
Thinking about my illness helps me work out what I need to do to manage it.	☐	☐	☐	☐	☐
Once I'm thinking about my illness, I can't seem to do anything else.	☐	☐	☐	☐	☐
I think about whether I could have avoided my illness if I had taken better care of myself.	☐	☐	☐	☐	☐
Thinking about my illness helps me work out how to cope.	☐	☐	☐	☐	☐
It often requires a real effort to stop myself thinking about my illness.	☐	☐	☐	☐	☐
I think about whether my illness was determined by a higher power.	☐	☐	☐	☐	☐

Now please take the time to consider the answers you have given to the above items regarding thoughts about your illness. Please indicate the extent to which the thoughts you have been having about your illness have been accompanied by feelings or emotions.

Not at all	☐
Rarely	☐
Sometimes	☐
Often	☐
Almost always	☐

Overall, would you say these feelings or emotions tend to be more positively or negatively orientated? Please indicate by selecting the appropriate option below.

Very negative	☐
Slightly negative	☐
Neutral	☐
Often	☐
Almost always	☐

Depression, Anxiety, Stress Scale (Lovibond & Lovibond, 1995)

Please read each statement and select the answer which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

	Did not apply to me at all	Applied to me some degree or some of the time	Applied to me a considerable degree or a good part of the time	Applied to me very much or most of the time
I find myself getting upset by quite trivial things.	☐	☐	☐	☐
I was aware of the dryness of my mouth.	☐	☐	☐	☐
I couldn't seem to experience any positive feeling at all.	☐	☐	☐	☐
I experienced difficulty breathing (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion).	☐	☐	☐	☐
I just couldn't seem to get going.	☐	☐	☐	☐
I tended to over-react to situations.				
I had a feeling of shakiness (e.g., legs going to give way).	☐	☐	☐	☐
I found it difficult to relax.	☐	☐	☐	☐
I found myself in situations that made me so anxious I was most relieved when they ended.	☐	☐	☐	☐

	Did not apply to me at all	Applied to me some degree or some of the time	Applied to me a considerable degree or a good part of the time	Applied to me very much or most of the time
I felt that I had nothing to look forward to.	☐	☐	☐	☐
I found myself getting upset rather easily.	☐	☐	☐	☐
I felt that I was using a lot of nervous energy.	☐	☐	☐	☐
I felt sad and depressed.	☐	☐	☐	☐
I found myself getting inpatient when I was delayed in any way (e.g., lifts, traffic lights, being kept waiting).	☐	☐	☐	☐
I had a feeling of faintness.	☐	☐	☐	☐
I felt that I had lost interest in just about everything.	☐	☐	☐	☐
I felt I wasn't worth much as a person.	☐	☐	☐	☐
I felt that I was rather touchy.	☐	☐	☐	☐
I perspired noticeably (e.g., hands sweaty) in the absence of high temperatures or physical exertion.	☐	☐	☐	☐
I felt scared without any good reason.	☐	☐	☐	☐
I felt that life wasn't worthwhile.	☐	☐	☐	☐

The Ruminative Response Scale (Nolen-Hoeksema & Morrow, 1991)

People think and do many different things when they feel sad, blue or depressed. Please indicate whether you never, sometimes, often or always think or do each one when you feel down, sad or depressed. Please indicate what you generally do and not what you think you should do.

	Never	Sometimes	Often	Always
Think about how alone you feel.	☐	☐	☐	☐
Think "I won't be able to do my job if I don't snap out of this".	☐	☐	☐	☐
Think about your feelings of fatigue and achiness.	☐	☐	☐	☐
Think about how hard it is to concentrate.	☐	☐	☐	☐
Think "What am I doing to deserve this?"	☐	☐	☐	☐
Think about how passive and unmotivated you feel.	☐	☐	☐	☐
Analyse recent events to try and understand why you are depressed.	☐	☐	☐	☐
Think about how you don't seem to feel anything any more.	☐	☐	☐	☐
Think "Why can't I get going?"	☐	☐	☐	☐
Think "Why do I always react this way?"	☐	☐	☐	☐
Go away by yourself and think about why you feel this way.	☐	☐	☐	☐
Write down what you are thinking and analyse it.	☐	☐	☐	☐
Think about a recent situation, wishing it had gone better.	☐	☐	☐	☐

	Never	Sometimes	Often	Always
Think about a recent situation, wishing it had gone better.	☐	☐	☐	☐
Think "I won't be able to concentrate if I keep feeling this way".	☐	☐	☐	☐
Think "Why do I have problems that other people don't have?"	☐	☐	☐	☐
Think "Why can't I handle things better?"	☐	☐	☐	☐
Think about how sad you feel.	☐	☐	☐	☐
Think about all your shortcomings, failings, faults, mistakes.	☐	☐	☐	☐
Think about why you don't feel up to doing anything.	☐	☐	☐	☐
Analyse your personality to try and understand why you are depressed.	☐	☐	☐	☐
Go someplace alone to think about your feelings.	☐	☐	☐	☐
Think about how angry you are with yourself.	☐	☐	☐	☐

Impact of Events Scale

The following is a list of difficulties people sometimes have after stressful life events. Please read each item and then indicate how distressing each difficulty has been for you during the last 7 days with respect ot the disaster. How much were you distressed or bothered by these difficulties?

	Not at all	A little bit	Moderately	Quite a bit	Extremely
Any reminder brought back feelings about it.	☐	☐	☐	☐	☐
I had trouble staying asleep.	☐	☐	☐	☐	☐
Other things kept making me think about it.	☐	☐	☐	☐	☐
I felt irritable and angry.	☐	☐	☐	☐	☐
I avoided letting myself get upset when I thought about it or was reminded of it.	☐	☐	☐	☐	☐
I thought about it when I didn't mean to.	☐	☐	☐	☐	☐
I felt as if it hadn't happened or wasn't real.	☐	☐	☐	☐	☐
I stayed away from reminders about it.	☐	☐	☐	☐	☐
Pictures about it popped into my head.	☐	☐	☐	☐	☐
I was jumpy and easily startled.	☐	☐	☐	☐	☐
I tried not to think about it.	☐	☐	☐	☐	☐
I was aware that I still had a lot of feelings about it but I didn't deal with them.	☐	☐	☐	☐	☐
My feelings about it were kind of numb.	☐	☐	☐	☐	☐
I found myself acting or feeling that I was back at that time.	☐	☐	☐	☐	☐
I had trouble falling asleep.	☐	☐	☐	☐	☐

	Not at all	A little bit	Moderately	Quite a bit	Extremely
I had waves of strong feelings about it.	☐	☐	☐	☐	☐
I tried to remove it from my memory.	☐	☐	☐	☐	☐
I had trouble concentrating.	☐	☐	☐	☐	☐
Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea or a pounding heart.	☐	☐	☐	☐	☐
I had dreams about it.	☐	☐	☐	☐	☐
I felt watchful and on guard.	☐	☐	☐	☐	☐
I tried not to talk about it.	☐	☐	☐	☐	☐

The Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990)

Rate each of the following statements on a scale of '1' ("Not at all typical of me") to 5 ("Very typical of me").

	Not at all typical of me 1	2	3	4	Very typical of me 5
If I do not have enough time to do everything, I do not worry about it.	☐	☐	☐	☐	☐
My worries overwhelm me.	☐	☐	☐	☐	☐

	Not at all typical of me 1	**2**	**3**	**4**	**Very typical of me 5**
I do not tend to worry about things.	☐	☐	☐	☐	☐
Many situations make me worry.	☐	☐	☐	☐	☐
I know I should not worry about things but I just cannot help it.	☐	☐	☐	☐	☐
When I am under pressure, I worry a lot.	☐	☐	☐	☐	☐
I am always worrying about something.	☐	☐	☐	☐	☐
I find it easier to dismiss worrisome thoughts.	☐	☐	☐	☐	☐
As soon as I finish one task, I start to worry about everything else I have to do.	☐	☐	☐	☐	☐
I never worry about anything.	☐	☐	☐	☐	☐
When there is nothing more I can do about a concern, I do not worry about it any more.	☐	☐	☐	☐	☐
I have been a worrier all my life.	☐	☐	☐	☐	☐
I notice that I have been worrying about things.	☐	☐	☐	☐	☐
Once I start worrying, I cannot stop.	☐	☐	☐	☐	☐
I worry all the time.	☐	☐	☐	☐	☐
I worry about projects until they are done.	☐	☐	☐	☐	☐

The Positive Affect – Negative Affect Schedule (Watson, Clark, & Tellegen, 1988)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now, that is, at the present moment. Use the following scale to record your answers.

	Not at all	Rarely	Some-times	Often	Almost always
Interested.	☐	☐	☐	☐	☐
Distressed.	☐	☐	☐	☐	☐
Excited.	☐	☐	☐	☐	☐
Upset.	☐	☐	☐	☐	☐
Strong.	☐	☐	☐	☐	☐
Guilty.	☐	☐	☐	☐	☐
Scared.	☐	☐	☐	☐	☐
Hostile.	☐	☐	☐	☐	☐
Enthusiastic.	☐	☐	☐	☐	☐
Proud.	☐	☐	☐	☐	☐
Irritable.	☐	☐	☐	☐	☐
Alert.	☐	☐	☐	☐	☐
Ashamed.	☐	☐	☐	☐	☐
Inspired.	☐	☐	☐	☐	☐
Nervous.	☐	☐	☐	☐	☐
Determined.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
Attentive.	☐	☐	☐	☐	☐
Jittery.	☐	☐	☐	☐	☐
Active.	☐	☐	☐	☐	☐
Afraid.	☐	☐	☐	☐	☐

The Big Five – Neuroticism Scale (John, Donahue, & Kettle, 1991)

Here are are number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please select the appropriate answer next to each statement to indicate the extent to which you agree or disagree with that statement.

