

Longitudinal Processes That Predict Affective Symptoms

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Declaration

I declare that this thesis is the product of my own work carried out under the supervision of Associate Professor Rhonda Brown, Associate Professor Bruce Christensen, and Associate Professor Elizabeth Rieger. I declare that the research presented in this thesis is predominantly my own work. This thesis is 39,139 words in length.



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Abstract

Depressive and anxiety symptoms can be associated with high levels of impairment and distress. Thus, it is important to understand the processes that contribute to the exacerbation and alleviation of affective symptoms. Various factors have been implicated, including individuals' tendencies towards rumination and mindfulness, and the psychological processes of stress and sleep disturbance. While these associations are generally well established, the bulk of existing research is dominated by specific conceptualisations, and thus limited measurement, of these constructs, and there is a paucity of research into theoretically important interactive processes.

Hence, the aim of this thesis was to explore various key mechanisms by which core depression and anxiety symptoms can change over time, including the direct and/or interactive effects of dispositional rumination and mindfulness (Study 1), and the effects of psychological stress, whether direct, mediated by rumination and/or sleep disturbance, and/or attenuated by dispositional mindfulness (Study 2). A prospective study was conducted, whereby a convenience sample of Australian community adults completed three online surveys, three months apart (Time 1, $n = 730$; Time 2, $n = 498$; and Time 3, $n = 353$). Participants answered questions about their recent experiences of depression, anxiety, stress, and sleep disturbance, and their tendencies towards non-mood-responsive rumination, mindful-acting-with-awareness, and mindful-non-judging.

Findings from Study 1 revealed that greater rumination directly predicted increased depression across three months, and stress across three and six months. In addition, greater mindful-acting-with-awareness directly predicted decreased

anxiety across three months. Finally, high mindful-acting-with-awareness attenuated the effects of lower non-judging on increasing anxiety and stress across three months, in addition to the effects of greater rumination on increasing anxiety and depression across six months. Findings from Study 2 revealed that greater stress predicted increased six-month depression and anxiety indirectly via three-month sleep disturbance, and also via rumination leading to three-month sleep disturbance, whereas rumination uniquely mediated between stress and six-month depression. Further, high mindful-acting-with-awareness attenuated the effects of greater stress on increased anxiety across six months.

Overall, the findings suggested that: (1) a general tendency to ruminate is more predictive of later stress and depression over anxiety symptoms; (2) that poor sleep plays a key intermediary role in linking subjective stress to later affective symptoms (as a unique factor and also following rumination); and (3) a tendency to attend to present-moment experiences is especially protective in attenuating the effects of self-critical appraisal processes and/or subjective stress on later anxiety. Various theoretical, clinical, and methodological considerations are implicated from the research findings, elucidating numerous avenues for continued research. Of particular clinical importance, the findings align with mechanistic accounts of mindfulness-based treatment interventions by suggesting that regularly attending to present-moment experiences may protect against escalating distress by buffering the effects of harmful self-evaluative processes.

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List of Abbreviations

DASS-21: Depression, Anxiety and Stress Scale-Short Form (21-items)

DSM-5: Diagnostic and Statistical Manual of Mental Disorders 5th edition (2013)

DSM-IV: Diagnostic and Statistical Manual of Mental Disorders text revised
4th edition (2000)

FFMQ: Five Facet Mindfulness Questionnaire

HADS: Hospital Anxiety and Depression Scale

MAAS: Mindful Attention Awareness Scale

MBCT: Mindfulness-Based Cognitive Therapy

MBI: Mindfulness-Based Intervention

MBSR: Mindfulness-Based Stress Reduction

OR: Odds ratio

PSQI: Pittsburgh Sleep Quality Index

RRQ: Rumination-Reflection Questionnaire

RRS: Ruminative Responses Scale

RST: Responses Styles Theory

T1: Time 1 (baseline)

T2: Time 2 (3-month follow up)

T3: Time 3 (6-month follow up)

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Thesis Overview

The experience of depressive and anxiety symptoms comes at a significant cost to individuals, being associated with high distress, psychosocial impairment and disability. While several factors have been implicated in the development, maintenance and alleviation of affective symptoms, the processes involved are complex and nuanced. Thus, the broad aim of this thesis is to clarify various key mechanisms by which core depression and anxiety symptoms can change over time, including the direct and/or interactive effects of dispositional rumination and mindfulness (Study 1), and the effects of psychological stress, whether direct, mediated by rumination and sleep disturbance, and/or attenuated by dispositional mindfulness (Study 2). A prospective longitudinal design will be used to examine the temporal relationships between variables, utilising a community sample in order to investigate the effects of naturally occurring emotional regulation processes and psychological symptoms outside the context of treatment. Through this examination, it is hoped that avenues for effective treatment will be elucidated, including the tailoring of interventions to individuals' unique emotion regulation, sleep, and affective symptom profiles.

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Chapter 1: The Epidemiology of Depressive and Anxiety Disorders

Chapter Overview

This chapter will outline the characteristics and consequences of elevated depression and anxiety symptoms, thereby highlighting the importance of ongoing research into factors that may exacerbate or alleviate affective distress. To begin, an overview of depressive and anxiety disorders will be presented, including their clinical conceptualisation, prevalence estimates, comorbidity profiles, and associated individual and societal costs. Subclinical depressive and anxiety symptoms will then be discussed, including their incidence rates, concurrent relationships, and associated dysfunction and disability. The efficacy of psychological treatments in alleviating these symptoms will then be discussed. Finally, given that elevated affective symptoms are associated with significant impairment and disability, and may not respond to psychological treatments, a case will be made for continued investigations into the factors that contribute to, and alleviate, these symptoms.

Depressive and Anxiety Disorders

Clinical conceptualisation. The experience of emotion is a fundamental aspect of human experience. Emotions are thought to provide information to the individual to motivate and organise cognition and action (Izard, 2010). Various processes are involved in emotion generation including the situation itself, appraisal of the situation, and multi-system bodily responses that involve changes in subjective experience, behaviour, and physiology (Gross, 2014). Moreover, emotions are broadly categorised as either positive or negative, based on an appraisal of the situation that prompted it and how the emotion is experienced subjectively (Lazarus, 1991; Watson & Tellegen, 1985). Negative

emotions, including sadness and anxiety, are thought to arise from perceptions of harm, loss or threat (Lazarus, 1991), and they are generally experienced as upsetting or unpleasant (Watson & Tellegen, 1985). Experiences of sadness and anxiety are not unusual or problematic *per se*; however, prolonged experiences that are highly distressing and associated with impaired functioning may be considered as a symptom of a mental disorder, as outlined in the current *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association (APA), 2013).

Depressive disorders are characterised by significant impairments in mood. The diagnostic threshold for Major Depressive Disorder is the experience of either low mood or anhedonia (i.e., loss of pleasure) for more than two weeks as well as at least four additional symptoms including changes in body weight or appetite, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness or guilt, concentration difficulties, or recurring thoughts of death or suicide (APA, 2013). Similarly, Persistent Depressive Disorder is characterised by low mood experienced over two-years with at least two additional symptoms including appetite disturbance, sleep disturbance, low energy or fatigue, low self-esteem, concentration difficulties or feelings of hopelessness (APA, 2013). In contrast, Bipolar and Cyclothymic Disorders are characterised by experiences of manic or hypomanic mood episodes as well as major depressive episodes experienced at some point over the course of the disorder (APA, 2013), and they were listed together with the depressive disorders as mood disorders in the previous version of the *DSM* (text revised, 4th edition, DSM-IV-TR; APA, 2000). Taken together, despite the

variance in expressed symptoms, both Depressive and Bipolar Disorders are associated with periods of low mood (APA, 2013).

In contrast, anxiety disorders are characterised by excessive anxiety or fear that typically lasts more than six months. The disorders are differentiated diagnostically based on the focus of the anxiety (APA, 2013). For example, Social Anxiety Disorder centres around the potential for social scrutiny; Specific Phobias centre around a specific object or situation (e.g., spiders or heights); Panic Disorder is related to a fear of experiencing panic symptoms, whereas Generalised Anxiety Disorder is related to the experience of anxiety in relation to multiple situations, events or activities (APA, 2013). In addition, conditions that were listed as anxiety disorders in the previous version of the *DSM (DSM-IV-TR; APA, 2000)*, such as Obsessive-Compulsive Disorder and Posttraumatic Stress Disorder, also centre around anxiety; the former is associated with obsessions that contribute to anxiety and/or compulsions that aim to relieve anxiety; whereas the latter is related to marked affective, cognitive, behavioural, and physiological changes following exposure to a traumatic event (APA, 2013). In summary, the experience of anxiety is common to various clinical conditions, including Anxiety, Obsessive-Compulsive and Trauma-Related Disorders (APA, 2013).

Prevalence. Recent prevalence estimates based on *DSM-IV-TR* diagnostic criteria suggest that anxiety disorders are globally the most common mental disorders, followed by mood disorders (Kessler et al., 2009). Lifetime prevalence estimates for anxiety and mood disorders are high, with approximately 26% of Australians experiencing an anxiety disorder and 15% experiencing a mood disorder at some point in their lives (Australian Bureau of Statistics (ABS), 2008). Comparable lifetime prevalence estimates are reported

in other high-income Western nations. For example, in the United States and New Zealand, 31% and 24.6% of the population experienced an anxiety disorder and 21.4% and 20.4% experienced a mood disorder in their lifetime, respectively (Kessler et al., 2009). In 2007 alone, approximately 14% of Australians reported experiencing an anxiety disorder and 6% reported a mood disorder (ABS, 2008), again comparable to the 12-month estimates of 19% and 15% for anxiety disorders, and 9.7% and 8% for mood disorders, in the United States and New Zealand, respectively (Kessler et al., 2009). However, the prevalence estimates are reported to vary as a function of various demographic factors: for example, Australian 12-month prevalence estimates indicate that a higher percentage of women than men experience anxiety (17.9% vs. 10.8%) and mood disorders (7.1% vs. 5.3%) and the rates were even higher in cohorts that were younger, unemployed, unpartnered or with less education or income (ABS, 2008).

Impairment and dysfunction. Importantly, mood and anxiety disorders are leading causes of disease and burden in Australia (Begg et al., 2007), and depression is the leading cause of disability worldwide (World Health Organization, 2008). Suicide accounts for a significant proportion of the mortality rate associated with Major Depressive Disorder and Bipolar Disorder (APA, 2013). Suicide risk is also a significant concern for Australians with mood and anxiety disorders, with only 4.5% and 10.1% of these individuals respectively reporting the absence of suicidal ideation, plans or attempts (ABS, 2008). A large proportion of individuals with mood and anxiety disorders will also experience severe functional impairments in at least one major life domain including home-management, ability to work, social life, and intimate relationships, as revealed in a large population-based study (Kessler et al., 2009).

In this study of diagnosed individuals from developed nations, severe impairment was experienced by a large proportion of people with Bipolar Disorder (68.3%), Major Depression (65.8%), Generalised Anxiety Disorder (56.3%), Posttraumatic Stress Disorder (54.8%), Panic Disorder (48.4%), and Social Anxiety Disorder (35.1%; Kessler et al., 2009).

The cost of providing mental health services in Australia is also high, with approximately \$4.7 billion expended in 2006 alone (Commonwealth of Australia, 2009). Moreover, this estimate excluded ancillary costs such as housing, community and income support or lost work productivity, which is estimated to cost \$10 to 15 billion per year (Commonwealth of Australia, 2009). Despite the high societal and personal costs, almost two-thirds of Australians who experience significant psychological distress typically do not seek psychological assistance (ABS, 2008), which is comparable to global help-seeking trends indicating that about two-thirds of people with mood and anxiety disorders do not receive treatment (Ormel et al., 2008). These low rates of help-seeking are alarming given the high distress and functional impairment associated with these disorders.

Comorbidity. In addition, the comorbidity between anxiety and mood disorders is high. For example, 39% of all comorbid mental illnesses reported in Australia in 2007 were comorbid mood and anxiety disorders (ABS, 2009). Similarly, findings from a World Health Organisation study across 14 countries indicated that over one-half of the individuals who met criteria for an anxiety or mood disorder also met criteria for the other disorder (Lecrubier, 2001). Lifetime co-prevalence estimates may be even higher: in one Western sample, 95% of individuals who met lifetime criteria for an anxiety disorder also met criteria for

Major Depressive Disorder or Persistent Depressive Disorder (Brown, Campbell, Lehman, Grisham, & Mancill, 2001), suggesting the disorders rarely occur in isolation over time. Indeed, mood and anxiety disorders share overlapping symptoms including fatigue, sleep disturbance, and difficulty concentrating, particularly Major Depressive Disorder and Generalised Anxiety Disorder (APA, 2013). Furthermore, although autonomic arousal symptoms are a specific diagnostic criterion for several anxiety disorders (e.g., Generalised Anxiety Disorder, Panic Disorder), anxious distress is an additional diagnostic criterion for mood disorders (APA, 2013).

Subclinical symptoms. In addition to diagnosable disorders, many more individuals are reported to experience sub-clinical, albeit distressing, symptoms of depression and/or anxiety (hereafter referred to as affective symptoms). Indeed, in community samples reflecting on their recent experiences, 11.0% reported at least mild levels of physiological anxiety, 18.3% reported depressive symptoms, 19.8% reported subjective stress (Crawford & Henry, 2003), and 12.1% reported concurrent anxiety and depressive symptoms (Andrews & Slade, 2001). Thus, symptoms of depression and anxiety are strongly comorbid with each other (Clark, Steer, & Beck, 1994; Crawford & Henry, 2003; Sinclair et al., 2012) and also with high stress (Crawford & Henry, 2003; Lovibond & Lovibond, 1995a).

Importantly, even experiences of sub-threshold affective symptoms are associated with significant functional impairment and disability across various psychosocial domains (Haller, Cramer, Lauche, Gass, & Dobos, 2014; Lewinsohn, Solomon, Seeley, & Zeiss, 2000; Rodríguez, Nuevo, Chatterji, & Ayuso-Mateos, 2012). Moreover, sub-threshold affective symptoms pose an

increased risk for later psychopathology; depressive symptoms have been associated with a 1.6 to 6.2 fold risk for depressive disorders, and anxiety symptoms have been associated with a 1.5 to 2.7 fold risk for anxiety disorders (Karsten et al., 2011; Shankman et al., 2009). Thus, even experiences of subclinical mood and anxiety symptoms are potentially associated with far-reaching detrimental effects, including functional impairment, co-occurring distress, and a greater risk for developing into a mental disorder. As such, it is important to understand the mechanisms implicated in the cause, maintenance and alleviation of affective symptoms.

Treating affective symptoms. A number of psychological treatments have shown utility for reducing both depressive and anxiety symptomology, including Cognitive-Behavioural and Mindfulness-Based therapies (Cuijpers et al., 2014; Hofmann, Sawyer, Witt, & Oh, 2010; Hofmann & Smits, 2008; Lenz, Hall, & Bailey Smith, 2016). Thus, evidence-based psychological treatments offer promise for individuals experiencing distressing affective symptoms. However, concerns have been expressed that reported efficacy rates may be overrepresented as participants who discontinue treatment are not always included in these analyses (Hofmann & Smits, 2008). Furthermore, it has been reported that half to three-quarters of individuals participating in evidence-based treatments do not experience clinical improvements in affective distress (Loerinc et al., 2015; van Aalderen et al., 2012). Given these limitations, existing therapies would benefit from ongoing refinements in order to maximise efficacy and applicability. One avenue for achieving this is by deepening our understanding of the unique factors and processes associated with the onset, maintenance, and alleviation of affective symptoms.

Chapter Summary

Mood and anxiety disorders are highly comorbid disorders that frequently co-occur with other symptoms and can lead to distress, functional impairment, disability, and financial burden. In addition, sub-clinical affective symptoms are experienced by a significant minority of people in the community, which may also lead to significant impairment, and an increased risk for later psychopathology. Given the personal and global costs of these symptoms, combined with the need to strengthen the efficacy and applicability of existing therapies, a better understanding of the factors that are likely to contribute to the formation, maintenance and alleviation of affective symptoms is required. Such issues form the primary focus of this dissertation.

Chapter 2: Possible Aetiological Factors for Depressive and Anxiety Symptoms

Chapter Overview

Broadly, this chapter will review the theoretical and empirical literature pertaining to four key factors that have been implicated in the cause and maintenance of affective symptoms. Specifically, this chapter will review how two emotion regulation tendencies, dispositional rumination and dispositional mindfulness, and two psychological processes, stress and sleep disturbance, relate to changing affective symptoms over time.

The first section will explore dispositional rumination as a maladaptive emotion regulation strategy. Beginning with a conceptual overview, rumination will be explored as either a mood-responsive or general cognitive style, both of which are thought to amplify negative affect. An argument will be made for continued investigations into the effects of non-mood responsive rumination, given that it is a global ruminative process occurring irrespective of mood, which therefore may be associated with various forms of affective distress. A detailed review of the longitudinal literature will ensue, revealing mostly consistent predictive relationships between dispositional rumination and affective symptoms. It will be revealed that the bulk of these studies have explored mood-responsive rumination in predicting depressive symptoms, while fewer studies have investigated non-mood-responsive rumination, or anxiety and stress as outcomes. Thus, given the theoretical and empirical literature linking non-mood responsive rumination with discrete affective symptoms, an argument will be made for continued longitudinal investigations into these relationships.

The second section will explore dispositional mindfulness as an adaptive emotion regulation process. An overview of mindfulness will be presented, including how it is commonly conceptualised, and also how it may benefit psychological well-being, partly by attenuating the effects of ruminative thinking. Dispositional mindfulness will then be discussed and a case made for continued investigations into the core components of mindful acting-with-awareness and non-judging. A review of the longitudinal literature will ensue, revealing mixed results, and a narrow focus on acting-with-awareness in relation to depressive symptoms, with fewer studies investigating non-judging as a predictor, or anxiety and stress as outcomes, and with no known studies investigating mindfulness as a potential moderator of rumination. Thus, in order to elucidate the mechanistic processes by which dispositional emotion regulation processes can ameliorate or exacerbate distinct affective outcomes, a case will be made for continued longitudinal investigations into the predictive and interactive relationships between mindful-acting-with-awareness, mindful-non-judging, and non-mood-responsive rumination, to depression, anxiety, and stress. This is the rationale for Study 1.

The third and fourth sections will progress to an exploration of how psychological processes interact with emotional regulation tendencies to influence affective symptoms. Specifically, psychological stress and sleep disturbance will be explored in turn, together with dispositional rumination and mindfulness, in order to create a model that draws together the various processes implicated in affective symptom development or alleviation.

More specifically, the third section will review psychological stress, beginning with a conceptual overview, and including theorised associations with

affective symptoms. Empirical evidence will then be reviewed that establishes stress as a robust longitudinal predictor of affective symptoms, including findings where these associations have been mediated by dispositional rumination, or moderated by mindful acting-with-awareness and non-judging.

The fourth section will introduce another variable linking stress and later affective symptoms - sleep disturbance - beginning with an overview of subclinical and clinical manifestations, prevalence rates, comorbidity profiles, and associated impairment and/or disability. A comprehensive review will follow establishing sleep disturbance as a robust predictor of later affective symptoms, followed by psychological stress as a predictor of later sleep disturbance (both directly and indirectly via rumination). Based on the synthesis of the above reviewed-literatures, a case will be made for investigating the relationship between stress and later affective symptoms, with dispositional rumination and sleep disturbance as mediators, and dispositional mindfulness facets as moderators, of these associations. Correspondingly, two novel, theoretically and empirically derived models will be presented; the empirical testing of the key relationships in these models are the primary aim of Study 2.

Finally, the chapter will conclude with an extensive summary of the reviewed literature, incorporating the rationale for the two studies, and concluding with the specific research questions, aims, and hypotheses pertaining to each study.

Rumination

Conceptual overview. Multiple individual, social, and biological explanations have been advanced to account for the development, maintenance, and recovery from depressive and anxiety disorders. In particular, individuals

who develop clinically-relevant distress are thought to experience emotions inappropriate to the situational context, as well as impairments in the intensity, duration, and frequency of particular emotions (Gross & Jazaieri, 2014). Thus, theorists link the development and maintenance of depression and anxiety symptoms to difficulties in the ability to regulate emotions (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Emotion regulation is understood to involve a set of conscious or unconscious goal-directed processes whereby an individual modulates their emotions, including the type of emotion they experience, when they experience it, and how they experience it (Gross, 2014). Emotion regulation strategies are considered to be adaptive or maladaptive depending on whether they are positively or negatively associated with psychopathology and to vary naturally across individuals (Aldao & Nolen-Hoeksema, 2012; Aldao et al., 2010). It is theorised that individuals with anxiety and depression may habitually choose to use maladaptive over adaptive strategies and have difficulties in regulating negative affect (Campbell-Sills, Ellard, & Barlow, 2014; Joormann & Siemer, 2014).

Ruminative thinking is considered to be a common maladaptive emotion regulation strategy that is characterised by a tendency to repeatedly focus on distressing experiences and their associated causes and consequences (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). According to Response Styles Theory (RST), this ruminative processing is prompted by depressed mood, and a perseverative focus on these depressive symptoms can spur the development and maintenance of depression (Nolen-Hoeksema, 1991), partly by limiting access to more adaptive or instrumental approaches such as distraction or problem solving (Nolen-Hoeksema et al., 2008). The tendency to ruminate is considered to be a

cognitive style or tendency (Nolen-Hoeksema, 1991) that is stable over time (Smith & Alloy, 2009), even in individuals who experience a change in depressive symptoms (Nolen-Hoeksema et al., 2008).

The relationship between rumination and depressive symptomology has been studied extensively using the Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991), which ascertains ruminative responses to depressed mood, including the tendency to perseverate on the causes of specific depressive symptoms (e.g., difficulty concentrating, low motivation, fatigue). However, despite its broad use, several researchers have expressed concerns about the strong item and conceptual overlap shared between the RRS and measures of depression (see Roberts & Danoff-Burg, 2010; Smith & Alloy, 2009; Treynor, Gonzalez, & Nolen-Hoeksema, 2003; Watkins, 2008). For example, some items in the RRS ask about depressive symptoms that are also assessed by depression scales, which raises the possibility that the strength of previously reported relationships between rumination and depressive symptoms may be overestimated due to this conflation.

The focus on rumination as a mood-responsive process is limited in other ways. Specifically, rumination may be prompted by various forms of psychological distress. For example, individuals high in anxiety may be more likely to ruminate in order to help them manage their uncertainties by pondering the “whys and wherefores” of their distress, thereby, inadvertently contributing to greater vigilance, uncertainty, and anxiety (Nolen-Hoeksema, 2000). Furthermore, ruminative responses can be prompted by stress (Robinson & Alloy, 2003) or when progress towards personal goals is impeded (Lavalley & Campbell, 1995). Thus, in contrast to the RST conceptualisation of rumination as

a mood-responsive process, rumination can also be understood as negative and repetitive self-focused thoughts related to perceived losses, threats or injustices (Trapnell & Campbell, 1999), or more broadly as awareness of the perceived discrepancy between desired and actual status (Smith & Alloy, 2009). Thus, non-mood responsive rumination may confer a greater risk for affective distress since it occurs across contexts and irrespective of one's current mood. A general tendency to ruminate may also influence the duration and intensity of negative affect (Thomsen, 2006), potentially via a cyclic affect amplification process (Watkins, 2008). For example, if an individual is sad, then rumination may amplify the experience of sadness by extending the focus on depressive themes, and similarly, if they are anxious, it may amplify anxiety by prolonging attentional focus on perceived threats or worries. As will be detailed later, it is evident that mood-responsive and *non*-mood-responsive ruminative tendencies are both linked to depression, as well as to other types of affective symptoms (e.g., anxiety, stress).

Rumination and affective symptoms. Multiple large-scale meta-analyses indicate moderate to strong positive concurrent associations between dispositional rumination with both depression and anxiety symptoms (Aldao et al., 2010; Nolen-Hoeksema et al., 2008; Olatunji, Naragon-Gainey, & Wolitzky-Taylor, 2013; Watkins, 2008). Interestingly, these relationships are strong even when non-mood-responsive rumination measures are utilised (Aldao et al., 2010; Olatunji et al., 2013). These findings suggest that the tendency towards rumination may confer an increased risk of psychological distress irrespective of the focus or trigger (e.g., sad mood or stress). However, these concurrent

observations do not elucidate the role played by rumination in the development of affective symptoms over time. Rather, they simply suggest that rumination coexists with anxiety and depressive symptoms. In contrast, prospective longitudinal studies provide a clearer indication of the role played by rumination in the development of affective symptoms.

Rumination and depression over time. Multiple studies have shown that high RRS-measured mood-responsive rumination predicts higher depression levels over time, even after controlling for baseline depressive symptoms. In college students, mood-responsive rumination predicts depressive symptoms over four days (Sarin, Abela, & Auerbach, 2005), 10 days (Nolen-Hoeksema & Morrow, 1991), two weeks (Butler & Nolen-Hoeksema, 1994), and two months (Nolan, Roberts, & Gotlib, 1998; Nolen-Hoeksema & Morrow, 1991).

Significant predictive relationships have also been evidenced between mood-responsive rumination and depression in community-based samples over five months (Nolen-Hoeksema, Parker, & Larson, 1994), one year (Nolen-Hoeksema, 2000), and three years (Huffziger, Reinhard, & Kuehner, 2009). In adult samples with a pre-existing or recent depressive condition, mood-responsive rumination was also shown to predict depressive symptoms over three months (Kuehner & Weber, 1999; Rohan, Sigmon, & Dorhofer, 2003; Schmaling, Dimidjian, Katon, & Sullivan, 2002), five months (Young & Azam, 2003), six months (Yamada, Nagayama, Tsutiyama, Kitamura, & Furukawa, 2003), and one year (Nolen-Hoeksema, 2000). In summary, numerous studies have shown that mood-responsive rumination confers an increased risk for the development of depressive symptoms, over and above baseline depressive symptoms.

In addition, non-mood-responsive rumination has been shown to longitudinally predict depressive symptoms, even after controlling for baseline depression levels. For example, depressive symptoms were predicted by perseverative rumination related to life-problems over three months (Feldman & Hayes, 2005), habitual negative-self thinking over nine months (Verplanken, Friborg, Wang, Trafimow, & Woolf, 2007) and stress-reactive rumination over 2.5 years (Robinson & Alloy, 2003). In another study, individuals who ruminated most about a recent earthquake reported worse depressive symptoms seven weeks later (Nolen-Hoeksema & Morrow, 1991). In a bereaved sample, ruminating about the injustice of the death predicted depression levels at six months and one year, after controlling for neuroticism and time since bereavement (Eisma et al., 2015). Even outside the scope of significant life-events, a general tendency to ruminate predicted depressive symptoms over two months in a community sample (Kuster, Orth, & Meier, 2012), and over one-year in a student sample (Ciarrochi & Scott, 2006), although the latter study did not control for baseline symptoms. Overall, it appears that the general tendency to critically self-focus on personal experiences, irrespective of depressed mood or stressful life-events, can also increase a person's risk of developing depressive symptoms, and thus this construct is a worthy clinical focus.

While there are numerous studies showing significant longitudinal relationships between rumination and depression, there are also inconsistencies in the literature and study-related limitations. For example, some longitudinal studies reporting a significant predictive relationship between a general tendency to ruminate and depression did not control for baseline depression in the analyses (Ciarrochi & Scott, 2006), which is crucial in disentangling the independence of

rumination and depressed mood, and also to examine the relationship between rumination and *change* in mood. Further, some studies have reported that previously significant longitudinal associations between rumination and depressive symptoms became non-significant when including other predictors (e.g., difficulties identifying emotion, problem solving, worry; Ciarrochi & Scott, 2006; Hong, 2007), suggesting that there may be some overlap between the predictors. Even in studies that only considered rumination as a predictor, non-significant results have been reported in predicting depression across different time frames and samples, including college (Calmes & Roberts, 2007), community (Eisma et al., 2015), and especially in depressed samples (Arnow, Spangler, Klein, & Burns, 2004; Bagby & Parker, 2001; Bagby et al., 1999; Ciesla & Roberts, 2002; Huffziger et al., 2009; Lara, Klein, & Kasch, 2000; Nolen-Hoeksema, 2000; Schmaling et al., 2002). Taken together, the results suggest that rumination inconsistently predicts depressed mood over time in longitudinal studies, after controlling for appropriate measures in the analyses.

Methodological issues may account for some of the inconsistent findings in the literature. For example, some studies examined clinically-depressed samples with a restricted range of depressive manifestations (e.g., similar severity), thereby limiting the statistical power to discriminate potential differences and detect change. Non-significant results may also be an artefact of the often-utilised mood-responsive RRS rumination measure which, as previously stated, overlaps with the measurement of depressive symptomology (Nolen-Hoeksema, 1991), thus potentially decreasing the power to detect any changes in depressive symptoms over time when baseline depression is controlled (Bagby & Parker, 2001; Bagby et al., 1999; Calmes & Roberts, 2007).

Rumination and anxiety over time. Rumination is also associated with anxiety symptoms, although there are fewer studies that have examined this relationship, and particularly the role of non-mood-responsive rumination. Nonetheless, longitudinal research indicates that a tendency towards mood-responsive rumination can predict anxiety symptoms over time, after controlling for baseline anxiety; in college samples, RRS-measured rumination was shown to predict anxiety symptoms over four days (Sarin et al., 2005) and two months (Calmes & Roberts, 2007), while in community samples, it predicted anxiety over 10 days (Nolen-Hoeksema & Morrow, 1991) and one year (Nolen-Hoeksema, 2000). Non-mood-responsive rumination has also been implicated in the development of anxiety symptoms; in community samples, post-earthquake rumination predicted post-traumatic stress symptoms over seven weeks, controlling baseline symptoms (Nolen-Hoeksema & Morrow, 1991) and habitual negative thinking predicted anxiety over nine months (Verplanken et al., 2007). A general tendency to ruminate also predicted one-year anxiety and stress in a student sample (Ciarrochi & Scott, 2006). Thus, a general tendency to ruminate, irrespective of affective triggers, also appears to exert detrimental effects on anxiety and related symptoms, in addition to depression. Given that few studies have investigated the effects on anxiety specifically, further investigation is warranted.

However, there are conflicting findings in the longitudinal literature. For example, of the small number of studies reporting positive associations between non-mood responsive rumination and later anxiety, the only study investigating a general tendency to ruminate did not control for baseline anxiety in the analyses (Ciarrochi & Scott, 2006). Thus, these results do not establish general ruminative

tendencies as a risk factor for increased anxiety symptoms; rather they suggest anxiety may be merely a comorbid symptom. Further, some significant longitudinal associations between rumination and anxiety became non-significant after the other predictors were considered simultaneously, such as problem solving ability and emotion differentiation (Ciarrochi & Scott, 2006), and in particular, worry (Hong, 2007; Segerstrom, Tsao, Alden, & Craske, 2000). Thus, the unique influence of rumination, whether mood-responsive or not, may tend to be masked when overlapping aspects of repetitive thoughts, such as worry, are considered (Watkins, 2008). In addition, the relationship between rumination and anxiety may be obscured by the frequent measurement of rumination as a mood-responsive process, rather than a general tendency to ruminate, which may exert stronger effects since it occurs irrespective of mood and context. Finally, while non mood-responsive ruminative thinking has also been longitudinally associated with the related construct of stress (Ciarrochi & Scott, 2006), there is often little distinction between the experience of subjective stress and physiological arousal (Nolen-Hoeksema & Morrow, 1991; Verplanken et al., 2007), and little consideration of whether these states are differentially related to rumination.

Section summary. Research on rumination and affective symptoms is dominated by the theoretical tenets of RST and the related measurement of rumination as a mood-responsive and maintaining response style (Smith & Alloy, 2009), which raises the possibility that previously reported associations between rumination and depression are conflated. However, global ruminative tendencies also increase the risk of both depression and anxiety (Ciarrochi & Scott, 2006; Kuster et al., 2012), and thus may be a stronger trans-symptom risk factor than mood-responsive rumination given that it occurs irrespective of one's initial

mood. Unfortunately, existing longitudinal studies investigating non mood-responsive rumination do not consistently control for baseline affective symptoms in the analyses (Ciarrochi & Scott, 2006); thus, it is not clear if these ruminative tendencies are associated with increased affective symptoms over time. In addition, fewer studies have investigated the effects of non mood-responsive rumination on later anxiety (cf. with depression), or subjective arousal (cf. with physiological anxiety symptoms) (Nolen-Hoeksema & Morrow, 1991; Verplanken et al., 2007). Thus, it is not known how non mood-responsive rumination predicts different affective outcomes. However, investigating non mood-responsive rumination with distinct affective symptoms may reveal differential associations, which may offer insight into the mechanistic processes by which rumination impacts well-being. Thus, further research is required to evaluate the relationship between non-mood-responsive rumination with depressive, anxiety and stress symptoms, and after controlling for baseline affective symptoms.

Mindfulness

Conceptual overview. In contrast to the self-critical and discrepancy-focused attentional processes inherent in rumination, mindfulness is gaining considerable support as an adaptive form of self-focus that aids in emotion regulation (Chambers, Gullone, & Allen, 2009; Farb, Anderson, Irving, & Segal, 2014). Mindfulness is commonly understood as a process of paying attention to one's immediate experience with an orientation of non-judgement (Kabat-Zinn, 2003). It is thought to be comprised of two core components: attentional regulation and acceptance of experience (Bishop et al., 2004). Attentional regulation refers to the ability to focus on present-moment experiences including

thoughts, sensations, and emotions, without cognitively elaborating on these experiences (Bishop et al., 2004). Acceptance refers to an attitude towards present-moment experience that is characterised by openness and curiosity rather than judging or minimising the experience (Bishop et al., 2004).

Mindfulness has been conceptualised as a state of being and also a skill that can be cultivated with practice (Bishop et al., 2004). The idea that mindfulness can be learned has been advocated for many years by Jon Kabat-Zinn, who pioneered the use of mindfulness in medicine and mental health through his structured eight-week mindfulness meditation program, Mindfulness-Based Stress Reduction (MBSR; 1982; 2005). MBSR was initially developed as a self-regulation strategy to aid chronic pain management (Kabat-Zinn, 1982), based on a non-secular adaptation of the Buddhist practice of Vipassana or insight meditation (Kabat-Zinn, 2003). A core principle of MBSR is that by regularly and non-judgmentally attending to moment-by-moment experiences, one can gain a greater awareness into the habitual cognitive and emotional processes that exacerbate suffering, and this awareness can facilitate adaptive responding (Kabat-Zinn, 2005). Since its inception, the guiding tenets of MBSR have been applied to a range of different physical and mental health problems in promoting well-being (e.g., anxiety, depression, binge eating, fibromyalgia, cancer, heart disease; Baer, 2003; Grossman, Niemann, Schmidt, & Walach, 2004), and the program has been adapted into various mindfulness-based interventions (MBIs; Khoury et al., 2013). Meta-analytic comparisons across multiple MBI studies have reported small to moderate effects for reducing affective symptoms from pre-to-post intervention (Goyal, Singh, Sibinga, & et

al., 2014; Hofmann et al., 2010; Khoury et al., 2013), and also strong effects in reducing stress levels relative to controls (Chiesa & Serretti, 2009).

A key avenue by which mindfulness practice is thought to protect against affective distress is by attenuating the effects of rumination. For instance, under the framework of RST, Nolen-Hoeksema (1991) suggested that people with a low ruminative response style will tend to respond to depressed mood by redirecting their attention towards neutral (rather than valanced) activities and therefore may be less prone to depression. Relatedly, mindfulness is said to protect against rumination by occupying a person's limited information processing capacity with a more adaptive process (Teasdale, Segal, & Williams, 1995). That is, mindfulness facilitates connection with present moment-by-moment experiences, without cognitive elaboration or judgement about these experiences (Bishop et al., 2004; Kabat-Zinn, 2005); in contrast, rumination is a highly judgement-orientated cognitive-evaluative process whereby attention is typically focused on experiences of the past (Trapnell & Campbell, 1999). In addition, mindfulness is thought to cultivate the ability to view thoughts and feelings as merely transitory events in the mind and body, and not necessarily as truths to be acted upon, thereby lessening the impact of ruminative thinking and negative emotions (Kabat-Zinn, 1982; Teasdale et al., 1995). Mindfulness-Based Cognitive Therapy (MBCT), which is an extension of MBSR incorporating Cognitive Behavioural principles, was developed in line with these guiding tenets in order to reduce the risk of depressive relapse (Segal, Williams, & Teasdale, 2013). Aligning with these theoretical accounts, a growing number of studies have shown that participating in MBIs can significantly reduce the tendency towards ruminative thinking (Querstret & Cropley, 2013), which, in

turn, can reduce depression, anxiety, and psychological distress (Jain et al., 2007; Ramel, Goldin, Carmona, & McQuaid, 2004).

In addition to mindfulness practice, a higher tendency to be mindful in daily life is also associated with psychological well-being (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Brown & Ryan, 2003). That is, mindfulness has also been conceptualised as a dispositional tendency that naturally varies between people (Brown & Ryan, 2003). Of note, it appears that the tendency to be mindful can be learned; consistent findings across multiple studies show that dispositional mindfulness increases through participating in MBIs (Quaglia, Braun, Freeman, McDaniel, & Brown, 2016), and these changes have been linked to improved depression, anxiety, and stress levels (Kumar, Feldman, & Hayes, 2008; Quaglia et al., 2016; Shapiro, Brown, & Biegel, 2007). Thus, interest in the measurement of dispositional mindfulness via self-report scales has expanded in recent years, in part to assess the effectiveness and mechanisms of MBIs (Gu, Strauss, Bond, & Cavanagh, 2015; Quaglia et al., 2016), but also in its own right as a correlate and predictor of mental health and well-being (Keng, Smoski, & Robins, 2011).

In an attempt to examine and clarify the elements of dispositional mindfulness, Baer et al. (2006) conducted a factor-analytic study of existing mindfulness self-report questionnaires. These analyses revealed five different facets of mindfulness including the tendencies towards mindful *acting-with-awareness*, characterised by paying attention to experiences in the present moment, as opposed to operating on autopilot; mindful *non-judging*, characterised by accepting one's thoughts and feelings as they are; *non-reactivity*, characterised by noticing thoughts and emotions without reacting to them;

describing, characterised by the ability to verbalise thoughts and emotions; and *observing*, characterised by awareness of sensory experiences (Baer et al., 2006).

While this research clarified the core components of mindfulness within existing scales (Baer et al., 2006), the identified facets differ in their alignment with common conceptualisations of mindfulness. For example, it has been found that observing is unrelated to an overarching mindfulness factor and other mindfulness facets (Baer et al., 2006; Baer et al., 2008) and is positively associated with psychological distress and emotion dysregulation in non-meditators (Baer et al., 2006; Curtiss & Klemanski, 2014). In addition, neither facet of describing or non-reactivity is reflected in common definitions of mindfulness (Bishop et al., 2004; Kabat-Zinn, 2003); with the former thought to align more with the assumptions of dialectical behaviour therapy (Grossman, 2008; Grossman & Van Dam, 2011) and the latter considered to be an *outcome* of mindfulness practice (Bishop et al., 2004). In contrast, mindful acting-with-awareness and non-judging facets correspond with the Bishop et al. (2004) two-part conceptualisation of mindfulness encompassing present-moment attentional focus and a non-judging attitude. Thus, of the five facets identified by Baer et al. (2006), acting-with-awareness and non-judging appear to be more conceptually congruent with mindfulness, and thus are good candidates for further exploration.

Acting-with-awareness and non-judging are also empirically related to mindfulness and related constructs in expected ways. That is, they consistently arise as discrete factors in factor analytic studies of mindfulness questionnaires (e.g., see Baer et al., 2006; Curtiss & Klemanski, 2014; Veehof, Klooster, Taal, Westerhof, & Bohlmeijer, 2011; Williams, Dalgleish, Karl, & Kuyken, 2014). Furthermore, relative to the describing, non-reactivity and observing facets,

acting-with-awareness and non-judging have also been shown to share the strongest relationships with the overarching mindfulness factor (Baer et al., 2006; Christopher, Neuser, Michael, & Baitmangalkar, 2012; Lilja et al., 2011), and also with each other (Curtiss & Klemanski, 2014; de Bruin, Topper, Muskens, Bögels, & Kamphuis, 2012; Desrosiers, Klemanski, & Nolen-Hoeksema, 2013; Giovannini et al., 2014). However, they are also meaningfully distinct: compared to acting-with-awareness, non-judging tends to share somewhat stronger inverse associations with maladaptive emotional regulation strategies (e.g., suppression, worry, experiential avoidance; Baer et al., 2006; de Bruin et al., 2012; Giovannini et al., 2014; Sugiura, Sato, Ito, & Murakami, 2012; Tran, Glück, & Nader, 2013), including rumination (de Bruin et al., 2012; Gu et al., 2016; Petrocchi & Ottaviani, 2015). Conversely, acting-with-awareness tends to be more strongly positively associated with attentional control, behavioural control (Sugiura et al., 2012) and emotional awareness (Curtiss & Klemanski, 2014) compared to non-judging. In summary, the tendencies towards acting-with-awareness and non-judging appear to be theoretically and empirically core to mindfulness, yet they are also distinct constructs that are differentially related to other processes associated with emotion regulation.