I am someone who…

	Disagree strongly	Disagree a little	Moderately	Quite a bit	Extremely
Is depressed, blue.	☐	☐	☐	☐	☐
Is relaxed, handles stress well.	☐	☐	☐	☐	☐
Can be tense.	☐	☐	☐	☐	☐
Worries a lot.	☐	☐	☐	☐	☐
Is emotionally stable, not easily upset.	☐	☐	☐	☐	☐
Can be moody.	☐	☐	☐	☐	☐
Remains calm in tense situations.	☐	☐	☐	☐	☐
Gets nervous easily.	☐	☐	☐	☐	☐

Positive Beliefs about Rumination Scale (Papageorgiou & Wells, 2001)

Most people experience depressive thoughts at times. When depressive thinking is prolonged and repetitive, it is called *rumination.* This questionnaire is concerned about the beliefs that people have about rumination. Listed below are a number of these beliefs. Please read each belief carefully and indicate how much you *generally* agree with each one. Please circle the number that best describes your answer. Please respond to all of the items.

	Do not agree	Agree slightly	Agree Moderately	Agree very much
In order to understand my feelings of depression, I need to ruminate about my problems.	☐	☐	☐	☐
I need to ruminate about the bad things that have happened in the past to make sense of them.	☐	☐	☐	☐
I need to ruminate about my problems to find the causes of my depression.	☐	☐	☐	☐
Ruminating about my problems helps me to focus on the most important things.	☐	☐	☐	☐
Ruminating about the past helps me to prevent future mistakes and failures.	☐	☐	☐	☐
I need to ruminate about my problems to find answers to my depression.	☐	☐	☐	☐
Ruminating about my feelings helps me to recognise the triggers for my depression.	☐	☐	☐	☐
Rumining about my depression helps me to understand past mistakes and failures.	☐	☐	☐	☐
Ruminating about the past helps me to work out how things could have been done better.	☐	☐	☐	☐

Negative Beliefs about Rumination Scale (Papageorgiou, Wells & Meina, 2003)

Most people experience depressive thoughts at times. When depressive thinking is prolonged and repetitive, it is called *rumination.* This questionnaire is concerned about the beliefs that people have about rumination. Listed below are a number of these beliefs. Please read each belief carefully and indicate how much you *generally* agree with each one. Please circle the number that best describes your answer. Please respond to all of the items.

	Do not agree	Agree slightly	Agree Moderately	Agree very much
Ruminating makes me physically ill.	☐	☐	☐	☐
When I ruminate, I can't do anything else.	☐	☐	☐	☐
Ruminating means I'm out of control.	☐	☐	☐	☐
Every one would desert me if they knew how much I ruminate about myself.	☐	☐	☐	☐
People will reject me if I ruminate.	☐	☐	☐	☐
Ruminating about my problems is uncontrollable.	☐	☐	☐	☐
Ruminating will turn me into a failure.	☐	☐	☐	☐
I cannot stop myself from ruminating.	☐	☐	☐	☐
Ruminating means I'm a bad person.	☐	☐	☐	☐
It is impossible not to ruminate about the bad things that have happened in the past.	☐	☐	☐	☐
Only weak people ruminate.	☐	☐	☐	☐

End of study

If you have any questions regarding this survey or would like to receive general feedback regarding the outcome of this study, please contact Heather Soo.

If you have any concerns as a result of completing this study, please consult your physician. You may also contact Lifeline (Australia) on 13 11 14, the Samaritans (U.K.) on 98457 90 90 90, the Samaritans (Republic of Ireland) on 1850 60 90 90 or check Befrienders Worldwide for a local resource if outside of these listed areas.

Appendix G. Empirical Study III/IV: Rumination

MACQUARIE UNIVERSITY

PARTICIPANT INFORMATION

Title of Project

Thinking style in illness.

About the study

You are invited to participate in a series of studies because you are an adult, resident in Australia, who has either been diagnosed with breast cancer and is not in palliative care.

This study aims to examine the extent to which the style and content of a person's thinking can influence their emotional and behavioural reactions to illness, with a specific focus on breast cancer. Identifying thinking styles that may increase psychological distress or affect adherence to treatment and recommended health protective behaviours will allow the earlier identification of individuals at risk and the provision of early intervention.

This study is being conducted by Heather Soo ✉, a student at Macquarie University, Sydney, to meet the requirements for the degree of Doctor of Philosophy (Psychology) under the supervision of Dr. Kerry Sherman ✉, Senior Lecturer, Department of Psychology, contact [61 2] 9850 6874, and Dr. Maria Kangas ✉ Senior Lecturer, Department of Psychology, contact [61 2] 9850 8599.

What will happen on the study?

If you decide to participate in the study, you will be asked to complete a series of questionnaires about personal characteristics, breast cancer and feelings and thoughts about illness. It is estimated that the initial questionnaire will take approximately 30 minutes to complete. You will be contacted at six monthly intervals for a period of one year to complete further questionnaires. These questionnaires will be considerably shorter and will require only 15 minutes to complete. Subsequent questionnaires will be mailed out to you for completion but you may opt to switch to online completion at any time by requesting an id and password from the researcher.

You may choose to enter a draw to win one of seven iPod Shuffles (one per disease group) on completion of the study, with one chance in the draw allocated for each questionnaire completed.

Are there any risks?

There are no known risks associated with this study. However, answering questions about illness may be distressing for some people. If your responses show high levels of depression, anxiety or stress, you will be contacted by one of the researchers to help organise psychological assistance where required for further assistance.

If you feel upset during or after completing the survey, please feel free to contact either Dr. Kerry Sherman ✉, Senior Lecturer, Department of Psychology, contact [61 2] 9850 6874, or Dr. Maria Kangas ✉ Senior Lecturer, Department of Psychology, contact [61 2] 9850 8599 and we will be available to talk with you during business hours. If you need to speak to someone after-hours because you are feeling highly anxious or depressed, it is important that you take action immediately. Your first point of call should be your local Community Health Centre, Area Crisis or Extended Hours team; or a telephone counselling service such as Lifeline (131114), or the Emergency Department of your local hospital which are all available 24 hours a day, 7 days a week.

In addition, please note the following resources that are available to you.

The Cancer Council Helpline 13 11 20
Lifeline (Australia) on 13 11 14

Who May I Talk to About This Study

There are no known risks associated with this study. However, as answering questions about illness may be distressing for some people, you may choose to discuss your participation in this study with your medical practitioner before choosing to complete the questionnaires. Alternatively, if you have specific questions or concerns about the questionnaire at any stage, you may contact either Dr. Kerry Sherman ✉, Senior Lecturer, Department of Psychology, contact [61 2] 9850 6874, or Dr. Maria Kangas ✉ Senior Lecturer, Department of Psychology, contact [61 2] 9850 8599 for further assistance.

Confidentiality

Any information or personal details gathered in the course of the study are confidential. Only the researchers will have access to your personal information. No individual will be identified in the publication of the results. The process of storing the questionnaires and data will comply with regulations set by Macquarie University, Australia.

Voluntary Participation

If you decide to participate, it is important to note that you are free to withdraw from further participation in the research at any time without having to give a reason and without consequence.

Complaints

The ethical aspects of this study have been approved by the Macquarie University Ethics Review Committee (Human Subjects). If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through its Secretary (telephone [61 – country code] (02) 9850 7854; email ethics@mq.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Contact details

Thank you in advance for your time and assistance in this research study. If you have any queries about the research, please do not hesitate to contact either Dr. Kerry Sherman ✉, Senior Lecturer, Department of Psychology, contact [61 2] 9850 6874, or Dr. Maria Kangas ✉ Senior Lecturer, Department of Psychology, contact [61 2] 9850 8599 for further assistance.

Informed Consent

Please note that you must be 18 years or older to complete this survey. Please answer all questions and remember that there are no right or wrong answers.

I, _____ have read *(or, where appropriate, have had read to me)* and understand the information above and any questions I have asked have been answered to my satisfaction. I agree to participate in this research, knowing that I can withdraw from further participation in the research at any time without consequence. I have been given a copy of this form to keep. I also acknowledge that either Dr. Kerry Sherman or Dr. Maria Kangas will contact me to offer psychological assistance if my results demonstrate a high level of depression, anxiety or stress.

Participant's Name:_____
(Block letters)

Participant's Signature:_____ Date:_____

Investigator's Name:_____
(Block letters)

Investigator's Signature:_____ __ Date:_____

Section 1:

Please provide some demographic details. Please tick the appropriate box where applicable.

Gender *Female*

Age (please specify) _____

Marital status
- ☐ Single
- ☐ Defacto/Married
- ☐ Separated/divorced
- ☐ Widowed/Widowered

Postal code (please specify) _____

Level of education
- ☐ High School
- ☐ Technical College
- ☐ Undergraduate Studies
- ☐ Postgraduate Studies

Other than your breast cancer diagnosis, please list any other diagnosed physical health conditions.

_____

_____

_____

Please list any diagnosed psychological health conditions

_____

_____

_____

Section 2: Your breast cancer diagnosis and treatment

The next section will ask a number of questions about your breast cancer diagnosis and treatment.

Time since diagnosis
- ☐ Less than one month
- ☐ 1-3 months
- ☐ 4-6 months
- ☐ 7-9 months
- ☐ 10-12 months
- ☐ 1 year
- ☐ 2 years
- ☐ 3 years
- ☐ 4 years
- ☐ 5 years
- ☐ 6 years
- ☐ 7 years
- ☐ 8 years
- ☐ 9 years
- ☐ 10 years plus

Stage of cancer at diagnosis, if known _____

Please outline your current treatment status by ticking the appropriate boxes below:

	Planned	Current	Completed	Not applicable
Surgery				
Chemotherapy				
Radiation				
Hormonal therapy				

If you have completed all of your treatment, how long ago did you last have treatment?

- ☐ One week ago
- ☐ One month ago
- ☐ Within the last 6 months
- ☐ Within the last year
- ☐ Within the last 2 years
- ☐ Within the last 3 years
- ☐ Within the last 4 years
- ☐ Within the last 5 years
- ☐ Still in treatment

Section 3: The Illness Experience

Below is a list of statements that other people with your illness have said are important.

Please circle or mark one number per line to indicate your response as it applies to the past 7 days.