Nonetheless, empirical studies have historically tended to rely on a single-factor conceptualisation of mindful-acting-with-awareness (Quaglia et al., 2016; Van Dam et al., 2018), typically utilising the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). This is because the MAAS was one of the first mindfulness scales to be developed and has thus been the most widely used (Park, Reilly-Spong, & Gross, 2013). However, this is problematic. For example, the MAAS has been found to be moderately correlated with boredom-proneness

and strongly associated with day-to-day cognitive errors and memory failures (Cheyne, Carriere, & Smilek, 2006). Relatedly, some have argued that the MAAS may actually measure inattentiveness rather than mindfulness (Grossman, 2011; Jensen, Niclasen, Vangkilde, Petersen, & Hasselbalch, 2016). Furthermore, a reliance on a single-faceted attentional measure of mindfulness neglects the pivotal attitudinal component of acceptance, open-heartedness, and friendliness towards experience (Bishop et al., 2004; Kabat-Zinn, 2003); that is, to be non-judging.

These limitations suggest that it may be better to use a newer and well-validated measurement tool of dispositional mindfulness. That is, the Five Facet Mindfulness Questionnaire (Baer et al., 2006) includes scales for both non-judging and acting-with-awareness, and with some problematic MAAS-derived items removed from the act-with-awareness scale (e.g., "I break or spill things because of carelessness, not paying attention, or thinking of something else"; Brown & Ryan, 2003). Thus, aligning with common conceptual understandings of mindfulness, investigations into both acting-with awareness and non-judging, utilising a well-validated assessment tool, may provide a more comprehensive understanding into how day-to-day mindfulness influences well-being.

Mindfulness and affective symptoms. A growing number of cross-sectional studies have established significant inverse associations between dispositional mindfulness with depression, anxiety, stress, and rumination (Keng et al., 2011). That is, in both community and clinical samples, mindful-acting-with-awareness tends to share moderate to strong inverse associations with depressive symptoms ($r = -.20$ to $-.60$), as does mindful-non-judging ($r = -.25$ to $-.60$) (Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011; Brown, Bravo,

Roos, & Pearson, 2015; Cebolla et al., 2012; Christopher et al., 2012; Desrosiers et al., 2013; Ostafin, Brooks, & Laitem, 2014; Solem, Thunes, Hjemdal, Hagen, & Wells, 2015; Tran et al., 2013; Veehof et al., 2011). While more variable, weak to strong inverse associations have been established between anxiety symptoms with both mindful acting-with-awareness ($r = -.18$ to $-.66$) and non-judging ($r = -.17$ to $-.60$) (Bohlmeijer et al., 2011; Cebolla et al., 2012; Desrosiers et al., 2013; Ostafin et al., 2014; Tran et al., 2013; Veehof et al., 2011). Stress also appears to share strong inverse associations with both mindful-acting-with-awareness ($r = -.56$) and non-judging ($r = -.58$) (Brown et al., 2015), although few prior studies have investigated these relationships. Mindful acting-with-awareness also tends to be moderately inversely associated with dispositional rumination ($r = -.27$ to $-.41$), while non-judging tends to share moderate to strong inverse associations with rumination ($r = -.41$ to $-.66$) (de Bruin et al., 2012; Gu et al., 2016; Petrocchi & Ottaviani, 2015). Thus, both mindfulness facets are related to psychological symptoms and rumination in expected directions; however, given the cross-sectional nature of these enquiries, temporal orderings cannot be established.

Mindfulness and depression over time. Longitudinal studies offer more insight into the temporal processes and mechanisms by which core mindfulness variables influence well-being. A handful of longitudinal studies have investigated the effects of mindfulness on decreasing depressive symptoms, and many of them assessed dispositional mindfulness using the MAAS (Brown & Ryan, 2003). For example, after controlling for baseline affective symptoms, MAAS-measured acting-with-awareness was shown to predict lower depression levels over 10 days in college students (Dixon & Overall, 2016), three months in

Chinese adolescents (Black, Sussman, Johnson, & Milam, 2012), one year in Australian police recruits (Williams, Ciarrochi, & Deane, 2010), and one year in a previously depressed sample who completed a MBCT program (Michalak, Heidenreich, Meibert, & Schulte, 2008).

However, few studies have longitudinally examined the relationship between mindful-non-judging and depression. Nonetheless, non-judging (but not acting-with-awareness or the three other FFMQ facets of mindfulness) predicted lower depressive symptoms over two years in college students and employed adults, after controlling for baseline depression and mood-responsive rumination (Petrocchi & Ottaviani, 2015). Interestingly, the relationship between baseline mindful-non-judging and two-year depression was fully mediated by two-year rumination, such that non-judging no longer directly predicted depression (Petrocchi & Ottaviani, 2015). The discrepancies between analyses suggests that rumination and non-judging may exert differential predictive effects when considered together, depending on when they are measured. In another study, an increase in a kind of mindful-non-judging “acceptance” was related to lower depression over 18-months in mothers of children with an intellectual disability, after controlling for baseline affective symptoms (Lloyd & Hastings, 2008). Finally, non-judging combined with other mindfulness facets (i.e., acting-with-awareness, describing, observing; Baer, Smith, & Allen, 2004) predicted lower depression levels one month later in college students, after controlling for baseline depression (Moore, Brody, & Dierberger, 2009).

Taken together, a greater tendency towards mindful-acting-with-awareness appears to protect against elevated depressive symptoms over time. However, the tendency towards mindful-non-judging was less consistently

associated with later depression, although few prior longitudinal studies have been conducted to date. Overall, existing studies have yielded inconsistent results. For example, in one study, neither acting-with-awareness nor non-judging predicted changes in depressive symptoms in students over a semester, even when considered independently to other mindfulness facets (Barnes & Lynn, 2010). Furthermore, to the author's knowledge, no existing studies have investigated interactive effects between dispositional mindfulness and rumination, even though mindfulness is thought to attenuate rumination and therefore protect against depression (Kabat-Zinn, 2005; Segal et al., 2013).

Mindfulness and other affective symptoms over time. There is little research investigating the relationship between dispositional mindfulness and anxiety over time, although some studies have investigated mindfulness in relation to stress or negative affect. For example, MAAS-measured acting-with-awareness was shown to predict lower perceived stress three months later in Chinese adolescents, after controlling for baseline affective symptoms (Black et al., 2012). Further, Weinstein, Brown, and Ryan (2009) found that across three different college samples, MAAS-measured acting-with-awareness predicted lower "ill being" (i.e., combined negative affect and perceived stress) across seven days, four weeks, six weeks and 12 weeks, although baseline negative affect and stress were not reportedly controlled in these analyses. High baseline MAAS score also predicted lower daily-experiences of negative affect over 21 days in adults, and over 14 days in college students, after controlling for baseline affect (Brown & Ryan, 2003). Finally, an increase in a kind of non-judging "acceptance" predicted lower anxiety and stress symptoms over 18-months, controlling for baseline affective symptoms (Lloyd & Hastings, 2008).

In summary, results from a small number of studies indicate that a greater tendency to mindfully act-with-awareness may protect against the experience of negative affect and stress over time; however, the association with anxiety specifically remains unclear. Furthermore, the research is dominated by the utilisation of a unidimensional measure of mindfulness characterised by acting-with-awareness and thus the role played by mindful-non-judging in predicting anxiety over time is unknown. In addition, given the focus on broad constructs such as negative affect and stress, it is unclear whether the different facets of mindfulness differentially predict the physiological symptoms of anxiety (e.g. autonomic arousal) compared with the more subjective experience of stress. Finally, to the author's knowledge, no prior longitudinal studies investigating anxiety symptoms have looked at dispositional acting-with-awareness and non-judging as potential moderators of rumination, as per theoretical accounts (Kabat-Zinn, 2005; Segal et al., 2013).

Section summary. Mindfulness is thought to benefit well-being by facilitating present moment attention of experiences without accompanying cognitive elaboration or judgement (Bishop et al., 2004; Kabat-Zinn, 2005), thereby lessening the influence of negative thoughts and feelings (Kabat-Zinn, 1982; Teasdale et al., 1995). Thus, those with a higher tendency to mindfully attend to present moment experiences with an attitude of non-judgement are expected to have a lower chance of developing affective distress. However, the mindfulness literature is dominated by cross-sectional correlational and MBI studies, and few longitudinal studies exist. Cross-sectional studies suggest that mindful acting-with-awareness and non-judging are inversely associated with depression, anxiety, and stress. However, mixed findings have been reported in

the longitudinal literature, and most studies have used a unidimensional conceptualisation of dispositional mindfulness (i.e., mindful-acting-with-awareness only) that excludes mindful-non-judging. Moreover, the extant longitudinal literature typically studies the impact of mindfulness on depression negative affect, and stress, but not anxiety. Furthermore, even though dispositional acting-with-awareness, non-judging, and rumination are conceptually and empirically related; their interactive effects on affective outcomes are rarely explored. Such investigations are important because the core facets of dispositional mindfulness may attenuate or counter dispositional rumination, in line with the conceptual tenets and empirical findings of MBIs (Kabat-Zinn, 2005; Quaglia et al., 2016; Segal et al., 2013), and therefore benefit various affective outcomes. Indeed, emerging evidence suggests that adaptive emotion-regulation strategies may be especially effective in protecting against psychopathology when maladaptive strategies such as rumination are relied upon (Aldao & Nolen-Hoeksema, 2012). Thus, there is a need to investigate the longitudinal predictive and interactive relationships between mindful-acting-with-awareness, mindful-non-judging, and rumination to depression, anxiety, and stress. Such investigations may shed light on the likely mechanisms by which distinct mindfulness tendencies can ameliorate psychological distress over time.

Psychological Stress

Conceptual overview. In addition to the emotion regulation processes of rumination and mindfulness, psychological stress has also been linked to later depressive and anxiety symptoms. Stress has broadly been defined as an imbalance between a person's environmental or psychological demands and their ability to effectively respond to those demands (McGrath, 1970). Psychological

stress in particular has been conceptualised as a transaction between an individual and their environment, whereby the person appraises their environment as taxing, detrimental to their well-being, and beyond their capacity to cope (Lazarus & Folkman, 1984). Thus, psychological stress reflects a person's difficulty in coping with life-demands, and can be experienced as a non-specific over-arousal or tension (Lovibond & Lovibond, 1995b) that is highly comorbid with negative affect (Brown, Chorpita, Korotitsch, & Barlow, 1997).

Stress and affective symptoms. While stress is conceptually and empirically distinct from anxiety and depression (Lovibond & Lovibond, 1995b), it also shares strong associations with affective symptoms (Brown et al., 1997; Crawford & Henry, 2003; Lovibond & Lovibond, 1995b). Furthermore, stress levels are higher in people with mood and anxiety disorders relative to community controls (Antony, Bieling, Cox, Enns, & Swinson, 1998), and also higher in people with Generalised Anxiety Disorder and Major Depressive Disorder relative to other anxiety disorders (Brown et al., 1997).

The experience of stress may also contribute to the later development of affective symptoms. The diathesis-stress model proposes that a predisposition towards psychopathology – either constitutional or learning/acquired - may be catalysed into a psychological disorder via the experience of stress (Monroe & Simons, 1991). In addition, different stress-buffering accounts have been proposed that suggest that different factors may moderate the impact of stress on psychopathology, including social support (Cohen & McKay, 1984) and biological processes (Bale, 2006). Of particular interest to this project, adaptive emotion regulation processes have also been proposed to protect against the

adverse impact of stress on affective symptom development (Gross, 2014), as will be discussed in more detail in subsequent sections.

Stress and depression over time. Ample research has been dedicated towards explorations of stress as a risk factor for the development of depressive disorders (Monroe & Simons, 1991). In the *DSM-5*, it clearly specifies that stressful life-events, particularly experiences of loss, can precipitate major depressive episodes and grief reactions, both of which may be characterised by sad mood, rumination, insomnia, appetite disturbance and/or weight loss (APA, 2013). Indeed, stressors have reliably been shown to predict depression levels in community samples (Hammen, 2005). For example, stressful life-events characterised by high ratings of loss or humiliation increased the risk of developing a major depressive episode in adults in the following month by 1.7 and 1.4, respectively (Kendler, Hettema, Butera, Gardner, & Prescott, 2003). Further, a greater number of prior stressful experiences have been shown to increase the risk of experiencing a major depressive episode (Bebbington et al., 1988; Wichers et al., 2009), as has the severity and chronicity of stressful events (Hammen, Kim, Eberhart, & Brennan, 2009; Siegrist, 2008). High subjective stress has also been shown to predict higher depressive symptoms at three and six months, after controlling for baseline depressive symptoms (Morrison & O'Connor, 2005; Wichers et al., 2009). Thus, exposure to significant stressors and/or the experience of high perceived stress appears to increase the risk of later experiencing higher depressive symptoms, and in some cases at clinically relevant levels.

Stress and anxiety over time. The development of anxiety disorders has also been proposed to be influenced by life stress, in combination with biological

and psychological vulnerabilities (i.e., emotional reactivity, interpretative biases; Barlow, 2002). Consistent with this account and the diathesis-stress model (Monroe & Simons, 1991), stress has been shown to predict anxiety symptoms over time in community samples. For example, exposure to life-events that involved loss or danger were shown to be associated with a 1.4 and 1.2 times greater risk of developing generalised anxiety symptoms in the next month, respectively (Kendler et al., 2003). Further, in individuals exposed to an earthquake, the stress related to the earthquake was associated with Posttraumatic Stress Disorder symptoms experienced 10-days later (Nolen-Hoeksema & Morrow, 1991). Similarly, individuals who experienced a car accident and then later experienced social stressors were at a greater risk of phobic travel anxiety (OR = 1.7 to 2.7), Generalised Anxiety Disorder (OR = 1.9 to 3.5) and Posttraumatic Stress Disorder (OR = 3.8 to 4.0) nine months later (Mayou, Bryant, & Ehlers, 2001). Finally, subjective stress and stressor exposure have also been shown to predict higher anxiety levels over six months, after controlling for baseline anxiety levels (Morrison & O'Connor, 2005; Young & Dietrich, 2015). Thus, exposure to life stressors and/or subjectively experienced stress is also associated with increasing anxiety symptoms over time.

Stress and affective symptoms mediated by rumination. One of the mechanisms by which stress is thought to lead to higher affective symptoms is via ruminative thinking. Indeed, stress and rumination share conceptual similarities: psychological stress is said to occur when there is a discrepancy between the demands of a situation and the personal resources one has to deal with it (Lazarus & Folkman, 1984), whereas rumination is a process of perseverative thinking about the perceived discrepancy between the actual and

desired state of being (Smith & Alloy, 2009). Hence, unsurprisingly, dispositional rumination and psychological stress are reported to share strong concurrent associations (Nolen-Hoeksema et al., 1994; Young & Dietrich, 2015), and the tendency to ruminate is also associated with higher levels of later stress (Ciarrochi & Scott, 2006).

In addition, the experience of stress may prompt a person to employ ruminative thinking as a maladaptive coping strategy; for example, stress may lead to ruminating about the discrepancies between one's actual and desired circumstances in an attempt to resolve the stress (Smith & Alloy, 2009). Thus, highly stressed individuals may ruminate about various aspects of stress, including the perceived environmental demands, impairments to well-being, and perceived personal resources or coping capacities (see Lazarus & Folkman, 1984). Of note, several types of dispositional ruminative thinking, including mood-responsive rumination, have been shown to be stress-responsive (Smith & Alloy, 2009), implying that individuals prone to rumination may be especially vulnerable after experiencing high stress. Indeed, even over a one-year period, higher stress levels were shown to predict higher mood-responsive rumination, after controlling for baseline rumination levels (Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2013; Nolen-Hoeksema, Larson, & Grayson, 1999).

According to the Perseverative Cognition Hypothesis, responding to stress by perseverating about it can prolong the duration of physiological arousal and create an allostatic load that may contribute to ill-health (Brosschot, 2010). Consistent with this hypothesis and the diathesis-stress model (Monroe & Simons, 1991), high dispositional rumination may reflect a person's vulnerability that is activated in the context of high stress and influence later affective

symptom levels. That is, rumination may be one of the mechanisms by which stress contributes to increased depression and anxiety symptoms.

Specifically, with regards to depression, rumination may exacerbate the effects of high stress on depression by activating discrepancy-focused thinking related to perceptions of failure and the perceived inability to cope, which are known to be associated with depressed mood (Beck, 2011). A diverse range of longitudinal research supports the premise that high stress can exacerbate depression via ruminative thinking. For example, rumination about an earthquake 10 days after it occurred significantly predicted worse depressive symptoms six weeks later in college students, after controlling for baseline stress and depression (Nolen-Hoeksema & Morrow, 1991). In bereaved individuals, additional stressors occurring after the bereavement predicted high rumination and depression levels five months later (Nolen-Hoeksema et al., 1994), whereas a greater tendency to ruminate on the injustices of bereavement was related to depression six and 12 months later (Eisma et al., 2015). In another study, high daily stress exposure predicted high depressive symptoms via high post-stressor rumination in a sample of college students and community-well individuals tracked daily over seven days (Ruscio et al., 2015). Finally, high subjective stress has also been shown to indirectly predict higher depressive symptoms at one-year via high mood-responsive rumination in community samples (Michl et al., 2013; Nolen-Hoeksema et al., 1999). Taken together, the results illustrate that responding to stress with ruminative thinking may exacerbate depressive symptoms.

Ruminative thinking also appears to mediate between stress and later anxiety levels, putatively via excessive cognitive arousal (e.g., stress-responsive

rumination) leading to physiological over-arousal (Brosschot, Gerin, & Thayer, 2006) and/or because rumination exacerbates uncertainty and continued vigilance (Nolen-Hoeksema, 2000). In two studies that assessed daily symptoms over seven days, high stress exposure was shown to predict high generalized anxiety symptoms via high post-stressor rumination (Ruscio et al., 2015), and high negative affect (i.e. combined anxiety, irritability, and sadness) via high mood-responsive rumination (Moberly & Watkins, 2008). Further, students who reported high post-earthquake rumination were more likely to experience Posttraumatic Stress Disorder symptoms six weeks later, after controlling for baseline symptoms and stress (Nolen-Hoeksema & Morrow, 1991). Similarly, a greater number of stressors experienced at baseline predicted higher anxiety levels at seven and 12 months in adolescents and community adults, respectively, and these associations were mediated by high mood-responsive rumination, after controlling baseline anxiety (Michl et al., 2013). Finally, people who had experienced a car accident and tended to ruminate about the accident were at a greater risk of developing Generalised Anxiety Disorder (OR = 2.3) and Posttraumatic Stress Disorder (OR = 3.2) one year later, after controlling for medical issues, previous mood, and additional stressors (Mayou et al., 2001). In summary, the tendency to ruminate during and after stressor exposure appears to exacerbate anxiety over time.

Stress and affective symptoms moderated by mindfulness. In comparison to the detrimental effects of rumination on mood and anxiety, mindfulness may instead protect against the development of affective symptoms in times of high stress. That is, based on the tenets of mindfulness training, mindfulness may increase awareness of automatic stress reactions, and therefore short-circuit

habitual stress responses and facilitate more adaptive responding (Kabat-Zinn, 2005). Furthermore, according to the Mindfulness Stress-Buffering Account, mindfulness practice is thought to buffer against the effects of stress on health and well-being by attenuating appraisals of stress in the mind, and subsequently physiological stress-reactivity in the body (Creswell & Lindsay, 2014). Thus, mindfulness practice should be particularly protective for people who experience high stress, and be especially effective in buffering against the development of adverse health outcomes that are well-known to be initiated or exacerbated by stress (e.g., depression; Creswell & Lindsay, 2014).

Correspondingly, given that participation in mindfulness training consistently increases participants' tendencies towards acting-with-awareness and non-judging (Quaglia et al., 2016), which in turn has been associated with improved stress, depression, and anxiety (Kumar et al., 2008; Quaglia et al., 2016; Shapiro et al., 2007), it is plausible that a higher tendency towards day-to-day mindfulness also acts as a stress-buffering agent. That is, even in the face of stress, higher dispositional mindfulness may offer an antidote to the experience of stress by acting as an early-warning system (Kabat-Zinn, 2005) and/or by facilitating continued day-to-day awareness that is not evaluative or discrepancy-focused (cf. with stress; Lazarus & Folkman, 1984), thereby attenuating stress appraisals and associated reactivity, in line with the Mindfulness Stress-Buffering Account (Creswell & Lindsay, 2014).

Results from the experimental literature indicate that dispositional mindfulness can serve a stress-buffering function. That is, high dispositional mindfulness appears to attenuate stress-reactivity and associated emotional responses, particularly in high-stress situations. For example, after an

experimentally-induced stressor (i.e., exposure to aversive pictures slides), students who reported lower mindful-acting-with-awareness and mindful-non-judging experienced higher anxiety levels than those reporting higher mindfulness, and this effect was partly mediated by high negative affect (Ostafin et al., 2014). In another study, high baseline MAAS-measured mindful-acting-with-awareness was shown to predict lower anxiety levels 30 minutes after an experimental stressor (i.e., solving a difficult mathematics problem under time-pressure) via low perceived stress levels five minutes after stressor exposure (Weinstein et al., 2009). Finally, Brown, Weinstein, and Creswell (2012) found that high MAAS-measured acting-with-awareness was related to an attenuated cortisol response, lower negative affect, and lower state-anxiety in students exposed to a social-evaluative stressor compared to controls who were not exposed to the stressor. Taken together, the results of these studies suggest that high dispositional mindfulness may act as a stress-buffering agent, which protects individuals against the development of anxiety in the context of high stress.

Naturalistic studies have also revealed that high dispositional mindfulness may exert stress-buffering effects. In a recent cross-sectional study, weaker positive relationships existed between perceived stress with both depression and anxiety in law students high in dispositional five-facet mindfulness, relative to those low in mindfulness (Bergin & Pakenham, 2016). However, the effects were not significant at the subscale level (i.e., acting-with-awareness or non-judging) when considered along with the other three mindfulness facets (Bergin & Pakenham, 2016). In another cross-sectional study, mindful acting-with-awareness and non-judging both moderated the relationship between high

perceived stress to depression in adults; that is, at high stress, participants higher in mindfulness reported lower depression than those low in mindfulness (Branstrom, Duncan, & Moskowitz, 2011). However, neither facet moderated the relationship between stress and anxiety symptoms (Branstrom et al., 2011). Finally, positive relationships between life stressors with depression, anxiety, and stress were weaker for adolescents higher in MAAS-measured mindful-acting-with-awareness compared to those lower in acting-with-awareness (Marks, Sobanski, & Hine, 2010). Overall, despite the emerging evidence that trait mindfulness may act as a stress-buffering agent against the experience of depression and anxiety in cross-sectional investigations, the findings are conflicting, and the nature of the temporal associations cannot be established.

Two longitudinal studies do however offer a more robust account of the potential stress-buffering role played by dispositional mindfulness in regards to affective symptoms. For example, baseline MAAS-measured mindful-acting-with-awareness moderated the relationship between high daily-stress levels and daily depressed mood over 10 days in students, after controlling for ruminative tendencies, depressive symptoms, neuroticism, and other emotion regulation strategies (Dixon & Overall, 2016). In another study, Ciesla, Reilly, Dickson, Emanuel, and Updegraff (2012) found that FFMQ mindful-non-judging moderated the effect of more stressors in predicting higher daily depressed mood over one-week for adolescents, and this effect was mediated by daily mood-responsive rumination. That is, high daily rumination mediated the effects of a greater number of stressors on depressed mood, but only in those reporting low (but not high) mindful-non-judging (Ciesla et al., 2012). These findings suggest that high dispositional mindfulness may protect against the detrimental effects of

high stress in increasing rumination, thereby reducing the severity of negative affective symptoms. Overall, it appears that highly mindful individuals may be better able to manage their stress levels, which, in turn lowers the risk of experiencing both rumination, and also affective symptoms.

Nonetheless, variable findings have also been reported in the literature. For example, while mindful-non-judging moderated the effects of daily stress on rumination and depressed mood over one week, FFMQ-measured mindful-acting-with-awareness moderated the effect of high stress on rumination but not depressed mood over the same period (Ciesla et al., 2012). Alternatively, another study reported that MAAS-measured acting-with-awareness did not moderate the relationship between stress and later depressive symptoms (Calvete, Orue, & Sampedro, 2017), although the follow-up period was long at one-year. Given that there is limited research in this area, however, it is difficult to make inferences about the discrepancies that exist between the different studies.

Section summary. It has been proposed that perceptions of high stress can lead to increased depressive and anxiety over time (Hammen, 2005; Kendler et al., 2003); however, the mechanisms by which this occurs are unclear. While people may ruminate in response to stress in an attempt to resolve the perceived discrepancies between their actual and desired goals (Smith & Alloy, 2009), this may prolong the stress experience and associated autonomic arousal, thereby adversely impacting on health and well-being (Brosschot et al., 2006). Indeed, individuals who respond to stress by ruminating are at an increased risk of developing depression and anxiety symptoms; that is, rumination has been found to mediate the relationship between stress and affective symptoms (Michl et al., 2013; Nolen-Hoeksema & Morrow, 1991). Correspondingly, it has been

proposed that mindfulness training may cultivate stress-buffering effects via increased awareness of one's habitual stress-reactions (Kabat-Zinn, 2005) or via a change in stress-related appraisals and reduced physiological strain (Creswell & Lindsay, 2014). It appears that higher dispositional mindfulness also exerts a stress-buffering effect that positively impacts later well-being; dispositional mindfulness has been shown to moderate the effects of high stress to anxiety and depression concurrently (i.e., FFMQ global score; Bergin & Pakenham, 2016; MAAS acting-with-awareness; Marks et al., 2010) and longitudinally (i.e., MAAS acting-with-awareness: Dixon & Overall, 2016; Weinstein et al., 2009), and it has also been shown to moderate the effects of high stress on depression via rumination (i.e., FFMQ-measured non-judging; Ciesla et al., 2012).

However, the research investigating mindfulness as a potential stress-buffering agent is limited in several ways. First, there are few longitudinal studies conducted (Calvete et al., 2017; Ciesla et al., 2012), which are required to elucidate the nature of the temporal relationships between causal factors. Second, the mindfulness to anxiety relationship has mostly been investigated in the context of experimental studies (Brown et al., 2012; Ostafin et al., 2014), which tend to have shorter follow-up periods and comparatively less ecological validity than longitudinal studies. Third, the literature is biased towards a unitary conceptualisation of mindfulness that includes acting-with-awareness but not mindful-non-judging (Dixon & Overall, 2016; Weinstein et al., 2009), which does not align with the common conceptualisation of mindfulness (Bishop et al., 2004). Fourth, mixed results have been reported in the comparisons of different mindfulness facets as individual stress-buffering agents (Ciesla et al., 2012), which may reflect that these facets possess differential stress-buffering effects, or

merely that insufficient studies have been conducted to date to establish consistent patterns. Finally, to the author's knowledge, there is only one prior longitudinal study investigating the combined effects of rumination as a potential mediator and mindfulness as a moderator of the relationship between stress to affective symptoms, and it only investigated depression as an outcome in adolescents (Ciesla et al., 2012). Thus, further prospective investigation is warranted to more thoroughly explore dispositional rumination and the core mindfulness facets as respective mediators and moderators between stress and later affective outcomes, including anxiety. Such an investigation would enrich the literature by elucidating the discrete processes that are likely to be involved in affective symptom development.

Sleep Disturbance

Conceptual overview. In addition to rumination, sleep disturbance is another factor implicated in the processes by which stress can adversely impact on mental health. Specifically, as will be discussed in the following sections, sleep disturbance is a robust predictor of depression and anxiety longitudinally and may play a key role in linking stress and rumination with later affective distress. Indeed, adequate sleep is a robust predictor of mental health and well-being: good sleepers consistently score more favourably on a range of mental health and well-being outcomes compared to poor sleepers (LeBlanc et al., 2007; Leger, Scheuermaier, Philip, Paillard, & Guilleminault, 2001; Steptoe, O'Donnell, Marmot, & Wardle, 2008). Nonetheless, sleep disturbance is relatively common in the general population. In large epidemiological studies, about 35% of respondents typically report current difficulties with initiating, maintaining, or experiencing non-restorative sleep (Ohayon & Reynolds, 2009), although in

some community samples up to 48% report sleep difficulties (Ohayon, 2002).

Thus, given the high incidence rates and deleterious consequences, sleep disturbance is a worthy research focus.

There are various manifestations and indices of sleep quality or disturbance. That is, sleep disturbance can be measured by self-report questionnaires, sleep diaries and/or specialised sleep laboratory equipment (e.g., polysomnography). Typical measures include sleep onset latency (i.e., time taken to fall asleep), total sleep time, sleep efficiency (i.e., proportion of time spent in bed compared with actual time spent asleep), and night-time or early morning awakenings (Bastien, Vallières, & Morin, 2001; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989; Van De Water, Holmes, & Hurley, 2011). Self-report measures also typically gauge perceived sleep quality, daytime sleepiness, daytime dysfunction due to sleep disturbance, preoccupation with sleep disturbance, and the use of sleep medication (Bastien et al., 2001; Buysse et al., 1989). For example, the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) is a commonly utilised measure that generates a composite score incorporating scores on subjective sleep quality, sleep onset latency, sleep duration, sleep efficiency, sleep disturbances (e.g., awakenings), sleep medication usage, and daytime dysfunction.

Sleep disturbance can also vary with regards to the frequency, intensity, and/or impairments associated with experienced symptoms. If sleep is disrupted for some time and is associated with significant distress or impairment, then sleep disturbance may develop into a clinically-relevant sleep-wake disorder (APA, 2013). Several sleep-related disorders are described in the *DSM-5* and each is characterised by sleep disruption and/or daytime impairment (APA,

2013). The most prevalent sleep disorder, Insomnia Disorder, is characterised by dissatisfaction with sleep quality or quantity and associated difficulties in initiating sleep, maintaining sleep, and/or waking earlier than intended, occurring on at least three nights per week (APA, 2013). Episodic Insomnia can be considered when the symptoms are experienced for at least one month, while Persistent Insomnia reflects cases where the symptoms persist for more than three months, and variations in the symptoms can be considered under Other Specified or Unspecified Insomnia Disorder (APA, 2013). Recent point prevalence estimates for Insomnia Disorder are approximately 5.4% in Australia (Bin, Marshall, & Glozier, 2012), which is consistent with an estimate of about 6.6% reported in other Western countries (Ohayon & Reynolds, 2009).

Daytime dysfunction is the cornerstone of Insomnia Disorder and it is characterised by fatigue or daytime sleepiness, impairments in concentration, attention, and memory, and/or accompanying mood or anxiety symptoms (APA, 2013). Other functional impairments can include a loss of work productivity or absenteeism, reduced quality of life, relationship difficulties, and an increased risk of economic burden, hypertension, and myocardial infarction (APA, 2013; Ohayon & Reynolds, 2009; Roth, 2007). Thus, insomnia is associated with significant healthcare utilisation (Bin et al., 2012) and the impact of prolonged sleep disturbance is far-reaching, especially when considering the potential contribution to comorbid psychopathological symptoms and disorders.

Sleep disturbance and affective symptoms. A diagnosis of Insomnia Disorder can be made either independently or coexistent with other mental disorders (APA, 2013). However, it has been estimated that up to one-half of the individuals who present with Insomnia Disorder will meet criteria for another

disorder, especially depressive and anxiety disorders (APA, 2013; Ohayon & Reynolds, 2009). Epidemiological studies indicate that only a small percentage of people with the disorder have no current or prior history of mental illness (i.e., 2.4%; Ohayon & Roth, 2003). Thus, sleep disturbance is a common symptom of depressive and anxiety disorders and it is explicitly included in the diagnostic criteria for some of these disorders including Major Depressive Disorder, Generalised Anxiety Disorder, and Posttraumatic Stress Disorder (APA, 2013). More broadly, clinical sleep disturbance may reflect a prodromal expression of mental illness (APA, 2013).

Unsurprisingly, moderate to strong concurrent associations have been shown to exist between global measures of self-reported sleep disturbance with both depressive (Pillai, Steenburg, Ciesla, Roth, & Drake, 2014; Stewart, Rand, Hawkins, & Stines, 2011; Takano, Iijima, & Tanno, 2012) and anxiety symptoms (Carpenter & Andrykowski, 1998; Hinz et al., 2017; Stewart et al., 2011; Takano et al., 2012). Furthermore, several studies have shown that high levels of both anxiety (Jansson-Fröjmark & Lindblom, 2008; Johnson, Roth, & Breslau, 2006; Morphy, Dunn, Lewis, Boardman, & Croft, 2007) and depression (Jansson-Fröjmark & Lindblom, 2008; Morphy et al., 2007; Ohayon & Roth, 2003) predict the onset of insomnia over time. Sleep disturbance also reliably precedes an increase in depression and anxiety symptoms and/or the onset of anxiety and depressive disorders (Baglioni et al., 2011; Baglioni, Spiegelhalder, Lombardo, & Riemann, 2010). That is, bidirectional relationships between sleep disturbance with anxiety and depression symptoms are well documented in the literature (Jansson-Fröjmark & Lindblom, 2008; Morphy et al., 2007), although some studies suggest that sleep disturbance more frequently precedes depression but

follows anxiety symptoms (Johnson et al., 2006; Ohayon & Roth, 2003). Thus, sleep disturbance, anxiety, and depression likely share complex interactive associations (Alvaro, Roberts, & Harris, 2013).

However, the overarching focus of the current thesis is to investigate the processes associated with elevated affective symptoms over time, including the role of sleep disturbance, in line with the conceptualisation of sleep disturbance as a potential prodromal expression of depressive and anxiety disorders (APA, 2013). As will be discussed in the next sections, sleep disturbance is a well-established risk factor for the experience of affective symptoms over time (Baglioni et al., 2010).

Multiple factors have been proposed to account for the association between sleep disturbance with depression and anxiety, including shared neurobiological, genetic, social, and/or environmental processes (Alvaro et al., 2013), in addition to emotion regulation processes (Baglioni et al., 2010). For example, sleep disturbance is associated with more frequent utilisation of maladaptive emotion-regulation strategies such as avoidance and greater attention given to threat-related information, and the decreased use of adaptive strategies such as distraction and reappraisal (Palmer & Alfano, 2017). Unsurprisingly, sleep disturbance is associated with difficulties in executive functioning and regulating negative emotions (Gruber & Cassoff, 2014) and the experience of more negative and fewer positive emotions (Palmer & Alfano, 2017). In summary, it appears that individuals who have sleep disturbance are more likely to experience negative affect and to respond ineffectively to their negative affect, and over time this maladaptive approach may contribute to the development of anxiety and depression.

Sleep disturbance and depression over time. Sleep disturbance is reported to reliably precede the development of depression. Recent meta-analytic estimates across 17 studies indicated that initially non-depressed individuals with insomnia had at least a two-fold increased risk of developing Major Depressive Disorder at least one year later (Baglioni et al., 2011). A typical methodological approach used in the literature is to categorise participants as scoring above or below established clinical severity cut-off points for sleep disturbance and depressive symptoms (e.g., insomnia: yes, no; clinically high depression: yes, no), and to then track their symptom profile over time. For example, in a large Swedish prospective study, non-depressed participants with insomnia at baseline (i.e., difficulties initiating or maintaining sleep for three days a week for more than three months) exhibited a greater risk of developing clinically significant depressive symptoms one year later (OR = 3.5; Jansson-Fröjmark & Lindblom, 2008), using depression severity ratings from the Hospital Anxiety and Depression Scale (HADS; Bjelland, Dahl, Haug, & Neckelmann, 2002; Zigmond & Snaith, 1983). In another large retrospective study, American respondents who reported insomnia symptoms (i.e., difficulties initiating and maintaining sleep over the past year) but no other psychiatric issues at baseline were more likely to experience Major Depressive Disorder one year later, as ascertained by structured clinical interviews (OR = 5.4; Weissman, Greenwald, Niño-Murcia, & Dement, 1997). Somewhat lower risk estimates have been reported over one year after controlling for baseline depressive symptoms. For example, non-depressed British respondents with insomnia at baseline (i.e., difficulties initiating and/or maintaining sleep on most nights for more than one month) exhibited a greater

risk of developing clinically significant depressive symptoms one year later (OR = 2.7; Morphy et al., 2007).

Sleep impairment may also confer an increased risk for depression over longer time periods. For example, initially non-depressed American respondents with insomnia symptoms (i.e., at least three symptoms comprising difficulties falling asleep, staying asleep, waking repeatedly or early morning awakening experienced more than five times a month) were at a greater risk of experiencing clinically significant depression levels four years later, after controlling for multiple health issues (OR = 3.2; Szklo-Coxe, Young, Peppard, Finn, & Benca, 2010). Furthermore, in a large Australian community sample, for initially non-depressed participants, high sleep disturbance (i.e., high scores on a three-item self-report measure of perceived poor sleep, difficulty falling asleep and waking early) were associated with an increased risk of developing Major Depressive Disorder four years later, after controlling for baseline sleep disturbance, pain, and significant life-events (OR = 1.3; Batterham, Glozier, & Christensen, 2012). In another large study, non-depressed Norwegian middle-aged adults with insomnia (i.e., difficulties initiating or maintaining sleep most nights in the last month) were at an increased risk of high HADS-measured depression levels even 11 years later, after controlling for multiple health issues (OR = 2.4; Sivertsen et al., 2014).

In summary, it is evident that sleep disturbance represents a potential catalyst for the development of clinical depression, even over lengthy timeframes, and thus represents a critical focus of clinical attention. However, of the studies reviewed in this section, only one study controlled for baseline sleep scores (Batterham et al., 2012), and only one controlled for baseline depression levels

(Morphy et al., 2007) which makes it difficult to ascertain if longitudinal associations exist independently of concurrent associations. Second, dichotomising the sleep and depression data (i.e., disorder/no disorder) decreases the statistical power compared to investigations that use continuous variables (Cohen, 1983). Furthermore, focusing just on new onsets of clinically severe cases limits the ability to make inferences about changing subclinical symptoms over time. Finally, methodological approaches have tended to vary between studies, including the clinical cut-off points for insomnia (i.e., by type, number, and frequency of symptoms and/or associated impairment or distress), categorisation of depression (e.g., scores above a certain HADS score suggests a diagnostic threshold for Major Depressive Disorder), and some studies did not specify if the clinical diagnoses of Major Depressive Disorder excluded diagnostic criteria pertaining to disturbed sleep (Batterham et al., 2012; Weissman et al., 1997), which is crucial in establishing whether sleep disturbance is an independent risk factor for later depression.

Sleep disturbance and anxiety over time. Clinically-significant anxiety may also appear after sleep disturbance in individuals who were not previously clinically anxious, as evidenced in multiple studies using the same methodology as the abovementioned depression studies (i.e., tracking symptom profiles over time based on categorised clinical severity cut-off scores). For example, in a large prospective study, non-anxious British respondents with insomnia at baseline (i.e., difficulties initiating and/or maintaining sleep on most nights for more than one month) exhibited a greater risk of developing clinically-significant HADS-measured anxiety symptoms one year later, after controlling for baseline anxiety levels (OR = 2.3; Morphy et al., 2007). Comparable risk estimates (OR =

2.3) were also reported in an initially non-anxious Swedish sample with insomnia (i.e., difficulties initiating or maintaining sleep for more than three days a week for three months) who were at an increased risk of developing clinically-significant HADS-measured anxiety symptoms over a one-year period (Jansson-Fröjmark & Lindblom, 2008). Finally, in a retrospective study, American respondents who experienced insomnia symptoms (i.e., difficulties initiating and maintaining sleep over the past year) and no other psychiatric issues were more likely to experience Panic Disorder one year later (OR = 20.3; Weissman et al., 1997), although they were not at an increased risk of developing other anxiety disorders.

Sleep disturbance is also associated with anxiety over longer follow-up periods. For example, non-anxious Australian respondents with baseline sleep disturbance (i.e., high scorers on a three-item self-report measure of perceived poor sleep, difficulty falling asleep and waking early) exhibited an increased risk of developing Generalised Anxiety Disorder and Panic Disorder four years later (OR = 1.2 and 1.5, respectively), after controlling for baseline sleep disturbance, life-events, neuroticism, and rumination (Batterham et al., 2012). Furthermore, participants from a large non-anxious Norwegian cohort with insomnia symptoms (i.e., frequent difficulties initiating or maintaining sleep for more than one month) were at increased risk of developing clinically high anxiety 10 years later, after controlling for baseline anxiety and depression symptoms (OR = 1.6; Neckelmann, Mykletun, & Dahl, 2007). In the same sample over a subsequent 11-year period, initially non-anxious participants with insomnia were at an increased risk of high anxiety, after controlling for health issues (OR = 2.1; Sivertsen et al., 2014).

Taken together, the findings suggest that the risk profile of sleep disturbance can be expanded to include clinically-relevant anxiety and anxiety disorders, even over lengthy timeframes. However, methodological limitations are also evident in these studies. First, of the reviewed studies, only two controlled for baseline anxiety (Morphy et al., 2007; Neckelmann et al., 2007), and only one controlled for baseline sleep disturbance (Batterham et al., 2012); thus, longitudinal associations may merely reflect existing concurrent associations. Second, the clinical cut-off scores for both clinically-significant insomnia and anxiety varied between the studies, and it is unclear if the clinical diagnoses of Generalised Anxiety Disorder excluded the diagnostic criterion of sleep disturbance (Batterham et al., 2012), which is crucial in establishing whether sleep disturbance is independently associated with later anxiety symptoms. Further, as previously discussed, investigating new onsets of clinically severe cases limits the ability to make inferences about changing subclinical symptoms over time. Finally, there is heterogeneity between anxiety disorders in terms of the experienced symptoms (APA, 2013), thus sleep disturbance may more reliably predict core anxiety symptoms rather than specific anxiety disorders.

Risk factors for sleep disturbance. While it is important to investigate the relationship between sleep disturbance to later depression and anxiety, it is also imperative to investigate the processes by which sleep becomes impaired in the first place. As previously discussed, sleep disturbance may represent a prodromal expression of mental illness (APA, 2013). It is also an established risk factor for clinically-significant depression and anxiety, even over lengthy timeframes (Baglioni et al., 2011; Sivertsen et al., 2014). Thus, a better

understanding of the psychological processes by which sleep disturbance occurs is imperative for the early treatment and prevention of mental illness.

A broad range of factors have been proposed as risk factors for disturbed sleep, including certain behaviours (e.g., late night eating, lack of exercise; Kelley & Kelley, 2017; Winkelman, 2006), biological processes (e.g., high nocturnal body temperature; Lack, Gradisar, Van Someren, Wright, & Lushington, 2008), and illnesses (e.g., sleep apnoea; Shapiro, Devins, & Hussain, 1993). With regards to psychological processes, autonomic arousal states (e.g., high perceived stress; Morin, Rodrigue, & Ivers, 2003) and cognitive processes (e.g., rumination; Harvey, 2002) have also been reported to influence sleep quality. With particular reference to this thesis, and in line with the diathesis-stress model (Monroe & Simons, 1991) and Perseverative Cognition Hypothesis (Brosschot et al., 2006), it is postulated that stress may activate ruminative thinking, which in turn impairs sleep. These premises will be explored below.

Stress and sleep disturbance over time. Sleep disturbance is variable and episodic over time. In one epidemiological study, around 54%-60% of the respondents with Insomnia Disorder at baseline no longer met criteria for the disorder one to three years later (Morin et al., 2009). In the same study, of the participants who experienced sub-clinical sleep disturbance at baseline (i.e., difficulties initiating or maintaining sleep more than three nights per week, for less than one month with no associated distress or daytime impairment), 38%-40% no longer experienced sub-clinical sleep symptoms one to three years later, and only 10%-14% later met the clinical criteria for Insomnia Disorder (Morin et al., 2009). Thus, many people experience improvements in their sleep over time, although others experience recurrent sleep difficulties.

From this perspective, Insomnia is an episodic disorder, with episodes frequently emerging in the context of stressful life-events (APA, 2013). Cognitive and autonomic over-arousal are considered to be key precipitants and maintaining factors for insomnia (Bonnet & Arand, 2010), and in particular, stress-related over-arousal (Drake, Schwartz, & Roth, 2008), which is thought to be incompatible with the cognitive deactivation that is necessary for sleep (Åkerstedt, 2006). Indeed, insomnia is often associated with recent exposure to negative life-events (Bastien, Vallieres, & Morin, 2004; Healey et al., 1981), global sleep disturbance is often associated with the subjective experience of high perceived stress and autonomic arousal (Lund, Reider, Whiting, & Prichard, 2010; Markarian, Pickett, Deveson, & Kanona, 2013), and sleep disturbance also appears to increase an individual's perception of stress (Morin et al., 2003).

Although insomnia commonly emerges in the context of high stress, it may continue long after the stressor has subsided (APA, 2013). For example, in a retrospective community-based study, self-identified poor sleepers (with difficulties initiating or maintaining sleep on more than four nights per week) reported many more negative life-events in the year preceding their sleep disturbance than good sleepers, and relative to previous years (Healey et al., 1981); although it is likely that their recall of events was biased by their current reported difficulties. In prospective studies, participants without insomnia who experienced recent negative life-events were at a greater risk of developing Insomnia Disorder six months later (after controlling baseline sleep problems; LeBlanc et al., 2009) and one year later (not reportedly controlling baseline sleep problems; Drake, Pillai, & Roth, 2014), with each additional stressor adding a 13% increased risk for developing Insomnia Disorder in the latter study. Thus,

negative life-events appear to increase the risk of developing sleep disturbance even over long periods of time.

High subjective stress is also associated with Insomnia Disorder (APA, 2013) and subclinical sleep disturbance over time in community-samples. For example, new onsets of Insomnia Disorder have been predicted by perceived stressor-severity over one year, even after controlling for actual stressor exposure (Pillai, Roth, Mullins, & Drake, 2014), in addition to baseline arousal and increases in perceived stress over six and 12-months, after controlling baseline global sleep disturbance, depression, and anxiety (LeBlanc et al., 2009). In another study, self-reported work stress predicted sleep disturbance one year later (using a 1-item measure of sleep disturbance in the preceding three months; Linton, 2004). In addition, using a one-item measure of perceived sleep quality, high subjective stress at baseline among initially non sleep-disturbed participants was predictive of worse sleep quality five years later (OR = 1.9), after controlling for baseline indices of general health, and the risk of sleep disturbance increased as their perceived stressor severity increased (Vahtera et al., 2007). Finally, employees without disturbed sleep (i.e., no frequent difficulties initiating or maintaining sleep) who reported high perceived work demands were more likely to experience new episodes of disturbed sleep five years later (OR=1.47), after controlling for perceived work pressure (Åkerstedt, Nordin, Alfredsson, Westerholm, & Kecklund, 2012). Overall, it appears that the experience of subjective stress may contribute to both clinical and subclinical sleep disturbance over time, with effects evident over several years.

Stress and sleep disturbance mediated by rumination. Given established associations between subjectively experienced stress and sleep, cognitive-

evaluative processes are clearly implicated in sleep disturbance. Indeed, Insomnia Disorder is associated with high cognitive arousal that may interfere with sleep, including perseverative thinking about sleeplessness, clock-watching, and day-time impairment (APA, 2013). These negative sleep-related cognitions are thought to increase a person's physiological arousal which consequently interferes with sleep initiation (Harvey, 2002). More broadly, irrespective of specific perceptions about sleep, cognitive over-activity is generally considered to be the cornerstone of insomnia (Perlis, Giles, Mendelson, Bootzin, & Wyatt, 1997) and it is consistently reported as a core determinant of poor sleep in both sleep-impaired and non-sleep-impaired individuals (Espie, 2002). In one study, the proportion of respondents who attributed their sleep disturbance to cognitive arousal was 10-times greater than those who attributed it to physiological arousal (Lichstein & Rosenthal, 1980). However, cognitive and physiological arousal likely share comorbid bidirectional relationships, with both processes implicated in sleep disturbance (Espie, 2002; Lundh & Broman, 2000).

In the present study, rumination will be examined as a cognitive process that contributes to sleep disturbance. In particular, the repetitive thinking that characterises rumination may extend wakefulness due to increased cognitive and autonomic arousal (Pillai & Drake, 2015). Perseverative thinking occurring prior to bed is reported to be associated with difficulties in falling asleep (Harvey, 2002), although general tendencies towards perseverative thinking have been linked with sleep disturbance more globally (Pillai & Drake, 2015). Furthermore, rumination may also operate *during* sleep via continued unconscious perseveration and associated physiological over-activation (Brosschot, 2010).

Several studies have reported moderate to strong concurrent associations between dispositional rumination and global sleep disturbance (Mitchell, Mogg, & Bradley, 2012; Pillai, Steenburg, et al., 2014; Stewart et al., 2011; Takano et al., 2012), even after controlling for depression and anxiety levels (Fernandez-Mendoza et al., 2010; Thomsen, Mehlsen, Christensen, & Zachariae, 2003). In addition, people categorised as poor sleepers are more likely to ruminate than normal sleepers (Carney, Edinger, Meyer, Lindman, & Istre, 2006; Semler & Harvey, 2004) and individuals prone to mood-responsive rumination are more likely to report lower sleep quality and more night-time awakenings than those who are not prone to rumination (Carney, Harris, Moss, & Edinger, 2010). Thus, rumination and sleep disturbance are clearly related, even independently of the experience of affective symptoms.

Longitudinal studies have also established that rumination predicts later sleep disturbance. In one study, for people with moderate depression, high pre-sleep mood-responsive rumination predicted longer sleep onset latency over seven days, but it did not predict poor sleep quality, total sleep, or wake times, as measured using subjective reports and actigraphy, and after controlling for baseline global sleep quality and baseline depression levels (Pillai, Steenburg, et al., 2014). In another study, Takano et al. (2012) found that higher baseline mood-responsive rumination predicted lower global sleep quality three weeks later in college students, even after controlling for baseline affective symptoms, global sleep quality, worry, and negative life-events. For initially good sleepers, higher stress-responsive rumination predicted the onset of Insomnia Disorder one year later (Drake et al., 2014). Finally, higher work-related rumination predicted disturbed sleep five years later (i.e., frequent difficulties initiating or maintaining

sleep), after controlling for work-related pressures (Åkerstedt et al., 2012). Thus, while limited in number, these longitudinal studies suggest that a higher tendency to ruminate can increase the risk of worse sleep quality over various timeframes.

Furthermore, rumination is likely to be especially predictive of sleep issues in the context of high stress. Diathesis-stress accounts of insomnia emphasise that the onset and trajectory of insomnia is typically influenced by predisposing factors, precipitating events or stressors, and perpetuating factors (Spielman, 1986). In line with this account, trait ruminative thinking may be envisaged as both a predisposing and perpetuating factor for sleep disturbance, which may help to explain why sleep disturbance continues well beyond initial stressor exposure (see APA, 2013). Correspondingly, according to the Perseverative Cognition Hypothesis, perseverating about stressors can prolong the physiological stress-response and therefore compromise health, including sleep quality (Brosschot, 2010). Thus, a tendency to ruminate, which becomes exacerbated in times of high stress, may represent a risk factor that exacerbates the effects of stress to compromise sleep quality.

Indeed, findings from the experimental literature suggest that the relationship between stress and sleep quality is influenced by the tendency to ruminate. For example, the night before a stressful exam, participants prone to high mood-responsive rumination experienced more intrusive pre-sleep thoughts and later poor sleep quality than low-ruminators (Guastella & Moulds, 2007). Furthermore, when prompted to ruminate about the exam, those with higher dispositional rumination reported worse later sleep quality than individuals low in dispositional rumination (Guastella & Moulds, 2007). In another study,

stressor-related rumination and a general tendency to ruminate both predicted longer sleep onset latencies for participants previously exposed to a social-evaluative stressor, as measured by self-report and actigraphy (Zoccola, Dickerson, & Lam, 2009). In this study, the longest sleep onset latencies were observed in participants with the greatest combined stressor-related and dispositional rumination (Zoccola et al., 2009). These experimental findings suggest that it is not the experience of stress alone that influences sleep disturbance, but rather the tendency to ruminate in response to perceived stressors.

Longitudinal studies have also yielded similar results, and they offer a longer-term perspective on how rumination might mediate the relationship between stress and sleep impairment. For example, in a sample of teachers, perceived occupational stress was associated with poorer self-reported sleep quality the following night, and this effect was partially mediated by rumination about work (Cropley, Dijk, & Stanley, 2006). Furthermore, Drake et al. (2014) found that among individuals without insomnia at baseline, exposure to more stressors at baseline predicted the onset of insomnia one year later, and this relationship was fully mediated by intrusive ruminative cognitions about the stressors. Similarly, Åkerstedt et al. (2012) found that non-sleep disturbed employees with high baseline ratings of work-related rumination were more likely to experience a new episode of disturbed sleep five years later (OR = 1.6, i.e., frequent difficulties initiating or maintaining sleep) and especially when work-related rumination increased (OR = 2.5) or was persistently high (OR = 3.8), after controlling for the perceived severity of the work demands. High perseverative cognitions mediated the relationship between high daily

stress levels and two-month sleep quality, sleep efficiency and night-time awakenings in a student sample, after controlling for baseline sleep disturbance (Van Laethem, Beckers, van Hooff, Dijksterhuis, & Geurts, 2016). High perseverative cognitions also mediated between high baseline work-stress and poorer subjective sleep (i.e., difficulties initiating sleep, maintaining sleep, or experiencing non-restorative sleep) more than one year later in a sample of employees (Van Laethem et al., 2015).

In sum, the relationship between stress and sleep impairment appears to be influenced by the tendency towards perseverative ruminative thinking. These relationships are evident in experimental and longitudinal studies across various time periods. However, the extant studies vary widely with regards to the measures utilised as indices of stress (e.g., work-related, general perceived stress), rumination (e.g., mood-responsive, perseverative cognitions), and sleep quality (e.g., meets criteria for insomnia, one-item self-reported sleep quality). Therefore, continued investigations that utilise validated and less situation-specific measures of stress, rumination and sleep disturbance may provide insight into the global longitudinal processes implicated in sleep disturbance. That is, it is hoped that utilising well-validated measures that are not confined to specific contexts or emotional states (e.g., stress or mood) will thereby increase the generalisability of the findings.

Stress and sleep disturbance moderated by mindfulness. In contrast to the exacerbating effects of stress-prompted rumination on sleep quality, mindfulness is thought to confer beneficial effects. That is, being mindful is said to facilitate the cognitive deactivation that is necessary for sleep to occur, including a reduction in active verbal information-processing and an increase in

the acceptance of spontaneous physiological and mental processes (Lundh, 2005). Mindfulness is also theorised to increase awareness of the psychological and physical states associated with sleep disturbance (e.g., stress, rumination), thereby potentially facilitating a more adaptive stance to sleep difficulties, and also attenuating the cognitive and autonomic arousal processes that fuel sleep disturbance (Ong, Ulmer, & Manber, 2012). In line with these conceptualisations, high dispositional acting-with-awareness may facilitate greater awareness of sleep-interfering and sleep-promoting processes, whereas high non-judging may reflect an adaptive response that promotes non-striving, and each of these processes may facilitate sleep.

Supporting the link between dispositional mindfulness and sleep, several prior cross-sectional studies have established small to moderate associations between measures of global sleep quality with both mindful acting-with-awareness (Garland, Campbell, Samuels, & Carlson, 2013; Howell, Digdon, & Buro, 2010) and non-judging (Caldwell, Harrison, Adams, Quin, & Greeson, 2010; Garland et al., 2013). However, these studies do not elucidate temporal associations.

Nonetheless, practicing mindfulness appears to benefit sleep over time. Specifically, participation in MBIs have been associated with significant improvements in global sleep quality in community, medical, and clinical populations (Black, O'Reilly, Olmstead, Breen, & Irwin, 2015; Carlson & Garland, 2005; Klatt, Buckworth, & Malarkey, 2009; Yook et al., 2008), with sleep improvements maintained three and six months post-intervention (Gross et al., 2011; Kreitzer, Gross, Ye, Russas, & Treesak, 2005; Ree & Craigie, 2007). However, some studies have reported that sleep does not improve with MBI

participation, using a one-item measure of perceived sleep-quality (Roth & Robbins, 2004) or in self-reported and polysomnography-measured total sleep time, sleep onset latency, and night time awakenings (Britton, Haynes, Fridel, & Bootzin, 2012).

Inconsistent findings in the MBI literature may reflect that mindfulness training more effectively benefits sleep when participants' day-to-day mindfulness also increases. Indeed, some MBI studies have linked improved sleep to improved dispositional mindfulness; over the course of one MBSR program, an increase in mindful-acting-with-awareness was related to improvement in a one-item measure of perceived sleep quality (Salmoirago-Blotcher, Hunsinger, Morgan, Fischer, & Carmody, 2013). In another study, MBI-induced increases in mindful-non-reactivity were associated with improved self-reported global sleep quality (Black et al., 2015); however, the effects of mindful acting-with-awareness and non-judging were not reported. Thus, while existing studies are sparse, participating in MBIs may protect individuals from developing later sleep disturbance through increased dispositional mindfulness.

It remains unclear, however, whether dispositional mindfulness predicts later sleep quality outside the context of MBIs. To the author's knowledge, no published studies have previously examined the longitudinal associations between trait mindfulness and sleep. Given existing longitudinal relationships between acting-with-awareness and non-judging with lower affective symptoms (Petrocchi & Ottaviani, 2015; Williams et al., 2010), and between sleep disturbance with higher affective symptoms (Baglioni et al., 2011), it is worthwhile to examine if these core mindfulness tendencies may benefit sleep

over time, because this may have subsequent protective effects on affective symptoms.

Of particular interest to the current research, to the author's knowledge, no published longitudinal studies have investigated the potential for dispositional mindfulness to attenuate stress levels and thus improve sleep over time, in line with the Mindfulness Stress-Buffering Account (Creswell & Lindsay, 2014). However, relevant findings have been reported. For example, MBI participation has been shown to improve global sleep quality in highly stressed and sleep-impaired medical patients (Kreitzer et al., 2005), with improved sleep linked to decreasing stress (Carlson & Garland, 2005). Thus, mindfulness practice may improve sleep by attenuating stress. However, in a cross-sectional study of cancer patients with insomnia, Garland et al. (2013) found that neither mindful acting-with-awareness or non-judging moderated the effects of stress on insomnia severity, global sleep quality, or dysfunctional sleep beliefs. Given the scarcity of research and absence of longitudinal studies, it is unclear if the core tendencies towards mindfulness can ameliorate the effects of high stress to improve sleep over time in naturalistic community-based settings, and this premise will be examined in the current thesis.

Stress and affective symptoms mediated by sleep disturbance. Even though subjective stress has been linked with later sleep issues (LeBlanc et al., 2009; Vahtera et al., 2007), and sleep impairment in turn has been associated with later affective distress (Batterham et al., 2012; Jansson-Fröjmark & Lindblom, 2008), to the author's knowledge, no known studies have examined sleep disturbance as a mediator between stress and later affective symptoms. However, rumination is a well-established mediator between stress and affective

distress (Michl et al., 2013; Nolen-Hoeksema et al., 1999); thus, it is worthwhile to investigate if poor sleep exerts comparable intermediary effects as rumination. Furthermore, given established associations between rumination and sleep disturbance (Fernandez-Mendoza et al., 2010; Thomsen et al., 2003), these processes may work in tandem to mediate between stress and affective distress. That is, stress-responsive rumination is thought to maintain physiological arousal that can impair health (Brosschot et al., 2006); poor sleep may represent a key manifestation or outcome of this extended physiological arousal, which has subsequent effects of depression and anxiety. Thus the role of sleep disturbance, as both a unique factor and rumination-responsive process, will be explored as a mediator between stress and later affective symptoms in the current research.

Section summary. Sleep disturbance may represent a prodromal expression of or risk factor for the development of affective disorders (APA, 2013); that is, it consistently predicts the onset of depressive and anxiety disorders (Baglioni et al., 2011; Batterham et al., 2012) and sub-clinical affective symptoms (Jansson-Fröjmark & Lindblom, 2008; Sivertsen et al., 2014), making it a worthy focus of clinical and empirical attention. Various factors have been shown to predict later sleep disturbance, including stress (LeBlanc et al., 2009; Vahtera et al., 2007), rumination (Åkerstedt et al., 2012; Takano et al., 2012), and stress mediated by rumination (Cropley et al., 2006; Drake et al., 2014; Van Laethem et al., 2015). These findings provide some insight into the processes by which subjective over-arousal (e.g., high perceived stress) and cognitive over-arousal (e.g., rumination) might influence sleep over time (Espie, 2002; Lundh & Broman, 2000), and thus also later affective symptoms. That is, stress-responsive perseverative thinking may prolong harmful physiological arousal to

compromise health, including sleep (Brosschot, 2010), and therefore also subsequent affective distress. However, to date, no known studies have investigated sleep quality as a mediator between stress with later affective symptoms, either in isolation, or in combination with rumination.

Furthermore, if mindfulness practice can benefit mental health by attenuating the effects of stress (Creswell & Lindsay, 2014; Kabat-Zinn, 2005), dispositional mindfulness may similarly moderate stress to benefit later sleep quality. While, to the author's knowledge, no prior longitudinal studies have investigated these relationships, complementary MBI studies have established that improved sleep has been linked with increased dispositional mindfulness (Black et al., 2015; Salmoirago-Blotcher et al., 2013), and also attenuated stress (Carlson & Garland, 2005). However, the only direct test of dispositional mindfulness as a moderator in the stress to sleep quality relationship was a cross-sectional study that revealed null findings for mindful-non-judging and acting-with awareness (Garland et al., 2013). Thus, there are too few studies on which to make inferences about the role played by trait mindfulness in potentially attenuating the adverse effects of stress on later sleep quality.

More broadly, in the longitudinal literature reviewed in this subsection, studies have varied considerably in terms of their methods. For example, some studies did not specify if the affective symptom outcome measure excluded sleep items (Batterham et al., 2012; Weissman et al., 1997), which makes it difficult to distinguish if longitudinal associations were unduly influenced by existing subclinical and/or comorbid symptoms. Furthermore, studies varied in terms of the measures utilised, resulting in differences with regards to their specificity (e.g., mood-responsive vs. stress-responsive rumination, general vs. work-related

stress), measurement scales (e.g., dichotomised categorisations of clinical severity vs. continuous measures of core symptoms), and the facets investigated (e.g., global sleep vs. sleep onset latency, and acting-with-awareness vs. non-judging mindfulness). The measurement of sleep has been particularly inconsistent, with many non-validated or single-item sleep measures being utilised (Fichter, Kohlboeck, Quadflieg, Wyschkon, & Esser, 2009; Linton, 2004). Furthermore, many of the investigations focused on new episodes of clinically severe sleep or affective symptoms rather than the experience of changing symptoms over time. Given that subclinical symptoms of depression, anxiety, and sleep disturbance are relatively common (Andrews & Slade, 2001; Crawford & Henry, 2003; Ohayon, 2002), investigating the core components of these symptoms and their associated risk factors, using well-validated measures, promises to better elucidate the processes involved and increase the generalizability of study findings.

Chapter Summary and Thesis Rationale

The experience of depressive and anxiety disorders and associated symptoms are related to high levels of impairment and distress, thus necessitating further research in to the factors implicated in their development and alleviation. However, significant gaps and inconsistencies are evident in the literature pertaining to the ways in which different emotion regulation strategies and processes influence affective outcomes over time. With regards to dispositional rumination, the literature is dominated by measurement of a mood-responsive style that overlaps considerably with depressive symptoms (Smith & Alloy, 2009). However, non-mood responsive tendencies also increase the risk for elevated depression and anxiety (Ciarrochi & Scott, 2006; Kuster et al., 2012)

and thus may represent a potent cross-symptom risk factor. However, the bulk of existing investigations in to non-mood responsive rumination have focused on depression as an outcome, rather than anxiety or related constructs such as stress (Nolen-Hoeksema & Morrow, 1991; Verplanken et al., 2007), and baseline affective symptoms are not consistently controlled for in the analyses (Ciarrochi & Scott, 2006) thereby making it difficult to ascertain whether rumination predicts changes in affective symptoms. With regards to dispositional mindfulness, longitudinal investigations are uncommon, and findings have tended to be inconsistent across studies (Barnes & Lynn, 2010; Petrocchi & Ottaviani, 2015). Additionally, existing studies have tended to focus on depressed mood and stress rather than anxiety as an outcome (Dixon & Overall, 2016; Michalak et al., 2008), and acting-with-awareness rather than non-judging mindfulness as predictors (Weinstein et al., 2009; Williams et al., 2010). Notably, even though mindfulness practice is theorised to attenuate the effects of rumination (Kabat-Zinn, 2005; Segal et al., 2013), dispositional mindfulness has not been examined as a potential moderator of rumination in longitudinal studies. Consequently, additional research is required to examine the longitudinal predictive relationships between non-mood-responsive rumination, mindful-acting-with-awareness, and mindful-non-judging, including their interactions, with discrete affective symptoms including depression, anxiety, and stress. This is the focus of Study 1.

In regards to Study 2, high stress consistently predicts greater depression and anxiety symptoms over time (Hammen, 2005; Kendler et al., 2003), although these effects may be indirect. That is, high stress is reported to result in increased ruminative thinking (Michl et al., 2013; Nolen-Hoeksema et al., 1999), and stress

has been shown to indirectly predict higher depression and anxiety over time via ruminative thinking (Michl et al., 2013; Ruscio et al., 2015). In addition, stress also predicts later sleep disturbance, both directly (LeBlanc et al., 2009; Vahtera et al., 2007) and indirectly via rumination (Cropley et al., 2006; Drake et al., 2014; Van Laethem et al., 2015), while sleep disturbance, in turn, is associated with greater anxiety and depressive symptoms over time (Jansson-Fröjmark & Lindblom, 2008; Sivertsen et al., 2014). However, to date, no known longitudinal studies have investigated sleep as a mediator between stress with depression and anxiety, either in isolation, or in combination with rumination. Nonetheless, taken together, these observations suggest that stress may lead to later sleep disturbance via rumination, and also that stress may lead to later affective symptoms via rumination, sleep disturbance, or both, as depicted in Figure 1. That is, responding to stress with ruminative perseverative thinking may prolong harmful physiological arousal, thereby compromising health and well-being (Brosschot, 2010), including sleep quality and subsequent affective symptoms. These processes will be explored in Study 2.

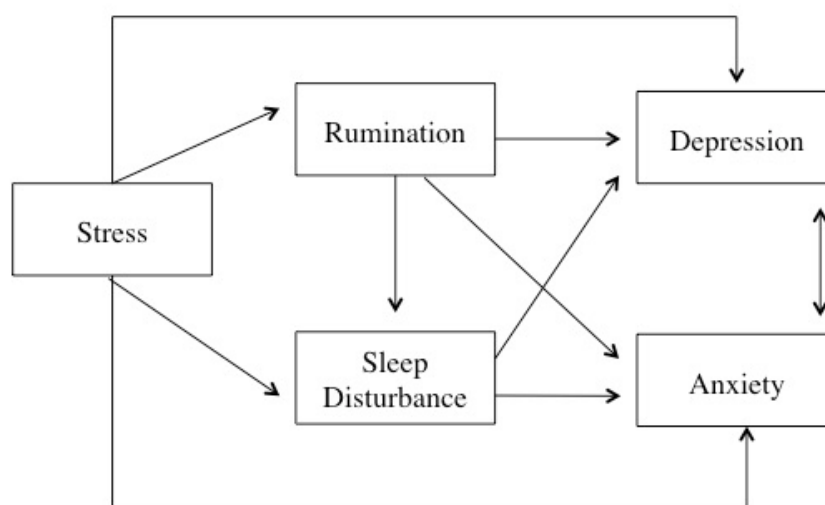


Figure 1. A proposed model of affective symptom development

However, protective factors may short-circuit these detrimental processes, and provide insight into efficacious treatment interventions. Specifically, mindfulness practice is proposed to act as a stress-buffering agent that can benefit well-being through increased awareness of habitual reactions (Kabat-Zinn, 2005) and attenuation of stressor-related appraisals and autonomic arousal (Creswell & Lindsay, 2014). Thus, dispositional mindfulness may similarly exert stress-buffering effects to benefit psychological symptoms over time in naturalistic settings. Indeed, emerging evidence has shown that mindful acting-with-awareness and non-judging can moderate the effects of stress on affective symptoms longitudinally (Ciesla et al., 2012; Dixon & Overall, 2016). However, few longitudinal studies exist, no known studies have investigated the effects on sleep quality, and investigations into anxiety tend to be confined to experimental studies (Brown et al., 2012; Ostafin et al., 2014). In addition, acting-with-awareness tends to be explored as a stress-buffer rather than non-judging (Dixon & Overall, 2016; Weinstein et al., 2009), and differential findings have been reported between the facets (Ciesla et al., 2012). Thus, further prospective investigation is warranted to explore the aforementioned mechanistic factors implicated in affective symptom exacerbation or alleviation, with a model that draws together these processes, as outlined in Figure 2. Such an enquiry is an additional focus of Study 2.

More broadly, several methodological factors are noteworthy across the longitudinal literature, including a lack of control over baseline affective symptoms (Just & Alloy, 1997; Matheson & Anisman, 2003; Szklo-Coxe et al., 2010), an over-reliance on dichotomised data of clinically severe cases (Drake et al., 2014; Jansson-Fröjmark & Lindblom, 2008), questionable validity of the

sleep measures utilised (Fichter et al., 2009; Linton, 2004), and with rumination typically measured as a mood or stress-responsive process (Drake et al., 2014; Takano et al., 2012), and dispositional mindfulness as a unidimensional tendency towards acting-with-awareness only (Dixon & Overall, 2016; Weinstein et al., 2009). Thus, investigating the constructs of interest as continuous variables with well-validated assessment tools, while controlling for baseline affective symptoms, should further illuminate the processes through which affective symptoms can change.

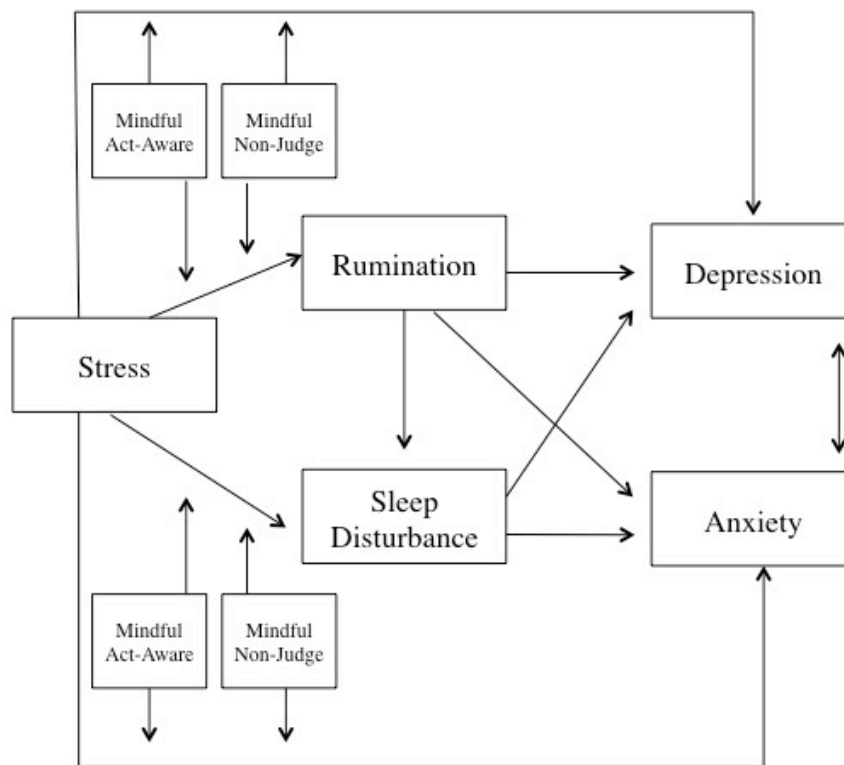


Figure 2. A proposed stress-buffering model of affective symptom development

In summary, the broad aim of this thesis was to clarify various key mechanisms by which core depression and anxiety symptoms can change over

time, including the direct and/or interactive effects of dispositional rumination and mindfulness (Study 1), and the effects of psychological stress, whether direct, mediated by rumination and sleep disturbance, and/or attenuated by dispositional mindfulness (Study 2). A prospective longitudinal design will be used to examine the temporal relationships between variables, with three waves occurring three months apart. The three-month interval between waves was chosen in order to 1) facilitate comparisons with previous longitudinal studies investigating similar timeframes (Black et al., 2012; Weinstein et al., 2009), 2) to compare the effects across three and six months (Study 1), and 3) to test the hypothesised longitudinal processes model (Study 2). A community sample was sought in order to investigate the effects of naturally occurring emotional regulation processes and psychological symptoms outside the context of treatment, and also to maximise the likelihood of obtaining varied responses, which should more closely reflect the general population than a clinical sample. Similarly, core symptoms of depression and anxiety were investigated, given the potential for high associated impairment (Haller et al., 2014; Lewinsohn et al., 2000; Rodríguez et al., 2012), the applicability to a range of clinical disorders (APA, 2013), and also to maximise the generalisability of findings. Through examining the mechanisms associated with the exacerbation and alleviation of affective symptoms, it is hoped that avenues for effective treatment will be elucidated, including the tailoring of interventions to individual's unique emotion regulation, sleep, and affective symptom profiles.

Specific study research questions, aims, and hypotheses.

Study 1. The primary research question evaluated in Study 1 is whether an individual's tendencies towards dispositional non-mood-responsive

rumination, mindful-acting-with-awareness, and mindful-non-judging will predict affective symptoms over time, over-and-above baseline levels of affective symptoms. A second question is whether discrete facets of dispositional mindfulness (i.e., acting-with-awareness vs. non-judging) will differentially moderate the effects of dispositional rumination on affective symptoms over time, over-and-above baseline levels of affective symptoms. More broadly, the aim of this study is to investigate the predictive relationships between baseline dispositional non-mood-responsive rumination, mindful-non-judging, and mindful-acting-with-awareness to depression, anxiety, and stress symptoms at three and six months, in a large community sample.

Consistent with the abovementioned literature, it is hypothesised that (1) higher rumination will predict higher depression, anxiety, and stress levels at three and six months, after controlling for baseline affective symptoms; (2) both lower mindful-acting-with-awareness and mindful-non-judging will predict higher depression, anxiety, and stress levels at three and six months, after controlling for baseline affective symptoms; and (3) that both higher mindful-acting-with-awareness and mindful-non-judging will moderate the effects of higher rumination in predicting higher depression, anxiety, and stress levels at three and six months, after controlling for baseline affective symptoms.

Study 2. The primary aim of Study 2 is to investigate the processes by which psychological stress might lead to worsened depression and anxiety levels over time, while controlling for baseline affective symptoms. In particular, a hypothesised model will be tested to see whether stress predicts changes in depression and anxiety, either directly, indirectly via ruminative thinking and sleep disturbance, and/or as attenuated by mindful acting-with-awareness and

non-judging. The primary research question is whether stress can predict changes in depression and anxiety, either directly, or indirectly via ruminative thinking and sleep disturbance (Figure 1). The second research question is whether the effects of stress on rumination, sleep disturbance, depression and anxiety can be attenuated by mindful acting-with-awareness and non-judging (Figure 2).

Several predictions were made consistent with the abovementioned literature, although it was also expected that differential effects may emerge given that, to the author's knowledge, the pattern of relationships represented in the current model have not previously been examined simultaneously.

Hypotheses are numbered according to three core areas of enquiry: (1) direct effects, (2) indirect effects, and (3) stress-moderating effects.

With regards to direct effects, it was hypothesised that, while controlling for baseline depression and anxiety, baseline stress would predict (1a) baseline rumination, (1b) three-month sleep disturbance, (1c) six-month depression, (1d) and six-month anxiety; that baseline rumination would predict (1e) three-month sleep disturbance, (1f) six-month depression, and (1g) six-month anxiety; and that three-month sleep disturbance would predict (1h) six-month depression, and (1i) six-month anxiety.

With regards to indirect effects, it was hypothesised that, while controlling for baseline depression and anxiety, baseline stress would predict (2a) three-month sleep disturbance via baseline rumination, (2b) six-month depression via baseline rumination, (2c) six-month depression via three-month sleep disturbance, (2d) six-month depression via baseline rumination and three-month sleep disturbance, (2e) six-month anxiety via baseline rumination, (2f)

six-month anxiety via three-month sleep disturbance, and (2g) six-month anxiety via baseline rumination and three-month sleep disturbance.

With regards to moderating effects, it was hypothesised that, while controlling for baseline depression and anxiety, baseline mindful-acting-with-awareness would moderate the effects of baseline stress on (3a) baseline rumination, (3b) three-month sleep disturbance, (3c) six-month depression, and (3d) six-month anxiety; and that baseline mindful-non-judging would moderate the effects of baseline stress on (3e) baseline rumination, (3f) three-month sleep disturbance, (3g) six-month depression, and (3h) six-month anxiety.

A summary of the aims of the current research, including the specific aims and research questions pertaining to each study, are outlined in Table 1.

Table 1

Summary of Aims and Research Questions

	Study 1	Study 2
Aims	To clarify various key mechanisms by which core depression and anxiety symptoms can change over time.	
Specific aims	To investigate the direct and/or interactive effects of dispositional rumination and mindfulness on depression and anxiety.	To investigate the effects of psychological stress on depression and anxiety, whether direct, mediated by rumination and sleep disturbance, and/or attenuated by dispositional mindfulness.
Research questions	Does dispositional non-mood-responsive rumination, mindful-acting-with-awareness, and mindful-non-judging predict affective symptoms over time?	Does stress predict changes in depression and anxiety either directly, or indirectly via ruminative thinking and sleep disturbance (Figure 1)?
	Do discrete facets of dispositional mindfulness (i.e., acting-with-awareness vs. non-judging) differentially moderate the effects of dispositional rumination on affective symptoms over time?	Can the effects of stress on rumination, sleep disturbance, depression and anxiety be attenuated by mindful acting-with-awareness and non-judging (Figure 2)?

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**Chapter 3. Study 1: A Longitudinal Investigation Into the Role of
Dispositional Rumination and Mindfulness in Predicting Depression,
Anxiety, and Stress Symptoms in Community Adults**

Introduction

As previously reviewed in Chapter 2, individuals' tendencies towards ruminative thinking and mindful awareness have been implicated in the exacerbation and alleviation of affective symptoms over time; thus, these emotion regulation processes are an important area of clinical focus. To date, longitudinal investigations into dispositional rumination have tended to focus on mood-responsive rumination in predicting later depressive symptoms (Nolen-Hoeksema et al., 2008), with fewer studies looking at non-mood-responsive rumination or outcomes such as anxiety and stress. However, individuals also ruminate irrespective of mood and thus a general tendency to ruminate may also influence multiple affective outcomes, including depression, as well as anxiety and stress (Ciarrochi & Scott, 2006; Kuster et al., 2012).

Similarly, research into dispositional mindfulness as a longitudinal predictor of affective symptoms is rare, conflicting findings have been reported, and depressive symptoms have been the core focus, with fewer studies investigating anxiety and stress as outcomes (Barnes & Lynn, 2010; Petrocchi & Ottaviani, 2015). Furthermore, existing research is dominated by mindfulness measured as a tendency to act-with-awareness, with far fewer studies investigating the other core component of mindfulness, non-judging (Black et al., 2012; Dixon & Overall, 2016). Finally, even though mindfulness practice has been theorised to attenuate the effects of ruminative thinking (Segal et al., 2013),

the role of dispositional mindfulness in attenuating the effects of dispositional rumination on affective symptoms over time has not previously been explored.

Thus, further research is required to evaluate the longitudinal relationships between non-mood-responsive rumination, mindful-non-judging, and mindful-acting-with-awareness on depression, anxiety, and stress symptoms over time. Investigating each of these emotion regulation processes simultaneously would allow comparisons to be made as to the relative strengths of the relationships. Furthermore, exploring interactive effects may illuminate the likely mechanisms by which these dispositional tendencies ameliorate or exacerbate psychological distress. Finally, a prospective design, controlling for baseline affective symptoms, would elucidate the temporal patterns by which these dispositional tendencies influence well-being over extended time-frames.

The primary research question evaluated in Study 1 is whether an individual's tendencies towards dispositional non-mood-responsive rumination, mindful-acting-with-awareness, and mindful-non-judging will predict affective symptoms over time, over-and-above baseline levels of affective symptoms. A second question is whether an individual's different tendencies towards dispositional mindfulness (i.e., acting-with-awareness and non-judging) will moderate the effects of dispositional rumination on affective symptoms over time, over-and-above baseline levels of affective symptoms. More broadly, the aim of this study is to investigate the predictive relationships between baseline dispositional non-mood-responsive rumination, mindful-non-judging, and mindful-acting-with-awareness to depression, anxiety, and stress symptoms at three and six months, in a large community-derived sample.

Thus, it is hypothesised that: (1) higher rumination will predict higher depression, anxiety, and stress levels at three and six months, after controlling for baseline affective symptoms; (2) both lower mindful-acting-with-awareness and mindful-non-judging will predict higher depression, anxiety, and stress levels at three and six months, after controlling for baseline affective symptoms; and (3) both higher mindful-acting-with-awareness and mindful-non-judging will moderate (i.e., diminish) the effects of higher rumination in predicting higher depression, anxiety, and stress levels at three and six months, after controlling for baseline affective symptoms.

Method

Both Study 1 and Study 2 utilised the survey data. As such, only the measures pertaining to Study 1 are outlined here.

Participants. The current research was approved by the Australian National University Human Ethics Research Committee, protocol 2014/340, in accordance with National Health and Medical Research Council (2007) standards. Study inclusion criteria were that participants were Australian residents or citizens, currently living in Australia, and aged 18 years or older. They were recruited via online discussion boards (e.g., <https://www.reddit.com/r/australia/>, <http://forums.whirlpool.net.au/forum/>), volunteering websites (e.g., <http://www.gumtree.com.au/s-volunteer/>, <http://www.probonoaustralia.com.au/>), research participation websites (e.g., <http://www.reddit.com/r/SampleSize/>, <http://depressionet.org.au/research/projects/>), and mindfulness websites or list-serves (e.g., MBSR-MBCT_ANZ@yahoogroups.com, <https://www.facebook.com/AustralianSchoolofMeditationandYoga>). The study advertisement is displayed in Appendix A.

A large sample ($N = 730$) of community-derived adults completed the survey at baseline (T1), 498 completed the three-month survey (T2), and 353 completed the six-month survey (T3), representing an attrition rate of 32% (T1 to T2) and 29% (T2 to T3), congruent with previously reported attrition rates of between 17 and 53% in longitudinal research across one to three months (Barnes & Lynn, 2010; Boyraz & Waits, 2015; Moore et al., 2009; Weinstein et al., 2009). Demographic details for each time point are provided in Table 2.