	Not a lot	A little bit	Some-what	Quite a bit	Very much
I have a lack of energy.	☐	☐	☐	☐	☐
I have nausea.	☐	☐	☐	☐	☐
Because of my physical condition, I have trouble meeting the needs of my family.	☐	☐	☐	☐	☐
I have pain.	☐	☐	☐	☐	☐

	Not a lot	A little bit	Some-what	Quite a bit	Very much
I am bothered by the side effects of treatment.	☐	☐	☐	☐	☐
I feel ill.	☐	☐	☐	☐	☐
I am forced to spend time in bed.	☐	☐	☐	☐	☐
I feel close to my friends.	☐	☐	☐	☐	☐
I get emotional support from my family.	☐	☐	☐	☐	☐
I get support from my friends.	☐	☐	☐	☐	☐
My family has accepted my illness.	☐	☐	☐	☐	☐
I am satisfied with family communications about my illness.	☐	☐	☐	☐	☐
I feel close to my partner (or the person who is my main support).	☐	☐	☐	☐	☐
I am satisfied with my sex life.	☐	☐	☐	☐	☐
I feel sad.	☐	☐	☐	☐	☐
I am satisfied with how I am coping with my illness.	☐	☐	☐	☐	☐
I am losing hope in the fight against my illness.	☐	☐	☐	☐	☐
I feel nervous.	☐	☐	☐	☐	☐
I worry about dying.	☐	☐	☐	☐	☐
I worry that my illness will get worse.	☐	☐	☐	☐	☐
I am able to work (include work at home).	☐	☐	☐	☐	☐
My work (include work at home) is fulfilling.	☐	☐	☐	☐	☐
I am able to enjoy life.	☐	☐	☐	☐	☐

	Not a lot	A little bit	Some-what	Quite a bit	Very much
I have accepted my illness.	☐	☐	☐	☐	☐
I am sleeping well.	☐	☐	☐	☐	☐
I am enjoying the things I usually do for fun.	☐	☐	☐	☐	☐
I am content with the quality of my life right now.	☐	☐	☐	☐	☐

Section 4: Thinking about Illness I

The list of statements below describes way in which people think about illness. For each item, please indicate how applicable each statement would be for you.

The Multidimensional Rumination in Illness Scale

	Not at all	Rarely	Some-times	Often	Almost always
Sometimes I become lost in thought about my illness.	☐	☐	☐	☐	☐
I think about the goals I may no longer be able to reach.	☐	☐	☐	☐	☐
I think about how little control I have over my illness.	☐	☐	☐	☐	☐
I think about whether my illness may have been caused by stress.	☐	☐	☐	☐	☐
Thinking about my illness helps me focus on what is still good in my life.	☐	☐	☐	☐	☐
I find that I can spend considerable time thinking about my illness.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
I think about my symptoms, pain or the side effects of treatment.	☐	☐	☐	☐	☐
Thinking about my illness helps me understand its cause.	☐	☐	☐	☐	☐
I think about where things went wrong.	☐	☐	☐	☐	☐
I can't seem to control my thinking about my illness.	☐	☐	☐	☐	☐
I think that trying new things might be pointless.	☐	☐	☐	☐	☐
I think about how little I can do to improve my situation.	☐	☐	☐	☐	☐
I am always thinking about what may have caused my illness.	☐	☐	☐	☐	☐
I exhaust myself thinking about the reasons for my illness.	☐	☐	☐	☐	☐
The time I spend thinking about my illness adds to my sense of isolation.	☐	☐	☐	☐	☐
Thinking about my illness is helpful in terms of protecting my health.	☐	☐	☐	☐	☐
I think about how serious my illness is.	☐	☐	☐	☐	☐
I think that no matter what I do now, my life will never get better.	☐	☐	☐	☐	☐
I have trouble sleeping because of thinking about my illness.	☐	☐	☐	☐	☐
I think about things I can no longer do.	☐	☐	☐	☐	☐
I think about being unable to cope with the things I have to do.	☐	☐	☐	☐	☐
I think about whether my illness is the result of poor diet or lack of exercise.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
I think about the prospect of getting sicker or even dying.	☐	☐	☐	☐	☐
Thinking about my illness helps me focus on what is important to me.	☐	☐	☐	☐	☐
Once I start thinking about my illness, I find it hard to think about other things.	☐	☐	☐	☐	☐
I think about whether I've just been unlucky to get this illness.	☐	☐	☐	☐	☐
I think about what I could have done in the past to cause my illness.	☐	☐	☐	☐	☐
I believe that people would think badly of me if they knew how much I think about my illness.	☐	☐	☐	☐	☐
I find myself thinking about my illness when I least expect it.	☐	☐	☐	☐	☐
I think about the impact illness will have on my life.	☐	☐	☐	☐	☐ I
I think about what life would be like if I had not become ill.	☐	☐	☐	☐	☐
Thinking about my illness helps me work out what I need to do to regain a sense of normality.	☐	☐	☐	☐	☐
Thinking helps me understand my illness.	☐	☐	☐	☐	☐
I think about whether it was fate that I got this illness.	☐	☐	☐	☐	☐
Thinking about my illness helps me work out what I need to do to manage it.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
Once I'm thinking about my illness, I can't seem to do anything else.	☐	☐	☐	☐	☐
I think about whether I could have avoided my illness if I had taken better care of myself.	☐	☐	☐	☐	☐
Thinking about my illness helps me work out how to cope.	☐	☐	☐	☐	☐
It often requires a real effort to stop myself thinking about my illness.	☐	☐	☐	☐	☐
I think about whether my illness was determined by a higher power.	☐	☐	☐	☐	☐

Now please take the time to consider the answers you have given to the above items regarding thoughts about your illness. Please indicate the extent to which the thoughts you have been having about your illness have been accompanied by feelings or emotions.

Not at all	☐
Rarely	☐
Sometimes	☐
Often	☐
Almost always	☐

Overall, would you say these feelings or emotions tend to be more positively or negatively orientated? Please indicate by selecting the appropriate option below.

Very negative	☐
Slightly negative	☐
Neutral	☐
Often	☐
Almost always	☐

Section 5: Thinking about Illness II

People think and do many different things when they feel sad, blue or depressed. Please indicate whether you never, sometimes, often or always think or do each one when you feel down, sad or depressed. Please indicate what you <u>generally do</u> and not what you think you should do.

	Never	Some-times	Often	Always
Think about how alone you feel.	☐	☐	☐	☐
Think "I won't be able to do my job if I don't snap out of this".	☐	☐	☐	☐
Think about your feelings of fatigue and achiness.	☐	☐	☐	☐
Think about how hard it is to concentrate.	☐	☐	☐	☐
Think "What am I doing to deserve this?"	☐	☐	☐	☐
Think about how alone you feel.	☐	☐	☐	☐
Think about how passive and unmotivated you feel.	☐	☐	☐	☐
Analyse recent events to try and understand why you are depressed	☐	☐	☐	☐
Thinking about how you don't seem to feel anything any more.	☐	☐	☐	☐
Think "Why can't I get going?"	☐	☐	☐	☐
Think "Why do I always react this way?"	☐	☐	☐	☐
Go away by yourself and think about why you feel this way.	☐	☐	☐	☐

	Never	Some-times	Often	Always
Write down what you are thinking and analyse it.	☐	☐	☐	☐
Think about a recent situation, wishing it had gone better.	☐	☐	☐	☐
Think "I won't be able to concentrate if I keep feeling this way."	☐	☐	☐	☐
Think "Why do I have problems that other people don't have?"	☐	☐	☐	☐
Think "Why can't I handle things better?"	☐	☐	☐	☐
Think about how sad you feel.	☐	☐	☐	☐
Think about all your shortcomings, failings, faults, mistakes.	☐	☐	☐	☐
Think about how you don't feel up to doing anything	☐	☐	☐	☐
Think about how alone you feel.	☐	☐	☐	☐
Go someplace alone to think about your feelings	☐	☐	☐	☐
Think about how angry you are with yourself	☐	☐	☐	☐

Section 6: Feelings I

Please read each statement and select the answer which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

	Did not apply to me at all	Applied to me some degree, or some of the time	Applied to me a considerable degree or good part of the time	Applied to me very much, or most of the time
I found myself getting upset by quite trivial things.	☐	☐	☐	☐
I was aware of dryness of my mouth.	☐	☐	☐	☐
I couldn't seem to experience any positive feeling at all.	☐	☐	☐	☐
I experienced difficulty breathing (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion).	☐	☐	☐	☐
I just couldn't seem to get going.	☐	☐	☐	☐
I tended to over-react to situations.	☐	☐	☐	☐
I found it difficult to relax.	☐	☐	☐	☐
I found myself in situations that made me so anxious I was most relieved when they ended.	☐	☐	☐	☐
I felt that I had nothing to look forward to.	☐	☐	☐	☐
I found myself getting upset rather easily.	☐	☐	☐	☐
I felt that I was using a lot of nervous energy.	☐	☐	☐	☐
I felt sad and depressed.	☐	☐	☐	☐
I found myself getting impatient when I was delayed in any way (e.g. lifts, traffic lights, being kept waiting).	☐	☐	☐	☐
I had a feeling of faintness.	☐	☐	☐	☐

	Did not apply to me at all	Applied to me some degree, or some of the time	Applied to me a considerable degree or good part of the time	Applied to me very much, or most of the time
I had a feeling of faintness.	☐	☐	☐	☐
I felt that I had lost interest in just about everything.	☐	☐	☐	☐
I felt that I was rather touchy.	☐	☐	☐	☐
I perspired noticeably (e.g. hands sweaty) in the absence of high temperatures or physical exertion.	☐	☐	☐	☐
I felt scared without any good reason.	☐	☐	☐	☐
I felt that life wasn't worthwhile.	☐	☐	☐	☐

Section 7: Feelings II

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now, that is, at the present moment. Use the following scale to record your answers.

	Not at all	Rarely	Some-times	Often	Almost always
Interested.	☐	☐	☐	☐	☐
Distressed.	☐	☐	☐	☐	☐
Excited.	☐	☐	☐	☐	☐
Upset.	☐	☐	☐	☐	☐

	Not at all	Rarely	Some-times	Often	Almost always
Strong.	☐	☐	☐	☐	☐
Guilty.	☐	☐	☐	☐	☐
Scared.	☐	☐	☐	☐	☐
Hostile.	☐	☐	☐	☐	☐
Enthusiastic.	☐	☐	☐	☐	☐
Proud.	☐	☐	☐	☐	☐
Irritable.	☐	☐	☐	☐	☐
Alert.	☐	☐	☐	☐	☐
Ashamed.	☐	☐	☐	☐	☐
Inspired.	☐	☐	☐	☐	☐
Nervous.	☐	☐	☐	☐	☐
Determined.	☐	☐	☐	☐	☐
Attentive.	☐	☐	☐	☐	☐
Jittery.	☐	☐	☐	☐	☐
Active.	☐	☐	☐	☐	☐
Afraid.	☐	☐	☐	☐	☐

Section 8: Social Support in Illness

About how many close friends and close relatives do you have (people you feel at ease with and can talk to about what is on your mind)? Write in <u>the total</u> number of close relatives and friends combined below.