Table 2

Descriptive Statistics for the Demographic Variables at Baseline (T1), 3-Months (T2) and 6-Months (T3)

	T1	T2	T3
<i>N</i>	730	498	353
Age <i>M</i> (SD)	31.3 (11.30)	32.2 (11.80)	33.2 (12.33)
Gender			
<i>n</i> (%) Male	289 (39.6)	197 (39.6)	131 (37.2)
<i>n</i> (%) Female	438 (60.0)	300 (60.4)	221 (62.8)
<i>n</i> (%) Other	3 (0.4)	1 (0.2)	1 (0.3)
Education			
<i>n</i> (%) Bachelor degree or higher	366 (50.1)	262 (52.6)	196 (55.5)
<i>n</i> (%) Less than Bachelor degree	364 (49.9)	236 (47.4)	157 (44.5)
Marital status			
<i>n</i> (%) Married or de-facto	371 (50.8)	251 (50.4)	184 (52.1)
<i>n</i> (%) Not partnered	359 (49.2)	247 (49.6)	169 (47.9)
Ethnicity			
<i>n</i> (%) Caucasian	623 (85.3)	438 (88.0)	313 (88.7)
<i>n</i> (%) Non-Caucasian	107 (14.7)	60 (12.0)	40 (11.3)
Mindfulness practice			
<i>n</i> (%) Last month	221 (30.3)	156 (31.3)	120 (34.0)
<i>n</i> (%) Not last month	509 (69.7)	342 (68.7)	233 (66.0)

Measures. Participants completed the following measures in the same order as presented below.

The 21-item Depression, Anxiety and Stress Scale-Short Form (DASS-21; Lovibond & Lovibond, 1995b) was used to ascertain depression, anxiety, and stress levels over the past week. The DASS-21 includes seven items each that measure the core symptoms of depression (e.g., “I felt down-hearted and blue”), physiological experiences of anxiety (e.g., “I experienced trembling”), and subjective feelings of stress or over-arousal (e.g., “I found it difficult to relax”). Participants were asked to rate each item using 4-point intensity and frequency scales ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much/most of the time*). Given that existing longitudinal investigations of rumination have tended to focus on physiological anxiety as an outcome rather than subjective stress (Nolen-Hoeksema & Morrow, 1991; Verplanken et al., 2007), whereas mindfulness-based research has focused on subjective stress rather than physiological anxiety (Black et al., 2012; Weinstein et al., 2009), both DASS-21-Anxiety and DASS-21-Stress scales were investigated in order to compare any differential effects. While each of the DASS scales are highly correlated with each other, they are also conceptually and empirically distinct (Brown et al., 1997; Crawford & Henry, 2003; Lovibond & Lovibond, 1995b). DASS-depression, anxiety, and stress scores correlate highly with other measures of depression, anxiety, and stress, and the strongest associations are evidenced between corresponding constructs (Andreou et al., 2011; Antony et al., 1998; Crawford & Henry, 2003), thereby supporting convergent validity. In addition, DASS scores can differentiate people with mood and anxiety disorders relative to community controls (Antony et al., 1998), and can also differentiate between

mood and anxiety disorders (Brown et al., 1997). High internal consistency has been reported for the DASS-Depression (Cronbach's $\alpha = .88$ to $.94$), DASS-Anxiety ($\alpha = .87$ to $.90$), and DASS-Stress ($\alpha = .91$ to $.93$) scales (Antony et al., 1998; Henry & Crawford, 2005). In this study, subscale internal consistencies were high at all three time-points for the DASS-21-Depression ($\alpha \geq .92$), DASS-21-Anxiety ($\alpha \geq .83$), and DASS-21-Stress ($\alpha \geq .88$) scales. Temporal stability for each scale was as follows over three and six months, respectively: DASS-21-Depression ($r = .66$ and $.67$), DASS-21-Anxiety ($r = .70$ and $.70$), and DASS-21-Stress ($r = .68$ and $.62$).

Non mood-responsive rumination was assessed using the Rumination subscale (12-item) of the Rumination-Reflection Questionnaire (RRQ, Trapnell & Campbell, 1999). This scale assesses the tendency to dwell on perceived self-related threats, losses, and injustices (e.g., "My attention is often focused on aspects of myself I wish I'd stop thinking about"), irrespective of mood. Participants were asked to rate each item using five-point scales ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). RRQ-Rumination displays convergent and discriminant validity; the scale correlates highly with other measures of rumination (Peters et al., 2017; Ruscio et al., 2015) and maladaptive emotion regulation strategies (Thomsen et al., 2013), while being inversely correlated with adaptive emotion regulation processes (Boyraz & Waits, 2015). The subscale is reported to have high internal consistency ($\alpha = .90$) (Crocker, Canevello, Breines, & Flynn, 2010; Trapnell & Campbell, 1999) and generally acceptable test-retest stability ($r = .66$ to $.76$) over two to eight months (Kuster et al., 2012; Thomsen et al., 2013). In this study, internal consistency was high for RRQ-Rumination at all time points ($\alpha \geq .93$), and test-rest reliability was

acceptable over three ($r = .78$) and six-months ($r = .76$), thus supporting rumination as a relatively stable dispositional tendency.

The 39-item Five Factor Mindfulness Questionnaire (FFMQ) is comprised of five facets measuring the predilection towards mindfulness in daily life (Baer et al., 2006). In line with the two-component conceptualisation of mindfulness (Bishop et al., 2004), and factor-analytic studies indicating that acting-with-awareness and non-judging components load highest on an overarching mindfulness factor compared to other mindfulness facets (Baer et al., 2006; Christopher et al., 2012; Lilja et al., 2011), only these subscales were analysed in the present research. Mindful-acting-with-awareness (8-items) assesses the tendency towards present-moment attention as opposed to operating on autopilot (e.g., “I find it difficult to stay focused on what is happening in the present”, reverse-scored), and mindful-non-judging (8-items) assesses the tendency to take an accepting and non-evaluative stance towards one’s thoughts and feelings (e.g., “I tell myself I shouldn’t be feeling the way I am feeling”, reverse-scored). Participants were asked to rate each item using five-point frequency scales ranging from 1 (*never or very rarely true*) to 5 (*very often or always true*). The convergent and discriminant validity for both acting-with-awareness and non-judging is supported by findings that mindfulness meditators score more highly on both scales compared to non-meditators (Baer et al., 2008; de Bruin et al., 2012), and each scale also shares strong inverse associations with various maladaptive emotional regulation processes (Giovannini et al., 2014; Sugiura et al., 2012; Tran et al., 2013). High internal consistencies have been reported for mindful-acting-with-awareness ($\alpha = .87$ to $.90$) and mindful-non-judging ($\alpha = .87$ to $.93$) (Baer et al., 2006; Christopher et al., 2012). In a Dutch

sample, test-retest reliability was questionable for mindful-acting-with-awareness ($r = .61$) and good for mindful-non-judging ($r = .84$) over two weeks (Veehof et al., 2011). In a French sample, test-retest reliability was acceptable for acting-with-awareness ($r = .72$) and unacceptable for non-judging ($r = .41$) over two months (Heeren, Douilliez, Peschard, Debrauwere, & Philippot, 2011). In an Italian sample, test-retest reliability was acceptable for acting-with-awareness ($r = .70$) and questionable for non-judging ($r = .58$) over two years (Petrocchi & Ottaviani, 2015). In this study, internal consistencies were high at all time points for mindful-acting-with-awareness ($\alpha \geq .89$) and mindful-non-judging ($\alpha \geq .93$). Test-retest reliabilities were acceptable over three and six months, respectively, for both for mindful-acting-with-awareness ($r = .72$ and $.70$) and mindful-non-judging ($r = .76$ and $.72$), thus providing support for the constructs as relatively stable dispositional tendencies.

Procedure. Participants were asked to click on the URL imbedded in the study advertisement if they wished to participate in the research. They were then provided with study information for their perusal before giving written informed consent (see Appendix B and C).

The online study was hosted using the Qualtrics Research Suite (Qualtrics, 2015). Participants were asked about their demographic details, amount of mindfulness meditation practice they had engaged in over the past month, and their experiences of rumination, mindfulness, depression, anxiety, and stress (see Appendix D). They were required to complete items in order to advance through the survey. Participants were also asked to provide an email address so that a survey link could be provided to the follow-up questionnaires at three and six months, which was kept in a separate file from the participant data.

Upon completion of each survey, participants were presented with a debrief statement (see Appendix E). T1 data was collected from January to March 2015, T2 data was collected from April to June 2015, and T3 data was collected from June to September 2015. As an incentive, participants were offered the opportunity to enter a prize draw to win one of three AUD\$100 shopping vouchers upon completion of the T2 and T3 questionnaires.

Statistical analysis. A series of hierarchical multiple regression analyses were conducted in the Statistical Package for the Social Sciences to examine whether baseline dispositional rumination and mindfulness variables, including their interactions, would predict depression, anxiety, and stress levels at both three and six months. The three and six month time periods were selected in order to investigate differential effects across varying timeframes. Regression was utilised in line with the analytic procedures employed in recent longitudinal studies (e.g., Eisma et al., 2015; Petrocchi & Ottaviani, 2015; Thomsen et al., 2013; Williams et al., 2010). In each analysis, relevant demographic variables and baseline affective symptoms were entered at step 1, rumination was then entered at step 2, mindful acting-with-awareness and non-judging were entered at step 3, and the interaction terms were entered at step 4 (i.e., acting-with-awareness X rumination, non-judging X rumination, acting-with-awareness X non-judging). Mean-centred predictors and interaction terms were created and utilised in all regression analyses.

The demographic variables controlled in all regression analyses included gender, age, and educational level. These variables were selected because mood and anxiety disorder prevalence estimates (Australian Bureau of Statistics, 2008) and subclinical affective symptoms (Crawford & Henry, 2003) have been shown

to vary by gender, age, and years of education. Furthermore, rumination is reportedly more pervasive in women than in men (Nolen-Hoeksema et al., 2008), and the relationship between rumination and depression has been reported to be stronger in women (Olatunji et al., 2013). Recent engagement in mindfulness practice was also considered as a potential confounding variable, given that meditators have been shown to score higher on non-judging and acting-with-awareness (Baer et al., 2008; de Barros, Kozasa, de Souza, & Ronzani, 2014; de Bruin et al., 2012; Josefsson, Larsman, Broberg, & Lundh, 2011). However, mindfulness practice over the last month was uncorrelated with any of the predictor variables, and it was only correlated with one outcome variable at one time point (i.e., T1 depression, point-biserial correlation $r = -.10, p < .01$); thus mindfulness practice was not controlled for in the regression analyses.

Results

Attrition analysis. Between-groups *t*-tests revealed that participants who discontinued after T1 were younger ($n = 232, M = 29.3, SD = 9.86$) than those who completed T2 surveys ($n = 498, M = 32.2, SD = 11.80$), $t(532.11) = -.3.49, p = .001$, as were those who discontinued after T2 ($n = 145, M = 30.0, SD = 10.02$), relative to those who completed T3 surveys ($n = 353, M = 33.4, SD = 12.24$), $t(324.74) = -.3.24, p = .001$. *Chi*-square analyses revealed that those who discontinued after T1 ($n = 232$) were less likely to hold a tertiary degree than those at T2 ($n = 498$), $\chi_1^2 = 4.73, p = .03$, and at T2 ($n = 145$) relative to T3 ($n = 353$), $\chi_1^2 = 8.76, p = .003$. Those who discontinued after T1 ($n = 232$) were also less likely to be Caucasian than those at T2 ($n = 498$), $\chi_1^2 = 8.53, p = .003$, and at T2 ($n = 145$) relative to T3 ($n = 353$), $\chi_1^2 = 6.05, p = .014$. No other

demographic differences were detected between the participants who were retained and those who discontinued.

A series of between-groups *t*-tests also revealed that the participants who continued versus discontinued at T2 and T3 did not differ in terms of depression, anxiety, stress, rumination, mindful-acting-with-awareness, or mindful-non-judging ($p > .05$).

Descriptive statistics. Descriptive statistics for all key study variables are displayed in Table 3. Paired-sample *t*-tests for each variable indicated that depression decreased from T1 to T2, rumination decreased from T1 to T2, and T2 to T3, and mindful-non-judging increased from T1 to T2, and T2 to T3.

Using normative data from a large Australian sample (Lovibond & Lovibond, 1995b), DASS clinical severity ratings were also ascertained based on average scores at each time point (i.e., “normal”, “mild”, “moderate”, “severe”, or “extremely severe”). Depression scores were moderate at T1 and mild at T3, while anxiety scores were consistently mild across T1 to T3, and stress scores were mild at T1 and normal at T3.

Bivariate correlations. Bivariate Pearson product-moment correlations were calculated between the predictor and outcome variables at all time points, as displayed in Table 4. Co-morbidity patterns between the affective symptoms revealed high concurrent correlations at all time points, including stress and anxiety, stress and depression, and anxiety and depression. Concurrent associations amongst predictors at all time points revealed moderate to high correlations between mindful-acting-with-awareness with both mindful-non-judging (positive direction) and rumination (inverse direction), and high positive correlations between mindful-non-judging and rumination.

Table 3

Descriptive Statistics and Comparisons for Depression, Anxiety, Stress, Rumination, Mindful-Acting-With-Awareness, and Mindful-Non-Judging at Baseline (T1), 3 Months (T2) and 6 Months (T3)

	Descriptive Statistics			Comparisons Between Time Points	
	T1	T2	T3	T1 to T2	T2 to T3
<i>n</i>	730	498	353	498 (<i>df</i> 497)	353 (<i>df</i> 352)
Depression					
<i>M</i> (SD)	7.4 (5.54)	6.8 (5.53)	6.2 (5.44)	7.5 (5.61) vs 6.8 (5.53)	6.5 (5.48) vs 6.2 (5.44)
Severity	“Moderate”	“Mild to moderate”	“Mild”	$t = 3.35^{**}$	$t = 1.13$
Anxiety					
<i>M</i> (SD)	4.4 (4.18)	4.2 (4.07)	4.0 (3.80)	4.3 (4.04) vs 4.2 (4.07)	4.1 (3.86) vs 4.0 (3.80)
Severity	“Mild”	“Mild”	“Mild”	$t = 0.79$	$t = 0.20$
Stress					
<i>M</i> (SD)	7.7 (4.82)	7.3 (4.76)	7.0 (4.68)	7.5 (4.73) vs 7.3 (4.76)	7.0 (4.57) vs 7.0 (4.68)
Severity	“Mild”	“Normal to mild”	“Normal”	$t = 1.67$	$t = 0.32$
Rumination					
<i>M</i> (SD)	44.6 (10.13)	43.1 (10.39)	41.9 (11.06)	44.9 (10.18) vs 43.1 (10.39)	42.7 (10.64) vs 41.9 (11.06)
				$t = 5.85^{***}$	$t = 2.00^*$
Act-Aware					
<i>M</i> (SD)	23.6 (6.11)	23.5 (5.90)	23.5 (5.87)	23.6 (5.98) vs 23.5 (5.90)	23.5 (5.51) vs 23.5 (5.87)
				$t = 0.32$	$t = 0.03$
Non-Judge					
<i>M</i> (SD)	23.6 (7.85)	24.1 (7.65)	24.9 (7.89)	23.6 (7.94) vs 24.1 (7.65)	24.4 (7.48) vs 24.9 (7.89)
				$t = -1.99^*$	$t = -2.03^*$

*Note: Depression = DASS-21-Depression, Anxiety = DASS-21-Anxiety, Stress = DASS-21-Stress, Rumination = RSQ-Rumination, Act-Aware = FFMQ Mindful-Acting-With-Awareness, Non-Judge = FFMQ Mindful-Non-Judging. DASS-21 severity descriptors are based off norm data from a large Australian sample (Lovibond & Lovibond, 1995b). *** $p < .001$, ** $p < .01$, * $p < .05$.*

Table 4

Bivariate Correlations Between Rumination, Mindful-Acting-With-Awareness, Mindful-Non-Judging, Depression, Anxiety and Stress at all Time Points

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. T1 Rum	-	.78	.76	-.41	-.35	-.38	-.63	-.58	-.59	.53	.39	.41	.49	.40	.44	.58	.49	.49
2. T2 Rum	.78	-	.80	-.31	-.40	-.37	-.59	-.66	-.62	.45	.51	.41	.44	.47	.43	.53	.58	.51
3. T3 Rum	.76	.80	-	-.27	-.33	-.41	-.59	-.63	-.69	.46	.45	.50	.45	.43	.47	.49	.51	.57
4. T1 Act-A	-.41	-.31	-.27	-	.72	.70	.44	.35	.28	-.41	-.33	-.30	-.36	-.33	-.28	-.43	-.38	-.27
5. T2 Act-A	-.35	-.40	-.33	.72	-	.79	.33	.41	.32	-.38	-.44	-.34	-.32	-.40	-.29	-.39	-.45	-.34
6. T3 Act-A	-.38	-.37	-.41	.70	.79	-	.33	.35	.45	-.35	-.37	-.41	-.27	-.31	-.36	-.35	-.40	-.43
7. T1 Non-J	-.63	-.60	-.59	.44	.33	.33	-	.76	.72	-.48	-.39	-.40	-.44	-.42	-.42	-.51	-.48	-.44
8. T2 Non-J	-.58	-.66	-.63	.35	.41	.35	.76	-	.80	-.42	-.48	-.42	-.43	-.47	-.46	-.47	-.54	-.47
9. T3 Non-J	-.59	-.62	-.69	.28	.32	.45	.72	.80	-	-.36	-.38	-.49	-.41	-.42	-.51	-.46	-.49	-.55
10. T1 Dep	.53	.45	.46	-.41	-.38	-.35	-.48	-.42	-.36	-	.66	.67	.61	.48	.47	.66	.49	.45
11. T2 Dep	.39	.51	.45	-.33	-.44	-.37	-.39	-.48	-.38	.66	-	.66	.47	.64	.45	.47	.70	.44
12. T3 Dep	.41	.41	.50	-.30	-.34	-.41	-.40	-.42	-.49	.67	.66	-	.47	.52	.60	.43	.49	.67
13. T1 Anx	.49	.44	.45	-.36	-.32	-.27	-.44	-.43	-.41	.61	.47	.47	-	.70	.70	.73	.54	.51
14. T2 Anx	.40	.47	.43	-.33	-.40	-.31	-.42	-.47	-.42	.48	.64	.52	.70	-	.66	.57	.74	.55
15. T3 Anx	.44	.43	.47	-.28	-.29	-.36	-.42	-.46	-.51	.47	.45	.60	.70	.66	-	.56	.52	.69
16. T1 Str	.58	.53	.49	-.43	-.39	-.35	-.51	-.47	-.46	.66	.47	.43	.73	.57	.56	-	.68	.62
17. T2 Str	.49	.58	.51	-.38	-.45	-.40	-.48	-.54	-.49	.49	.70	.49	.54	.74	.52	.68	-	.66
18. T3 Str	.49	.51	.57	-.27	-.34	-.43	-.44	-.47	-.55	.45	.44	.67	.51	.55	.70	.62	.66	-

Note: For T1 n = 730, T2 n = 498, T3 = n = 353, Rum = RSQ-Rumination, Act-A = FFMQ Mindful-Acting-With-Awareness, Non-J = FFMQ Mindful-Non-Judging, Dep = DASS-21-Depression, Anx = DASS-21-Anxiety, Str = DASS-21-Stress. All correlations are significant at $p < .01$, **bold** = concurrent association.

Concurrent associations between the predictors and affective outcomes revealed moderate to high correlations between both rumination and non-judging with depression and anxiety, and high associations with stress, whereas acting-with-awareness tended to be moderately correlated with all affective symptoms. Correlations between baseline predictors with T2 and T3 affective outcomes revealed that both rumination and non-judging tended to be moderately correlated with later depression and anxiety and highly with stress, while mindful-acting-with-awareness tended to share small to moderate correlations with later affective symptoms.

Longitudinal multiple regression analyses. A series of hierarchical multiple regression analyses examined whether baseline dispositional rumination, mindful-acting-with-awareness, and mindful-non-judging predicted depression, anxiety, and stress levels at both three and six months, after controlling for age, gender, and educational status and the particular affective symptom at baseline.

Prior to regression analyses, the variables of interest were examined for the assumptions of multivariate analysis as per the guidelines of Tabachnick and Fidell (2013). With regards to continuous variables, outliers were detected for age, in addition to anxiety at T1, T2 and T3 (i.e., z -scores > 3.29). No outliers were detected on gender or education level given dichotomized splits were not extreme (i.e., 10-90). Investigations of normality revealed that T1 rumination was negatively skewed, age was positively skewed, while T1 to T3 depression, anxiety, and stress were positively skewed. Thus, as per recommendations to reduce skewness, and particularly where variables are skewed in opposing directions (Tabachnick & Fidell, 2013), age was inverse transformed, depression, anxiety, and stress were square root transformed at all time points, and T1

rumination was reversed and then square root transformed (then reversed back for interpretability). Outliers were no longer evident for transformed variables.

Preliminary regression analyses with transformed variables revealed no major issues with heteroscedasticity, correlated errors, multicollinearity, or non-normally distributed errors. Cases including multivariate outliers were identified and removed based on extreme Mahalanobis distances (i.e., chi square critical value of > 29.59 , based on 10 predictors at $p = .001$) in order to reduce their influence (Tabachnick & Fidell, 2013). Thus, final regression analyses included 485 cases for predicting T1-T2 depression, 484 for T1-T2 anxiety, 482 for T1-T2 stress, 345 for T1-T3 depression, 347 for T1-T3 anxiety, and 346 cases for T1-T3 stress.

Given that participants who completed T2 and T3 questionnaires tended to be older and more educated than those who discontinued the study, weighting variables were created to minimise the possibility of sampling effects unduly influencing the data. Specifically, participant ages were transformed into age-categories based on deciles, and the number of completers and non-completers falling into each age category and educational status were cross-tabulated for T1, T2, and T3. Based on these cross-tabulations, two weighting variables were calculated so that the T2 and T3 completer cases matched the age category and educational status frequencies of the T1 sample. The T2 weighting variable was applied to the data for regressions investigating T1-T2, and the T3 weighting variable was applied to the T1-T3 regressions, and these analyses are reported below. Regressions were also run without weighting the data, revealing one difference in the pattern of results, which is specified below. Regression results are displayed in Tables 5 to 7.

Table 5

Hierarchical Multiple Regression Analyses for Rumination, Mindful-Acting-With-Awareness, and Mindful-Non-Judging in Predicting Depression at 3-Months (T1-T2) and 6-Months (T1-T3)

Predictor	T1-T2 (n = 485)				T1-T3 (n = 345)			
	F (ΔF)	R ² (ΔR^2)	β	sr ²	F (ΔF)	R ² (ΔR^2)	β	sr ²
Step 1 [^]	98.93***	.45			70.78***	.45		
T1 Depression			.66***	.41			.66***	.43
Step 2 [^]	(11.16**)	(.012)			(8.00**)	(.013)		
T1 Depression			.58***	.22			.58***	.23
Rum			.14***	.012			.14**	.013
Step 3 [^]	(0.71)	(.002)			(1.43)	(.004)		
T1 Depression			.57***	.19			.57***	.19
Rum			.12*	.006			.08	.003
Act-A			-.04	.001			-.01	<.001
Non-J			-.02	<.001			-.09	.004
Step 4 [^]	(0.95)	(.003)			(2.55)	(.012)		
T1 Depression			.57***	.19			.57***	.20
Rum			.12*	.006			.08	.003
Act-A			-.04	.001			-.01	<.001
Non-J			-.02	<.001			-.09	.003
RumXAct-A			.01	<.001			-.12*#	.006
RumXNon-J			-.02	<.001			-.06	.003
Act-AXNon-J			.05	.001			-.11	.005

*Note: Depression = DASS-21-Depression, Rum = RSQ-Rumination, Act-A = FFMQ Mindful-Act-With-Awareness, Non-J = FFMQ Mindful-Non-Judging. [^]Demographic variables included in step 1 of analyses but not listed here include age, dichotomised gender and dichotomised education. *** p < .001, ** p < .01, * p < .05. #With no weighting applied RumXAct-A was only marginally significant in predicting depression across T1-T3 (p = .08, sr² = .005).*

Table 6

Hierarchical Multiple Regression Analyses for Rumination, Mindful-Acting-With-Awareness, and Mindful-Non-Judging in Predicting Anxiety at 3-Months (T1-T2) and 6-Months (T1-T3)

Predictor	T1-T2 (n = 484)				T1-T3 (n = 347)			
	F (ΔF)	R ² (ΔR^2)	β	sr ²	F (ΔF)	R ² (ΔR^2)	β	sr ²
Step 1 [^]	123.35***	.51			88.79***	.51		
T1 Anxiety			.71***	.48			.69***	.46
Step 2 [^]	(8.57**)	(.009)			(7.06**)	(.010)		
T1 Anxiety			.64***	.28			.62***	.25
Rum			.11**	.009			.12**	.010
Step 3 [^]	(3.65*)	(.007)			(1.33)	(.004)		
T1 Anxiety			.62***	.25			.61***	.23
Rum			.06	.002			.08	.003
Act-A			-.08*	.004			-.05	.002
Non-J			-.05	.001			-.04	.001
Step 4 [^]	(2.41)	(.007)			(2.01)	(.008)		
T1 Anxiety			.61***	.24			.61***	.23
Rum			.07	.002			.09	.003
Act-A			-.08*	.005			-.05	.002
Non-J			-.05	.001			-.04	.001
RumXAct-A			.05	.001			-.11*	.006
RumXNon-J			.01	<.001			-.02	<.001
Act-AXNon-J			.12*	.006			-.05	.001

Note: Anxiety = DASS-21-Anxiety, Rum = RSQ-Rumination, Act-A = FFMQ Mindful-Act-With-Awareness, Non-J = FFMQ Mindful-Non-Judging. [^]Demographic variables included in step 1 of analyses but not listed here include age, dichotomised gender and dichotomised education.

*** $p < .001$, ** $p < .01$, * $p < .05$.

Table 7

Hierarchical Multiple Regression Analyses for Rumination, Mindful-Acting-With-Awareness, and Mindful-Non-Judging in Predicting Stress at 3-Months (T1-T2) and 6-Months (T1-T3)

Predictor	T1-T2 (n = 482)				T1-T3 (n = 346)			
	F (ΔF)	R ² (ΔR^2)	β	sr ²	F (ΔF)	R ² (ΔR^2)	β	sr ²
Step 1 [^]	107.69***	.48			52.31***	.38		
T1 Stress			.69***	.47			.62***	.38
Step 2 [^]	(23.41***)	(.025)			(15.33***)	(.027)		
T1 Stress			.56***	.19			.49***	.15
Rum			.20***	.025			.21***	.027
Step 3 [^]	(1.63)	(.003)			(1.37)	(.005)		
T1 Stress			.53***	.16			.47***	.13
Rum			.17***	.013			.16*	.010
Act-A			-.05	.002			.03	.001
Non-J			-.05	.001			-.10	.005
Step 4 [^]	(3.16*)	(.010)			(1.36)	(.007)		
T1 Stress			.53***	.15			.49***	.13
Rum			.18***	.014			.16*	.010
Act-A			-.05	.002			.03	.001
Non-J			-.04	.001			-.10	.004
RumXAct-A			.04	.001			-.11	.005
RumXNon-J			.003	<.001			-.01	<.001
Act-AXNon-J			.13**	.007			-.06	.001

Note: Stress = DASS-21-Stress, Rum = RSQ-Rumination, Act-A = FFMQ Mindful-Act-With-Awareness, Non-J = FFMQ Mindful-Non-Judging. [^]Demographic variables included in step 1 of analyses but not listed here include age, dichotomised gender and dichotomised education.

***p < .001, **p < .01, *p < .05.

As seen in Tables 5 to 7, depression, anxiety, and stress at baseline (T1) predicted depression, anxiety, and stress, respectively, at three months (T2) and six months (T3). In line with hypothesis 1, greater T1 rumination predicted higher T2 and T3 depression levels, after controlling for T1 depression and demographics, accounting for 1.2% and 1.3% of the variance in depression, respectively. When considered with the mindfulness variables, T1 rumination continued to predict T2 depression, accounting for 0.6% of the variance in depression, however it no longer predicted T3 depression. Contrary to the prediction of hypothesis 2, both T1 mindful-acting-with-awareness and T1 mindful-non-judging failed to predict T2 and T3 depression levels. However, as predicted in hypothesis 3, there was a significant interaction between T1 acting-with-awareness and T1 rumination predicting T3 depression levels ($p = .045$, accounting for 0.6% of the variance in depression; although this effect was not significant when weighting was not applied to the analysis).

Aligning with hypothesis 1, greater T1 rumination also predicted higher T2 and T3 anxiety levels, after controlling for T1 anxiety and demographics, accounting for 0.9% and 1.0% of the variance in anxiety, respectively. However, T1 rumination no longer predicted T2 or T3 anxiety levels after including the mindfulness variables. With regards to hypotheses 2 and 3, higher T1 mindful-acting-with-awareness predicted lower anxiety levels at T2, considered with T1 non-judging and T1 rumination, and also their interactions, accounting for 0.4% and 0.5% of the variance in anxiety, respectively; however, T1 mindful-acting-with-awareness did not predict T3 anxiety levels. Contrary to hypothesis 2, T1 mindful-non-judging failed to predict both T2 and T3 anxiety levels. Finally, while not hypothesised, the interaction between acting-with-awareness and non-

judging predicted T2 anxiety, accounting for 0.6% of the variance in anxiety, whereas as predicted in hypothesis 3 the interaction between acting-with-awareness and rumination predicted T3 anxiety, accounting for 0.6% of the variance in anxiety.

In line with hypothesis 1, greater T1 rumination predicted higher T2 and T3 stress levels after controlling for T1 stress and demographics, accounting for 2.5% and 2.7% of the variance in stress, respectively. T1 rumination continued to predict T2 and T3 stress levels after including the mindfulness variables, accounting for 1.3% and 1.0% of the variance in stress, respectively, and also when including their interactions, accounting for 1.4% and 1.0% of the variance in stress, respectively. Diverging from the prediction of hypothesis 2, T1 mindful-acting-with-awareness and T1 mindful-non-judging failed to predict both T2 and T3 stress levels. However, while not hypothesised, the interaction between T1 mindful-acting-with-awareness and T1 mindful-non-judging predicted T2 stress, accounting for 0.7% of the variance in stress.

Analyses of interaction effects. In order to probe the significant interactions, Model 1 of the PROCESS Macro (Hayes, 2013) was utilised to investigate the conditional effects of each interaction variable on the outcome variable at different levels of the other interaction variable (i.e., at 1 SD above the mean, the mean, and 1 SD below the mean), and to generate plots to visualise the interactions. Bias-corrected bootstrapping based on 10,000 samples was used to generate 95% confidence intervals. Because bootstrapping methods are robust to deviations of normality (Preacher & Hayes, 2004) and PROCESS cannot accommodate weighting commands, untransformed variables and non-weighted cases were investigated. Each analysis controlled for age, gender, education, the

baseline affective variable, and the main effects for rumination, acting-with-awareness and non-judging. Predictors and interaction terms were mean-centred.

Regression analyses indicated that the interaction term for T1 acting-with-awareness and T1 rumination predicted T3 depression; however, this just reached significance ($p = .045$) and was not significant when weighting was not applied. Correspondingly, post-hoc analyses revealed that the interaction between T1 acting-with-awareness and T1 rumination did not predict T3 depression (coefficient = $-.01$, $t = -1.34$, $p = .18$). However, conditional effects indicated that higher T1 rumination exerted somewhat stronger effects in predicting higher T3 depression when at low levels of T1 acting-with-awareness (effect = $.06$, $t = 1.37$, $p = .17$) than at high levels of T1 acting-with-awareness (effect = $.004$, $t = .13$, $p = .90$), as displayed in Figure 3.

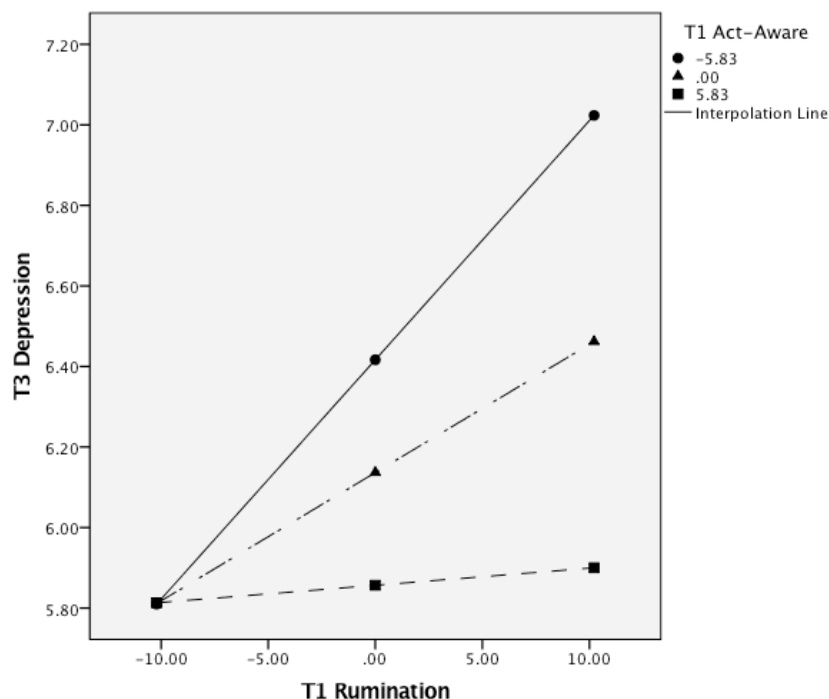


Figure 3. A graphical representation of the conditional effect of baseline rumination on six-month depression at different levels of baseline mindful-acting-with-awareness (1 SD \pm the mean)

The interaction between T1 acting-with-awareness and T1 non-judging predicted T2 anxiety symptoms (coefficient = .01, $t = 2.60$, $p = .01$). Conditional effects revealed that lower T1 non-judging predicted higher T2 anxiety when at low levels of T1 acting-with-awareness (effect = -.09, $t = -2.86$, $p = .004$), but not at high levels of T1 acting-with-awareness (effect = -.01, $t = -.26$, $p = .79$), as displayed in Figure 4.

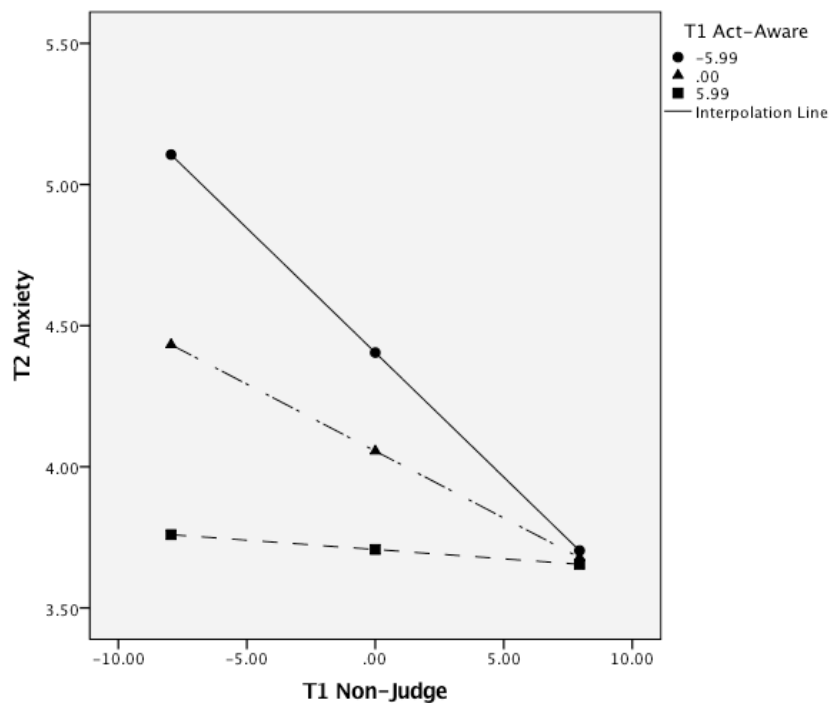


Figure 4. A graphical representation of the conditional effect of baseline mindful-non-judging on three-month anxiety at different levels of baseline mindful-acting-with-awareness (1 SD \pm the mean)

The interaction between T1 acting-with-awareness and T1 rumination predicted T3 anxiety symptoms (coefficient = -.01, $t = -2.74$, $p = .01$).

Conditional effects revealed that higher T1 rumination predicted higher T3

anxiety at low levels of T1 acting-with-awareness (effect = .07, $t = 2.49$, $p = .01$), but not at high levels of T1 acting-with-awareness (effect = -.004, $t = -.20$, $p = .84$), as displayed in Figure 5.

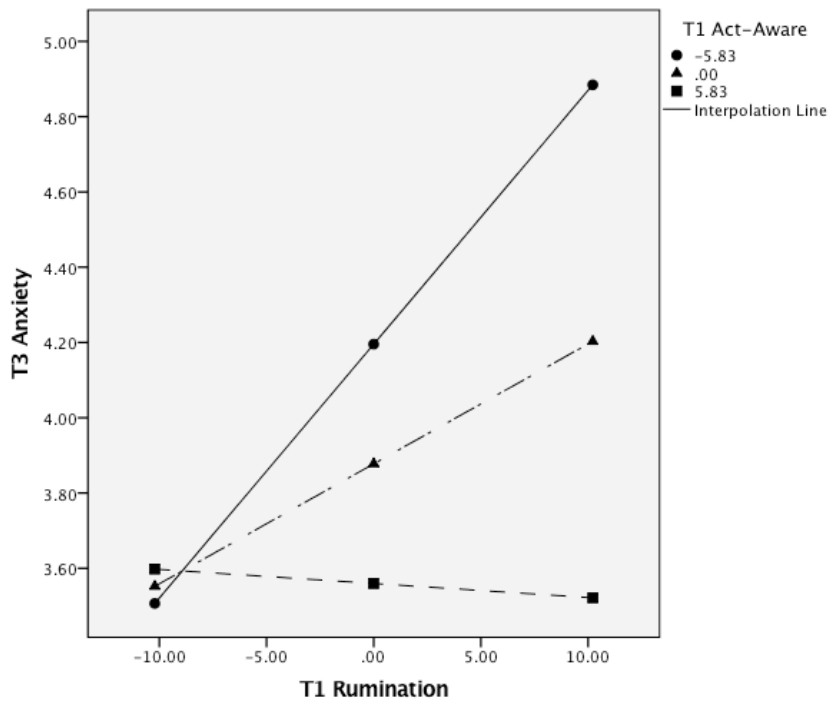


Figure 5. A graphical representation of the conditional effect of baseline rumination on six-month anxiety at different levels of baseline mindful-acting-with-awareness (1 SD \pm the mean)

Finally, the interaction between T1 acting-with-awareness and T1 non-judging predicted T2 stress symptoms (coefficient = .01, $t = 2.20$, $p = .03$). Conditional effects revealed that lower T1 non-judging predicted higher T2 stress when at low levels of T1 acting-with-awareness (effect = -.11, $t = -2.55$, $p = .01$), but not at high levels of T1 acting-with-awareness (effect = -.01, $t = -.19$, $p = .85$), as displayed in Figure 6.

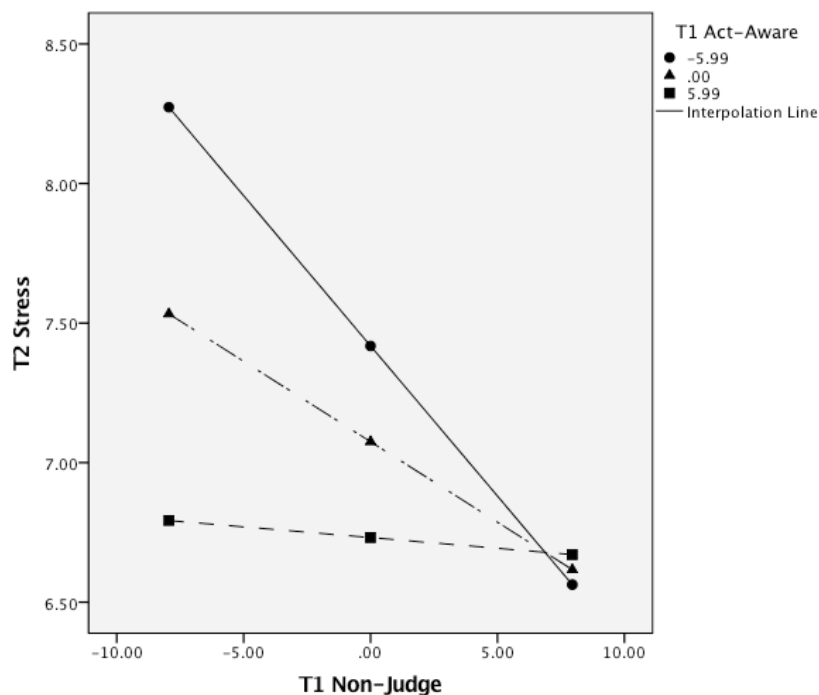


Figure 6. A graphical representation of the conditional effect of baseline mindful-non-judging on three-month stress at different levels of baseline mindful-acting-with-awareness (1 SD \pm the mean)

Supplementary analyses of factor structure. Rumination and non-judging were highly inversely correlated at baseline ($r = -.63$), they shared comparable bivariate associations with affective outcomes, demonstrated similar interaction patterns with acting-with-awareness, and evidenced similarity in their item content (e.g., rumination: *I often find myself re-evaluating something I've done* vs. non-judging: *I disapprove of myself when I have irrational ideas*). Thus, a principal components analysis was conducted on these scales to investigate their construct differentiation. Orthogonal (varimax) and oblique (direct oblim) rotations were conducted, with both analyses revealing three core factors with eigenvalues over Kaiser's criterion of 1 (Field, 2009): rumination (eigenvalue = 10.18), non-judging (2.34), and another factor representing reverse-scored

rumination items (1.03). To obtain a more accurate indication of factors, principal components analysis using parallel analysis with *RAWPAR* (O'Connor, 2000) was conducted and revealed two core factors: rumination and non-judging. These findings suggest that rumination and non-judging do indeed represent two distinct constructs.