_____

People sometimes look to others for companionship, assistance of other types of support. How often is each of the following kinds of support available to you if you need it?

	None of the time	A little of the time	Some of the time	Most of the time	All of the time
Someone to help you if you were confined to bed	☐	☐	☐	☐	☐
Someone you can count on to listen to you when you need to talk	☐	☐	☐	☐	☐
Someone to give you good advice about a crisis	☐	☐	☐	☐	☐
Someone to talk to the doctor if you needed it	☐	☐	☐	☐	☐
Someone who shows you love and affection.	☐	☐	☐	☐	☐
Someone to have a good time with.	☐	☐	☐	☐	☐
Someone to give you information to help you understand a situation.	☐	☐	☐	☐	☐
Someone to confide in or talk to about yourself or your problems.	☐	☐	☐	☐	☐
Someone who hugs you.	☐	☐	☐	☐	☐
Someone to get together with for relaxation.	☐	☐	☐	☐	☐
Someone to prepare your meals if you were unable to do it yourself.	☐	☐	☐	☐	☐

	None of the time	A little of the time	Some of the time	Most of the time	All of the time
Someone whose advice you really want.	☐	☐	☐	☐	☐
Someone to do things with to help you get your mind off things.	☐	☐	☐	☐	☐
Someone to help with daily chores if you were sick.	☐	☐	☐	☐	☐
Someone to share your most private worries and fears with.	☐	☐	☐	☐	☐
Someone to turn to for suggestions about how to deal with a personal problem.	☐	☐	☐	☐	☐
Someone to do something enjoyable with.	☐	☐	☐	☐	☐
Someone who understands your problem.	☐	☐	☐	☐	☐
Someone to love and make you feel wanted.	☐	☐	☐	☐	☐

Section 9: Changes following illness

Indicate for each of the following statements below the degree to which this change occurred in your life as a result of your crisis (illness), using the following scale:

How much?

	I did not experience this change as a result of my crisis/illness	I experienced this change to a very small degree as result of my crisis/illness	I experienced this change to a small degree as a result of my crisis/illness	I experienced this change to a moderate degree as a result of my crisis/illness	I experienced this change to a great degree a result of my crisis/illness
My priorities about what is important in life.	☐	☐	☐	☐	☐
An appreciation for the value of my own life.	☐	☐	☐	☐	☐
I developed new interests.	☐	☐	☐	☐	☐
A feeling of self-reliance.	☐	☐	☐	☐	☐
A better understanding of spiritual matters.	☐	☐	☐	☐	☐
Knowing that I can count on people in times of trouble.	☐	☐	☐	☐	☐
I established a new path for my life.	☐	☐	☐	☐	☐
A sense of closeness with others.	☐	☐	☐	☐	☐
A willingness to express my emotions.	☐	☐	☐	☐	☐
Knowing I can handle difficulties.	☐	☐	☐	☐	☐
I am able to do better things with my life.	☐	☐	☐	☐	☐
Being able to accept the way things work out.	☐	☐	☐	☐	☐

	I did not experience this change as a result of my crisis/illness	I experienced this change to a very small degree as result of my crisis/illness	I experienced this change to a small degree as a result of my crisis/illness	I experienced this change to a moderate degree as a result of my crisis/illness	I experienced this change to a great degree a result of my crisis/illness
Appreciating each day.	☐	☐	☐	☐	☐
New opportunities are available which wouldn't have been otherwise.	☐	☐	☐	☐	☐
Having compassion for others.	☐	☐	☐	☐	☐
Putting effort into my relationships.	☐	☐	☐	☐	☐
I'm more likely to try and change things which need changing.	☐	☐	☐	☐	☐
I have a stronger religious faith.	☐	☐	☐	☐	☐
I discovered that I'm stronger than I thought I was.	☐	☐	☐	☐	☐
I learned a great deal about how wonderful people are.	☐	☐	☐	☐	☐
I accept needing others.	☐	☐	☐	☐	☐

If you have any further comments you would like to make about your illness experience or about this study, please use the free text area below.

Thank you for your time in completing this survey.

There are no known risks associated with this study. However, answering questions about illness may be distressing for some people. If your responses show high levels of depression, anxiety or stress, you will be contacted by one of the researchers to help organise psychological assistance where required. Additionally, if you have any concerns as a result of completing this survey, please contact Dr. Kerry Sherman ✉, Senior Lecturer, Department of Psychology, contact [61 2] 9850 6874, and Dr. Maria Kangas ✉ Senior Lecturer, Department of Psychology, contact [61 2] 9850 8599 for further assistance.

In addition, please note the following resources that are available to you.

Australia

The Cancer Council Helpline 13 11 20

Lifeline (Australia) on 13 11 14

Appendix H. Ethics Approvals

MACQUARIE UNIVERSITY SYDNEY

16 December 2008

Ms Heather Soo
18 Clegg Place
Glenhaven
NSW 2156

Reference: HE28NOV2008-D06246

Dear Ms Soo

FINAL APPROVAL

Title of project: "Rumination and Informational Preferences in Psychological and Behavioural Outcomes in Illness: Pilot Test of Multidimensional rumination in Illness Scale (MRIS)"

Thank you for your recent correspondence. Your response has addressed the issues raised by the Ethics Review Committee (Human Research) and you may now commence your research.

Please note the following standard requirements of approval.

1. Approval will be for a period of twelve (12) months. At the end of this period, if the project has been completed, abandoned, discontinued or not commenced for any reason, you are required to submit a Final Report on the project. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. The Final Report is available at: http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms
2. However, at the end of the 12 month period if the project is still current you should instead submit an application for renewal of the approval if the project has run for less than five (5) years. This form is available at http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report (see Point 1 above) and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).
3. Please remember the Committee must be notified of any alteration to the project.
4. You must notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that might affect continued ethical acceptability of the project.
5. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University http://www.research.mq.edu.au/researchers/ethics/human_ethics/policy

If you will be applying for or have applied for internal or external funding for the above project **it is your responsibility** to provide Macquarie University's Research Grants Officer with a copy of this letter as soon as possible. The Research Grants Officer will not inform external funding agencies that you have final approval for your project and funds will not be released until the Research Grants Officer has received a copy of this final approval letter.

ETHICS REVIEW COMMITTEE (HUMAN RESEARCH)
LEVEL 3, RESEARCH HUB, BUILDING C5C
MACQUARIE UNIVERSITY
NSW, 2109 AUSTRALIA
Ethics Secretariat: Ph: (02) 9850 6848 Fax: (02) 9850 4465 E-mail: ethics.secretariat@vc.mq.edu.au
http://www.research.mq.edu.au/researchers/ethics/human_ethics

Yours sincerely

P.P

Dr Margaret Stuart
Director of Research Ethics
Chair, Ethics Review Committee (Human Research)

Cc: Dr Kerry Sherman, Department of Psychology

ETHICS REVIEW COMMITTEE (HUMAN RESEARCH)
LEVEL 3, RESEARCH HUB, BUILDING C5C
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MACQUARIE UNIVERSITY

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Ethics
Phone +61 (0)2 9850 6848
Email ethics.secretariat@vc.mq.edu.au

4 December 2009

Ms Heather Soo
18 Clegg Place
Glenhaven
NSW 2156

Reference: HE27NOV2009-D00192

Dear Ms Soo,

FINAL APPROVAL

Title of project: Rumination and informational preferences in psychological and behavioural outcomes in illness: reliability and validation testing of the multidimensional rumination in illness scale (MRIS)

The above application was reviewed by the Ethics Review Committee (Human Research) at its meeting on 27 November 2009. The Committee would like to commend you on the quality of your application.

Approval of the above application is granted, effective 27 November 2009 and you may now proceed with your research.

Please note the following standard requirements of approval:

1. The approval of this project is **conditional** upon your continuing compliance with the *National Statement on Ethical Conduct in Human Research (2007)*.

2. Approval will be for a period of five (5 years) subject to the provision of annual reports. **Your first progress report is due on 27 November 2010.**

If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report on the project.

Progress Reports and Final Reports are available at the following website:
http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. Please notify the Committee of any amendment to the project.

5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that might affect continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at: http://www.research.mq.edu.au/policy

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide Macquarie University's Research Grants Officer with a copy of this letter as soon as possible. The Research Grants Officer will not inform external funding agencies that you have final approval for your project and funds will not be released until the Research Grants Officer has received a copy of this final approval letter.

Yours sincerely

Dr Karolyn White
Director of Research Ethics
Chair, Ethics Review Committee (Human Research)

Cc: Dr Kerry Sherman, Department of Psychology

MACQUARIE UNIVERSITY

Ethics Secretariat <ethics.secretariat@mq.edu.au>

Final Approval- Ethics application reference-5201100387

Ethics Secretariat <ethics.secretariat@mq.edu.au> **Tue, Jul 12, 2011 at 2:53 PM**
To: Dr Kerry Sherman <kerry.sherman@mq.edu.au>
Cc: Dr Maria Kangas <maria.kangas@mq.edu.au>, Mrs Heather Jayne Soo <heather.soo@students.mq.edu.au>

Dear Dr Sherman

Re: "The role of rumination as an emotional regulatory strategy in cancer and diabetes: An exploration of affective and behavioural outcomes" (Ref: 5201100387)

The above application was reviewed by the Human Research Ethics Committee. Final Approval of the above application is granted, effective 12 July 2011, and you may now commence your research.

The following personnel are authorised to conduct this research:

Dr Kerry Sherman- Chief Investigator/Supervisor
Dr Maria Kangas & Mrs Heather Soo- Co-Investigators

NB. STUDENTS: IT IS YOUR RESPONSIBILITY TO KEEP A COPY OF THIS APPROVAL EMAIL TO SUBMIT WITH YOUR THESIS.

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).

2. Approval will be for a period of five (5) years subject to the provision of annual reports. Your first progress report is due on 12 July 2012.