Discussion

The aim of this study was to investigate longitudinal predictive relationships between various emotion regulation processes (i.e., non-mood-responsive rumination, mindful-acting-with-awareness, and mindful-non-judging) to affective symptom severity, after controlling for baseline affective symptoms. The results showed that greater baseline rumination predicted greater increases in depression, anxiety, and stress levels at both three and six months. When considered with acting-with-awareness and non-judging, greater rumination continued to predict higher depression levels at three months, and stress at three and six months, but not depression at six months, nor anxiety at three or six months. Baseline non-judging did not predict depression, anxiety or stress levels at either three or six months. Greater baseline acting-with-awareness predicted lower anxiety levels at three months, but not anxiety at six months, nor depression or stress at either three or six months. However, there was a trend for greater baseline rumination in predicting higher depression levels at six months when baseline acting-with-awareness was low (but not when acting-with-awareness was high). In addition, greater baseline rumination predicted higher anxiety levels at six months when baseline acting-with-awareness was low (but not when acting-with-awareness was high). Finally, lower baseline non-judging

predicted higher anxiety and stress levels at three months when baseline acting-with-awareness was low (but not when acting-with-awareness was high).

Considered on its own, rumination consistently predicted higher affective symptoms longitudinally, aligning with findings across various timeframes whereby both mood-responsive rumination (Calmes & Roberts, 2007; Ciarrochi & Scott, 2006; Nolen-Hoeksema, 2000; Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema et al., 1994) and non-mood-responsive rumination (Ciarrochi & Scott, 2006; Feldman & Hayes, 2005; Nolen-Hoeksema & Morrow, 1991; Robinson & Alloy, 2003) predicted depression, anxiety, and stress symptoms. Thus, expanding initial conceptualisations of rumination as a mood-responsive strategy linked with depression specifically (Nolen-Hoeksema, 1991), a general tendency to critically self-focus on personal experiences may serve to amplify and extend negative affect more broadly (Thomsen, 2006; Watkins, 2008) and/or limit the utilisation of more adaptive strategies (Nolen-Hoeksema et al., 2008). Furthermore, given that the tendency towards ruminative thinking influenced affective symptoms over-and-above baseline symptoms and across lengthy time periods, it appears to represent more than just a comorbid symptom of affective distress, and may instead be a potent trans-diagnostic risk factor.

Indeed, in the current study, the most consistent relationships were found between rumination with a measure of affective distress common to both depressive and anxiety symptoms: psychological stress (Lovibond & Lovibond, 1995a). Rumination was strongly concurrently associated with stress, it predicted stress across both three and six months, over-and-above the influence of mindful acting-with-awareness and non-judging, and it was not moderated by either mindfulness variable in predicting stress. Furthermore, when looking at the

unique variance accounted for in affective outcomes across analyses, of all emotion regulation predictors, rumination accounted for the highest unique variance in predicting stress. Thus, the tendency towards ruminative thinking appears to represent a significant risk factor for later stress, possibly by prompting self-questioning and uncertainty (Nolen-Hoeksema, 2000), and/or discrepancy-based thinking (Smith & Alloy, 2009; Trapnell & Campbell, 1999), which may fuel the perceived inability to cope (Lazarus & Folkman, 1984).

Furthermore, given that rumination reflects a tendency towards repetitive self-evaluative thinking (Trapnell & Campbell, 1999), it seems plausible that it will be more robustly associated with the subjective experience of over-arousal (i.e., stress) than with physiological over-arousal symptoms specifically (i.e., anxiety). Indeed, in the current study, rumination did not directly predict anxiety at either time point when considered with the mindfulness variables, aligning with previously reported diluted effects when other factors are considered simultaneously (e.g., worry, problem-solving ability; Ciarrochi & Scott, 2006; Hong, 2007). Thus, rumination may be one symptom of many implicated in anxiety, of which other maladaptive factors including worry (Hong, 2007), or combined worry and rumination (e.g., repetitive thinking; Segerstrom et al., 2000) may exert stronger effects. Indeed, worry represents the cognitive process of future-orientated vigilance and projected threat (Mathews, 1990), which is especially implicated in anxiety symptoms (McLaughlin, Borkovec, & Sibrava, 2007; Meyer, Miller, Metzger, & Borkovec, 1990). Conversely, a general tendency to ruminate reflects a broader process of dwelling on recent or past experiences (Trapnell & Campbell, 1999), and thus it likely shares stronger associations with stress over anxiety.

A general tendency to ruminate also differentially predicted depression over time when considered together with dispositional mindfulness variables; it directly predicted depression at three but not six months, thereby implying that it exerts a shorter-term rather than longer-term risk for depression. However, these findings should be interpreted in light of sample-specific factors. For example, rumination scores naturally decreased across both time points, whereas depression scores decreased over the first three months; the natural absence of change in depression over the later period may have limited the statistical power to detect changes influenced by predictors. Furthermore, the sample was moderately depressed at baseline, and non-significant longitudinal relationships between rumination and depression have previously been reported in depressed samples (Bagby et al., 1999; Schmalzing et al., 2002). Specifically, it has been proposed that ruminative tendencies may account for the progression from mild to high depression, but once an individual is clinically depressed, other neurobiological processes may maintain depressive symptoms (Nolen-Hoeksema et al., 2008). Irrespective of sampling effects, it is also possible that mood-responsive rumination is especially linked to depression (Nolen-Hoeksema, 1991), whereas a more general ruminative style may exert weaker and/or indirect effects over time.

Other processes may also account for the non-significant longitudinal associations found between rumination with both depression and anxiety. Specifically, rumination and stress were consistently associated in the current study, and thus they may work in unison to contribute to later depression and anxiety (Michl et al., 2013; Nolen-Hoeksema & Morrow, 1991), as will be explored in Study 2. In addition, it is noteworthy that every case where the main

effects of rumination became non-significant were qualified by significant predictive effects of dispositional mindful-acting-with-awareness. The idea that mindfulness can attenuate the detrimental effects of rumination on affective symptoms aligns with theoretical accounts regarding the protective effects of mindfulness practice (Segal et al., 2013) and also findings from MBI studies (Jain et al., 2007; Ramel et al., 2004). These considerations will be discussed in more detail shortly.

However, findings from the current study suggest that different tendencies towards mindfulness in daily life confer differential effects on later psychological symptoms. That is, contrary to expectations, considered together with rumination and mindful-acting-with-awareness, mindful-non-judging did not directly predict any affective outcome at either time-point, contrasting with previously reported significant predictions of later depression, anxiety, and stress (Lloyd & Hastings, 2008; Petrocchi & Ottaviani, 2015). Nonetheless, bivariate associations between baseline non-judging with affective outcomes at both three and six months were moderate to strong. Thus, non-judging might not be a significant predictor of later affective outcomes when considered together with other indices of dispositional mindfulness. For example, Barnes and Lynn (2010) found that later depression was not predicted by any of four different facets of mindfulness when considered simultaneously (i.e., non-judging, acting-with-awareness, non-reactivity or observing). However, non-judging has also been found to be the only significant mindfulness factor to longitudinally predict depression, considered together with acting-with-awareness, non-reactivity, observing and describing facets (Petrocchi & Ottaviani, 2015).

A more plausible explanation for the non-significant predictive effects of non-judging is its strong inverse association with rumination. Specifically, non-judging and rumination both represent varied tendencies towards critical self-evaluative appraisal processes (e.g., rumination: “I often find myself re-evaluating something I’ve done” vs. non-judging: “I disapprove of myself when I have irrational ideas”, reverse scored). Furthermore, in the current study, they were strongly inversely correlated, their levels both changed from baseline to six months (i.e., non-judging increased while rumination decreased), and their patterns of bivariate correlations with affective outcomes were nearly identical.

Thus, even though non-judging and rumination represent distinct constructs, their close negative association may have created suppressor effects in the regression analyses. Supporting this premise, it has been shown that non-judging is no longer a significant predictor of later affective symptoms when rumination is considered simultaneously (Petrocchi & Ottaviani, 2015). In the current study, rumination outperformed non-judging as a predictor, possibly because it was somewhat more stable over time (i.e., test-retest reliability was $r = .78$ and $.76$ for rumination, and $r = .76$ and $.72$ for non-judging, across three and six months, respectively). There are also noteworthy differences in the scales; rumination reflects the tendency towards appraisal of various internal and external experiences extending into the past (i.e., self-concept, thoughts, behaviours, events; Trapnell & Campbell, 1999), whereas non-judging reflects appraisal of emotions and thoughts more specifically (Baer et al., 2006). Thus, because rumination is a more global and empirically stable construct, it may be a more potent predictor of later psychological distress than non-judging. This may

also explain why non-judging did not moderate the effects of rumination on later affective distress in the current study as predicted.

In contrast to mindful-non-judging, a higher tendency to maintain present-moment attention was protective against later affective distress. Specifically, higher acting-with-awareness directly predicted lower anxiety across three months, thus aligning with prior reported longitudinal associations between acting-with-awareness and negative affect (Brown & Ryan, 2003; Weinstein et al., 2009). However, this effect was not maintained at six months, possibly because the temporal stability of anxiety and acting-with-awareness were comparable in the current study, which may have limited the possibility of detecting change in anxiety over the extended timeframe. Alternatively, a higher tendency to attend to moment-by-moment experiences may be particularly protective against anxiety over the shorter term, possibly by countering experiential and behavioural avoidance, which have been implicated in the maintenance and treatment of anxiety symptoms (Hayes, Strosahl, & Wilson, 1999; Leahy, Holland, & McGinn, 2012). That is, in contrast to mindlessness, which can be motivated by avoidance, being more aware of current experiences may facilitate self-awareness and adaptive behavioural responses (Brown & Ryan, 2003).

The current findings also illuminate another mechanistic factor by which dispositional acting-with-awareness may protect against psychological distress: by buffering against the negative effects of highly self-critical appraisal processes. That is, individuals high in acting-with-awareness were protected from the detrimental effects of lower non-judging on increasing anxiety and stress over three months, and also protected from the effects of higher rumination

on increasing anxiety and depression over six months. Overall, it appears that individuals with a high tendency to act-with-awareness are less likely to experience shorter-term affective distress, even if they tend to discredit their emotional and cognitive experiences (i.e., are lower in non-judging), and are also less likely to experience longer-term affective distress, even if they are prone to dwell on various aspects of internal and external experience (i.e., are higher in rumination). The longer-term protective effects conferred by acting-with-awareness for high ruminators may partially reflect the higher temporal stability of rumination (cf. with non-judging).

Acting-with-awareness consistently attenuated the effects of critical self-evaluative processes on anxiety, across timeframes. It is possible that having a greater awareness of present-moment experiences may minimise the risk that perseverative self-evaluations will continue and subsequently exacerbate physiological arousal (e.g., see Brosschot et al., 2006). Higher acting-with-awareness may be especially protective against anxiety over the shorter term for individuals who tend to be less accepting of their cognitive and emotional experiences (i.e., low in non-judging), because it offers an antidote to experiential avoidance (Hayes et al., 1999; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). That is, even if acceptance of thoughts and feelings tends to be low, a higher tendency to be aware of current experiences may cultivate more contact with, and thus tolerance of, uncomfortable experiences. A higher tendency to attend to present-moment experiences may protect against anxiety over the longer-term for individuals prone to dwell on various aspects of internal and external experience (i.e., high rumination), because it affords an alternative attentional process that is present-focused and non-elaborative, and which can

facilitate distance from unhelpful cognitive-evaluative processes (Brown & Ryan, 2003; Segal et al., 2013).

Less robust findings were found between acting-with-awareness with depression. Specifically, acting-with-awareness did not directly predict later depression, contrasting with previously reported findings (Dixon & Overall, 2016; Williams et al., 2010). However, non-significant results have also been reported when investigating various facets of mindfulness simultaneously (Barnes & Lynn, 2010; Petrocchi & Ottaviani, 2015), which suggests that acting-with-awareness may be only one adaptive emotion regulation factor amongst several implicated in depression. Nonetheless, the absence of direct effects was qualified by the modest interaction between acting-with-awareness and rumination predicting six-month depression. Thus, a higher tendency to be attentive of present-moment experiences may protect those prone to ruminative thinking from increased depressive symptoms over the longer-term, possibly by offering an alternative present-centred attentional process (Brown & Ryan, 2003), or by allowing even highly-self-critical ruminative thoughts to be perceived as merely transitory events in the mind, rather than as inherently truthful (Segal et al., 2013). These protective effects were not evident for three-month depression; at this shorter follow-up period the direct effects of rumination appeared to outweigh the putative protection conferred by higher acting-with-awareness.

Acting-with-awareness was also differentially related to stress over time. That is, it was not a direct predictor of later stress as per previous findings (Black et al., 2012; Brown & Ryan, 2003), although significant interaction effects emerged. That is, regularly attending to present-moment experiences may buffer against the tendency to discredit thoughts and emotions (i.e., low non-judging),

thereby benefiting stress over the shorter-term, possibly by countering experiential avoidance and/or increasing adaptive engagement with experiences (Hayes et al., 1999; Hayes et al., 1996). Notably, this protective effect was significant over-and-above the direct deleterious effect of rumination on three-month stress. Thus, while rumination was the strongest and most robust predictor of stress, it appears that acting-with-awareness can be simultaneously protective. However, for low non-judgers, the protective effects of acting-with-awareness did not extend to six-month stress symptoms, possibly due to the more powerful direct effects of rumination.

Taken together, the results suggest that regularly attending to present-moment experience may protect individuals prone to self-critical thinking against various forms of affective distress, even in naturalistic settings, and over extended timeframes. These findings correspond with the ever-growing MBI research, which attests to the multiple established benefits of mindfulness training for a range of affective symptoms (Goyal et al., 2014; Hofmann et al., 2010; Khoury et al., 2013), with improvements linked to both increased dispositional mindfulness (Kumar et al., 2008; Quaglia et al., 2016; Shapiro et al., 2007) and reduced rumination (Jain et al., 2007; Ramel et al., 2004). The findings also align with theoretical accounts, whereby mindfulness practice is said to cultivate a greater awareness of various experiences, including the processes that contribute to distress (e.g., self-critical thinking), which affords cognitive distance from these processes, and facilitates adaptive responding (Kabat-Zinn, 2005; Segal et al., 2013).

While the current findings are generally in accordance with treatment-based findings and theoretical accounts, there are some notable differences.

Specifically, while multiple studies have reported positive pre to post effects of mindfulness training on affective symptoms (Hofmann et al., 2010; Khoury et al., 2013), in the present study dispositional mindfulness only directly predicted lower affective distress in one instance (i.e., three-month anxiety). This is likely an artefact of the methodology utilised. That is, in the current study, three related dispositional emotion regulation processes were considered simultaneously and thus forced to compete for variance in outcomes. Furthermore, even though mindful-non-judging did not emerge as a significant predictor in the current study, *increasing* one's level of mindful-non-judging has been linked to improved mental health in treatment settings (Quaglia et al., 2016). Thus, increasing day-to-day mindfulness may exert stronger effects than one's baseline levels of dispositional mindfulness. In addition, mindfulness practice has been shown to improve affective symptoms in a dose-response relationship (Hawley et al., 2014; Speca, Carlson, Goodey, & Angen, 2000), and via various interrelated mechanistic processes (Gu et al., 2015). Therefore, it seems plausible that baseline mindful tendencies might exert weaker effects on affective symptoms compared to the effects of applied MBIs, which likely influence multiple areas of functioning simultaneously.

Even though the effects were modest, the current findings nonetheless establish dispositional mindfulness as a predictor of psychological well-being, even over long timeframes. Given that mindfulness is conceptualised as a skill (Kabat-Zinn, 2005), with regular practice shown to increase levels of dispositional mindfulness (Quaglia et al., 2016), mindfulness training may offer an avenue for skill-acquisition that could confer long-term psychological benefits. That is, broadly pitched mindfulness training such as MBSR may be beneficial

trans-diagnostically (Chiesa & Serretti, 2009; Khoury et al., 2013), since a core focus is on regularly attending to moment-by-moment experiences to increase awareness into one's own habitual cognitive and emotional processes that exacerbate distress (Kabat-Zinn, 2005). Mindfulness training may also be beneficial as an early intervention tool. Indeed, implementing mindfulness programs in schools is an emerging area of interest for increasing resilience and well-being across multiple domains (Felver, Celis-de Hoyos, Tezanos, & Singh, 2016; Zenner, Herrleben-Kurz, & Walach, 2014).

Findings from the current study also offer insight into tailoring therapeutic interventions. That is, despite the high comorbidity between the various affective states, different predictive relationships emerged, suggesting that different therapy approaches may be indicated for the treatment of different affective symptom profiles. For example, people high in anxiety may benefit from an explicit focus on applying present moment awareness as an antidote to self-critical cognitive processes; thus modalities focusing on integrating mindfulness into day-to-day activities may be particularly beneficial, such as Acceptance and Commitment Therapy (Hayes et al., 1999; Sharp, 2012; Swain, Hancock, Hainsworth, & Bowman, 2013) and/or MBSR (Hofmann et al., 2010; Kabat-Zinn, 2005). People with depressed mood may benefit from an approach that is tailored to address known maintaining factors for depression, such as MBCT which emphasises applying mindfulness towards decreasing habitual ruminative responses to depressed mood (Chiesa & Serretti, 2011; Hofmann et al., 2010; Segal et al., 2013). Given the consistent relationships between rumination and stress, highly stressed individuals may also benefit from an approach that focuses on strategies for countering rumination, either explicitly as

per MBCT (Segal et al., 2013) or more broadly as per MBSR (Chiesa & Serretti, 2009; Kabat-Zinn, 2005).

The results of this study need to be interpreted in light of several study limitations. First, participants were recruited and the data was collected online, which raises the possibility of random and/or non-serious responding. In addition, online respondents may tend to be younger and of higher socioeconomic status than non-respondents (Gosling, Vazire, Srivastava, & John, 2004), thereby potentially limiting the generalizability of the study findings. However, online data collection methods are reportedly not adversely affected by unreliable and random responding relative to conventional pen-and-paper methods (Gosling et al., 2004) and the sample size was likely sufficient to mitigate the impact of non-serious responses. Second, the study relied on self-report data, which may have influenced the veracity of results. For example, scales within surveys were not counterbalanced; thus, order effects may have inadvertently influenced responding patterns. In addition, self-report may also be subject to reporting bias; for example, non-meditators often deny negatively-worded items in the FFMQ relative to meditators (Baer, Samuel, & Lykins, 2011; Van Dam, Earleywine, & Danoff-Burg, 2009), and self-reported mindfulness may differ from actual mindful behaviour, or be influenced by amount of mindfulness practice (Grossman, 2011). However, mindfulness practice was unrelated to self-reported mindfulness in the current study. Third, the sample differed across time points. For example, more participants completed T2 compared to T3 surveys; thus, statistical power was stronger for analyses between T1 and T2, compared with T1 to T3. In addition, T2 and T3 respondents were slightly older and more likely to be Caucasian and university-educated relative to study non-completers. While

cases were weighted to align with T1 age and educational status, there was one difference in the pattern of regression results between weighted and non-weighted data, thus sample specific factors may have influenced results and limited generalisability. In addition, cases were not weighted by ethnicity, which may have limited the generalisability of the results to more ethnically diverse samples. However, these differences were minimal and unlikely to be of real-world significance, especially since a community-based sample is more likely to be representative of the general population than student samples, which are commonly utilised in research. Fourth, depression levels were moderate at baseline and tended to decrease over time, which raises the possibility of reporting bias or regression to the mean, and which may have limited the generalisability of the results to samples with lower or stable depression levels. Fifth, rumination and mindfulness predicted little variance in depression, anxiety, and stress over time, which suggests that other factors likely contributed to affective outcomes. Finally, prior and current mental illness diagnoses were not ascertained or controlled in this study; thus, reported results may not generalise to clinical samples.

A primary strength of the current study was that it investigated the distinct outcomes of depression, anxiety, and stress, while controlling for baseline symptoms, thereby establishing independence between predictors and outcomes, while also investigating the factors that may increase or decrease these distinct symptoms over time. In addition, the current study afforded an exploration of the mechanisms implicated in changing affective symptoms, through an exploration of the patterns of interactions between distinct emotion regulation tendencies. Furthermore, the sample was large which afforded ample

statistical power to run multiple analyses. The study also benefited from two follow-up points, such that it permitted comparisons across shorter and longer time periods, and therefore examined the persistence of the effects of different emotion regulation processes over time. Although the different emotional regulation strategies predicted little of the variance in affective symptoms (i.e., 1 to 2%), estimates should be considered in terms of the lengthy follow-up periods and statistical control of baseline affective symptoms and relevant demographics. It is hoped that future research continues to investigate longitudinal associations between emotional regulation processes, including their interactions, with distinct psychological distress outcomes in order to elucidate likely mechanisms of change, and therefore the most beneficial therapeutic interventions.

In summary, this study investigated longitudinal predictive relationships between dispositional non-mood-responsive rumination, mindful-acting-with-awareness, and mindful-non-judging on depression, anxiety, and stress symptoms in a large community sample, across three and six months, after controlling for baseline affective symptoms and demographic variables. When the emotion regulation variables were considered together, greater rumination predicted higher depression across three months, and stress across three and six months. In addition, greater mindful-acting-with-awareness predicted lower anxiety across three months; moderated the effects of lower non-judging on higher anxiety and stress across three months; and moderated the effects of greater rumination on higher anxiety and depression across six months. Mindful-non-judging did not predict affective outcomes at three or six months. Taken together, the results suggest that a higher tendency to dwell on personal

experiences may be a particularly potent risk factor for higher stress over time, whereas a propensity to be attentive of present-moment experiences appears to consistently protect against increasing anxiety. In addition, individuals with a higher tendency to pay attention to present-moment experiences appear to be buffered from the negative effects of critical self-appraisal processes on increasing affective distress, particularly anxiety. Thus, aligning with theoretical accounts and treatment-based findings, regularly attending to present-moment experiences may benefit well-being by providing an antidote to self-critical appraisal processes.

Chapter 4. Study 2: A Longitudinal Investigation Into the Mediating and Moderating Effects of Dispositional Rumination and Mindfulness on Associations Between Stress, Sleep Problems, and Affective Symptoms in Community Adults

Introduction

As previously reviewed in Chapter 2, a varied literature has established that high stress can lead to higher depression and anxiety over time (Jansson-Fröjmark & Lindblom, 2008; Sivertsen et al., 2014). Moreover, various intermediary factors may offer insight into the mechanisms by which stress influences later depression and anxiety symptoms. In particular, it has been demonstrated that high stress can lead to worsened sleep, both directly (LeBlanc et al., 2009; Vahtera et al., 2007) and indirectly via higher dispositional rumination (Drake et al., 2014; Van Laethem et al., 2015). That is, responding to stress with perseverative thinking may prolong physiological arousal and lead to health problems (Brosschot, 2010), including sleep disturbance. In turn, impaired sleep can lead to higher symptoms of both depression and anxiety (Jansson-Fröjmark & Lindblom, 2008; Sivertsen et al., 2014). Taken together, high stress may represent a toxic catalyst that increases ruminative thinking and sleep disturbance, and subsequently, depression and anxiety, as outlined in Figure 7. However, the tendency towards mindfulness may protect against these effects. Specifically, mindfulness training is purported to benefit psychological well-being by buffering the effects of stress (Creswell & Lindsay, 2014; Kabat-Zinn, 2005). Thus, high dispositional mindfulness may similarly attenuate the effects of stress on ruminative thinking, sleep disturbance, depression, and anxiety, as outlined in Figure 8. Accordingly, this study aims to investigate the key

relationships within these two integrated longitudinal diathesis-stress models, in order to elucidate various processes implicated in affective symptom exacerbation or alleviation.

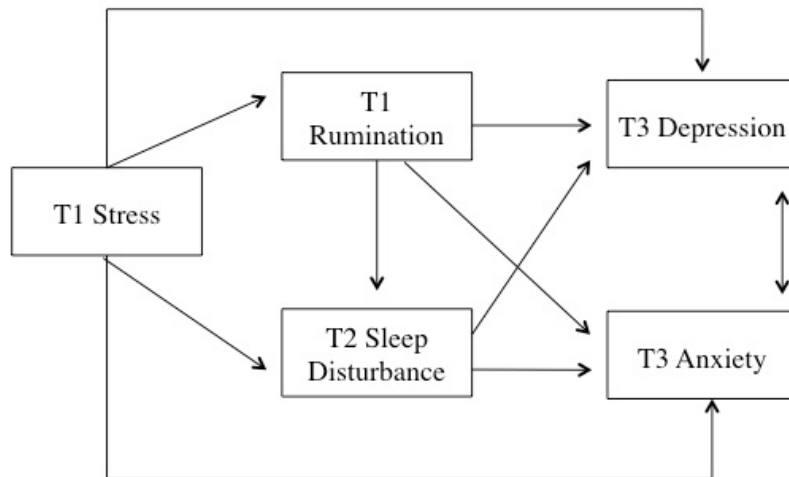


Figure 7. A proposed longitudinal model of affective symptom development

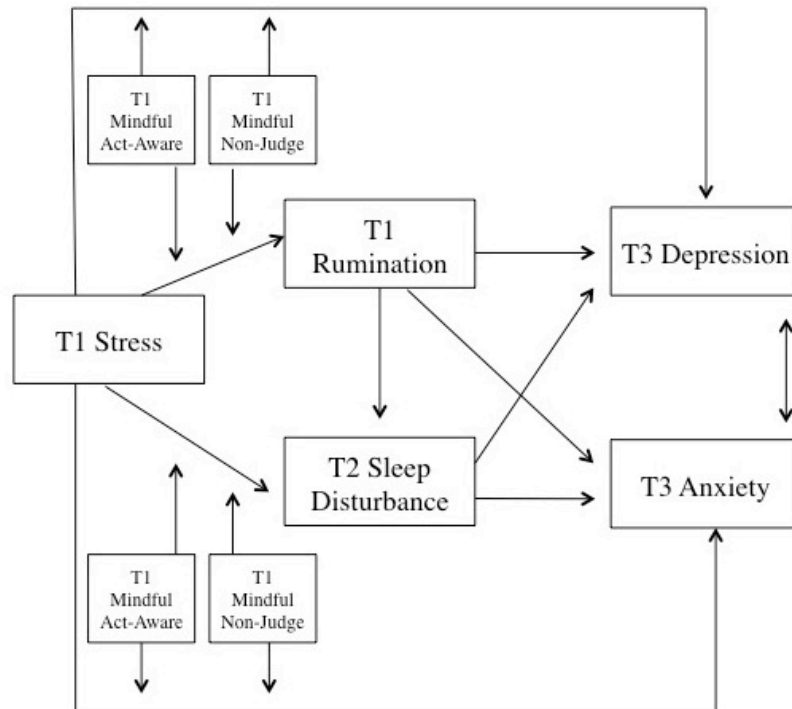


Figure 8. A proposed longitudinal stress-buffering model of affective symptom development

Study 2 extends upon Study 1 in several ways. First, it facilitates an investigation of high stress as a potential key precipitant to various forms of psychological distress, whereas Study 1 focused on stress solely as an outcome. Second, given that rumination may be activated in times of high stress (Brosschot, 2010), it may mediate the effect of stress on affective symptoms longitudinally; thus Study 2 additionally explores rumination as an indirect predictor of anxiety and depression. Third, the design of Study 2 allows comparisons to be made between stress and rumination as predictors of affective distress, which is important given that they are conceptually similar in terms of cognitive over-arousal and discrepancy-based thinking processes (Lazarus & Folkman, 1984; Smith & Alloy, 2009; Trapnell & Campbell, 1999), and they are also strongly empirically related, as evidenced in Study 1. Finally, Study 2 deepens the investigation into longitudinal risk factors for depression and anxiety by exploring the direct and indirect roles of sleep disturbance in this process.

Study 2 also seeks to clarify some of the findings from Study 1 in terms of dispositional mindfulness as an adaptive process that may moderate the effects of maladaptive processes. That is, while rumination uniquely predicted higher depression and anxiety symptoms over time in Study 1, in most cases these relationships were rendered non-significant when considered with the mindfulness variables, and were qualified by significant interactions between mindful-acting-with-awareness and self-evaluative appraisal processes (i.e., high rumination, low non-judging). Thus, given the strong relationships between rumination and stress, it is plausible that acting-with-awareness may similarly weaken the effects of stress to lower later affective distress. Furthermore, while non-judging did not moderate the effects of rumination in Study 1, a tendency to

be more accepting of internal experiences may nonetheless exert stress-buffering effects to benefit well-being (e.g., see Creswell & Lindsay, 2014). In this vein, Study 2 will expand upon Study 1 by continuing investigations into differential relationships between mindful-acting-with-awareness and non-judging in predicting different psychological symptoms over time (e.g., depression, anxiety), but focus instead on their stress-attenuating effects.

In summary, Study 2 aligns with Study 1 by investigating changes in depression and anxiety over time, but focuses specifically on the direct effects of stress, the mediating roles of rumination and sleep disturbance, and the stress-moderating effects of mindful acting-with-awareness and non-judging. The primary aim of Study 2 is to investigate the processes by which psychological stress might lead to worsened depression and anxiety levels over time, while controlling for baseline affective symptoms. In particular, the current study seeks to investigate whether stress predicts changes in depression and anxiety over time, either directly, or indirectly via ruminative thinking and sleep disturbance. A related question of interest concerns the role of mindful acting-with-awareness and non-judging in moderating the effects of stress on these various outcomes. As such, two hypothesised models will be tested to investigate these questions.

In line with the above-reviewed literature, several predictions were made (although it is also very possible that differential effects may emerge given that, to the author's knowledge, the pattern of relationships represented in the current model have not previously been examined simultaneously). Hypotheses are numbered according to three core areas of enquiry: (1) direct effects, (2) indirect effects, and (3) stress-moderating effects.

With regards to direct effects, it was hypothesised that, while controlling for baseline depression and anxiety, baseline stress would predict (1a) baseline rumination, (1b) three-month sleep disturbance, (1c) six-month depression, (1d) and six-month anxiety; that baseline rumination would predict (1e) three-month sleep disturbance, (1f) six-month depression, and (1g) six-month anxiety; and that three-month sleep disturbance would predict (1h) six-month depression, and (1i) six-month anxiety.

With regards to indirect effects, it was hypothesised that, while controlling for baseline depression and anxiety, baseline stress would predict (2a) three-month sleep disturbance via baseline rumination, (2b) six-month depression via baseline rumination, (2c) six-month depression via three-month sleep disturbance, (2d) six-month depression via baseline rumination and three-month sleep disturbance, (2e) six-month anxiety via baseline rumination, (2f) six-month anxiety via three-month sleep disturbance, and (2g) six-month anxiety via baseline rumination and three-month sleep disturbance.

With regards to moderating effects, it was hypothesised that, while controlling for baseline depression and anxiety, baseline mindful-acting-with-awareness would moderate the effects of baseline stress on (3a) baseline rumination, (3b) three-month sleep disturbance, (3c) six-month depression, and (3d) six-month anxiety; and that baseline mindful-non-judging would moderate the effects of baseline stress on (3e) baseline rumination, (3f) three-month sleep disturbance, (3g) six-month depression, and (3h) six-month anxiety.

Method

Study 2 utilised the survey data from Study 1. Full details for the methods employed to obtain this data are outlined in the [Chapter 3 Method](#) section. Thus,

only a brief outline will be presented here, highlighting the core methodological components and providing more detailed information where procedures diverged from Study 1.

Participants. Details about ethics approval, study inclusion parameters, and recruitment methods were previously presented in the [Chapter 3 Method \(Participants\)](#) section. A community sample ($N = 730$) of Australian adults completed the questionnaires at baseline (T1), 498 participants completed the three-month questionnaires (T2), and 353 completed the six-month questionnaires (T3), representing an attrition rate of 32% (T1 to T2) and 29% (T2 to T3), respectively. The demographic details for this sample at each time point were previously presented in Table 2. To summarise, the T1 sample was on average 31.3 ($SD = 11.30$) years old, 60.0% were female, 50.1% were university educated, 50.8% were married or defacto, 85.3% were Caucasian, and 30.3% practiced mindfulness meditation in the previous month.

Measures. Participants completed questionnaires in the following order: recent experiences of depression, anxiety, stress with the DASS-21 (Lovibond & Lovibond, 1995b), sleep disturbance with the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989), rumination with the RRQ (Trapnell & Campbell, 1999), and mindful acting-with-awareness and non-judging with the FFMQ (Baer et al., 2006). Full descriptions of the measures and psychometric properties of the DASS-21, RRQ, and FFMQ were previously outlined in the [Chapter 3 Method \(Measures\)](#) section.

The 19-item PSQI was utilised to assess perceived sleep disturbance over the previous month (Buysse et al., 1989). Seven domains of sleep are assessed including sleep quality, sleep onset latency (i.e., time taken to fall asleep), sleep

duration, sleep efficiency (i.e., proportion of time spent in bed to time asleep), sleep disturbances (e.g., difficulties sleeping due to disruptions), use of medication, and daytime dysfunction. Individual scores for these domains are produced as well as a composite score, with higher scores indicating higher perceived sleep disturbance. A global PSQI score of 5 or more has good sensitivity and specificity in distinguishing poor sleepers from normal sleepers (Buysse et al., 1989), and 6 or more for distinguishing those with insomnia from those without insomnia (Dietch et al., 2016). PSQI self-rated sleep onset latency has been shown to correlate with objective measures (Buysse et al., 1989), although self-reported sleep quality is known to diverge from objective measures (Perlis et al., 1997; Rosa, 2000; Zhang & Zhao, 2007), including PSQI ratings (Buysse et al., 2008; Grandner, Kripke, Yoon, & Youngstedt, 2006), which suggests that the PSQI is a subjective measure of sleep disturbance. The PSQI correlates highly with other validated measures of self-reported sleep quality (Carpenter & Andrykowski, 1998; Dietch et al., 2016), thereby supporting convergent validity. Acceptable to good internal consistency has been reported for the global PSQI score (Cronbach's $\alpha = .75$ to $.83$) (Buysse et al., 1989; Hinz et al., 2017) and high temporal stability over 18-months ($r = .85$) (Buysse et al., 1989). In this study, internal consistencies were acceptable across all three time-points ($\alpha \geq .73$), as was temporal stability over three and six months ($r = .74$ for both time periods).

Procedure. The procedure for this study was previously outlined in the [Chapter 3 Method \(Procedure\)](#) section. In summary, participants completed three online surveys, three-months apart. In the first survey participants were asked for demographic information, and in all surveys participants were asked if they

engaged in mindfulness meditation over the past month, and also their experiences of rumination, mindfulness, depression, anxiety, stress, and sleep disturbance. T1 data was collected from January to March 2015, T2 data was collected from April to June 2015, and T3 data was collected from June to September 2015.

Statistical analysis. Path analysis models were examined using Mplus version 7. Full information maximum likelihood (FIML) estimation was utilised in order to model observations based on all available data (Tabachnick & Fidell, 2013), which can be utilised for longitudinal models with missing data (Muthén & Muthén, 2012) and has been shown to be an efficient method even with large amounts of missing data (i.e., 25%; Enders & Bandalos, 2001). Because multiple imputation methods are also recommended for estimating longitudinal models with non-random missing data (Tabachnick & Fidell, 2013), multiple imputation (MI) analysis was also utilised to examine any potential differences in the pattern of results between the results estimated with FIML and those with MI. MI results revealed no substantive changes in model estimates between FIML and MI; therefore, only the FIML estimation results are reported here. Tests for indirect effects in Mplus utilise the delta method for calculating standard errors (Muthén & Muthén, 2012). All continuous variables were mean-centred and interaction terms created for moderation analyses.

As per Study 1, in order to investigate change in depression and anxiety symptoms over time, all analyses controlled for baseline depression and anxiety. Furthermore, since depressive and anxiety disorders and associated symptoms have been shown to vary by gender, age, and educational level (Australian

Bureau of Statistics, 2008; Crawford & Henry, 2003), these demographic characteristics were also controlled in all analyses.

Results

Attrition analysis. As previously reported in the [Chapter 3 Results \(Attrition Analysis\)](#) section, a series of between-groups *t*-tests revealed that participants who discontinued from the study participation between T1, T2, and T3 were significantly younger, less likely to hold a university degree, and less likely to be Caucasian. However, cases were not weighted to match these demographic characteristics as per Study 1 since FIML can model observations based on all available data. Furthermore, participants who continued versus discontinued at T2 and T3 did not differ in terms of depression, anxiety, stress, rumination, mindful-acting-with-awareness, mindful-non-judging, or sleep disturbance ($p > .05$).

Descriptive statistics. Descriptive statistics for all key study variables are displayed in Table 8. Paired-sample *t*-tests for each variable indicated that depression decreased from T1 to T2, rumination decreased between T1 to T2, and T2 to T3, mindful-non-judging increased between T1 to T2, and T2 to T3, and sleep disturbance decreased from T1 to T2.

As previously discussed in the [Chapter 3 Results \(Descriptive Statistics\)](#) section, based on normative data from an Australian sample (Lovibond & Lovibond, 1995b), average depression scores were moderate at T1 and mild at T3, while anxiety scores were consistently mild from T1 to T3, and stress scores were mild at T1 and normal at T3. In addition, based on normative data from an American sample (Dietch et al., 2016), average sleep scores indicated that participants were “poor sleepers” across T1 to T3.

Table 8

Descriptive Statistics and Comparisons for Depression, Anxiety, Stress, Sleep Disturbance, Rumination, Mindful-Acting-With-Awareness, and Mindful-Non-Judging at Baseline (T1), 3 Months (T2) and 6 Months (T3)

	Descriptive Statistics			Comparisons Between Time Points	
	T1	T2	T3	T1 to T2	T2 to T3
<i>n</i>	730	498	353	498 (<i>df</i> 497)	353 (<i>df</i> 352)
Depression <i>M</i> (SD) Severity	7.4 (5.54) “Moderate”	6.8 (5.53) “Mild to moderate”	6.2 (5.44) “Mild”	7.5 (5.61) vs 6.8 (5.53) <i>t</i> = 3.35**	6.5 (5.48) vs 6.2 (5.44) <i>t</i> = 1.13
Anxiety <i>M</i> (SD) Severity	4.4 (4.18) “Mild”	4.2 (4.07) “Mild”	4.0 (3.80) “Mild”	4.3 (4.04) vs 4.2 (4.07) <i>t</i> = 0.79	4.1 (3.86) vs 4.0 (3.80) <i>t</i> = 0.20
Stress <i>M</i> (SD) Severity	7.7 (4.82) “Mild”	7.3 (4.76) “Normal to mild”	7.0 (4.68) “Normal”	7.5 (4.73) vs 7.3 (4.76) <i>t</i> = 1.67	7.0 (4.57) vs 7.0 (4.68) <i>t</i> = 0.32
Sleep <i>M</i> (SD) Severity	7.2 (3.61) “Poor sleeper”	6.9 (3.68) “Poor sleeper”	6.9 (3.71) “Poor sleeper”	7.4 (3.58) vs 6.9 (3.68) <i>t</i> = 4.28***	6.9 (3.65) vs 6.9 (3.71) <i>t</i> = 0.21
Rumination <i>M</i> (SD)	44.6 (10.13)	43.1 (10.39)	41.9 (11.06)	44.9 (10.18) vs 43.1 (10.39) <i>t</i> = 5.85***	42.7 (10.64) vs 41.9 (11.06) <i>t</i> = 2.00*
Act-Aware <i>M</i> (SD)	23.6 (6.11)	23.5 (5.90)	23.5 (5.87)	23.6 (5.98) vs 23.5 (5.90) <i>t</i> = 0.32	23.5 (5.51) vs 23.5 (5.87) <i>t</i> = 0.03
Non-Judge <i>M</i> (SD)	23.6 (7.85)	24.1 (7.65)	24.9 (7.89)	23.6 (7.94) vs 24.1 (7.65) <i>t</i> = -1.99*	24.4 (7.48) vs 24.9 (7.89) <i>t</i> = -2.03*

*Note: Depression = DASS-21-Depression, Anxiety = DASS-21-Anxiety, Stress = DASS-21-Stress, Sleep = PSQI global sleep, Rumination = RSQ-Rumination, Act-Aware = FFMQ Mindful-Acting-With-Awareness, Non-Judge = FFMQ Mindful-Non-Judging. DASS-21 severity descriptors are based off norm data from a large Australian sample (Lovibond & Lovibond, 1995b), PSQI severity descriptors are based off data from an American sample (Dietch et al., 2016) where ≥ 6 = poor sleeper. *** $p < .001$, ** $p < .01$, * $p < .05$.*

Table 9

Bivariate Correlations Between Rumination, Mindful-Acting-With-Awareness, Mindful-Non-Judging, Depression, Anxiety, Stress, and Sleep Disturbance at all Time Points

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. T1 Rum	-	.78	.76	-.41	-.35	-.38	-.63	-.58	-.59	.53	.39	.41	.49	.40	.44	.58	.49	.49	.35	.36	.32
2. T2 Rum	.78	-	.80	-.31	-.40	-.37	-.59	-.66	-.62	.45	.51	.41	.44	.47	.43	.53	.58	.51	.32	.42	.33
3. T3 Rum	.76	.80	-	-.27	-.33	-.41	-.59	-.63	-.69	.46	.45	.50	.45	.43	.47	.49	.51	.57	.37	.39	.40
4. T1 Act-A	-.41	-.31	-.27	-	.72	.70	.44	.35	.28	-.41	-.33	-.30	-.36	-.33	-.28	-.43	-.38	-.27	-.26	-.27	-.17
5. T2 Act-A	-.35	-.40	-.33	.72	-	.79	.33	.41	.32	-.38	-.44	-.34	-.32	-.40	-.29	-.39	-.45	-.34	-.26	-.33	-.21
6. T3 Act-A	-.38	-.37	-.41	.70	.79	-	.33	.35	.45	-.35	-.37	-.41	-.27	-.31	-.36	-.35	-.40	-.43	-.26	-.31	-.27
7. T1 Non-J	-.63	-.60	-.59	.44	.33	.33	-	.76	.72	-.48	-.39	-.40	-.44	-.42	-.42	-.51	-.48	-.44	-.28	-.32	-.27
8. T2 Non-J	-.58	-.66	-.63	.35	.41	.35	.76	-	.80	-.42	-.48	-.42	-.43	-.47	-.46	-.47	-.54	-.47	-.29	-.32	-.31
9. T3 Non-J	-.59	-.62	-.69	.28	.32	.45	.72	.80	-	-.36	-.38	-.49	-.41	-.42	-.51	-.46	-.49	-.55	-.30	-.30	-.36
10. T1 Dep	.53	.45	.46	-.41	-.38	-.35	-.48	-.42	-.36	-	.66	.67	.61	.48	.47	.66	.49	.45	.42	.38	.35
11. T2 Dep	.39	.51	.45	-.33	-.44	-.37	-.39	-.48	-.38	.66	-	.66	.47	.64	.45	.47	.70	.44	.34	.47	.35
12. T3 Dep	.41	.41	.50	-.30	-.34	-.41	-.40	-.42	-.49	.67	.66	-	.47	.52	.60	.43	.49	.67	.35	.41	.47
13. T1 Anx	.49	.44	.45	-.36	-.32	-.27	-.44	-.43	-.41	.61	.47	.47	-	.70	.70	.73	.54	.51	.39	.37	.37
14. T2 Anx	.40	.47	.43	-.33	-.40	-.31	-.42	-.47	-.42	.48	.64	.52	.70	-	.66	.57	.74	.55	.32	.42	.32
15. T3 Anx	.44	.43	.47	-.28	-.29	-.36	-.42	-.46	-.51	.47	.45	.60	.70	.66	-	.56	.52	.69	.34	.36	.43
16. T1 Str	.58	.53	.49	-.43	-.39	-.35	-.51	-.47	-.46	.66	.47	.43	.73	.57	.56	-	.68	.62	.47	.42	.40
17. T2 Str	.49	.58	.51	-.38	-.45	-.40	-.48	-.54	-.49	.49	.70	.49	.54	.74	.52	.68	-	.66	.36	.48	.35
18. T3 Str	.49	.51	.57	-.27	-.34	-.43	-.44	-.47	-.55	.45	.44	.67	.51	.55	.70	.62	.66	-	.41	.44	.50
19. T1 Sle	.35	.32	.37	-.26	-.26	-.26	-.28	-.29	-.30	.42	.34	.35	.39	.32	.34	.47	.36	.41	-	.74	.74
20. T2 Sle	.36	.42	.39	-.27	-.33	-.31	-.32	-.32	-.30	.38	.47	.41	.37	.42	.36	.42	.48	.44	.74	-	.77
21. T3 Sle	.32	.33	.40	-.17	-.21	-.27	-.27	-.31	-.36	.35	.35	.47	.37	.32	.43	.40	.35	.50	.74	.77	-

Note: For T1 n = 730, T2 n = 498, T3 n = 353, Rum = RSQ-Rumination, Act-A = FFMQ Mindful-Acting-With-Awareness, Non-J = FFMQ Mindful-Non-Judging, Dep = DASS-21-Depression, Anx = DASS-21-Anxiety, Str = DASS-21-Stress, Sle = PSQI global sleep. All correlations are significant at $p < .01$, **bold** = concurrent association.

Bivariate correlations. Bivariate Pearson product-moment correlations were calculated between the predictor and outcome variables at all time points, as displayed in Table 9. With regards to the main outcomes of interest, T3 depression shared a moderate to strong association with T1 stress, T1 rumination, and T2 sleep disturbance. T3 anxiety shared a strong association with T1 stress, a moderate to strong association with T1 rumination, and a moderate association with T2 sleep disturbance. T2 sleep disturbance shared a moderate to strong relationship with T1 stress and T1 rumination, and moderate inverse associations with T1 acting-with-awareness and T1 non-judging.

Concurrent associations amongst T1 predictors revealed a strong relationship between stress and both rumination (positive) and non-judging (inverse), and a moderate to strong inverse relationship between stress and acting-with-awareness. Rumination was strongly inversely associated with non-judging, and moderately to strongly inversely associated with acting-with-awareness.

Longitudinal path analyses. Initially, variables of interest were examined for the assumptions of multivariate analysis as per the guidelines of Tabachnick and Fidell (2013). Outliers were detected for age, in addition to anxiety at T1, T2 and T3 (i.e., z -scores > 3.29). Investigations of normality revealed that T1 rumination was negatively skewed, age was positively skewed, while T1 to T3 depression, anxiety, stress, and sleep disturbance were positively skewed. Thus, as per recommendations to reduce skewness, and particularly where variables are skewed in opposing directions (Tabachnick & Fidell, 2013), age was inverse transformed, depression, anxiety, stress, and sleep disturbance were square root transformed at all time points, and T1 rumination was reversed

and then square root transformed (then reversed back for interpretability).

Outliers were no longer evident for transformed variables.

Hypothesised models. Two models were tested in line with the primary research questions. Model 1 was utilised to test each of the direct paths in the full longitudinal model. As displayed in Figure 9, solid lines represent hypothesised direct effects and greyed dotted lines represent the effects of covariates on depression and anxiety outcomes.

Model 1 was also utilised to test for each of the hypothesised indirect effects. Each of the tested mediation paths are outlined separately in Figure 10 by their respective hypothesis (i.e., 2a to 2g), where mediator variables are depicted at the top of each respective mediation diagram.

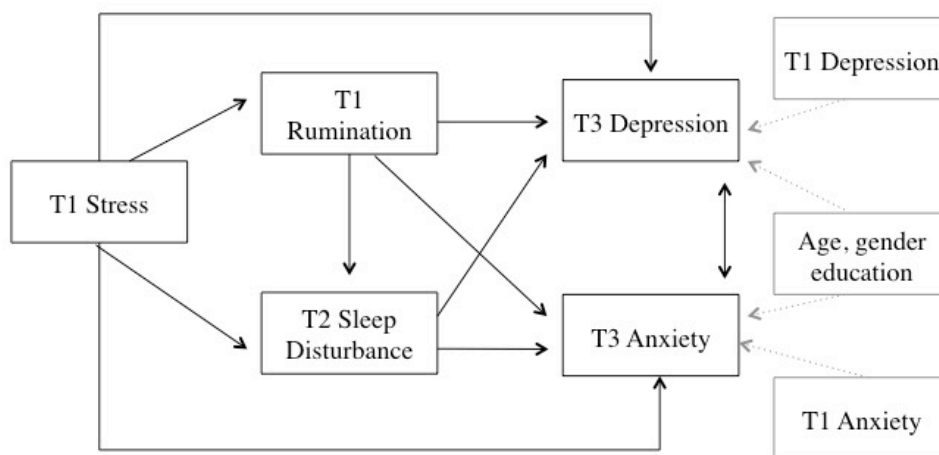


Figure 9. Hypothesised longitudinal model 1

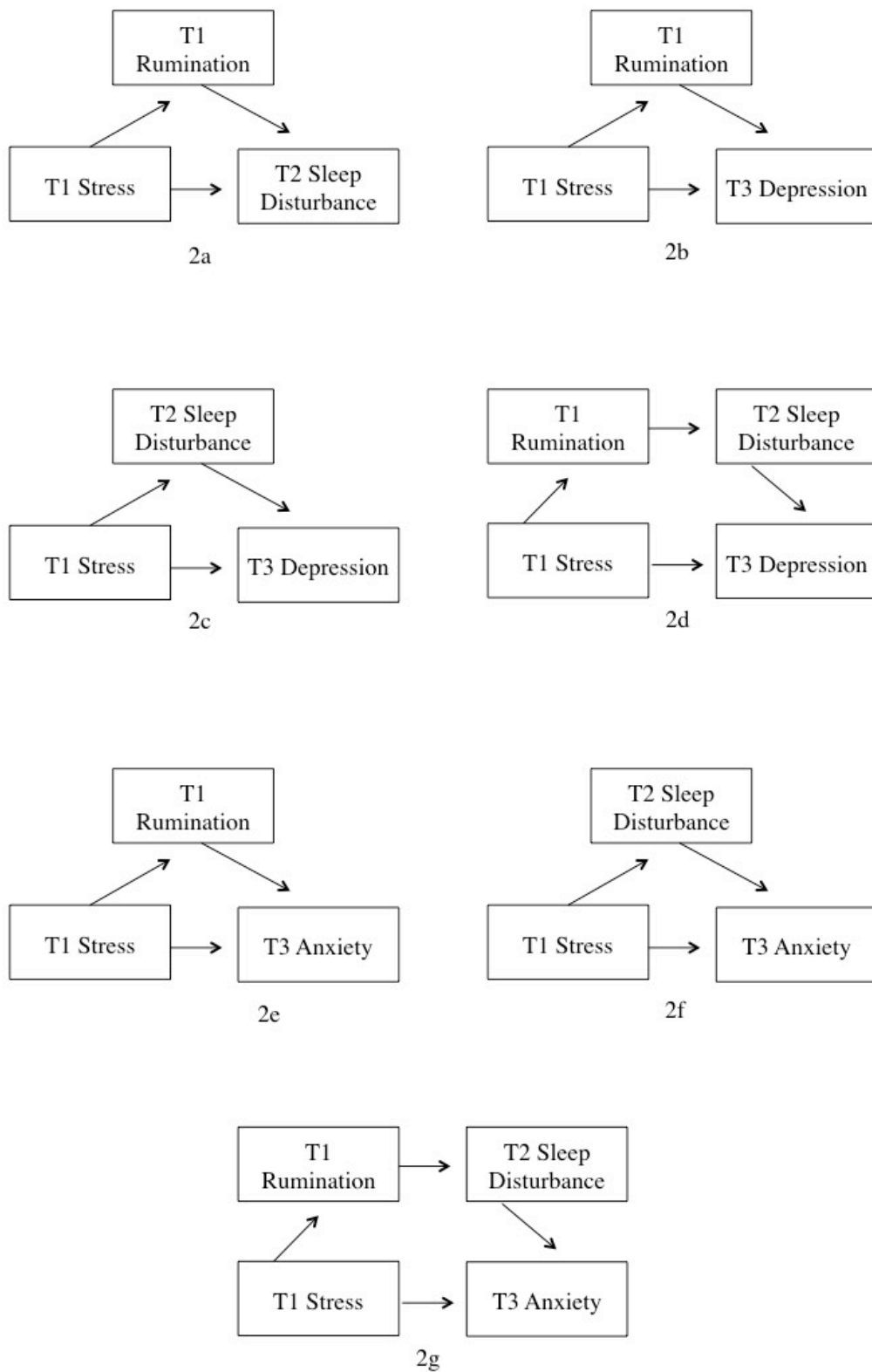


Figure 10. Hypothesised indirect relationships

Model 2 is an extension of Model 1 that was utilised to investigate mindfulness as a moderator of stress. The hypothesised model is displayed in Figure 11. As with Model 1, solid lines represent hypothesised direct effects and greyed dotted lines represent the effects of covariates on depression and anxiety outcomes. The additions to this model are the solid lines pointing towards existing pathways, which represent moderation effects.

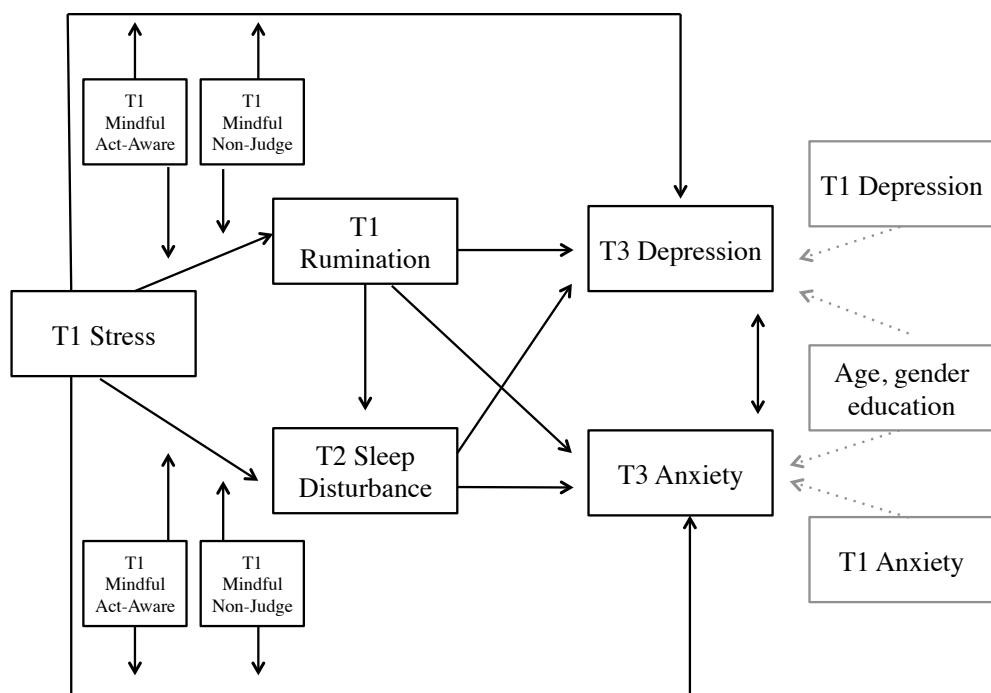


Figure 11. Hypothesised longitudinal model 2

Model 1 analyses of direct effects. Analyses were based on observations from 727¹ participants using maximum likelihood estimation. Model 1 was found to be a fair fit for the data, $\chi^2(12, 727) = 105.31, p < .05$, Comparative Fit Index

¹ Three participants from T1 did not identify as male or female and thus their data was not analysed given that gender was dichotomised for analysis.

(CFI) = 0.91 (values of > 0.95 indicate a good fitting model), root mean square error of approximation (RMSEA) = 0.10 [90% confidence interval = 0.09, 0.12] (values of < 0.06 indicate a good fit to the data, while > 0.10 indicates a poor fit). The model predicted 45% of the variance in T3 (after controlling for T1) depression and 52% of the variance in T3 (after controlling for T1) anxiety.

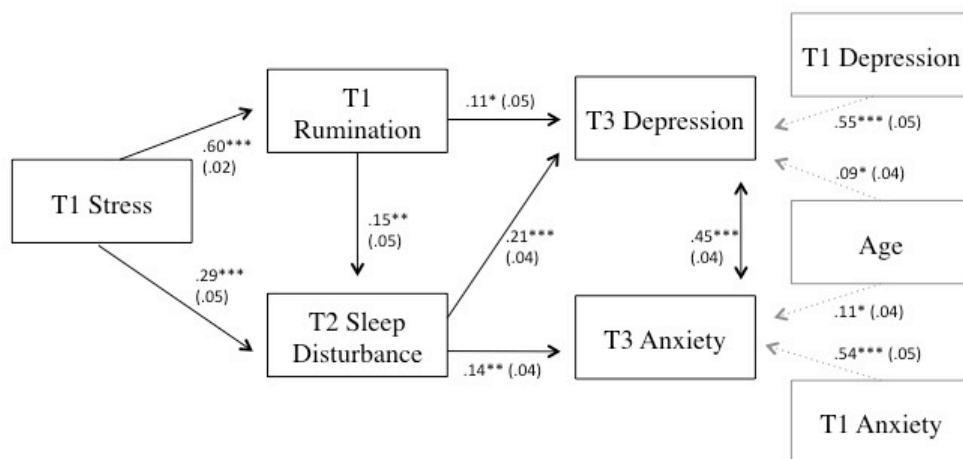


Figure 12. Final model 1 with significant coefficients (and standard errors) presented in standardised form

The final Model 1, including significant coefficients in standardised form, is displayed in Figure 12. T1 depression and anxiety predicted T3 depression and anxiety, respectively, with large effects sizes. Participant age also predicted T3 depression and anxiety, with small effects sizes. With regards to the direct relationships of interest, as hypothesised, higher T1 stress predicted higher T1 rumination (hypothesis 1a) and T2 sleep disturbance (hypothesis 1b), but not T3 depression (hypothesis 1c) or T3 anxiety levels (hypothesis 1d) as expected. In addition, consistent with hypotheses, higher T1 rumination predicted higher T2 sleep disturbance (hypothesis 1e) and T3 depression (hypothesis 1f), but not T3

anxiety levels (hypothesis 1g) as expected. Finally, higher T2 sleep disturbance predicted higher T3 depression (hypothesis 1h) and anxiety levels (hypothesis 1i) as hypothesised.

Model 1 analyses of indirect effects. Results for the tests of the indirect are presented in Table 10. There was an indirect relationship between T1 stress to T2 sleep via T1 rumination (hypothesis 2a) as expected. The relationship between T1 stress and T3 depression was also indirectly influenced by T1 rumination (2b), T2 sleep disturbance (2c), and the combined effects of T1 rumination and T2 sleep disturbance (2d) as hypothesised. There was also an indirect relationship between T1 stress to T3 anxiety via T2 sleep (hypothesis 2f), and combined T1 rumination and T2 sleep disturbance (hypothesis 2g) as hypothesised, but not T1 rumination (hypothesis 2e) contrary to expectations.

Table 10

Mediation Analyses for Stress Predicting Sleep Disturbance at 3-Months (T2) via Rumination, and Stress Predicting Depression and Anxiety at 6-Months (T3) via Rumination and 3-Month Sleep Disturbance

Relationship Tested	Direct Effect (SE)	Indirect Effect (SE)
T1 stress to T2 sleep via T1 rumination	.29*** (.05)	.09** (.03)
T1 stress to T3 depression via T1 rumination	-.06 (.06)	.07* (.03)
T1 stress to T3 depression via T2 sleep	-.06 (.06)	.06*** (.02)
T1 stress to T3 depression via T1 rumination and T2 sleep	-.06 (.06)	.08*** (.02)
T1 stress to T3 anxiety via T1 rumination	.06 (.05)	.05 (.03)
T1 stress to T3 anxiety via T2 sleep	.06 (.05)	.04** (.01)
T1 stress to T3 anxiety via T1 rumination and T2 sleep	.06 (.05)	.05** (.01)

Note. Sleep = sleep disturbance, SE = standard error. *** $p < .001$, ** $p < .01$, * $p < .05$.

Model 2 analyses of moderation effects. Analyses were based on observations from 727 participants using maximum likelihood estimation. The hypothesised model was found to be a good fit for the data, $\chi^2(12, 727) = 56.90$, $p < .05$, CFI = 0.96 (values of > 0.95 indicate a good fitting model), RMSEA = 0.07 [90% confidence interval = 0.05, 0.09] (values of < 0.06 indicate a good fit to the data, while > 0.10 indicates a poor fit). The model predicted 48% of the variance in T3 (after controlling for T1) depression and 55% of the variance in T3 (after controlling for T1) anxiety (cf. Model 1: 45% of the variance in T3 depression and 52% of the variance in T3 anxiety).

The final Model 2, including significant coefficients in standardised form, is displayed in Figure 13. The findings were generally in accordance with Model 1 regarding direct effects, except that T1 rumination did not predict T3 depression in Model 2 ($\beta = .07$, $p = .24$) whereas it did in Model 1 ($\beta = .11$, $p = .04$), and the effect of stress on rumination was smaller in Model 2 ($\beta = .34$, $p < .001$) than Model 1 ($\beta = .60$, $p < .001$). With regards to the research questions of interest, the interaction between T1 stress and T1 mindful acting-with-awareness predicted T3 anxiety (hypothesis 3d) as hypothesised. However, contrary to predictions, there was no interaction between T1 stress and T1 non-judging in predicting T3 anxiety (hypothesis 3h), or between T1 stress and either T1 mindful acting-with-awareness or T1 non-judging in predicting T1 rumination, T2 sleep disturbance, or T3 depression (hypotheses 3a, 3b, 3c, 3e, 3f, and 3g).

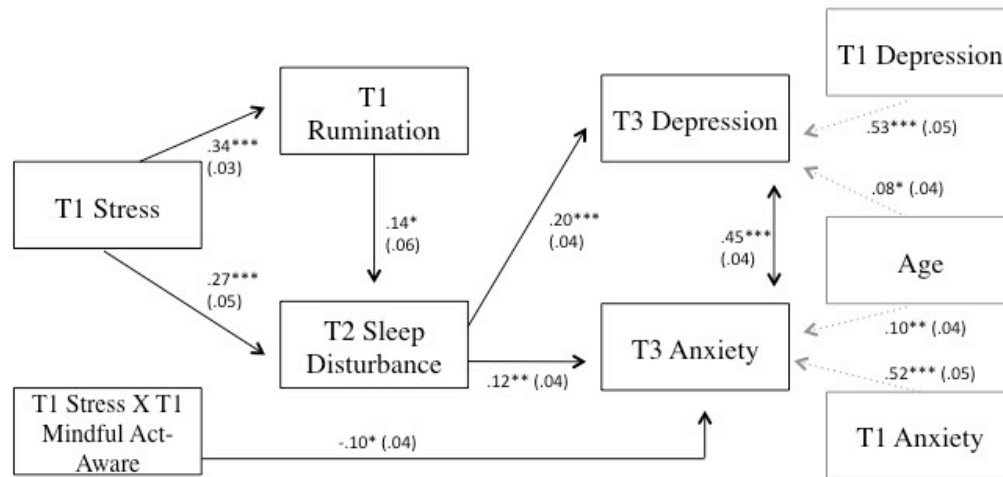


Figure 13. Final model 2 with significant coefficients (and standard errors) presented in standardised form

The interaction between T1 stress and T1 mindful acting-with-awareness on T3 anxiety was investigated with Model 1 of the PROCESS Macro (Hayes, 2013), in order to estimate conditional effects of each interaction variable on the outcome variable at different levels of the other interaction variable (i.e., at 1 SD above the mean, the mean, and 1 SD below the mean), and to generate plots to visualise the interactions. Bias-corrected bootstrapping based on 10,000 samples was used to generate 95% confidence intervals. Because bootstrapping methods are robust to deviations of normality (Preacher & Hayes, 2004) untransformed variables were investigated. To match the process model, the analysis controlled for age, gender, education, baseline anxiety, rumination, acting-with-awareness, non-judging, and T2 sleep disturbance. Predictors and interaction terms were mean-centred.

The interaction between T1 acting-with-awareness and T1 stress predicted T3 anxiety symptoms (coefficient = -.01, $t = -2.56$, $p = .01$).

Conditional effects revealed that higher T1 stress marginally predicted higher T3 anxiety at low levels of T1 acting-with-awareness (effect = .11, $t = 1.76$, $p = .08$), but not at high levels of T1 acting-with-awareness (effect = $-.04$, $t = -.77$, $p = .44$), as displayed in Figure 14.

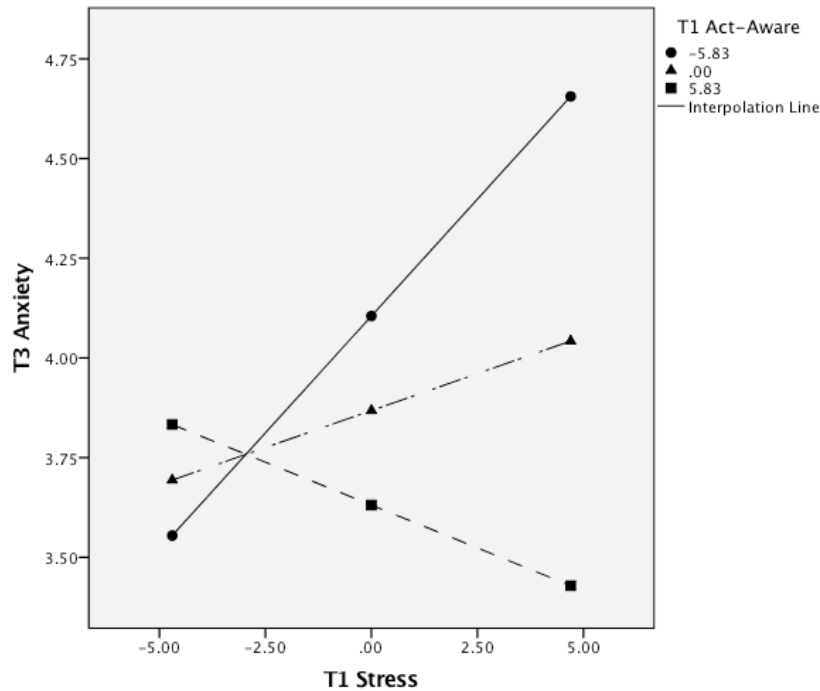


Figure 14. A graphical representation of the conditional effect of baseline stress on six-month anxiety at different levels of baseline mindful-acting-with-awareness (1SD +/- the mean)

Discussion

The aim of this study was to investigate various factors implicated in the exacerbation or alleviation of affective symptoms over time, after controlling for baseline affective symptoms. Specifically, to see if stress would predict changes in depression and anxiety, either directly, indirectly via dispositional rumination and sleep disturbance, and/or as moderated by dispositional mindful acting-with-

awareness and non-judging. The results showed that greater stress predicted higher rumination and three-month sleep disturbance. Greater rumination predicted higher three-month sleep disturbance and increased six-month depression. In addition, greater three-month sleep disturbance predicted increased six-month depression and anxiety levels. With regards to indirect effects, greater stress indirectly predicted higher three-month sleep disturbance via rumination. Moreover, greater stress indirectly predicted increased six-month depression via rumination, via three-month sleep disturbance, and also via the combined effects of rumination and three-month sleep disturbance. Greater stress also predicted increased six-month anxiety via three-month sleep disturbance, and via the combined effects of rumination and three-month sleep disturbance. Finally, mindful-acting-with-awareness and stress interacted to predict decreased six-month anxiety; greater baseline stress was marginally significant in predicting higher anxiety levels at six months when baseline acting-with-awareness was low (but not when acting-with-awareness was high).

Psychological stress did not directly predict elevations in six-month depression or anxiety, in contrast to previous longitudinal associations (Morrison & O'Connor, 2005; Wichers et al., 2009), and theoretical accounts that implicate stressful life experiences in affective disorder development (Barlow, 2002; Monroe & Simons, 1991). It is possible that generalised subjective over-arousal does not impact depression and anxiety to a similar extent as distinct life stressors, which can exert differential effects. For example, it has been reported that stressful experiences associated with loss are especially associated with depression, while experiences of threat are more likely to precede anxiety (Monroe & Simons, 1991). In addition, the number, chronicity and/or intensity of

stressors have also been differentially associated with later affective symptoms (Hammen et al., 2009; Wichers et al., 2009). Conversely, stress measured in the current study shared very high concurrent associations with depression and anxiety symptoms, which may have limited its power to detect changes in depression and anxiety, particularly over a lengthy follow-up period. Relatedly, stress may exert more powerful effects on affective symptoms in the period immediately following stressors (e.g., see Kendler, Karkowski, & Prescott, 1998).

In contrast to the effects of stress, non-mood-responsive rumination directly predicted increased six-month depression, in line with previous longitudinal findings (Ciarrochi & Scott, 2006; Kuster et al., 2012). However, rumination did not directly predict anxiety, aligning with previously reported findings when considering other variables simultaneously (e.g., problem solving ability, emotion differentiation, worry; see Ciarrochi & Scott, 2006; Hong, 2007; Segerstrom et al., 2000). Thus, future-focused appraisal processes such as worry, characterised by vigilance and projected threat (Mathews, 1990), may be more strongly implicated in later anxiety (Hong, 2007; Segerstrom et al., 2000) than the tendency to self-critically dwell on recent or past experiences.

While rumination was not a consistent predictor of affective symptoms, sleep disturbance directly predicted increases in both depressive and anxiety symptoms over three months. Thus, aligning with a well-established literature whereby clinical levels of sleep disturbance predicted clinically high depression (Baglioni et al., 2011; Morphy et al., 2007) and anxiety (Morphy et al., 2007; Neckelmann et al., 2007) levels over time, higher subclinical sleep issues also appear to exacerbate depressive and anxiety symptoms. These effects were somewhat stronger in predicting depression over anxiety, as per previous

research suggesting that clinical sleep disturbance more likely precedes clinical depression, but follows clinical anxiety (Johnson et al., 2006; Ohayon & Roth, 2003). Nonetheless, both depression and anxiety worsened following sleep disturbance in the current study, and impaired emotion regulation may account for this progression (Baglioni et al., 2010). That is, people with sleep disturbance are more likely to experience negative affect and to utilise maladaptive emotion regulation strategies, while also being less likely to experience positive affect and to utilise adaptive emotion regulation strategies (Baglioni et al., 2010; Palmer & Alfano, 2017). Thus, in the absence of effective emotion modulation, poor sleepers may experience continued high negative affect which exacerbates both depression and anxiety over time, while prolonged low positive affect may create an extra risk for depressive symptoms specifically (e.g., see Watson, Clark, & Carey, 1988).

Overall, based on the standardised coefficients, the direct effects of sleep disturbance on both depression and anxiety appeared to be much stronger than the direct effects of rumination. These differences may partially reflect the fact that sleep disturbance was considered in closer temporal proximity to affective outcomes compared to rumination. Alternatively, sleep disturbance is thought to represent a prodromal manifestation of mental illness (APA, 2013), which can negatively impact multiple areas of functioning (e.g., health, occupational, cognitive, physiological; see Bonnet & Arand, 2010; Roth, 2007). In contrast, rumination represents a more pointed process of critical self-evaluation (Trapnell & Campbell, 1999). Thus, the stronger direct effects of sleep disturbance on affective symptoms, over rumination, are to be expected.

Sleep quality was also directly influenced by prior psychological factors. That is, aligning with previous research, both stress (LeBlanc et al., 2009; Linton, 2004; Pillai, Roth, et al., 2014) and rumination (Åkerstedt et al., 2012; Takano et al., 2012) directly predicted three-month sleep disturbance. Comparatively, recently experienced stress bore a stronger direct effect on later sleep disturbance than a general tendency to ruminate. This may be because stress represents a broader construct of subjectively experienced over-arousal (e.g., “I felt that I was rather touchy”), whereas ruminative thinking is confined more singularly to the cognitive-evaluative realm (e.g., “I often find myself re-evaluating something I’ve done”). The findings also align with conceptualisations of insomnia as a stress-responsive disorder (APA, 2013).

The varying patterns of direct effects lend insight into indirect processes linking stress with later affective symptoms. That is, the general tendency to ruminate partially accounted for the link between subjective stress and three-month sleep disturbance, thus aligning with previously reported mediation effects evident for stressor-related rumination (Cropley et al., 2006; Van Laethem et al., 2015). Individuals may ruminate in response to stress as a maladaptive attempt to process or resolve the stress; for example, by perseverating on perceived discrepancies between current status and environmental demands or personal resources (see Lazarus & Folkman, 1984; Smith & Alloy, 2009). However, ruminating about stressors may inadvertently extend the physiological stress response to compromise health, including sleep, as per the Perseverative Cognition Hypothesis (Brosschot, 2010). Indeed, sleep disturbance has been consistently linked with cognitive and physiological over-arousal (Åkerstedt, 2006; Espie, 2002; Perlis et al., 1997; Pillai & Drake, 2015).

Taken together, the current findings correspond with established factors associated with the onset and maintenance of sleep disturbance, including physiological arousal (e.g., high perceived stress; see Morin et al., 2003), cognitive arousal (e.g., rumination; see Harvey, 2002), and their interdependence (Espie, 2002; Lundh & Broman, 2000).

In addition, stress also predicted six-month increases in depression via rumination, corresponding with previously established longitudinal relationships between stressor exposure to depression via both mood-responsive (Michl et al., 2013; Nolen-Hoeksema et al., 1999) and non-mood-responsive (Ruscio et al., 2015) rumination. High stress may activate increased discrepancy-focused ruminative cognitions about one's perceived ability to cope; thereby potentially prompting depression-related themes around hopelessness and failure (e.g., see Beck, 2011). More broadly, a tendency to perseverate on stress may inadvertently create an allostatic load that impacts not only physical health (Brosschot, 2010), but also mental health, including depression. Of note, even though stress did not directly predict later depression, rumination did. Taken together, the findings suggest that recently experienced subjective over-arousal may intensify depression over time to the degree that it triggers an increased tendency to dwell on personal experiences.

Conversely, psychological stress did not similarly predict six-month increases in anxiety via rumination, contrary to previous longitudinal findings whereby stressor exposure predicted anxiety via both mood-responsive (Michl et al., 2013) and non-mood-responsive (Mayou et al., 2001; Ruscio et al., 2015) rumination. These non-significant findings likely reflect the corresponding absence of direct effects between rumination and anxiety, as previously

discussed. In addition, each of the aforementioned mediation studies measured rumination as a direct response to an identifiable stressor; thus a general tendency to ruminate may not exert comparable effects on anxiety symptoms. Correspondingly, the absence of associations between rumination and later anxiety in the multi-variable longitudinal models, compared with moderate to strong bivariate associations, suggests that other processes may be more strongly implicated in increased anxiety over time (e.g., sleep disturbance).

Different factors may explain why stress predicted depression but not anxiety via rumination in the current study. For example, rumination shared stronger associations with later depression over anxiety, as previously discussed. In addition, high psychological stress may also be especially associated with later depressive over anxiety symptoms. That is, the *DSM-5* emphasises that stressful life events commonly precede major depressive episodes, but stressors are rarely discussed in relation to disorders characterised by anxiety (APA, 2013; although cf. with PTSD). Finally, the differential findings may also reflect temporal effects; that is, elevations in depressive symptoms may take longer to emerge as a result of stressor-prompted rumination, whereas physiological anxiety symptoms may manifest more immediately (e.g., see Nolen-Hoeksema & Morrow, 1991).

In contrast to rumination, sleep disturbance consistently mediated between stress with both depression and anxiety symptoms over time. These novel findings align with previously established longitudinal associations between subjective stress to sleep disturbance (LeBlanc et al., 2009; Linton, 2004; Pillai, Roth, et al., 2014), and sleep disturbance to higher depression (Baglioni et al., 2011; Morphy et al., 2007) and anxiety (Morphy et al., 2007;

Neckelmann et al., 2007) levels. To the author's knowledge, this is the first known study establishing disturbed sleep as a catalyst linking prior psychological stress with worsening affective symptoms. It is possible that poor sleep links subjective over-arousal to affective symptoms via ineffective emotion modulation (Palmer & Alfano, 2017) and thus prolonged negative affect (Thomsen, 2006; Watkins, 2008).

Indeed, maladaptive emotion regulation processes were clearly implicated in linking stress with subsequent sleep impairment and affective symptoms. Specifically, stress indirectly predicted increased six-month depression and anxiety via the combined effects of rumination leading to three-month sleep disturbance. That is, rumination that accompanies stress may eventually decrease overall sleep quality, which can then catalyse into increased depression and anxiety symptoms. These findings correspond with the Perseverative Cognition Hypothesis, and suggest that perseverating about stress may prolong the stress response, thereby creating an allostatic load that compromises health (Brosschot et al., 2006), including mental health. Sleep disturbance may represent a manifestation of this harmful allostatic load, and/or a consequence of physiological over-activation.

In contrast to maladaptive processes linking stress with later affective symptoms, dispositional mindfulness was expected to temper these effects. Indeed, mindful-acting-with-awareness moderated the effects of stress on later anxiety; that is, for participants high in acting-with-awareness, greater stress was less likely to be associated with worsening anxiety over six months compared to participants low in acting-with-awareness. These findings align with the reported stress-buffering effects of mindful-acting-with-awareness in alleviating anxiety

in both cross-sectional (Marks et al., 2010) and experimental (Brown et al., 2012; Ostafin et al., 2014; Weinstein et al., 2009) studies. Regularly attending to present-moment experiences may protect against the detrimental effects of subjective over-arousal by promoting tolerance of aversive emotional states and thereby countering the negative effects of avoidance, which have been implicated in the onset and maintenance of anxiety (Hayes et al., 1999; Hayes et al., 1996). More broadly, greater awareness of one's day-to-day experiences, including habitual stress-reactions, may short-circuit stress by attenuating stress-related appraisals and over-arousal (Creswell & Lindsay, 2014), and/or by prompting alternative adaptive responding (Kabat-Zinn, 2005), which over time may prevent subjective stress from cascading into heightened physiological anxiety.

In contrast to these supportive findings, the stress-buffering effects of dispositional mindfulness were not consistent. That is, contrasting with previously reported stress-attenuating effects for both acting-with-awareness (Dixon & Overall, 2016) and non-judging (Ciesla et al., 2012) in decreasing depression over time, neither facet moderated the effects of stress on six-month depression in the current study (see Calvete et al., 2017 for other non-significant findings). Mindful-non-judging also did not buffer the effects of stress on six-month anxiety, in line with previously reported non-significant findings in cross-sectional studies (Bergin & Pakenham, 2016; Branstrom et al., 2011).

Furthermore, neither mindful acting-with-awareness or non-judging buffered the effects of high stress on three-month sleep disturbance, as per theorising that mindfulness may cultivate an adaptive stance towards sleep-interfering factors (Ong et al., 2012) and decrease cognitive and physiological activation (Lundh, 2005). These non-significant findings should be viewed in light of the

complexity of the current model, which incorporated various interrelated indices of psychological well-being. That is, even though the addition of the mindfulness variables to the model increased the variance accounted for in depression and anxiety, the unique effects of mindful acting-with-awareness and non-judging may be diluted when considered simultaneously with other robust longitudinal predictors of affective distress (i.e., sleep disturbance).

An alternative explanation for the lack of expected stress-moderating effects concerns the measurement of mindfulness as a dispositional tendency. That is, while acting-with-awareness moderated the effects of stress on later anxiety, these effects were modest, and contrast with the small to moderate pre-post treatment effects for MBI training on both depression and anxiety symptoms (Goyal et al., 2014; Hofmann et al., 2010; Khoury et al., 2013). Similarly, MBI participation has been associated with moderate to strong improvements in sleep quality (Gross et al., 2011; Ree & Craigie, 2007; Yook et al., 2008), with improved sleep linked to improved stress levels (Carlson & Garland, 2005). Thus, while day-to-day mindfulness exerted modest stress-buffering effects longitudinally, more active or dynamic processes, such as practicing mindfulness regularly (Black et al., 2015; Carlson & Garland, 2005) and/or increasing trait mindfulness (Quaglia et al., 2016), may be more efficacious in decreasing affective distress and sleep disturbance over time.

There are various treatment implications arising from the current findings. For example, because sleep disturbance emerged as a consistent and strong predictor of later affective distress, improving sleep may offer an important early-intervention strategy. Furthermore, given that stress directly and indirectly predicted later sleep disturbance, stress-management strategies may prevent sleep

problems from emerging in the first place. Thus, preventative intervention efforts may benefit from addressing the known maintaining factors common to both stress and sleep disturbance (Basta, Chrousos, Vela-Bueno, & Vgontzas, 2007); for example, with strategies targeted towards arousal reduction and/or managing unhelpful cognitive processes (see Konsta et al., 2013; Schutte-Rodin, Broch, Buysse, Dorsey, & Sateia, 2008; Varvogli & Darviri, 2011). In addition, since being more aware of current experiences may buffer against high stress to prevent elevated affective distress, community-based mindfulness programs like MBSR, which aim to increase day-to-day mindful awareness (Kabat-Zinn, 2005), may also be particularly efficacious as an early-intervention strategy (Felder et al., 2016; Zenner et al., 2014).

The current findings should be interpreted in light of several study limitations. Broadly, generalisation of the current findings may be somewhat limited given the data-collection methods (i.e., use of a self-selected online convenience sample) and/or sample characteristics (i.e., high depression scores which decreased over time, and study completers tending to be older, more educated, and Caucasian). In summary, reported results may not generalise to samples with lower and/or consistent depressive symptoms, or to younger, less educated, non-Caucasian, or clinical samples. Furthermore, current or previous diagnosis of mental illness was not ascertained or controlled and thus inferences cannot be made about the factors associated with the onset, improvement or worsening of clinical disorders. For example, stress may be particularly detrimental in predicting the first onset of clinical disorders rather than recurrent episodes (Lewinsohn, Allen, Seeley, & Gotlib, 1999). Moreover, baseline sleep disturbance was not controlled; thus, interpretations cannot be made about the

effects of longitudinal changes in sleep quality. In addition, while the current study focused on changes in anxiety and depression as outcomes, depression and anxiety symptoms have also been shown to predict later sleep disturbance (Alvaro et al., 2013), stress (Hammen, 2005), and rumination (Olatunji et al., 2013). Therefore, various possible unexamined bidirectional associations may have influenced the results, and extrapolations cannot be made about these associations.

In addition, the reliance on subjectively reported symptoms may have increased the risk of reporting bias. For example, PSQI self-reported sleep disturbance has been shown to occur in the absence of sleep disturbance measured by actigraphy and polysomnography (Buysse et al., 2008; Grandner et al., 2006).. Correspondingly, interpretations of the current findings are confined to the constructs represented in the chosen self-report measures. In addition, stressful life events were not ascertained in the current study; however, different stressors may differentially impact on affective symptoms (e.g., depending on chronicity or intensity; see Hammen et al., 2009; Monroe & Simons, 1991; Wichers et al., 2009), and also on sleep disturbance (e.g., depending on medical issues or chronic pain; see Basta et al., 2007). Relatedly, physiological measures of stress were not ascertained, although some markers such as cortisol have been linked with later affective symptoms (Dedovic & Ngiam, 2015) and sleep issues (Roth, 2007), and may also be influenced by dispositional mindfulness (Brown et al., 2012). Furthermore, other maladaptive thinking processes such as worry were not measured, even though worry has been implicated in sleep disturbance (Pillai & Drake, 2015), anxiety (Hong, 2007), and may also mediate between stress and anxiety (Brosschot, 2010). Thus, extrapolations about the role of

stressful life events, physiological indices of stress or sleep disturbance, or the effects of worry cannot be made.