If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at the following websites:

http://www.mq.edu.au/policy/

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/policy

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies will not be informed that you have final approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email.

If you need to provide a hard copy letter of Final Approval to an external organisation as evidence that you have Final Approval, please do not hesitate to contact the Ethics Secretariat at the address below.

Please retain a copy of this email as this is your official notification of final ethics approval.

Yours sincerely
Dr Karolyn White
Director of Research Ethics
Chair, Human Research Ethics Committee

Appendix I. Conferences

Abstract, Research Festival, Macquarie University, 2008

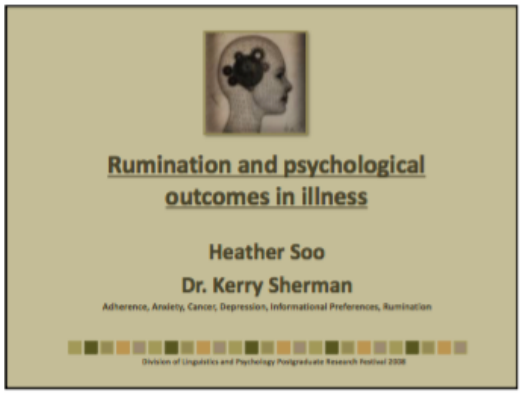
Abstract

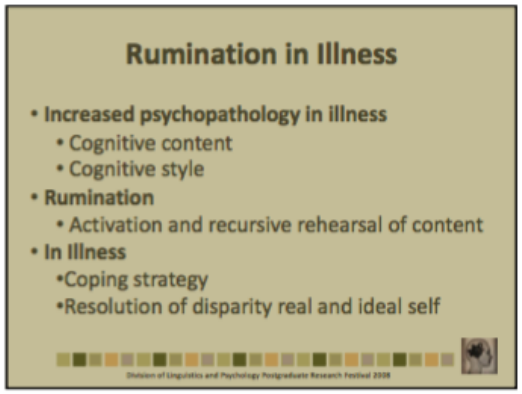
With increasing focus on the cognitive style of rumination, the activation and recursive rehearsal of cognitive content, in the aetiology and maintenance of psychological disorders, this study examines the extent to which thinking style influences emotional and behavioural responses to illness. In light of inadequate measures for rumination in this setting, Phase I involves the development of a scale to assess key ruminative themes in illness. Phase II will examine the impact of rumination on affective and behavioural outcomes, accounting for individual informational preferences. The comparison of both 'diagnosed' and 'at risk' cancer groups should provide useful information on how different groups perceive and process health threat.

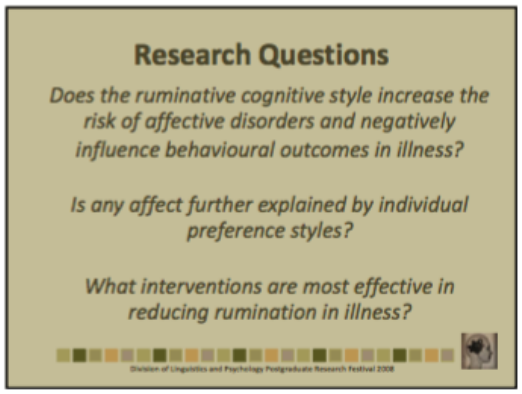
Keywords: Cancer, Coping, Informational preferences, Rumination

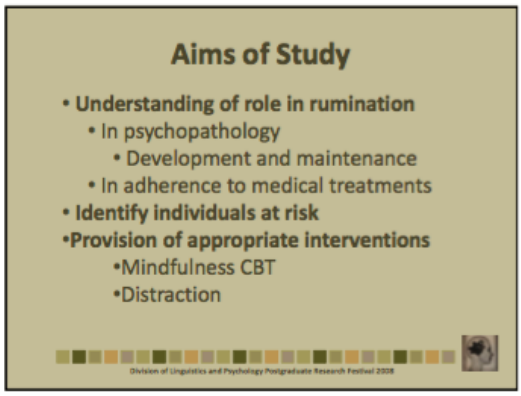
Rumination and psychological and behavioural outcomes in illness
Heather SOO #
Dr Kerry Sherman, Dr Maria Kangas (Psychology; PHD)

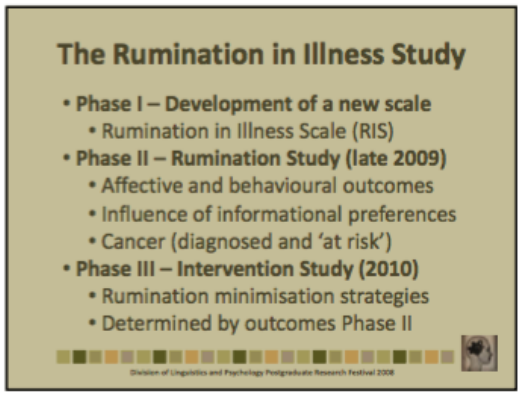
Presentation, Research Festival, Macquarie University, 2008











Phase I: Rumination in Illness Scale

- **Why develop a new scale?**
  - Narrow focus of existing measures
  - Conceptual and empirical concerns
    - Symptom-based items
    - Construct overlap
  - Absence of scale for use in illness

Examining Rumination in Illness

- Brief, self-report measure
  - Generic aspects of rumination
  - Illness perception content
    - 'Why did this happen to me?'
    - 'What would life be like if I wasn't sick?'
  - Positive beliefs about rumination
    - Maintenance of rumination
  - Negative beliefs about rumination
    - Link to psychopathology

RIS Development

- **Stage 1 – Pilot test**
  - Item pool generation
  - Online study
  - Final item selection
  - Cancer (diagnosed and 'at risk')
- **Stage 2 – Reliability and validity testing**
  - Online study

Contact Details

Heather.Soo@student.macquarie.edu.au

Abstract, Research Festival, Macquarie University, 2009

Abstract

Cognitive models of emotional distress in illness have largely taken a content-based approach yet research has suggested that rumination, the activation and recursive rehearsal of cognitive content, may represent an important extension to such models. The development of the Multidimensional Rumination in Illness Scale (MRIS) represents the first phase of a planned study to examine the extent to which thinking style influences both emotional and behavioural response to illness. Developed in response to inadequate measures of rumination for use in this setting, an initial item pool was generated from an extensive review of the rumination literature and existing measures. A pilot study has been conducted (N=244) to refine the choice of scale items. The preliminary analysis of data is presented and planned further reliability and validation testing of the MRIS discussed.

Key words: Illness, Scale development, Rumination

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Presentation, Research Festival, Macquarie University, 2010

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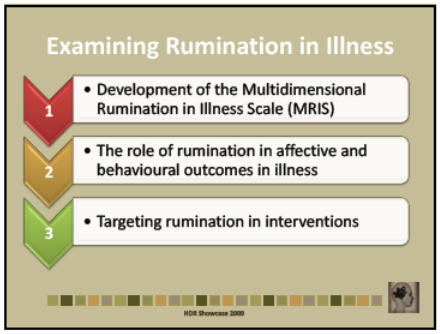
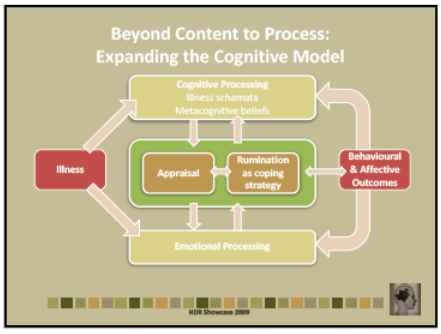
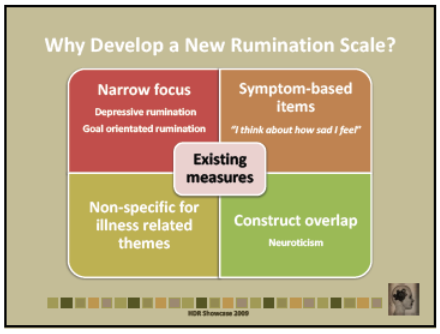
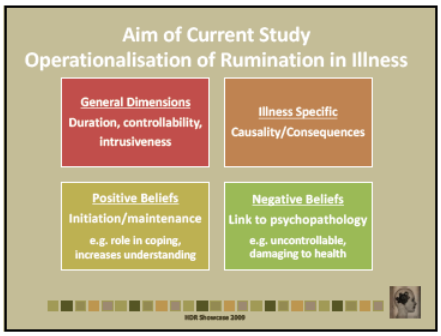
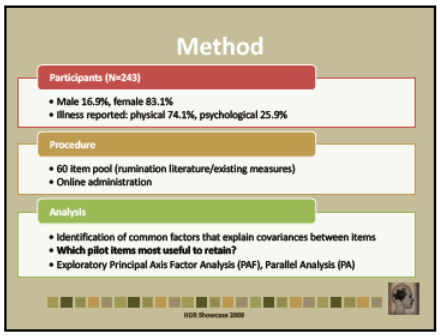
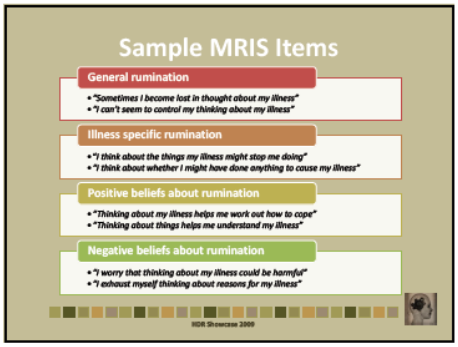


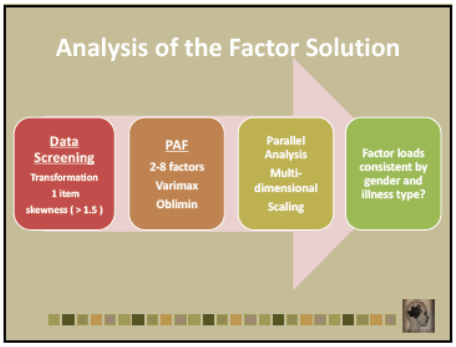


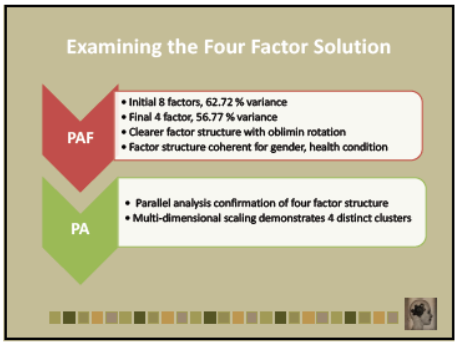


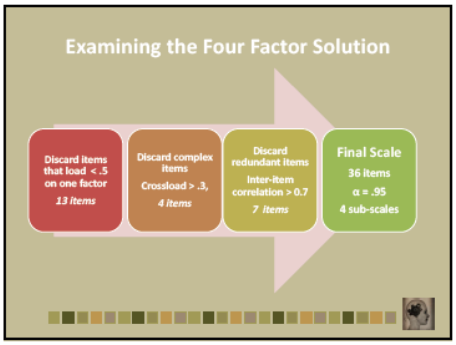


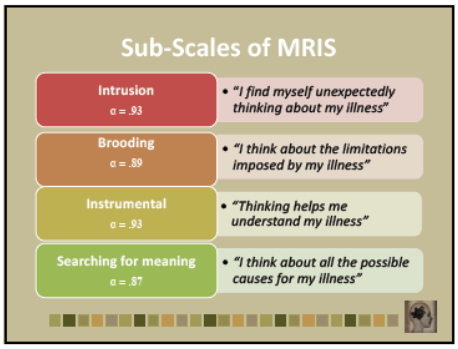


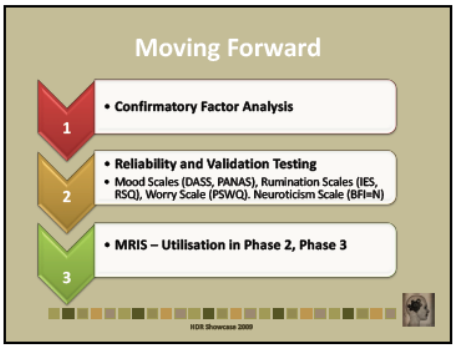

Sample MRIS Items
General rumination
• "Sometimes I become lost in thought about my illness"
• "I can't seem to control my thinking about my illness"
Illness specific rumination
• "I think about the things my illness might stop me doing"
• "I think about whether I might have done anything to cause my illness"
Positive beliefs about rumination
• "Thinking about my illness helps me work out how to cope"
• "Thinking about things helps me understand my illness"
Negative beliefs about rumination
• "I worry that thinking about my illness could be harmful"
• "I exhaust myself thinking about reasons for my illness"


Analysis of the Factor Solution
Data Screening
Transformation
1 item
skewness (> 1.5)
PAF
2-8 factors
Varimax
Oblimin
Parallel Analysis
Multi-dimensional Scaling
Factor loads consistent by gender and illness type?


Examining the Four Factor Solution
PAF
• Initial 8 factors, 62.72 % variance
• Final 4 factor, 56.77 % variance
• Clearer factor structure with oblimin rotation
• Factor structure coherent for gender, health condition
PA
• Parallel analysis confirmation of four factor structure
• Multi-dimensional scaling demonstrates 4 distinct clusters


Examining the Four Factor Solution
Discard items that load < .5 on one factor
13 items
Discard complex items
Crossload > .3,
4 items
Discard redundant items
Inter-item correlation > 0.7
7 items
Final Scale
36 items
α = .95
4 sub-scales


Sub-Scales of MRIS
Intrusion
α = .93
• "I find myself unexpectedly thinking about my illness"
Brooding
α = .89
• "I think about the limitations imposed by my illness"
Instrumental
α = .93
• "Thinking helps me understand my illness"
Searching for meaning
α = .87
• "I think about all the possible causes for my illness"


Moving Forward
1
• Confirmatory Factor Analysis
2
• Reliability and Validation Testing
• Mood Scales (DASS, PANAS), Rumination Scales (IES, RSQ), Worry Scale (PSWQ). Neuroticism Scale (BFI=N)
3
• MRIS – Utilisation in Phase 2, Phase 3

9/15/17

Abstract, Research Festival, Macquarie University, 2010

Abstract

Reliability and Validity Testing of the Multi-Dimensional Rumination in Illness Scale (MRIS)
Beyond cognitive content, it is anticipated that the way in which people think about their illness may have an important role in both affective and behavioural responses to illness. An ongoing study is investigating the validity of a new scale to assess rumination in illness. Preliminary confirmatory factor analyses evaluated the adequacy of a proposed four factor model of rumination (intrusion, instrumentality, search for meaning, brooding). Concurrent and discriminant validity was also evaluated and internal consistency and test-retest stability examined. Preliminary validation outcomes will be presented and implications and directions for future research discussed.

Key words: Illness, Scale development, Rumination

Presentation, Research Festival, Macquarie University, 2010

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Reliability and Validity Testing of the Multi-Dimensional Rumination in Illness Scale (MRIS)

Heather Soo
Dr. Kerry Sherman

Why Examine Rumination in Illness?

- **Potential role of rumination in cognitive coping models**
  - Refocus from cognitive content to cognitive processing
  - Proposed role in affective & behavioural outcomes
- **Operationalisation of rumination in illness**
  - General aspects e.g. controllability, duration
  - Illness-specific e.g. causality, consequences
  - Metacognitive aspects of rumination
    - Positive beliefs explain use as coping procedure
    - Negative beliefs linked to psychopathology

The Multidimensional Rumination in Illness Scale (MRIS)

- **Existent measures of rumination**
  - Narrow focus
    - Depressive or goal-orientated rumination
  - Symptom-based items
    - *"Think about how sad I feel"*
  - Content non-specific for illness-related concerns
  - Construct overlap e.g. neuroticism

Pilot Test of MRIS (2009)

- **Exploratory factor analysis (oblimin rotation)**
  - 4 factor model of rumination, 32 items

Intrusion α = .95	*"I find myself thinking about my illness when I least expect it"*
Brooding α = .93	*"I think about how serious my illness is"*
Instrumentality α = .89	*"Thinking helps me understand my illness"*
Meaning α = .86	*"I am always thinking about what may have caused my illness"*

Figure 1: Four subscales of MRIS

Validation and Reliability Testing of MRIS

- **Aim**
  - Confirm four factor model of MRIS
  - Psychometric testing of MRIS
    - Reliability testing
      - Internal consistency
      - Test-retest (2 week period)
    - Validity testing
      - Concurrent validity
      - Convergent validity
      - Discriminant validity

Methodology

- **Participants (N=266)**
  - Recruited online and from Student Participant Pool, Macquarie University
  - **Gender:** Male 18.8% Female 81.2%
  - **Age:** Range 18 to 75 (M=29.12, SD=13.77)
  - **Illness:** Physical 62% Psychological 38%
- **Procedure**
  - MRIS Item Pool (41 items)
    - Additional items for 'Meaning' & 'Brooding' subscales
  - Additional measures for validation purposes (see following slides)
- **Planned analysis**
  - **Confirmatory factor analysis**
    - Hierarchical model
    - Items parcelled/grouped within each factor
      - Small sample size
      - Item level responses not normally distributed
  - **Reliability and validation testing**

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Concurrent Validity Testing

- **Concurrent Validity**
  - **Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991)**
    - Assesses proneness to depressive rumination
    - Predicted to be significantly and positively correlated with the MRIS
  - **Impact of Events Scale (IES; Horowitz, Wilner, & Alvarez, 1979)**
    - Assesses intrusive thoughts associated with the experience of a distressing event
    - Predicted to be significantly and positively correlated with the MRIS
  - **Positive Beliefs about Rumination Scale (PBRS; Papageorgiou & Wells, 2001)**
    - Assesses positive metacognition on rumination
    - Predicted to be significantly and positively correlated with the MRIS
  - **Negative Beliefs about Rumination Scale (NBRS; Papageorgiou & Wells, 2001)**
    - Assesses negative metacognition on rumination
    - Predicted to be significantly and positively correlated with the MRIS

Convergent and Discriminant Validity Testing

- **Convergent Validity**
  - **Depression, Anxiety, Stress Scales (DASS; Lovibond & Lovibond, 1995)**
    - Assesses proneness to depression and anxiety
    - Depression and anxiety subscales predicted to be significantly correlated with the MRIS
  - **Big5 Inventory Neuroticism Subscale (BIG5-N; John & Srivastava, 1999)**
    - Assesses personality dimension of neuroticism
    - Neuroticism subscale predicted to be significantly correlated with MRIS
- **Discriminant Validity**
  - **Penn-State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990)**
    - Assesses proneness to anxious worry
    - Predicted to be significantly correlated with the MRIS but to a lesser degree than the RRS
  - **Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988)**
    - Assesses both positive and negative affective arousal
    - Negative ideation should be significantly and positively correlated to MRIS
    - MRIS should remain significantly correlated with DASS-D when PANAS-N controlled

Confirmatory Factor Analysis

Chi-square = 31.4
df = 21
TLI = .980
CFI = .905
RMSEA = .043
AIC = 97.43

Figure 2: Standardised solution for the MRIS four-factor model

Reliability Testing

Table 1: Reliability Scores for the MRIS and its Subscales

Reliability	Scale	n	Number of Items	Cronbach's Alpha
Internal	MRIS	266	41	.958
	Intrusion	266	10	.937
	Brooding	266	14	.921
	Instrumentality	266	8	.877
	Meaning	266	9	.834
Test-retest	2 week	99		.722**

Note: **p<.01

Validation Testing

Table 2: Correlations Between the MRIS and Other Measures

Type of validity	Dimension	Scale	n	r
Concurrent	Rumination	RRS	258	.544
	Intrusive Thoughts	IES		
	Metacognition	PBRS	246	.495
		NBRS	248	.429
Convergent	Depression	DASS-D	258	.515
	Anxiety	DASS-A	259	.470
	Neuroticism	BIG5-N	248	.369
Discriminant	Negative Affect	PANAS-NA	249	.475
	Worry	PSWQ	248	.340

Note: All correlations are significant at p <.01. Fluctuations in sample size are due to missing values.