The current study also benefited from several strengths. In particular, an empirically and theoretically-driven longitudinal model of affective symptom development was investigated, in line with the perseverative cognition hypothesis (Brosschot et al., 2006) and the mindfulness stress-buffering hypothesis (Creswell & Lindsay, 2014), which elucidated various mechanisms of change. Relatedly, investigating key variables together, including their direct, indirect and moderation effects, allowed key processes to emerge, which generated a richer mechanistic picture than simply comparing the effects of different psychological processes. Moreover, including two follow-up periods extending over lengthy timeframes, while controlling for relevant covariates and baseline affective symptoms, enabled inferences to be made about unique temporal effects and processes of change, while protecting against the potentially contaminating effects of bidirectional associations between variables. Correspondingly, well-validated tools were utilised that did not overlap in terms of relevant item content; for example, depression and anxiety symptoms did not contain sleep-related items, and rumination was measured as a global tendency rather than a stressor or mood-responsive process. In addition, the constructs of interest were investigated as continuous variables, which enabled inferences to be made about how varying levels of emotional regulation tendencies and/or psychological symptoms may influence core affective distress symptoms over time. Finally, statistical power was bolstered by the large sample size and use of statistical methods that maximised the use of available data.

It is hoped that future research continues to investigate longitudinal associations between key psychological and emotion regulation processes, with discrete affective outcomes, over varying timeframes, and while controlling for baseline symptoms to elucidate processes of change. In particular, given the scarcity and conflicting findings with regards to dispositional mindfulness as a stress-moderator, and the absence of studies investigating sleep quality as a mediator between stress and affective distress, it is hoped that these avenues of enquiry will continue. It would also be worthwhile to investigate the temporal associations and process model tested in the current study with different variables, potentially including physiological measurement tools and/or clinical interviews. For example, to see if ruminative thinking can extend various physiological indices of stress (i.e., endocrine, cardiovascular, immune; see Brosshot et al., 2006), thereby potentially predicting the onset and/or maintenance of clinical sleep, mood and/or anxiety disorders. Such investigations with different predictors may illuminate if changing the examined variables improves the associated outcomes, thus furthering knowledge into fruitful avenues for preventative and clinical mental-health interventions.

In summary, this study investigated an empirically and theoretically derived longitudinal model of affective symptom development in a large community sample, while controlling for baseline affective symptoms. Specifically, it explored the relationship between psychological stress with six-month depression and anxiety symptoms: directly, indirectly via dispositional rumination and three-month sleep disturbance, and/or moderated by dispositional mindful acting-with-awareness and non-judging. While stress did not directly predict changes in affective symptoms, it predicted increased six-month

depression and anxiety via three-month sleep disturbance, and also via the combined effects of rumination leading to three-month sleep disturbance, but not six-month anxiety via rumination alone. In addition, high mindful-acting-with-awareness attenuated the effects of stress on six-month anxiety. In summary, stress may catalyse into increased depression and anxiety symptoms via increased ruminative thinking and sleep disturbance. While poor sleep quality appears to play a crucial intermediary role in accounting for the link between heightened stress to increased depression and anxiety, high ruminative tendencies appear to be uniquely associated with later depression but not anxiety symptoms. In contrast, regularly attending to present-moment experiences may buffer the effects of stress on increasing anxiety symptoms.

Chapter 5: General Discussion

Summary of Results

Various factors have been implicated in the exacerbation or alleviation of depression and anxiety symptoms over time, including emotion regulation tendencies towards rumination and mindfulness, and the psychological processes of stress and sleep disturbance. While these associations are generally well established, the bulk of the existing research is dominated by specific conceptualisations, and thus measurement, of these constructs. Moreover, investigations into some factors are favoured over others and there is a paucity of research into theoretically important interactive processes. Thus, the aim of this thesis was to explore various key mechanisms by which core depression and anxiety symptoms can develop over time, including the direct and/or interactive effects of dispositional rumination and mindfulness (Study 1), and the effects of psychological stress, whether direct, mediated by rumination and sleep disturbance, and/or attenuated by dispositional mindfulness (Study 2).

Overall, non mood-responsive rumination was a potent predictor of distress, and shared consistent associations with stress. That is, even when considered along with mindful acting-with-awareness and non-judging, greater rumination directly predicted increased three-month depression, three-month stress, and six-month stress (Study 1). Moreover, rumination mediated the relationship between stress with both three-month sleep disturbance and increased six-month depression (Study 2). Conversely, stress tended to exert its effects indirectly; while directly predicting three-month sleep disturbance, stress only predicted increased six-month depression and anxiety symptoms indirectly via rumination and/or sleep disturbance (Study 2). Indeed, sleep disturbance was

a key intermediary process linking stress and affective distress; stress predicted greater six-month depression and anxiety via higher three-month sleep disturbance, and the combined effects of rumination leading to three-month sleep disturbance (Study 2).

In contrast, mindful-acting-with-awareness tended to attenuate the effects of maladaptive processes on affective symptoms, and was especially protective against anxiety. That is, considered with mindful-non-judging and rumination, greater acting-with-awareness predicted decreased three-month anxiety, in addition to attenuating the effects of low non-judging on three-month anxiety (Study 1), high rumination on six-month anxiety (Study 1), and high stress on six-month anxiety (Study 2). Greater mindful-acting-with-awareness also attenuated the effects of low non-judging on three-month stress, and high rumination on six-month depression (Study 1). However, mindful-non-judging did not predict changes in three and six-month depression, anxiety, and stress, either directly or by attenuating the effects of rumination (Study 1), and it did not attenuate the effects of stress on rumination, three-month sleep disturbance, or changes in six-month depression and anxiety (Study 2).

Rumination. While ruminative thinking has been implicated in the onset and maintenance of depression specifically (Nolen-Hoeksema, 1991; Segal et al., 2013), it appears that a general tendency to ruminate additionally exerts broader longitudinal effects, affecting both stress and sleep disturbance (Åkerstedt et al., 2012; Ciarrochi & Scott, 2006). Rumination also appears to be a key mechanism by which stress can catalyse into later sleep disturbance and increased depressive symptoms (Cropley et al., 2006; Ruscio et al., 2015). Given the subjective and cognitive-evaluative element of stress measured in the current research (e.g., “I

felt I was rather touchy”; “I tended to over-react to situations”), strong relationships with rumination were expected. Indeed, findings suggest that even a relatively stable tendency to ruminate may co-occur with stress (Smith & Alloy, 2009), in addition to being mood-responsive as per previous accounts (Nolen-Hoeksema et al., 2008). That is, broad ruminative tendencies may reflect a vulnerability that is activated in the context of high stress, and which can catalyse into further affective distress.

Various factors may account for the close associations between rumination and stress and therefore the subsequent effects on psychological well-being, including depression and sleep disturbance. The tendency to critically self-focus on recent personal experiences may be relied on in times of stress as a cognitive strategy intended to resolve perceived discrepancies between one’s desired and actual circumstances (Smith & Alloy, 2009); however, this may inadvertently exacerbate self-questioning and uncertainty (Nolen-Hoeksema, 2000) and physiological arousal (Brosschot et al., 2006). Ruminating on previous events may also prolong and exacerbate a sense of loss (APA, 2013; Lazarus, 1991), or perceptions of failure and poor coping (Beck, 2011), both of which are associated with depressed mood. Ruminating is also thought to prolong cognitive and physiological activation, which is incompatible with sleep (Åkerstedt, 2006; Pillai & Drake, 2015). More broadly, high ruminative thinking may prolong negative affect (Thomsen, 2006; Watkins, 2008) and prevent adaptive responding (Nolen-Hoeksema et al., 2008). The absence of direct and indirect effects of rumination on anxiety may reflect the past-oriented focus of ruminative thinking, whereas anxiety tends to be associated with anticipated threat (Lazarus, 1991); thus, future orientated perseveration such as worry may be more closely

linked with anxiety (Hong, 2007; Mathews, 1990). In sum, the repetitive, discrepancy-based, and self-critical appraisal processes inherent in dispositional rumination may increase or prolong unpleasant arousal and/or negative affect, which over time may exacerbate sleep disturbance and depression.

Stress. Psychological stress has many faces; it has been considered a correlate and/or outcome of maladaptive emotion regulation processes (Gross, 2014; Lazarus & Folkman, 1984), including rumination (Ciarrochi & Scott, 2006), as well as a correlate and/or predictor of later affective distress and poor sleep (Hammen, 2005; LeBlanc et al., 2009; Monroe & Simons, 1991). In the current research, stress shared strong concurrent associations with rumination, depression, anxiety, and sleep disturbance; however, longitudinal associations revealed stress to be more than merely a correlate of these factors. That is, baseline rumination predicted longitudinal increases in stress (Study 1), and baseline stress also directly resulted in higher sleep disturbance, and indirectly increased depression and anxiety via rumination leading to sleep disturbance (Study 2). Of note, even though stress can directly predict affective symptoms (Morrison & O'Connor, 2005; Young & Dietrich, 2015), only indirect effects emerged in the current study. Together these findings suggest that high subjective stress may not be inherently detrimental for increased affective symptoms, and, instead, impart deleterious effects through rumination and subsequent poor sleep (see Brosschot et al., 2006).

Sleep disturbance. The role of impaired sleep appears to be threefold: it represents (1) a potential outcome of maladaptive processes such as high stress (LeBlanc et al., 2009; Pillai, Roth, et al., 2014) and rumination (Åkerstedt et al., 2012; Drake et al., 2014); (2) a risk factor for affective symptoms (Baglioni et al.,

2011; Morphy et al., 2007); and, (3) a mediator between stress and later affective symptoms. To the author's knowledge, this latter association has not previously been elucidated, and thus represents a novel finding with important clinical implications. Notably, sleep disturbance exerted stronger direct effects on affective outcomes than either rumination or stress. Thus, non-significant direct relationships between both stress (Study 2) and rumination (Study 1) in predicting increased six-month depression and anxiety may reflect the crucial intermediary role that sleep quality plays. That is, it appears that both high arousal states (e.g., subjective stress) and cognitive processes (e.g., rumination) can contribute to and maintain poor sleep (Bonnet & Arand, 2010), which offers insight into the episodic nature of clinical sleep disturbance (APA, 2013). In turn, sleep disturbance is associated with difficulties regulating negative affect, leaving the individual prone to more negative and fewer positive emotions (Baglioni et al., 2010; Gruber & Cassoff, 2014; Palmer & Alfano, 2017), which over time may increase symptoms of depression and anxiety.

Mindfulness. Conversely, dispositional mindfulness may mitigate the effects of maladaptive processes. That is, higher mindful-acting-with-awareness was consistently protective against increasing anxiety, and particularly in buffering the effects of critical self-evaluation and/or high tension (i.e., high rumination or low non-judging in Study 1, stress in Study 2). Complementary findings have previously been reported for acting-with-awareness in decreasing negative affect over time (Brown & Ryan, 2003; Weinstein et al., 2009), and moderating the effects of stress to decrease anxiety in experimental studies (Brown et al., 2012; Weinstein et al., 2009). The current findings are novel, given the absence of existing longitudinal studies into the effects of dispositional

mindfulness on anxiety, and the stress- or rumination-moderating effects on affective symptoms more broadly. Of note, these results potentially illuminate mechanistic processes; that is, when maladaptive self-evaluation or tension is prevalent, a higher tendency to pay attention to present-moment experiences may protect against increasing anxiety by facilitating contact with these experiences rather than avoidance (Hayes et al., 1996), or lessen cognitive over-activation which can protect against physiological over-activation (Brosschot et al., 2006). Higher acting-with-awareness also buffered the effects of critical self-evaluative processes on increasing stress and depression, with shorter-term effects (i.e., three months) on stress, and longer-term effects (i.e., six months) on depression. Broadly, it appears that being aware of present-moment-experiences, without cognitively elaborating on them, may protect against judgement-fuelled and discrepancy-based cognitive processes (Brown & Ryan, 2003; Farb et al., 2014; Segal et al., 2013), thereby resulting in reductions in stress and depression over time.

On the other hand, the tendency to be mindfully non-judgemental towards thoughts and feelings was *not* protective against affective symptoms over time, consistent with previously reported non-significant effects when considered together with rumination (Petrocchi & Ottaviani, 2015) or other facets of dispositional mindfulness (Barnes & Lynn, 2010). Given that rumination and non-judging are inversely related (de Bruin et al., 2012; Gu et al., 2016; Petrocchi & Ottaviani, 2015), and rumination represents a more stable and global tendency towards self-critical appraisal than non-judging (i.e., of self-concept, thoughts, behaviours, and events; Trapnell & Campbell, 1999), rumination may have overpowered the unique effects of non-judging. Alternatively, acting-with-

awareness tends to share somewhat higher correlations with attentional control, behavioural control, and emotional awareness compared to non-judging (Curtiss & Klemanski, 2014; Sugiura et al., 2012); thus, it may be these constructs that facilitate awareness and adaptive responding in the context of high maladaptive processes.

Theoretical Considerations

The perseverative cognition hypothesis. According to the Perseverative Cognition Hypothesis, responding to stress by perseverating about it is thought to extend physiological activation and create a pathogenic state which compromises health (Brosschot et al., 2006). The current findings support this hypothesis and highlight the potential effects of perseverative thinking on psychological health in particular. That is, high rumination was associated with prolonged stress over both three and six-months (Study 1), and rumination also mediated the effects of stress on impaired sleep at three-months, and increased depression over six-months (Study 2). These findings suggest that ruminative thinking may contribute to psychological disturbance (i.e., depression and poor sleep quality) by extending the stress response. Of note, stress did not directly predict depression, which suggests that stress itself may not be inherently harmful for later depression; instead it is the tendency to perseverate in the face of stress that diminishes well-being. Conversely, stress predicted sleep disturbance both directly and indirectly via rumination, which highlights that high stress, irrespective of perseverative thinking, is inherently detrimental to sleep quality. In addition, stress was related to both depression and anxiety via the indirect effects of rumination leading to sleep disturbance. Taken together, aligning with the Perseverative Cognition Hypothesis (Brosschot et al., 2006), these findings

suggest that perseverative thinking co-occurring with stress may create an allostatic load that impacts later sleep quality, or that poor sleep is itself a manifestation of this harmful allostatic load (e.g., see Åkerstedt, 2006; Cappuccio, D'Elia, Strazzullo, & Miller, 2010; Irwin, Olmstead, & Carroll, 2015), which can subsequently exacerbate depressive and anxiety symptoms.

The mindfulness stress-buffering account. Current theory casts mindfulness practice as beneficial to health via its stress-buffering function on stress-related appraisals and physiological reactivity (Creswell & Lindsay, 2014). Indeed, even in the current community sample, dispositional mindful-acting-with-awareness appeared to benefit psychological well-being by attenuating the effects of self-critical appraisal processes (i.e., high rumination and low non-judging) or high subjectively experienced arousal (i.e., stress). These effects were consistently protective against anxiety; thus, mindfully paying attention to present-moment experiences may lessen the possibility that harmful appraisal processes are automatically enacted (e.g., threat-appraisals; see Creswell & Lindsay, 2014), or serve as an early-warning system such that, if harmful appraisal processes are enacted, individuals are more quickly able to notice and then disengage from them (Kabat-Zinn, 2005; Segal et al., 2013). It was also expected that a higher tendency towards non-judging would counter self-critical appraisal processes; however, these effects were not evident in the current research. Thus, mindfulness may be beneficial by altering one's relationship towards cognitive-evaluative content and processes, rather than countering the content itself as per traditional cognitive therapies (e.g., see Segal et al., 2013).

Clinical Implications

Several theorists, researchers, and practitioners of mindfulness have called for research into how mindfulness training impacts health and well-being (Coffey, Hartman, & Fredrickson, 2010; Didonna, 2009; Fjorback, Arendt, Ornbøl, Fink, & Walach, 2011; Shapiro, Carlson, Astin, & Freedman, 2006). The current research was considered a complementary investigation in line with these aims. That is, if MBI participation can increase one's day-to-day mindfulness (Quaglia et al., 2016), and these increases underpin improvements in affective symptoms (Kumar et al., 2008; Quaglia et al., 2016; Shapiro et al., 2007), then one's natural tendencies should similarly exert positive longitudinal effects on depression and anxiety in naturalistic settings. This was indeed found in the current research, with the findings indicating that even a naturally-occurring tendency to pay attention to present-moment events and experiences can confer benefits for depression and anxiety, by attenuating the effects of high rumination, low non-judging, and high stress, even over lengthy timeframes. Thus, adaptive emotion regulation strategies or processes may be particularly effective in protecting against psychopathology when maladaptive strategies are also being employed (Aldao & Nolen-Hoeksema, 2012).

Given the beneficial effects of a natural inclination towards mindful awareness, MBI participation may confer even stronger effects. Thus, broadly-pitched MBIs such as MBSR may be beneficial for alleviating various manifestations of psychological distress (Chiesa & Serretti, 2009; Khoury et al., 2013), or be particularly effective as a preventative or early-intervention strategy that can increase resilience and well-being (Felver et al., 2016; Zenner et al., 2014). Anxiety may be effectively targeted through interventions that focus on

applying mindful awareness in daily life as an antidote to self-critical thinking and stress (e.g., Acceptance and Commitment Therapy and/or MBSR; Hayes et al., 1999; Hofmann et al., 2010; Kabat-Zinn, 2005; Sharp, 2012; Swain et al., 2013). Depression may be most effectively targeted by applying mindfulness towards decreasing habitual ruminative responses to depressed mood (e.g., MBCT; Chiesa & Serretti, 2011; Hofmann et al., 2010; Segal et al., 2013). Given the key role that sleep disturbance played in linking stress with later affective distress, efforts to prevent generalised stress and sleep issues may also offer an effective early-intervention strategy. Targeting maintaining factors common to both stress and sleep issues may be particularly beneficial, including arousal reduction and/or cognitive strategies (Konsta et al., 2013; Schutte-Rodin et al., 2008; Varvogli & Darviri, 2011).

Methodological Considerations

Comparing dispositional mindfulness with mindfulness practice.

While participating in MBIs has been associated with small to moderate effects in reducing affective symptoms (Goyal et al., 2014; Hofmann et al., 2010; Khoury et al., 2013), day-to-day mindful acting-with-awareness exerted consistently modest effects in the current research. Various factors may account for the somewhat stronger effects of MBI participation over dispositional mindfulness. For example, MBIs are applied interventions that aim to facilitate behavioural change (e.g., daily mindfulness practice, regular reflective activities; Kabat-Zinn, 2017), and actual amount of time practicing mindfulness has been associated with improved affective symptoms (Hawley et al., 2014; Speca et al., 2000). Furthermore, psychological improvements across MBIs have been associated with *increased* dispositional mindfulness and *decreased* repetitive

thinking (including rumination) as key mechanisms of change (Gu et al., 2015). Finally, MBIs are typically of eight-weeks duration, as are the reported pre-post effects (Gu et al., 2015). Thus, applied mindfulness practice over an eight-week period, which can *increase* mindful behaviours and tendencies, while *decreasing* ruminative tendencies, seems to exert more powerful effects than stable baseline mindfulness tendencies over longer timeframes.

In addition, several mechanisms that have been proposed to account for how mindfulness practice may improve well-being were not captured by the mindfulness scales utilised in the current research. For example, mindfulness practice is said to cultivate a decentred relationship with thoughts (Kabat-Zinn, 1982; Teasdale et al., 1995), a willingness to stay with and tolerate various cognitive, emotional, and body-felt experiences (Baer, 2003; Shapiro et al., 2006), and compassion (Crane et al., 2017; Holzel et al., 2011). Thus, while mindfulness meditators score more highly on both acting-with-awareness and non-judging compared to non-meditators (Baer et al., 2008; de Bruin et al., 2012), they may differ in other important ways, including their propensities to *apply* mindful practice (e.g., disengaging from unhelpful thinking processes, turning towards body-sensations and emotional experiences) or to embody related qualities (e.g., compassion). That is, a person who scores highly in dispositional self-reported mindfulness may have not have received teaching in the effortful, intentional, and applied practice of mindfulness, which may cultivate psychological well-being via various interrelated processes.

Comparing trait and state-based effects over different timeframes.

The relatively modest longitudinal effects evidenced in the current research also need to be viewed in terms of the study design. That is, the effects of stable

tendencies were investigated, both together and in interaction, on other relatively stable outcomes, over moderate timeframes. However, state-based effects may reveal quite different outcomes. For example, rumination is said to operate as an affect-amplifier (Watkins, 2008), and state-induced rumination has been shown to exert immediate effects on affective distress (Huffziger & Kuehner, 2009; Kuehner, Huffziger, & Liebsch, 2009), whereas dispositional rumination may confer more modest effects on affective symptoms over longer time periods. Similarly, dispositional mindfulness may offer a buffer in the context of high state-based stress or rumination (Brown et al., 2012; Niemiec et al., 2010; Ostafin et al., 2014), but exert less powerful buffering effects on high stress and rumination which is pre-existing and/or relatively stable. Dispositional mindfulness may also be protective by *preventing* high stress or rumination from occurring in the first place, by providing an early-warning system that facilitates differential responding (Kabat-Zinn, 2005). In summary, differential effects likely exist between state versus trait predictors, on shorter versus longer-term outcomes.

Measurement considerations. In a research program that relies on self-report data, it is worthwhile to comment on the relative merits and limitations of the measures utilised, and by extension, the corresponding inferences that can be drawn from their effects.

Dispositional rumination. Investigating rumination as a general predilection to dwell on personal experiences, rather than a process triggered by low mood or stress (as per other rumination measures), was a strategy to minimise potential overlap with affective symptoms. Notably, it appeared that even this stable generalised tendency to ruminate was highly related to current

stress levels. Thus, although not investigated in the current study, ruminative tendencies may be partially stress-responsive, in line with previous findings whereby stress longitudinally predicted higher trait mood-responsive rumination (Michl et al., 2013; Nolen-Hoeksema et al., 1999). That is, high ruminators may be particularly susceptible to rumination during or following certain experiences or triggers, rather than necessarily engaging in constant rumination (Smith & Alloy, 2009). In addition, engagement in rumination may vary by whether it is controllable or uncontrollable, conscious or unconscious, or by its associated emotional valence, motivational factors, and/or perceived utility (Smith & Alloy, 2009; Vanhalst, Luyckx, Raes, & Goossens, 2012). Thus, investigating a global tendency to ruminate was useful in differentiating it from affective-triggers; nevertheless, this tendency may nonetheless be stress-responsive and therefore context-bound, and inferences cannot be made about the role of other (unmeasured) features of rumination.

Dispositional mindfulness. The mindfulness tendencies investigated – acting-with-awareness and non-judging – align with the two-pronged conceptualisation of mindfulness encompassing an attentional focus on present-moment experiences, together with an attitudinal focus encompassing non-judgement (Bishop et al., 2004). These facets are also empirically related to mindfulness as an overarching factor (Baer et al., 2006; Christopher et al., 2012; Lilja et al., 2011), yet are also distinct as they are differentially associated with other indices of emotion regulation (Curtiss & Klemanski, 2014; Sugiura et al., 2012). Thus, even though acting-with-awareness has been the most commonly investigated self-reported component of mindfulness to date (Park et al., 2013; Van Dam et al., 2018), the current study sought to additionally explore the

pivotal attitudinal tendency towards non-judging. Investigating both mindfulness facets was useful in comparing their differential effects. Interestingly, it was revealed that being high in one mindful tendency may protect against the adverse effects of being low in another mindful tendency. These unexpected findings were novel and raise the possibility that low adaptive emotion regulation tendencies may be comparably harmful to high maladaptive tendencies.

While the research benefited from investigating these distinct mindfulness facets, several theorists and researchers have expressed concerns about the lack of consensus around conceptualising, and therefore measuring, mindfulness (Bergomi, Tschacher, & Kupper, 2013; Grossman, 2008; Van Dam et al., 2018). In particular, questions have been raised about the construct validity of existing mindfulness scales. For example, it has been argued that content in existing questionnaires diverges from Buddhist conceptualisations of mindfulness (e.g., cultivating knowledge, joy, and compassion; Grossman, 2008, 2011). Other mindful qualities have also been identified that are not included in all questionnaires (e.g., self-acceptance, non-avoidance, non-identification with experiences, and insightful understanding; Bergomi et al., 2013). Existing mindfulness questionnaires have also been critiqued for being empirically rather than theoretically derived (Bergomi et al., 2013), and for their lack of content validation with relevant populations (Grossman, 2008; Park et al., 2013). Thus, given these conceptual issues, existing mindfulness scales may incompletely, or inaccurately, represent mindfulness.

In addition, the utility of self-report has been questioned given the potential for biased-responding, ambiguities in meaning within the scales, and differences in responding between different populations (Bergomi et al., 2013;

Grossman, 2011). For example, experienced and novice meditators may differ with regards to their understanding of, and value placed upon, different items within mindfulness scales (Grossman, 2011). Indeed, it has been shown that non-meditators are more likely to deny negatively worded FFMQ-items than endorse positively worded items (Baer et al., 2011; Van Dam et al., 2009), which is problematic given that the FFMQ acting-with-awareness and non-judging scales are entirely negatively worded. Thus, even though recent mindfulness practice was unrelated to acting-with-awareness and non-judging in the current research, these findings nonetheless raise the possibility of differential item-endorsement based on one's experience with mindfulness practice. Furthermore, given the reliance on negatively worded items, both acting-with-awareness and non-judging may inadvertently measure critical self-perception (Bergomi et al., 2013), which may be linked less to mindfulness and more to negative affectivity or similar constructs (Grossman, 2011). Indeed, in the current research low non-judging in particular appeared to function comparably to high rumination, even though they represented discrete constructs. Thus, self-reported mindfulness in the present research may have been subject to inadvertent response biases, which decreases the certainty in making inferences about their effects.

Relatedly, acting-with-awareness scales possesses unique issues with construct validity. For example, while the ability to regulate attention is considered core to mindfulness, this focus is thought to include awareness of thoughts, emotions, and body-sensations (Bishop et al., 2004; Farb et al., 2014). However, FFMQ-acting-with-awareness reflects attention paid to activities of daily life (Baer et al., 2006), not internal experiences. Furthermore, the MAAS (Brown & Ryan, 2003), of which the FFMQ acting-with-awareness scale is

largely drawn (Baer et al., 2006), has been criticised with regards to its over-reliance on negatively worded items that assess inattentiveness and concentrative lapses (Grossman, 2011). Furthermore, MAAS-measured acting-with-awareness has been found to be moderately inversely associated with boredom-proneness and strongly inversely associated with day-to-day cognitive errors and memory failures (Cheyne et al., 2006), which raises the possibility that the FFMQ scale shares similar associations. In summary, FFMQ-measured acting-with-awareness may not completely capture mindfulness as it is commonly conceptualised.

Similarly, while the attitudinal component of non-judging is also considered core to mindfulness (Bishop et al., 2004; Farb et al., 2014), FFMQ-non-judging has conceptual limitations. For example, the attitudinal element of mindfulness is thought to comprise non-judging in addition to openness and curiosity (Bishop et al., 2004), and a de-centred stance towards cognitive-evaluative processes (Farb et al., 2014); however, FFMQ-non-judging does not capture these complementary components. Furthermore, FFMQ-non-judging ascertains one's level of acceptance of thoughts and emotions, rather than reflecting a broader tendency towards accepting various experiences, including physical sensations, as per common conceptualisations of mindfulness (Bishop et al., 2004). Thus, akin to FFMQ-measured acting-with-awareness, non-judging may not represent mindfulness in line with broader conceptualisations.

Depression, anxiety and stress. Symptoms of depression, anxiety, and stress measured in the current research each represented distinct yet core features of the respective constructs, which facilitated inferences to be made about different subclinical symptom profiles and their patterns of change over time. However, even though the DASS-21 measures symptoms experienced over the

previous week (Lovibond & Lovibond, 1995b), each of the subscales possessed high temporal stability, aligning with previously reported moderate temporal stability for each DASS subscale over several years (Lovibond, 1998). Such stability, when considered against the well-known dynamic variability of affective symptoms, may have limited the power to detect changes in depression and anxiety over time, and/or the putative moderating effects of mindfulness on stress. In addition, the DASS-21 is not a diagnostic tool, and thus firm inferences cannot be made about the onset or maintenance of clinical depression and anxiety. Nonetheless, predictive effects from this study suggest that even relatively stable affective symptoms can be influenced over time by different emotional regulation and/or psychological processes.

Sleep disturbance. The measurement of sleep in the current study represented a global construct encompassing various common manifestations of poor sleep (Buysse et al., 1989), thereby offering a more robust measure of sleep disturbance than some previously utilised scales (i.e., a one-item measure of perceived sleep-quality; see Salmoirago-Blotcher et al., 2013; Vahtera et al., 2007). Even though the PSQI possesses adequate internal consistency, however, it comprises various different facets of sleep disturbance, which may be differentially related to other symptoms. For example, rumination has been found to predict sleep onset latency in particular (Pillai, Steenburg, et al., 2014; Zoccola et al., 2009). Furthermore, even though “poor sleep” over the previous month was the reported average for the current sample (Buysse et al., 1989), thereby implying a level of chronicity of sleep disturbance, firm distinctions could not be made in line with clinical diagnoses such as Episodic versus Persistent Insomnia Disorder (APA, 2013). Finally, objectively measured sleep

quality has been shown to differ from self-reported sleep quality (Perlis et al., 1997; Rosa, 2000; Zhang & Zhao, 2007), including PSQI self-ratings (Buysse et al., 2008; Grandner et al., 2006). In summary, while global sleep quality was measured with a well-validated self-report tool, inferences cannot be made about the potential differential effects of sleep facets, clinical sleep disturbance, or objectively measured sleep disturbance.

Limitations of the Research

The limitations inherent in the current research have previously been discussed. Briefly, across both studies, the veracity and generalisability of findings may be affected by the use of particular measurement tools (e.g., limitations inherent in the mindfulness scales and non-clinical measures of distress), online data-collection methods (e.g., self-selected convenience sample), reliance on self-report (e.g., potential for biased, inaccurate or non-serious responding), specific sample characteristics (e.g., participants who continued were older, and more likely to be Caucasian and university educated, and were moderately depressed at baseline), and potentially important variables were not ascertained (e.g., mental illness, stressful life events, physiological markers of stress or sleep disturbance), including various other emotional regulation processes implicated in psychological well-being (e.g., worry, suppression, reappraisal, experiential avoidance). Thus, these considerations merit caution in applying findings to the Australian population, community samples broadly, or to clinical samples, treatment-samples, or to those who have experienced stressful life events specifically.

Other limitations pertaining to the research as a whole are also noteworthy. For example, the meaningfulness of the results are belied by small

effect sizes, which raises the possibility that significant findings may have been unduly influenced by the large sample size, or, more generally, reflect modest effects across extended follow-up periods. Relatedly, it is possible that investigating various emotion regulation and psychological processes may have simultaneously created suppressor effects, thus masking the unique influence of certain predictors (e.g., non-judging vs. rumination; see Petrocchi & Ottaviani, 2015). Furthermore, there are several theoretically and empirically supported temporal orderings that could have been investigated between the variables of interest, such as depression and/or anxiety predicting later sleep disturbance (Jansson-Fröjmark & Lindblom, 2008; Morphy et al., 2007), or stress predicting later rumination (Michl et al., 2013; Nolen-Hoeksema et al., 1999). Furthermore, given that sleep disturbance is associated with impaired executive functioning and attentional regulation (Gruber & Cassoff, 2014), and impaired attentional regulation is associated with heightened ruminative thinking (Koster, De Lissnyder, Derakshan, & De Raedt, 2011), poor sleep also likely leads to increased rumination (Carney et al., 2006). Thus, while the aim of the current thesis was to investigate processes involved in the exacerbation or alleviation of depression and anxiety symptoms specifically, there remain various other longitudinal designs and models of psychological distress that are plausible.

Strengths of the Research

Nonetheless, the research benefited from several strengths. The thesis examined key mechanisms of affective change in a longitudinal fashion and with analytic techniques that not only elucidated their temporal prediction but also their mechanistic impact. Moreover, it improved upon previous methodological shortcomings by focusing on emergent affective symptoms through controlling

baseline symptoms, inclusion of sleep as an important mechanism in the overall model, examination of non-mood-responsive rumination and discrete facets of mindfulness, and the use of measurement tools with psychometric support. The inclusion of two follow-up points also enabled conclusions to be made about the maintenance of effects across time (Study 1) and the underlying longitudinal mechanisms as manifest in a complex, theoretically and empirically-derived process model (Study 2). Finally, the large community-based sample also offered utility over the student-based samples that are frequently recruited for psychological research, as it increases the confidence by which the data can be interpreted and generalised to the Australian population.

Future Directions

Generally, future research would benefit from continued longitudinal investigations into the effects of distinct emotion regulation and psychological processes, on distinct affective outcomes, over varying time frames. Such investigations would further illuminate the likely mechanisms associated with psychological health and/or illness, and, thus, the most beneficial therapeutic interventions for people with different symptom profiles. It would be particularly fruitful if longitudinal studies continued to investigate infrequently researched processes, such as the potential for dispositional mindfulness to act as a buffer to stress and/or self-critical appraisal processes, in addition to sleep quality as a mediator between stress and affective symptoms.

Future research may benefit from a varied approach to measuring indices of emotion regulation and psychological processes. For example, investigating stress in its various manifestations – such as via life stressors that vary by acuity, severity, or associated themes (e.g., loss or threat-based experiences) – may yield

clinically relevant differential associations with other psychological symptoms (e.g., see Hammen, 2005; Kendler et al., 2003). Similarly, ascertaining other processes of perseverative or self-relevant thinking, such as worry or reflective tendencies, may also be useful in comparing the relative strengths of different processes, and also to further investigations into the utility of adaptive strategies in ameliorating the effects of maladaptive strategies (e.g., see Aldao & Nolen-Hoeksema, 2012). Ascertaining physiological indices of stress (e.g., cortisol levels) and sleep disturbance (e.g., via polysomnography), may be useful to gather more objective data, and also to investigate the underlying physiological correlates between different symptoms. Given that mindfulness has been conceptualised in various ways, if self-report surveys are utilised it would be worthwhile to clearly delineate the constructs measured therein (Grossman, 2011), to consider investigating various facets (Bergomi et al., 2013), and also outcomes commonly associated with mindfulness practice (e.g., compassion; Grossman, 2008; Van Dam et al., 2018). Alternatively, ecological validity may be improved by measuring mindfulness via experimental tasks, interview data, third-person report, or behavioural indicators (Bergomi et al., 2013; Van Dam et al., 2018). Finally, utilising diagnostic tools or clinical interviews to ascertain mood and anxiety disorders may be beneficial in ascertaining mechanistic factors associated with the onset and maintenance of clinical disorders, and thus the most efficacious treatment interventions.

Conclusions

The current thesis examined the mechanisms involved in increasing depression and anxiety symptoms over time, including the direct and/or interactive effects of dispositional rumination and mindfulness (Study 1), and the

effects of psychological stress, whether direct, mediated by rumination and sleep disturbance, and/or attenuated by dispositional mindfulness (Study 2). Overall, findings suggested that a general tendency to ruminate is more predictive of later stress and depression over anxiety symptoms, that poor sleep quality plays a key intermediary role in linking subjective stress to later affective symptoms (as a unique factor and also following rumination), and that the tendency to attend to present-moment experiences is especially protective in buffering the effects of high stress and/or critical self-evaluation on later anxiety symptoms. Thus, the tendency to ruminate may extend stress to exacerbate sleep disturbance and subsequent affective symptoms, whereas a tendency to attend to present-moment experiences may buffer the effects of different maladaptive processes to improve affective well-being. The findings are novel in revealing poor sleep as a key process linking high stress with increasing affective distress and suggest that interventions targeting sleep quality may offer a potent early-intervention strategy. Relatedly, therapies aimed at increasing day-to-day present-orientated attention may reduce the risk that individuals who are highly stressed and/or self-evaluative will experience worsening affective symptoms over time.

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Appendices

Appendix A: Advertisement

There is nothing either good or bad but thinking makes it so. – Shakespeare

Was Shakespeare right? Can our awareness or thinking contribute to our emotional experiences, including the tendency to feel stressed or anxious?

You are invited to participate in an online questionnaire study that is investigating how the tendency to reflect, ruminate, or be mindful can contribute to the development of stress, anxiety, depression, and sleep difficulties.

The ethical aspects of this research have been approved by the Australian National University Human Research Ethics Committee, ethics protocol: 2014/340.

If you are interested, please contact Ms Monique Wilson (DPsych Candidate) at monique.wilson@anu.edu.au or click the following link:

<https://anupsyh.col.qualtrics.com/SE/nomadhkshdhajksh>

Alternatively, please cut and paste the address into your Internet address bar.

Appendix B: Participant Information Sheet



Participant Information Sheet

Researchers:

This research is being conducted by Ms. Monique Wilson, Doctor of Psychology (Clinical) student, Research School of Psychology, College of Medicine, Biology and Environment at the Australian National University. This research is being supervised by A/Prof Rhonda Brown, Research School of Psychology, the Australian National University.

Project Title:

The Relationship Between Mindfulness and Rumination with Depression and Anxiety Symptomology: A Prospective Study.

General Outline of the Project:

Many people experience significant stress, anxiety, depression and/or sleep difficulties in their lifetime. Several factors have been suggested to contribute to the development of these symptoms. For example, individuals who are less likely to be mindful and accepting of their experiences tend to experience higher levels of anxiety, depression and sleep disturbance (Keng, Smoski, & Robins, 2011). In contrast, individuals who tend to ruminate on negative experiences appear to be more likely to develop distressing psychological symptoms such as depression (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008).

We aim to investigate how Australian adults' tendencies to ruminate or be mindful may specifically contribute to the development of stress, anxiety, depression, and sleep difficulties. The study will be hosted online via three surveys that address current experiences of stress, anxiety, depression, sleep disturbance and the tendency to ruminate, reflect, and be mindful in daily life. After completion of the first survey participants will be emailed an invitation to complete the second survey three-months later, and then a final survey three-months later. That is, participants will be invited to complete a baseline survey, a three-month follow-up survey, and a six-month follow-up survey. At the conclusion of the study, the results will be presented in the student's doctoral thesis project, as well as scientific journal articles and conference presentations.

Participant Involvement:**Voluntary Participation and Withdrawal**

Participating in this study is completely voluntary. You are not under any obligation to participate, and if you do consent, you can withdraw from the study without affecting your relationship with staff at the Australian National University. You can discontinue participation by simply closing the survey browser window. If you begin a survey but choose not to finish it, any data obtained in this survey will be discarded. However, once you have completed a survey, the data you have submitted from this survey will be retained and utilised for publication.

All participants who have consented to participate in this study will be emailed about completing the second and third surveys. At any time you can select the "opt out" link provided in these emails or can email the researcher to request your nominated email address is removed from the distribution list. Opting out indicates your withdrawal from the study and you will not be contacted subsequently.

What will participants have to do?

If you consent to participate in the study, you will be asked to complete three online surveys, three-months apart. Each survey will contain the same questions about your current experiences of stress, anxiety, depression,



sleep disturbance and the tendency to ruminate, reflect, and be mindful in daily life. Each survey should take no longer than 15 minutes to complete.

If you consent to participate in this study, you will be asked to provide an active email address. Your email address will be used to contact you about completing the three-month follow-up survey. After the three and six-month follow-up surveys, you may also be contacted one and two weeks later to remind you to complete these surveys. It is advised that you add the Qualtrics distribution email (noreply@qemailserver.com) to your address book in order to receive these emails, although you are not required to do so and you can opt out from receiving emails at any time. No reference to sensitive mental health topics (e.g., depression, rumination) will be made in any of the email correspondences.

Incentives

Upon completion of both the three and six-month follow-up surveys, you have the option to enter a prize draw to win one of three \$100 Coles or Woolworths/Safeway vouchers. If you are a first year psychology student at the Australian National University, you can be awarded course credit after completion of each survey.

Risks

Some participants may find that completing the surveys causes them to feel distress or concern about their own or another's psychological health. If at any stage you wish to discuss these concerns, you may wish to contact Lifeline on 13 11 14 or Beyond Blue on 1300 224 636. If any of the survey questions cause you distress, you are also encouraged to discontinue participation in the study.

Implications of Participation

Participants may benefit from participating in this study by learning about how research is conducted or through learning about themselves via a process of self-reflection that is encouraged in the surveys. However, we cannot guarantee or promise that you will receive any benefits from participating in this study.

Exclusion Criteria:

A large sample of Australian adults is sought for participation in this study. You will not be eligible to participate if you are under 18 years of age, reside outside of Australia, or are not an Australian resident or citizen.

Confidentiality:

Only the researchers will have access to information collected from participants. During the study, your survey responses and email address will be captured on the Qualtrics online survey platform. When your data is downloaded from this platform, your email address and survey responses will be downloaded in to two separate reports and stored on separate computers so that you cannot be identified personally (e.g., via your email address) in your survey responses. Study results will be presented in the student's doctoral thesis project, as well as scientific journal articles and conference presentations; however, individual's participant data will not be identifiable.