Psychometric Properties of the MRIS

- **CFA support for four factor model of MRIS**
  - Non-significant χ^2 test
  - CFI and TLI > .95; RMSEA < .05
- **Multidimensional nature of rumination in illness**
  - **Intrusion** Perceived negative consequences e.g. uncontrollability
  - **Brooding** Dwelling on the physical & emotional consequences of illness
  - **Instrumentality** Positive beliefs about the benefits of rumination
  - **Meaning** Understanding causality and integration

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Psychometric Properties of the MRIS

- **Reliable and valid measure**
  - **Reliability testing**
    - Full scale and subscales good internal consistency ($r > .8$)
    - Good test-retest reliability over 2 weeks, $t(90) = 0.722$, $p < .01$
  - **Validation testing**
    - The MRIS correlated positively and significantly with all measures
    - Correlation with IES, RRS, PBRS & NBRS provide preliminary concurrent validation
    - As predicted, greater correlation between MRIS and RRS than for MRIS and PWSQ
      - Rumination therefore related to but not identical to worry
    - As predicted, MRIS significantly correlated with DASS-D when PANAS-N controlled
      - Rumination therefore related to but not identical to negative affect

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The Next Stage: Using the MRIS

- **Examining the role of rumination in cancer**
  - Comparison of 'diagnosed' and 'at risk' populations
  - Across cancer types
    - Breast, cervical, colorectal, prostate groups
  - Across cancer trajectory
    - Diagnosis, treatment, survivorship
  - Outcomes of interest
    - Affective (depression, anxiety, post-traumatic growth)
    - Behavioural (adherence to treatment and screening)

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Contact Details

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Abstract, Australasian Society for Behavioural Health and Medicine, 2010

AUSTRALASIAN SOCIETY FOR BEHAVIOURAL HEALTH AND MEDICINE (ASBHM, 2010

ABSTRACT SUBMISSION FORM

7th Annual Scientific Conference
Novotel Hotel
Brisbane, Qld, Australia

February 10-12, 2010

Name of presenter:	Heather Soo and Kerry Sherman
Organisation:	Macquarie University, Sydney, Australia
Address of presenter (or corresponding author):	Department of Psychology, Macquarie University
Phone number:	9850 6874
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E-mail address:	heather.soo@students.mq.edu.au
Do you wish to be considered for the **Early Career Award**? (This is for best poster presentation; your PhD should have been awarded within last 5 years.)	☐ Yes, what year did you receive your PhD? _____ ☑ No
Do you wish to be considered for a **Student Award**? (This is for best poster presentation)	☑ Yes, what postgraduate degree / programme are you enrolled in? __ PhD_____ ☐ No

DEVELOPING THE MULTIDIMENSIONAL RUMINATION IN ILLNESS SCALE (MRIS)

Dr. Kerry Sherman[1], Heather Soo[2],

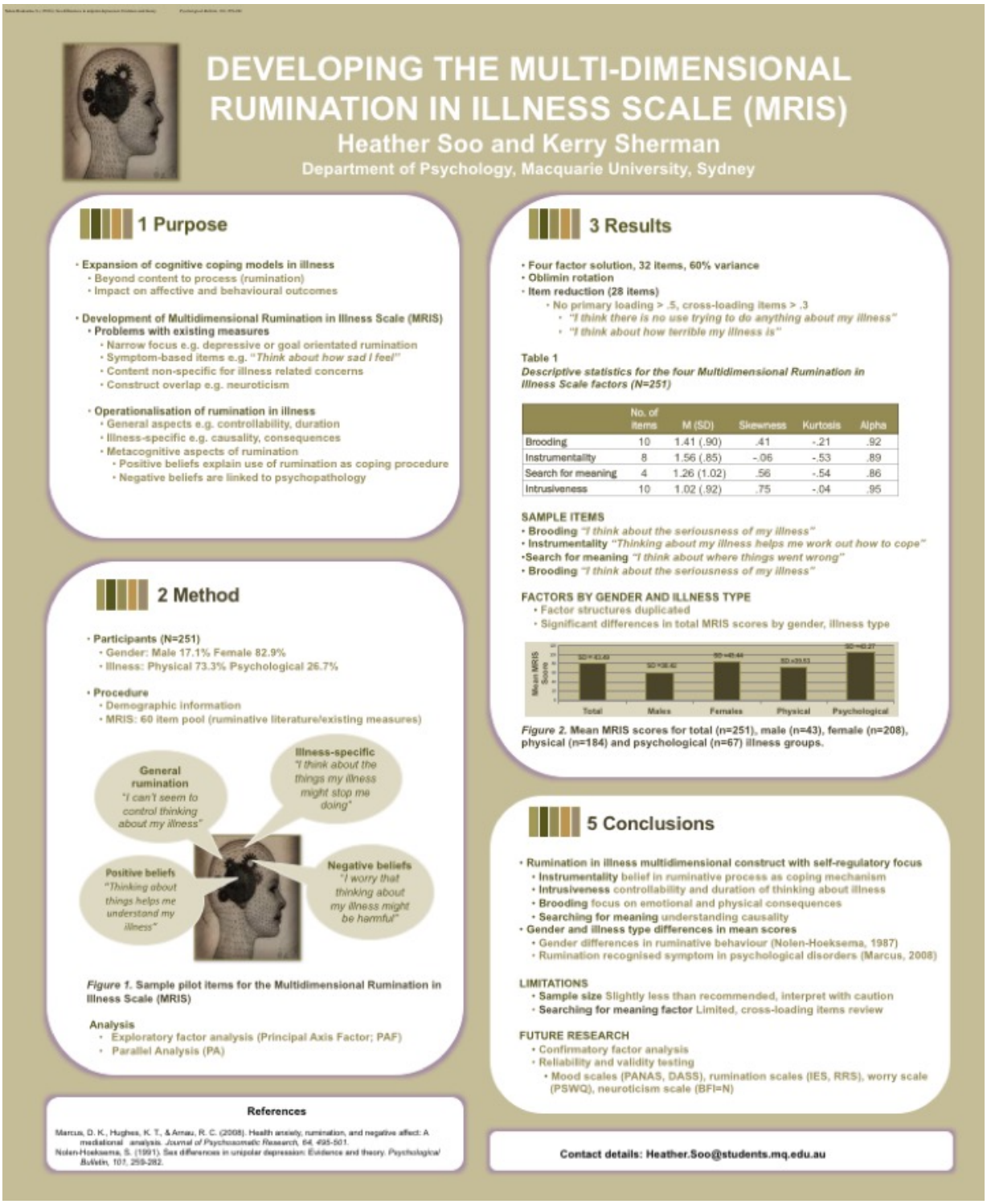
[1]Faculty of Human Sciences, Department of Psychology, Macquarie University, Sydney, Australia
[2]Faculty of Human Sciences, Department of Psychology, Macquarie University, Sydney, Australia

Abstract

Introduction: Increasingly, cognitive models of psychopathology are being expanded to incorporate the cognitive process of rumination. Given limitations with existing rumination measures and the absence of a measure specifically for use in the context of illness, the Multidimensional Rumination in Illness Scale (MRIS) is designed to measure ruminative tendencies which may be influential in the way people think about their illness. The MRIS should account for general and illness-specific dimensions of rumination as well as meta-cognitive beliefs about the usefulness of rumination in this context.
Methods: Participants (n=251) were asked to complete an online pilot version of the MRIS consisting of 60 items generated from an extensive review of the rumination literature and from existing rumination measures. Exploratory factor analysis and parallel analysis were conducted to identify common factors and facilitate item reduction. Factor structures were also examined for consistency across gender and illness type.
Results: Exploratory factor analysis of a reduced 36 item scale with oblique rotation suggested a four factor solution for rumination in illness (intrusiveness, brooding, instrumental and searching for meaning). Internal consistency reliability indices were examined and found to be satisfactory. The factor structure proved to be coherent both for gender and health condition.
Conclusions: Initial testing of the MRIS suggests a robust instrument for the examination of ruminative thinking in illness but further testing of the psychometric properties of the scale, specifically confirmatory factor analysis, reliability and validity testing will be required.

Word count: **237**

Presentation, Australasian Society for Behavioural Health and Medicine, 2010



DEVELOPING THE MULTI-DIMENSIONAL RUMINATION IN ILLNESS SCALE (MRIS)

Heather Soo and Kerry Sherman
Department of Psychology, Macquarie University, Sydney

1 Purpose

- **Expansion of cognitive coping models in illness**
  - Beyond content to process (rumination)
  - Impact on affective and behavioural outcomes
- **Development of Multidimensional Rumination in Illness Scale (MRIS)**
  - **Problems with existing measures**
    - Narrow focus e.g. depressive or goal orientated rumination
    - Symptom-based items e.g. "*Think about how sad I feel*"
    - Content non-specific for illness related concerns
    - Construct overlap e.g. neuroticism
  - **Operationalisation of rumination in illness**
    - General aspects e.g. controllability, duration
    - Illness-specific e.g. causality, consequences
    - Metacognitive aspects of rumination
      - Positive beliefs explain use of rumination as coping procedure
      - Negative beliefs are linked to psychopathology

2 Method

- **Participants (N=251)**
  - Gender: Male 17.1% Female 82.9%
  - Illness: Physical 73.3% Psychological 26.7%
- **Procedure**
  - Demographic information
  - MRIS: 60 item pool (ruminative literature/existing measures)

Figure 1. **Sample pilot items for the Multidimensional Rumination in Illness Scale (MRIS)**

Analysis
- Exploratory factor analysis (Principal Axis Factor; PAF)
- Parallel Analysis (PA)

3 Results

- **Four factor solution, 32 items, 60% variance**
- **Oblimin rotation**
- **Item reduction (28 items)**
  - No primary loading > .5, cross-loading items > .3
    - *"I think there is no use trying to do anything about my illness"*
    - *"I think about how terrible my illness is"*

Table 1
Descriptive statistics for the four Multidimensional Rumination in Illness Scale factors (N=251)

	No. of items	M (SD)	Skewness	Kurtosis	Alpha
Brooding	10	1.41 (.90)	.41	-.21	.92
Instrumentality	8	1.56 (.85)	-.06	-.53	.89
Search for meaning	4	1.26 (1.02)	.56	-.54	.86
Intrusiveness	10	1.02 (.92)	.75	-.04	.95

SAMPLE ITEMS
- **Brooding** *"I think about the seriousness of my illness"*
- **Instrumentality** *"Thinking about my illness helps me work out how to cope"*
- **Search for meaning** *"I think about where things went wrong"*
- **Brooding** *"I think about the seriousness of my illness"*

FACTORS BY GENDER AND ILLNESS TYPE
- Factor structures duplicated
- Significant differences in total MRIS scores by gender, illness type

Figure 2. **Mean MRIS scores for total (n=251), male (n=43), female (n=208), physical (n=184) and psychological (n=67) illness groups.**

5 Conclusions

- **Rumination in illness multidimensional construct with self-regulatory focus**
  - **Instrumentality** belief in ruminative process as coping mechanism
  - **Intrusiveness** controllability and duration of thinking about illness
  - **Brooding** focus on emotional and physical consequences
  - **Searching for meaning** understanding causality
- **Gender and illness type differences in mean scores**
  - Gender differences in ruminative behaviour (Nolen-Hoeksema, 1987)
  - Rumination recognised symptom in psychological disorders (Marcus, 2008)

LIMITATIONS
- **Sample size** Slightly less than recommended, interpret with caution
- **Searching for meaning factor** Limited, cross-loading items review

FUTURE RESEARCH
- Confirmatory factor analysis
- Reliability and validity testing
  - Mood scales (PANAS, DASS), rumination scales (IES, RRS), worry scale (PSWQ), neuroticism scale (BFI=N)

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Abstract, Australian Psychological Society Conference, Canberra, 2011

Abstract

The Multidimensional Rumination in Illness Scale: Development and validation of a measure of rumination in illness

SOO, H. (Macquarie University), & SHERMAN, K. (Macquarie University and Westmead Breast Cancer Institute)

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Introduction and Aims Research suggests that the cognitive style of rumination, the activation and recursive rehearsal of cognitive content, represents a key extension to existing cognitive models of emotional distress in illness. Given limitations with existing rumination measures and the absence of a measure specifically for use in the context of illness, we developed the Multidimensional Rumination in Illness Scale (MRIS). The MRIS is designed to incorporate both general and illness-specific dimensions of rumination and meta-cognitive beliefs about rumination. In Study 1 an exploratory factor analysis of an initial pool of 60 items was undertaken. This was followed by confirmation of the hypothesised factor structure in Study 2. *Procedure* In Study 1, participants diagnosed with a chronic physical or mental illness (n=251) completed an online pilot version of the MRIS comprising 60 items generated from an extensive literature review and existing rumination measures. Exploratory factor analysis and parallel analysis were conducted to identify common factors and facilitate item reduction. Factor structures were also examined for consistency across gender and illness type. In Study 2, participants with a chronic physical or mental illness (n=266) completed a revised version of the MRIS comprising 41 items. Confirmatory factor analysis assessed the adequacy of a proposed four factor model of rumination, concurrent and discriminant validity was evaluated, and test-retest reliability examined. *Results* In Study 1, exploratory factor analysis of a reduced 36 item scale with oblique rotation suggested a four factor solution for rumination in illness (intrusiveness, brooding, instrumental and searching for meaning). Internal consistency reliability indices were satisfactory. The factor structure was found to be coherent both for gender and health condition. In Study 2, confirmatory factor analysis confirmed the adequacy of the multi-dimensional model of rumination in illness. The MRIS demonstrated good internal consistency, for the full scale and sub-scales, as well as good test-rest reliability over two weeks, and good concurrent and discriminant validity. *Discussion* The MRIS is a reliable and valid measure that should provide a comprehensive assessment of the cognitive style of rumination in the context of both physical and mental illness.

Presentation, Australian Psychological Society Conference, Canberra, 2011

The Multi-Dimensional Rumination in Illness Scale: Development and validation of a measure of rumination in illness

Heather Soo[1] and Kerry Sherman[1,2]

[1]Department of Psychology, Macquarie University, Sydney, [2] Westmead Breast Cancer Institute

Abstract

Introduction and Aim The cognitive style of rumination extends existing cognitive models of emotional distress in illness. Given limitations in existing rumination measures and the absence of a measure specifically for use in the illness context, we developed the Multidimensional Rumination in Illness Scale (MRIS).

Study 1: Method Participants (n=251) completed an online pilot version of the MRIS containing 60 items. Exploratory factor analysis (EFA) and parallel analysis were conducted to identify common factors and facilitate item reduction.

Results EFA of a reduced 32 item scale with oblique rotation suggested a 4 factor solution for rumination in illness (intrusion, brooding, instrumentality, searching for meaning).

Study 2: Method Participants (n=284) completed a revised version of the MRIS comprising 41 items. Confirmatory factor analysis (CFA) assessed the adequacy of a proposed four factor model of rumination, with reliability and validity properties of the scale also examined.

Results CFA confirmed the adequacy of the multidimensional model of rumination in illness. The MRIS demonstrated good internal consistency, test-retest reliability, concurrent and discriminant validity

Conclusion The MRIS is a reliable and valid measure that should provide a comprehensive assessment of the cognitive style of rumination in illness.

Introduction

1. Cognitive coping models in illness are expanding beyond content to incorporate aspects of processes, such as rumination.
2. Rumination is the *activation and recursive rehearsal of cognitive content* and it has been proposed to have a role in affective and behavioural outcomes.
3. Current rumination measures are limited by:
   a) Having a narrow focus e.g. depressive or goal orientated rumination
   b) Including symptom-based items e.g. *'Think about how sad I feel'*
   c) Content that does not account for illness related concerns
   d) An overlap with other constructs such as neuroticism
4. There's a need for a measure of rumination to address both these limitations and the specific context of illness with rumination in illness operationalised as:
   a) General aspects of rumination e.g. controllability, duration
   b) Illness-specific themes e.g. causality, consequences
   c) Metacognitive elements (Positive beliefs explain initiation/maintenance of rumination; Negative beliefs linked to psychopathology)

Aims: **Study 1** Initial development of illness-specific measure of rumination (MRIS)
Study 2 Confirmation of four factor model, reliability and validation testing

Method

Study 1

Participants **N=251** First year Macquarie University Psychology students and community members (Male 17.1%; Female 82.9%; Median age group 18-20 years; Self-reported illness type: Physical 73.3% Psychological 26.7%

Procedure Participants completed online questionnaires that included demographic information and clinical characteristics; the **MRIS:** 60 item pool (based on ruminative literature/existing measures); an open-ended self-report item allowing participants to specify additional areas of thinking in illness

Analysis EFA (Principal Axis Factor Analysis) and Parallel analysis (PA)

Study 2

Participants **N=284** First year Macquarie University Psychology students and community members (Male 19.4%; Female 80.6%; Age M=28.94, SD=13.62, 18-75; Self-reported illness type: Physical 60.9% Psychological 39.1%

Procedure Participants completed online questionnaires that included demographic information and clinical characteristics; demographic information and clinical characteristics; **MRIS:** 41 items (additional items for 'Meaning' and 'Brooding' subscales derived from the open-ended item in Study1); additional scales for validation (see Tables 1, 2)

Analysis CFA (Confirmatory Factor Analysis), reliability, validation testing

References

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Heather.Soo@students.mq.edu.au
Study: http://mris.com.au

Results

Study 1

Four factor solution with oblimin rotation, 56.4% variance, 32 items

Intrusion *'I find myself thinking about my illness when I least expect it'*
Brooding *'I think about the things I can no longer do'*
Instrumentality *'Thinking helps me understand my illness'*
Searching for meaning *'I am always thinking about what caused my illness'*

Item reduction (28 items)

No primary loading > .5; cross-loading items > .3; redundancy

Study 2

CFA support for four factor model of MRIS, items packaged (small sample)

Non-significant χ^2 test; GFI, CFI and TLI > .95; RMSEA < .05

Figure 1: Standardised solution for the MRIS four-factor model

Table 1: *Reliability Scores for the MRIS and its Subscales*

Reliability	Scale	n	Number of items	Cronbach's Alpha (α)
Internal	MRIS	284	41	.96
	Intrusion	284	10	.94
	Searching for meaning	284	9	.85
	Brooding	284	10	.90
	Instrumentality	284	8	.88
Test-retest	2 week	100	41	.73

Table 2: *Correlations Between the MRIS and Other Measures*

Validity	Scale	Dimension	n	r
Concurrent	Ruminative Responses Scale	Rumination	272	.54
	Impact of Events Scale	Intrusive Thoughts	264	.57
	Positive Beliefs about Rumination	Metacognition	262	.48
	Negative Beliefs about Rumination	Metacognition	264	.45
Convergent	Depression, Anxiety, Stress (D)	Depression	277	.51
	Depression, Anxiety, Stress (A)	Anxiety	278	.46
	BIG5-Neuroticism	Neuroticism	263	.36
Discriminant	Positive and Negative Affect Scale (N)	Negative affect	263	.48
	Penn State Worry Questionnaire	Worry	263	.34

Conclusion

1. **Confirmation of rumination as a multidimensional construct**
   Intrusion The perceived negative consequences e.g. uncontrollability
   Brooding A dwelling on the physical/emotional consequences of illness
   Instrumentality Positive beliefs that initiate/maintain rumination
   Searching for meaning Understanding causality and integration
2. **MRIS reliable and valid measure of rumination in illness**
3. **Gender and illness differences**
   Higher rumination scores for females mirrors documented gender differences in rumination behaviour[1]
   Higher rumination scores for individuals reporting psychological illness reflects rumination as a symptom of psychological disorders[2]
4. **Limitations:**
   Sample size (less than recommended 5 subjects per measured variable)
5. **Going forward: Examining the role of rumination in illness**
   Examining rumination in both acute illness (cancer) and chronic illness (diabetes mellitus) and any potential role in:
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Item reduction (28 items)

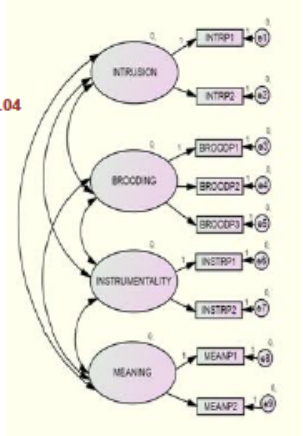
No primary loading > .5; cross-loading items > .3; redundancy

Study 2

CFA support for four factor model of MRIS, items packaged (small sample)

Non-significant χ^2 test; GFI, CFI and TLI > .95; RMSEA < .05

Chi-Square = 31.78
df = 21
p = .06
GFI = .98
TLI = .99
CFI = .99
RMSEA = .04



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