Privacy Statement:

This study will be hosted using Qualtrics online survey software. Qualtrics utilises data encryption to protect the privacy of submitted data, details of which can be located at <http://www.qualtrics.com/security-statement/> and <http://www.qualtrics.com/privacy-statement/>. However, even with established privacy protections, the World



Wide Web is an insecure public network that gives rise to a potential risk that a user's transactions are being viewed, intercepted or modified by third parties or that data which the user downloads may contain computer viruses or other defects. However, as far allowed by law, all aspects of this study, including the results, will be kept strictly confidential.

Data Storage:

During the study, participant data will be stored on the Qualtrics server and/or the ANU secure online server and/or the researcher's computers, each accessible only via password. At the conclusion of the data collection phase, all data will be downloaded and then deleted from the Qualtrics online survey platform. The file containing participant email addresses will also be permanently deleted. Thus, data will only be held in a de-identified form on the researcher's computers or ANU online server. At the conclusion of the study write up, survey data will be held on A/Prof Rhonda Brown's work computer for a period of five years and then will be deleted.

Queries and Concerns:

If you have questions or would like to know more about the study at any stage, please feel free to contact the researcher, Ms Monique Wilson of the Research School of Psychology, College of Medicine, Biology and Environment, at monique.wilson@anu.edu.au or + 61 2 6125 5585. Alternatively, please contact the chief supervisor A/Prof Rhonda Brown of the Research School of Psychology, College of Medicine, Biology and Environment at rhonda.brown@anu.edu.au or + 61 2 6125 0635.

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee. If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager
The ANU Human Research Ethics Committee
The Australian National University
Telephone: +61 2 6125 3427
Email: Human.Ethics.Officer@anu.edu.au

References

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Appendix C: Consent

WRITTEN CONSENT for Participants

Research Title: The Relationship between Mindfulness and Rumination with Depression and Anxiety Symptomology: a Prospective Study.

In giving my consent I acknowledge that:

- I have read and understood the Participant Information Sheet provided about this research study.
- I have been provided with the researchers' contact details in order to discuss any questions or concerns about the study.
- I agree to participate in the study.

Consent:

- I consent to participating in this study.
- I do not consent to participating in this study.

Appendix D: Questionnaire and Measures**Demographics**

Please indicate your current age: _____

Are you currently residing in Australia?

Yes

No

Please indicate your gender identity

Male

Female

Intersex

Other, please specify: _____

Please indicate the state or territory that you currently reside in:

Australian Capital Territory

New South Wales

Northern Territory

Queensland

South Australia

Tasmania

Victoria

Western Australia

Please indicate how you found out about this survey:

Community website, please specify: _____

Mental health website, please specify: _____

Research participation website, please specify: _____

Online community, please specify: _____

Friend

Please indicate your highest level of completed education:

Some high school

High school graduate

Certificate 1 to 4

Diploma or advanced diploma

Undergraduate degree (e.g., bachelor)

Postgraduate (e.g., masters degree, doctorate, phd)

Please indicate your primary occupation status:

Full time worker

Part time worker

Student

Unemployed

Home duties

Unable to work

Retired

Please indicate your marital status

Single
 Defacto
 Married
 Divorced / separated
 Widowed

Please indicate your ethnicity
 Caucasian
 Asian
 Middle Eastern
 Indian
 Aboriginal or Torres Strait Islander
 Other _____

The Depression, Anxiety and Stress Scale, 21-item (DASS-21) (Lovibond & Lovibond, 1995b)

Please read each statement and select a number 0, 1, 2 or 3 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.

The rating scale is as follows:

- 0 Did not apply to me at all
- 1 Applied to me to some degree, or some of the time
- 2 Applied to me to a considerable degree, or a good part of time
- 3 Applied to me very much, or most of the time

- 1. I found it hard to wind down
- 2. I was aware of dryness of my mouth
- 3. I couldn't seem to experience any positive feeling at all
- 4. I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)
- 5. I found it difficult to work up the initiative to do things
- 6. I tended to over-react to situations
- 7. I experienced trembling (eg, in the hands)
- 8. I felt that I was using a lot of nervous energy
- 9. I was worried about situations in which I might panic and make a fool of myself
- 10. I felt that I had nothing to look forward to
- 11. I found myself getting agitated
- 12. I found it difficult to relax
- 13. I felt down-hearted and blue
- 14. I was intolerant of anything that kept me from getting on with what I was doing
- 15. I felt I was close to panic
- 16. I was unable to become enthusiastic about anything
- 17. I felt I wasn't worth much as a person
- 18. I felt that I was rather touchy

19. I was aware of the action of my heart in the absence of physical exertion
(eg, sense of heart rate increase, heart missing a beat)
20. I felt scared without any good reason
21. I felt that life was meaningless

The Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989)

Instructions: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night? _____

3. During the past month, what time have you usually gotten up in the morning?

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.) _____

Not during the past month

Less than once a week

Once or twice a week

Three or more times a week

5. During the past month, how often have you had trouble sleeping because you

a. Cannot get to sleep within 30 minutes

b. Wake up in the middle of the night or early morning

c. Have to get up to use the bathroom

d. Cannot breathe comfortably

e. Cough or snore loudly

f. Feel too cold

g. Feel too hot

h. Have bad dreams

i. Have pain

j. Other reason(s), please describe:

6. During the past month, how often have you taken medicine to help you sleep (prescribed or “over the counter”)?

7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

No problem at all

Only a very slight problem

Somewhat of a problem

A very big problem

8. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

Very good
Fairly good
Fairly bad
Very bad

9. During the past month, how would you rate your sleep quality overall?

No bed partner or room mate
Partner/room mate in other room
Partner in same room but not same bed
Partner in same bed

The Rumination-Reflection Questionnaire (RRQ) (Trapnell & Campbell, 1999)

For each of these statements, rate your level of agreement using the following scale:

- 1) strongly disagree
- 2) disagree
- 3) neutral
- 4) agree
- 5) strongly agree

1. My attention is often focused on aspects of myself I wish I'd stop thinking about.
2. I always seem to be rehashing in my mind recent things I've said or done.
3. Sometimes it is hard for me to shut off thoughts about myself.
4. Long after an argument or disagreement is over with, my thoughts keep going back to what happened.
5. I tend to "ruminate" or dwell over things that happen to me for a really long time afterward.
6. I don't waste time rethinking things that are over and done with.
7. Often I'm playing back over in my mind how I acted in a past situation.
8. I often find myself reevaluating something I've done.
9. I never ruminate or dwell on myself for very long.
10. It is easy for me to put unwanted thoughts out of my mind.
11. I often reflect on episodes in my life that I should no longer concern myself with.
12. I spend a great deal of time thinking back over my embarrassing or disappointing moments.
13. Philosophical or abstract thinking doesn't appeal to me that much.
14. I'm not really a meditative type of person.
15. I love exploring my "inner" self.
16. My attitudes and feelings about things fascinate me.
17. I don't really care for introspective or self-reflective thinking.

18. I love analyzing why I do things.
19. People often say I'm a "deep," introspective type of person.
20. I don't care much for self-analysis.
21. I'm very self-inquisitive by nature.
22. I love to meditate on the nature and meaning of things.
23. I often love to look at my life in philosophical ways.
24. Contemplating myself isn't my idea of fun.

The Five Facet Mindfulness Questionnaire (FFMQ) (Baer et al., 2008)

Please rate each of the following statements using the scale provided. Choose the option that best describes your own opinion of what is generally true for you.

- 1 never or very rarely true
- 2 rarely true
- 3 sometimes true
- 4 often true
- 5 very often or always true

1. When I'm walking, I deliberately notice the sensations of my body moving.
2. I'm good at finding words to describe my feelings.
3. I criticize myself for having irrational or inappropriate emotions.
4. I perceive my feelings and emotions without having to react to them.
5. When I do things, my mind wanders off and I'm easily distracted.
6. When I take a shower or bath, I stay alert to the sensations of water on my body.
7. I can easily put my beliefs, opinions, and expectations into words.
8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
9. I watch my feelings without getting lost in them.
10. I tell myself I shouldn't be feeling the way I'm feeling.
11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
12. It's hard for me to find the words to describe what I'm thinking.
13. I am easily distracted.
14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
15. I pay attention to sensations, such as the wind in my hair or sun on my face.
16. I have trouble thinking of the right words to express how I feel about things.
17. I make judgments about whether my thoughts are good or bad.
18. I find it difficult to stay focused on what's happening in the present.
19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.
20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
21. In difficult situations, I can pause without immediately reacting.
22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.

23. It seems I am “running on automatic” without much awareness of what I’m doing.
24. When I have distressing thoughts or images, I feel calm soon after.
25. I tell myself that I shouldn’t be thinking the way I’m thinking.
26. I notice the smells and aromas of things.
27. Even when I’m feeling terribly upset, I can find a way to put it into words.
28. I rush through activities without being really attentive to them.
29. When I have distressing thoughts or images I am able just to notice them without reacting.
30. I think some of my emotions are bad or inappropriate and I shouldn’t feel them.
31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
32. My natural tendency is to put my experiences into words.
33. When I have distressing thoughts or images, I just notice them and let them go.
34. I do jobs or tasks automatically without being aware of what I’m doing.
35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.
36. I pay attention to how my emotions affect my thoughts and behavior.
37. I can usually describe how I feel at the moment in considerable detail.
38. I find myself doing things without paying attention.
39. I disapprove of myself when I have irrational ideas.

Mindfulness experience

The following question asks about how often you engage in mindfulness practices, such as meditation, yoga or tai-chi.

Have you engaged in mindfulness practices in the last:

Month

3 months

6 months

Year

5 years

10 years

If you participated in mindfulness activities in the last month, please indicate approximately how often you engaged in these practices.

Approximately _____ minutes in total over the last month.

Please indicate approximately how often you practiced mindfulness:

Daily

A couple of times a week

A few times a week

Weekly

Fortnightly

Once in the month

Appendix E: Debrief Statement



Debrief Statement

Project Title: The Relationship Between Mindfulness and Rumination with Depression and Anxiety Symptomology: A Prospective Study.

The Purpose of This Research:

Anxiety and depression are highly prevalent conditions that cause significant distress for individuals and a significant impact on the community. Over a lifetime, approximately 15% of Australians experience an depressive disorder and 26% of people experience an anxiety disorder (Australian Bureau of Statistics, 2008). Depression and anxiety disorders commonly occur together (Australian Bureau of Statistics, 2009) and also with symptoms of sleep disturbance (Stewart, Rand, Hawkins, & Stines, 2011; Takano, Iijima, & Tanno, 2012). Many factors have been proposed to account for the development, maintenance and recovery from symptoms of depression and anxiety, including the role of individuals' tendencies towards habitual rumination or mindfulness (Keng, Smoski, & Robins, 2011; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008).

To date, little research has been conducted that investigates how an individual's naturally varying tendencies towards rumination, reflectiveness or mindfulness might influence stress, anxiety, depression and sleep difficulties over time. Given that day-to-day mindful awareness is thought to counter the negative effects of habitual ruminative thinking (e.g., Segal, Teasdale, & Williams, 2012) and since mindfulness is considered a skill that can be learned (Kabat-Zinn, 2005), the current study may illuminate the mechanisms involved in alleviating various forms of psychological distress.

Your Participation:

Some participants may have found that completing the surveys caused them distress or concern about their own or another's psychological health.

If you wish to discuss these concerns, you may wish to contact the primary researcher, Ms Monique Wilson of the Research School of Psychology, College of Medicine, Biology and Environment, at monique.wilson@anu.edu.au or + 61 2 6125 5585. Alternatively, please contact the chief supervisor A/Prof Rhonda Brown of the Research School of Psychology, College of Medicine, Biology and Environment at rhonda.brown@anu.edu.au or + 61 2 6125 0635.

Alternatively, you may wish to contact Lifeline on 13 11 14 (24 hours a day, 7 days a week) or visit their website at <https://www.lifeline.org.au/>. You may also wish to contact Beyond Blue (24 hours a day, 7 days a week) on 1300 224 636 or visit their website at <http://www.beyondblue.org.au/>.

If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager
The ANU Human Research Ethics Committee
The Australian National University
Telephone: +61 2 6125 3427
Email: Human.Ethics.Officer@anu.edu.au



Thank you for your participation.

A handwritten signature in black ink that reads "M Wilson".

Ms Monique Wilson
DPsych Candidate, ANU

A handwritten signature in black ink that reads "Rhonda Brown".

Dr Rhonda Brown
A/Prof, ANU

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Appendix F: Research Practicum

Mechanisms of Mindfulness: A Qualitative Analysis

As part of the requirements of the Doctor of Psychology (Clinical) degree at the Australian National University, students are required to complete a Research Practicum. This is a small research project of an applied nature that relates to the student's main research topic. Proposed projects are approved by the Director of the Clinical Psychology Program.

Introduction

Affective Symptoms and Emotion Regulation

Experiences of clinical and subclinical depression and anxiety are relatively common in the general population (Australian Bureau of Statistics, 2008; Crawford & Henry, 2003), and are associated with substantial impairment and disability (Haller, Cramer, Lauche, Gass, & Dobos, 2014; Kessler et al., 2009). Moreover, depressive and anxiety symptoms consistently share strong associations with each other (Andrews & Slade, 2001; Sinclair et al., 2012), psychological stress (Crawford & Henry, 2003; Lovibond & Lovibond, 1995), and sleep disturbance (Ohayon & Roth, 2003; Takano, Iijima, & Tanno, 2012). The high concordance rates between different manifestations of psychological distress suggest that common processes may underlie the development, maintenance, and abatement of these symptoms.

Difficulties in emotion regulation may be among these common processes given that elevated affective symptoms are consistently associated with difficulties in regulating emotions, and particularly negative affect (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Emotion regulation reflects the processes

by which emotions are modulated (Gross, 2014) and there has been an increasing interest in improving these capabilities through various clinical interventions, including mindfulness-based interventions (MBIs; Farb, Anderson, Irving, & Segal, 2014). A growing evidence-base supports the efficacy of MBIs in attenuating the symptoms of depression, anxiety, stress, and sleep disturbance (Chiesa & Serretti, 2009; Hofmann, Sawyer, Witt, & Oh, 2010; Khoury et al., 2013; Winbush, Gross, & Kreitzer, 2007).

Mindfulness-Based Interventions: Mechanisms of Action

In order to elucidate the processes by which MBIs may attenuate psychological distress, an understanding of the practice and application of mindfulness is warranted. Mindfulness was popularised as a psychological intervention in the West through the work of Jon Kabat-Zinn and his manualised eight-week mindfulness meditation program, Mindfulness-Based Stress Reduction (MBSR; 2005). Kabat-Zinn conceptualises mindfulness as a process of paying attention to one's immediate experience with an orientation of acceptance (Kabat-Zinn, 2003), which he believes can be cultivated through committed practice (Kabat-Zinn, 2005). Across the MBSR program, various formalised meditations are practiced within the group and a daily home-practice of at least 45 minutes is also encouraged (Kabat-Zinn, 2017). Formalised meditations are either movement-based (e.g., yoga, walking) or static (e.g., sitting, lying down) and typically involve attending to a particular attentional focus - such as the breath, body-sensations, sensory inputs, emotions, or thoughts - with encouragement to notice when the mind has wandered, and without judgement or elaboration, to gently return one's attention to the chosen focus (Kabat-Zinn, 2017). MBSR also encourages regular practice of informal

mindfulness exercises that can be practiced during day-to-day activities, such as mindful eating or listening (Kabat-Zinn, 2017). Throughout the program, psycho-education is provided about psychological stress, including common triggers and manifestations (i.e., physiological, emotional, cognitive, and behavioural), and participants are encouraged to notice and reflect on their own experiences and patterns of responding (Kabat-Zinn, 2017). MBSR emphasises student-centred, experiential, and enquiry-based learning (Crane et al., 2016) and participants are regularly invited to reflect on and share their experiences.

While the principles underlying MBSR were grounded in the Buddhist practice of insight meditation (Kabat-Zinn, 2003), the program was initially designed to assist people with chronic pain conditions (Kabat-Zinn, 1982). It was theorised that, by regularly observing one's own cognitive appraisal processes in a detached and accepting way, one may come to view thoughts as merely "events in the mind", and not inherently truthful, important, or harmful, thereby diminishing the cognitive and emotional experience of pain (Kabat-Zinn, 1982, p. 35). More broadly, regular mindfulness practice is thought to cultivate greater awareness of the various habitual processes that interact to exacerbate stress and suffering, including cognitive, emotional, and/or behavioural experiences, which may in turn facilitate more conscious and adaptive responding (Kabat-Zinn, 2005).

Since its inception in the 1980s, MBSR has been adapted into various MBIs (Khoury et al., 2013), with efficacious outcomes reported across various symptoms of poor health and well-being (e.g., depression, anxiety, stress, binge eating, fibromyalgia, cancer; Baer, 2003; Chiesa & Serretti, 2009; Grossman, Niemann, Schmidt, & Walach, 2004). Given its broad scope and evident trans-

diagnostic efficacy, participating in MBIs likely influences multiple areas of functioning simultaneously and via various interrelated mechanisms of change (e.g., see Gu, Strauss, Bond, & Cavanagh, 2015). In the discussion that follows, an attempt will be made to differentiate and expand upon a selection of mechanistic processes consistently outlined in the theoretical literature, by which MBIs are speculated to improve mental health and well-being.

Stress buffering. As per the core theoretical tenets of MBSR, regularly practicing mindfulness may facilitate awareness into habitual stress reactions, including ones own signature of cognitive, behavioural, emotional, and body-based experiences, and this awareness may lead to decreased stress reactivity and alternative adaptive responding (Kabat-Zinn, 2005). It has been suggested that mindfulness practice attenuates cognitive and physiological stress-reactivity, thereby reducing one's allostatic load (Creswell & Lindsay, 2014; Vago & Silbersweig, 2012). Thus, regular mindfulness practice may serve as an early warning system, or antecedent-focused emotion regulation strategy (Farb et al., 2014), which short-circuits stress reactivity and associated stress-prompted processes, including other affective symptoms.

In addition, mindfulness practice has been shown to facilitate arousal reduction, including decreased heart rate, blood pressure, and cortisol levels (Holzel et al., 2011). Thus, even though relaxation is not the goal of mindfulness practice (Baer, 2003; Bishop et al., 2004), engaging in mindfulness practice often necessitates slowing down and/or a shift from *doing* to *being* (Kabat-Zinn, 2017). For example, over-arousal of the body and mind may be attenuated during mindfulness meditation, given that the body is often still or invited to move slowly and consciously, while the mind's attentional focus is typically directed

non-judgmentally towards one object at a time. Thus, mindfulness practice may alleviate stress.

Defusion. It is thought that people habitually respond to incoming stimuli by appraising them from pleasant to unpleasant (Brown, Ryan, & Creswell, 2007), which generates internal processes of varying degrees of attraction or aversion, respectively (Grabovac, Lau, & Willett, 2011). During mindfulness meditation, people are taught to observe thoughts, sensations, and emotions as they occur, noticing one's tendency to evaluate these experiences, but rather than engage in these habitual evaluative processes, to instead return to the focus of observation (Kabat-Zinn, 2005). Thus, mindfulness practice cultivates the ability to view thoughts as merely mental events, and not necessarily as truths to be acted upon (Kabat-Zinn, 1982; Teasdale, Segal, & Williams, 1995), a process that has been variously described as *defusion* (Hayes, Strosahl, & Wilson, 1999), *decentering* (Segal, Williams, & Teasdale, 2013), or *reperceiving* (Shapiro, Carlson, Astin, & Freedman, 2006). Observing thoughts in this way allows one to be with experiences rather than being defined by them (e.g., "this pain is not me"; Shapiro et al., 2006, p. 378). It also diminishes the compulsion to respond with avoidance or yearning (Chambers, Gullone, & Allen, 2009) and stops the cyclic proliferation of negative cognitions and emotions (Farb et al., 2014; Teasdale et al., 1995). Thus, the meta-cognitive awareness cultivated in mindfulness practice may offer cognitive distance from unhelpful thoughts and beliefs, which is hypothesised to facilitate greater well-being.

Exposure. Non-judgemental-acceptance of experience is another core component of mindfulness practice (Baer, 2003; Bishop et al., 2004). Rather than attempting to change, escape or avoid experiences, either cognitively or

behaviourally (Baer, 2003; Bishop et al., 2004), mindfulness practice encourages people to adopt an attitude of mindful acceptance and curiosity towards their experiences, irrespective of their intensity, valance, or perceived usefulness (Kabat-Zinn, 2017). In line with the principles of exposure, staying with cognitive, emotional, and body-felt experiences without attempts to avoid or escape them is thought to increase tolerance of and/or desensitization to negative emotional states (Baer, 2003; Brown et al., 2007; Shapiro et al., 2006). Staying with and/or ‘turning towards’ emotional experiences may be particularly beneficial; increased willingness to experience uncomfortable emotions is said to facilitate more adaptive engagement with emotions and counter the harmful effects of experiential avoidance (Hayes & Feldman, 2004).

Self-compassion. Repeatedly attending to one’s experiences with a friendly attitude may also increase self-compassion (Holzel et al., 2011). This attitude may be particularly efficacious against harmful cognitive processes, including self-criticism, personalisation of suffering, and over-identification with unhelpful thoughts (Neff, 2003). That is, in contrast to the discrepancy-focused and self-critical cognitive processes of rumination and worry, mindful acceptance offers an alternative stance where participants learn to be with their experiences, listen deeply to their own needs, and adapt the meditation exercises (and their lives) accordingly.

Insight. While mindfulness practice in western psychology has a strong focus on awareness of habitual stress-reactions, the awareness cultivated in mindfulness may extend more broadly towards insight into the self, others, and even the human condition (Brown et al., 2007). On an individual level, regularly staying with one’s own experiences may lead to greater clarification of, and

connection to, personally-meaningful values (Shapiro et al., 2006). In addition, through mindfulness practice, one may come to understand and appreciate the changing nature of experience (Bishop et al., 2004; Crane et al., 2016) and thus the futility of attempting to prolong pleasure or avoid pain (Grabovac et al., 2011). It is also posited that an attitude of non-attachment may result in greater equanimity (Vago & Silbersweig, 2012). Finally, through the environment of sharing facilitated in MBIs, participants may come to understand the common correlates of distress and thus to develop a sense of shared humanity (Crane et al., 2016), which may lead to greater compassion, empathy, and pro-sociality (Vago & Silbersweig, 2012). In summary, mindfulness practice may facilitate well-being on multiple levels by instigating a greater understanding to oneself and others.

Limitations of Existing Literature

As evidenced in the previous discussion, there are multiple intersecting processes by which mindfulness practice may improve psychological well-being, and researchers have called for continued investigations into these mechanisms (Coffey, Hartman, & Fredrickson, 2010; Didonna, 2009; Fjorback, Arendt, Ornbøl, Fink, & Walach, 2011; Shapiro et al., 2006). Intervention studies are increasingly examining mechanisms of change, typically by ascertaining change across the intervention with various validated self-assessment tools (Gu et al., 2015). For example, self-reported dispositional mindfulness is the most commonly researched mechanism of change in the intervention literature, with results across multiple studies indicating that increases in mindfulness partially mediate the impact of participating in MBIs on decreased psychological distress (Gu et al., 2015).

While such empirical investigations lend insight into potential mechanisms of change, there are some limitations inherent in the methodologies of the existing literature. First, the majority of studies utilise pre-existing scales to ascertain mechanisms of change, yet these assessment tools may reflect very broad mechanistic processes (e.g., mindfulness measured as an aggregate of five factors; see Keng, Smoski, Robins, Ekblad, & Brantley, 2012), which can make it difficult to draw inferences about specific mechanistic processes of change, or otherwise reflect very specific constructs (e.g., acting-with-awareness; see Shahar, Britton, Sbarra, Figueredo, & Bootzin, 2010), thereby potentially overlooking important processes. Furthermore, the reliance on self-report data from novice meditators is problematic. Specifically, given differential self-report patterns between novices and experienced meditators on mindfulness scales (de Bruin, Topper, Muskens, Bögels, & Kamphuis, 2012; Van Dam, Earleywine, & Danoff-Burg, 2009), novices may have a different or limited experience of mindfulness, and by extension, the potential mechanisms of change. Furthermore, the overreliance on quantitative investigations (e.g., see Gu et al., 2015) conflicts with the inherently experiential nature of mindfulness. Thus, qualitative investigations from experienced meditators may more richly elucidate the mechanistic processes of mindfulness practice, and may also facilitate the discovery of new (or nuanced) processes (Grossman, 2011). In particular, facilitators of mindfulness interventions may be ideally placed to comment on the active ingredients of mindfulness training, given their well-established daily personal mindfulness practice (Crane et al., 2016), and their observation of numerous participants' experiences and reflections on mindfulness practice.

Aims and Research Question of the Current Study

There are various interrelated mechanisms by which mindfulness practice may benefit psychological well-being and understanding these processes has important practical implications in terms of tailoring mindfulness interventions to different populations. Given that mindfulness practice is inherently experiential, and its influence on well-being is conceptually complex, a qualitative investigation with experienced facilitators of MBIs would provide an ideal means by which to explore these concepts and potential inter-relations, in a more in depth manner than quantitative analysis based on self-report from novice-meditators using a limited range of measures would allow.

Thus, the aim of the current study was to conduct a qualitative investigation into the processes by which mindfulness training influences mental health and well-being, from the perspective of experienced MBI trainers. The primary research question was as follows: What are the core mechanisms by which mindfulness training positively influences well-being?

Method

Participants

The current research was approved by the Australian National University Human Ethics Research Committee, protocol 2016/762. Participants were required to be Australian residents or citizens, aged 18-years or older, and experienced in facilitating Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 2005).

Nine individuals initially expressed an interest in the study, either by emailing the researcher or completing the initial consent survey; however, one individual did not meet inclusion criteria (i.e., facilitated adapted MBIs), one

individual provided consent but was not contactable for interview, and another individual was not contactable via email. The final sample was comprised of six MBSR facilitators, representing a 66.7% completion rate. Six participants is a sample size that is consistent with the recommendations for qualitative research that is phenomenological in nature (Creswell, 2013; Morse, 1994).

The sample comprised five females (83.3%) and one male and had a mean age of 52.3 years ($SD = 8.94$). Educational qualifications were as follows: Masters degree ($n = 1, 16.7%$), Postgraduate Diploma ($n = 2, 33.3%$), or Bachelor's degree ($n = 3, 50.0%$). Primary professions included therapist (i.e., psychologist, counsellor or psychotherapist, $n = 3, 50%$), medical doctor ($n = 1, 16.7%$), or MBSR facilitator in conjunction with another role (not specified here to maintain confidentiality, $n = 2, 33.3%$). Details pertaining to participants' mindfulness experience are detailed in Table 1.

Table 1

Descriptive Statistics of Mindfulness Experience

Code	MBSR Courses			Personal Mindfulness Practice		
	Est. years teaching	Est. no. of groups	Est. no. ppl per group	Est. years	Est. days per week	Est. minutes per sitting
P1	6	9	12	7	7	20
P2	7	13	15	17.5	5	30
P3	13	70	22	35	7	30
P4	15	30	25	27	7	20
P5	5.5	12	13	9	5.5	37.5
P6	5	15	15	30	6	45
<i>M</i>	8.6	24.8	17.0	20.9	6.3	30.4
(SD)	(4.29)	(23.32)	(5.25)	(11.53)	(0.88)	(9.80)

Note. Code = participant code, est. = estimated, no. = number, ppl = people.

As can be seen in Table 1, participants facilitated an average of approximately 25 MBSR courses, over eight years, with around 17 students per class. There was high variability with regards to the number of courses taught, with two participants having facilitated more than twice as many MBSR courses than the remainder of participants (i.e., 70 vs. 30, 30 vs. 15). Participants possessed an average of approximately 21 years of regular personal mindfulness practice, practicing approximately six days per week, for around 30 minutes per

session; however, there was high variability evidenced with regards to years of personal practice.

Measures

Preliminary questions were asked at the onset of the interview pertaining to participants' demographic information, engagement with a personal mindfulness practice, and MBSR facilitation experience. A semi-structured interview schedule was utilised, which was informed by the primary research question. Specifically, participants were asked: *What is your understanding of how mindfulness training influences mental health and well-being?* Participants who required additional prompting were asked a variation of the following question: *What are the core mechanisms by which mindfulness training influences well-being?* Minimal follow-up prompts were utilised during the interview to elucidate participant responses.

Procedure

Participants were invited to take part via email through the *Australian and New Zealand MBSR and MBCT* email list-serve (i.e., MBSR-MBCT_ANZ@yahoo.com). Email invitations were also sent to individuals and/or organisations currently facilitating MBSR in Australia, as ascertained by a targeted Google search using the terms "MBSR Australia".

Participants were asked to click on the URL embedded in the email invitation if they wished to participate in the study, which redirected them to a pre-survey hosted with the Qualtrics Research Suite (Qualtrics, 2015). Participants were presented with an outline of the study, and were then asked to indicate their consent to participate, including consent for audio-recording. In order to ascertain eligibility criteria, consenting participants were progressed

through the survey and asked questions about their age, Australian resident or citizen status, and experience facilitating MBIs. Eligible participants were then asked to provide their name, email address, and telephone number in order for the researcher to arrange a suitable time for interview. The primary researcher then contacted participants via email to arrange an interview time.

All interviews were conducted individually in a private location via telephone with the audio routed through the researcher's password-protected computer, and recorded using Apple QuickTime Player version 10.4. At the onset of the interview, the researcher advised participants when audio-recording commenced, explained the basic format of the interview, and provided an opportunity to ask questions. The interview was then conducted.

Interviews occurred between January and June 2017, and ranged between to 32 to 62 minutes in duration ($M = 51.7$, $SD = 10.63$). MP3 audio files of the interviews were saved on the researcher's password-protected computer. Preliminary questions regarding demographics were recorded in an excel spreadsheet on a password-protected computer. Interviews were then transcribed verbatim and analysed using ALTAS (Muhr & Friese, 2004).

Analytic Strategy

Preliminary analysis was guided by the primary research question; that is, to identify the core mechanisms by which mindfulness training impacts psychological well-being. Thematic analysis was selected as the analytic strategy, so that thematic patterns within the data could be identified and analysed (Braun & Clarke, 2006). In order to allow for conceptually novel or nuanced mechanisms to be identified, a data-driven inductive strategy was utilised, such that analysis was guided by the data, rather than by existing theoretical accounts.

Analysis was conducted in line with recommendations provided by Braun and Clarke (2006). First, the transcripts were read through and pertinent text segments were coded, and then arranged into preliminary themes. Initially generated themes were then checked for coherency and differentiation from other themes by first examining the codes within each theme and then re-examining all of the codes across transcripts; when the codes were deemed not to fit the identified theme, themes were re-conceptualised (e.g., merged, separated), and codes were reallocated or discarded, accordingly. When the list of themes was finalised, codes within each theme were organised, defined, and then analysed. The primary researcher conducted the coding, development of themes, and final analysis.

Results

Analyses revealed 14 distinct themes, comprising four major categories, which explained the core processes by which mindfulness training was believed to positively influence psychological well-being (see Table 2). For clarity, in the reported analyses that follow, “facilitators” describes the MBSR trainers interviewed in the current study, whereas “participants” describes the individuals participating in the facilitators’ mindfulness groups.

Table 2

Categories and Themes Identified

Awareness	Attitude	Responding	Group processes
Body-sensations	Acceptance	Body-sensations and emotions: tolerance	Community
Emotions	Compassion	Thoughts: defusion	Facilitator presence
Thoughts	Curiosity Non-striving Perseverance	Behaviours: agency	Normalisation

Awareness

Participation in mindfulness training was said to facilitate well-being via increased awareness of internal experiences, including body-sensations, emotions, and thoughts.

Body-sensations. Facilitators described a key process in MBSR whereby participants learn to reconnect with awareness of their body-sensations. One facilitator suggested that being more aware of physical sensations “*gives a lot of traction in terms of being able to recognise arousal earlier and respond to it*”. Several facilitators also described the attentional shift from thought-based to body-based awareness as adaptive. For example, one facilitator described the body as “*grounding*” and “*a place that you can linger and hang out in that is not the crazy busy mind*”, while another facilitator described the qualitative difference between body-based and cognitive-evaluative attentional processes:

“[Participants] maybe start to go, ‘Oh, what is the body sensation of that? Oh, it’s a heaviness, it’s very heavy, it’s cold and heavy and it’s in this part of my chest’. And that becomes a very different experience to going, ‘Oh fuck, I’m depressed, I’m a loser, I’m hopeless [...] How did I get like this? This is terrible’ – all of those second arrow thoughts that then create more thoughts of hopelessness and despair. They then come to have the felt sense of the difference between looking at depression and being in depression that way, and being in depression in a way that goes ‘Oh, this is a heavy feeling in my body.’”

Emotions. Although less frequently reported, some facilitators also suggested that mindfulness training can assist with emotion recognition and differentiation, and increased awareness of how emotions are triggered by thoughts and particular situations. One facilitator suggested that attuning to emotional experience facilitates the regulation of affect:

“So this affect recognition is so important, for people to start recognising what they’re actually feeling and being able to name them. And we know how that can contribute so much to emotional regulation.”

Thoughts. Awareness of thoughts, including their content and quality, and corresponding impact on emotions, was also described as a key process that emerges through mindfulness training. As one facilitator described:

“That whole experience people have of becoming more aware, stepping out of autopilot and starting to recognise this continuous stream of semi-conscious or unconscious commentary suddenly is able to be seen [...] So people start to be able to recognise that “Ah, these are thoughts... and this is the emotional tone of those thoughts”.

Attitude

Facilitators also discussed various attitudinal factors as avenues by which well-being can increase through mindfulness training.

Acceptance. Facilitators described a process of accepting, and developing a relationship with, various experiences arising in one's life, without attempting to fix or change anything. As one facilitator elucidated: *“Even if it's diverse kinds of experiences, it's ‘yes’ to everything.”*

Compassion. Cultivating compassion was frequently discussed as a core attitudinal component. Both self-compassion and compassion towards others were described, often as part of the same overarching concept, although they also appeared to represent distinct qualities. Self-compassion was described as the attitude that *“There is more right with me than wrong with me”*, and represented a willingness to attend to oneself and associated needs, which is explicitly and implicitly reinforced throughout the course (e.g., within the meditations, by being encouraged to adapt meditations as needed). Compassion towards other people was also said to arise in the group context, as participant's experiences are regularly shared and *“honoured”*. Two facilitators suggested that compassion towards others may be influenced by the acknowledgment that all people are suffering in some way, as can be seen in the reflections of one participant with a chronic medical illness:

“[...] She realised that although she probably was the most severely ill person in the room, everyone was struggling. So that's the power of the group. Everybody's brain was the same, everyone was struggling on some level, and she just had it with an illness.”

Curiosity. A curious attitude encompassing a sense of exploration, experimentation, and open enquiry was also described by facilitators, and particularly as an alternative to self-judgement or reactivity. This curiosity could be applied to a range of experiences:

“We’re really not interested in one truth, we’re interested in a generative kind of [...] We’re really asking the question, ‘What is it?’ ‘What is emotion?’ ‘What is a thought?’ ‘What is body experience?’ ‘What is grief?’ ‘What is rage?’ ‘What is feeling isolated?’ ‘What is...?’”

Non-striving. An attitude of non-striving was discussed as an attitudinal shift from achievement-striving towards being with whatever arises. Non-striving was expressed as a useful attitude for engaging with mindfulness practices, and is encompassed in the idea that, *“There’s no such thing as a good meditation or a bad meditation”*. Non-striving was also described as an alternative stance to chronic busyness:

“When people give themselves permission [...] to actually stop, and slow up, and be still, and not have to achieve anything for ten minutes or half an hour or two and a half hours, it’s kind of like a blessing that they haven’t had in a long, long time”.

Perseverance. The willingness to continue with regular committed practice, even when it becomes difficult, was also described as important attitudinal component associated with beneficial outcomes. Facilitators emphasised that the format of the MBSR program, which extends across eight-weeks and incorporates daily practice, offers an opportunity for participants to develop a relationship with mindfulness practice and, correspondingly, with *“...approaching difficulties time and time again.”* One facilitator explained that:

“It’s the [participants] that are really throwing themselves in and really getting taught by their own practice, they’re the ones that are able to notice those life changing shifts.”

Responding

Changed patterns of responding were the most frequently discussed processes by which mindfulness training was said to benefit well-being. In particular, facilitators discussed fundamental shifts in how participants relate to their bodies, their minds, and their lives.

Body-sensations and emotions: tolerance. A core mechanism of change identified by facilitators concerned the process of increasing tolerance of physical sensations and emotions. That is, through mindfulness training, participants come to develop a relationship with their bodies, through a repeated process of coming back to, turning towards, or befriending body-sensations. This increased tolerance towards body-sensations and associated emotions was said to decrease physiological arousal and counter habitual patterns of avoidance and/or reactivity. Several facilitators reported that participants could come to feel their bodies as a safe or grounding place, even if they had a history of negative or traumatic body-based experiences. One facilitator summed up this theme as follows:

“Through this kind of body-based training of interoception, people are learning how to bring curiosity to otherwise aversive experiences when they would probably normally just stop what they’re doing to get away from it, or do something else to stop the unpleasantness arising. And so they’re learning how to make a relationship with unpleasant experiences arising in the body and mind through this body-based training. [...] I

mean, in a way I think the [mindfulness-based practices] are exposure therapy in a kind of... but not in a rigidly structured experimental way... but whatever is arising, people are learning how to feel it, investigate it, tolerate it, not react to it."

Thinking: defusion. Facilitators also reported that, by increasing awareness of cognitive processes, participants have greater choice and agency over their thought content and processes. In particular, several facilitators spoke about the power of defusion, of learning not to merge with thoughts as truths or facts, which offers distance and relief from the harmful effects of over-identifying with thoughts. That is, "*One comes to understand that 'I am not my thoughts' [...] So that the rumination becomes 'the rumination', rather than something so personal, an assault on the psyche*". As another facilitator noted:

"People are able to... kind of... start reflecting on their attitudes and beliefs, rather than just being subject to them, just considering them natural or you know 'this is just me'. They really get a sense to see how 'Oh, these are particular to me... and they are contingent on a whole lot of things'. Yeah, very powerful for people to start seeing that they are an actual shape that could be different actually."

Behaviours: agency. Behavioural change was another core mechanism identified by facilitators. That is, through increasing awareness of one's experiences and patterns of responding, participants can come to choose new patterns of responding in their everyday lives, in ways that are "helpful" and "life-giving", and congruent with personal values. For example, several facilitators discussed improved ways of interacting in relationships. Concepts of

agency, choice, and self-efficacy were repeatedly emphasised by facilitators. As one facilitator summarised:

“I think that’s really important, that [MBSR] isn’t just for getting calm or something, it’s actually about acting differently in your life, it’s about choice and agency and making shifts and changes that are going to reduce suffering for yourself. And that involves actions, it involves, yeah, changing your behaviour...”

Group Processes

A number of group processes were also identified as important factors by which MBSR participation can facilitate well-being.

Community. Facilitators frequently reflected that participating in MBSR generates a sense of community, where everybody is included and respected. One facilitator spoke about the “*democratic*” environment and “*we feeling*” created, while another remarked that:

“There is something about the way that mindfulness groups are run that are very collegial, seeking to balance out power in the group, so that the leader or teacher is purely a facilitator and not someone with all the answers, having a sense that everyone’s perspective is important and to be valued, so there is a sense of spirit in the group which is so powerful.”

Facilitator presence. Several facilitators discussed the positive influence of facilitators supporting and “*holding*” the group, by embodying mindfulness qualities such as being open, curious, enquiring, non-expert, non-coercive, democratic, respectful, compassionate, non-striving, and non-judging. As one facilitator remarked:

“What works is a teacher that’s accessible, that’s real, that’s authentic,

that doesn't know it all, that holds mystery over mastery, that's open to things as they arise and that can be mindful within themselves and within the group."

Normalisation. Facilitators also reported that learning about other people's difficulties can provide a normalising environment whereby participants feel less alone in their own difficulties. One facilitator remarked that participants:

"[Are] coming to that 'same boat' experience of 'Oh, I'm not alone here, I thought I was mad! There I was, thinking I was this crazy insane person, but actually, look at that person over there, they've got the same 'crazy and insane' and they seem quite normal to me'."

Discussion

The current study provided an exploratory examination into MBSR facilitators' perceived mechanisms by which mindfulness training can improve psychological well-being. It was revealed that MBSR training was perceived to positively impact psychological well-being via increased awareness of internal states (i.e., body-sensations, emotions and thoughts), cultivation of particular attitudes (i.e., acceptance, compassion, curiosity, non-striving, and perseverance), changed patterns of responding to experience (i.e., tolerance of body-states and emotions, defusion from unhelpful cognitions, and increased behavioural agency), and finally, through specific group processes (i.e., community-building, facilitator presence, and the normalisation of distress).

Awareness

Common conceptualisations of mindfulness explicitly emphasise the process of paying attention to present-moment experiences (Bishop et al., 2004; Kabat-Zinn, 2003), and findings from the current study suggest how this may be

beneficial psychologically. That is, in line with common theorising (Kabat-Zinn, 2005), mindfulness training appears to facilitate a greater awareness into various habitual cognitive, physical, and/or emotional experiences that can interact to influence distress. Thus, regular mindfulness practice and the corresponding connection to inner experiences, may act as an early-warning system that prevents the further escalation of distress (Farb et al., 2014). Of note, facilitators described reconnection with physical sensations as particularly adaptive, and especially when compared to a cognitive-evaluative focus. Thus, connecting with felt-sensations may provide a different kind of non-conceptual information or, as Shapiro et al. (2006, p. 379), states, “We experience what *is* instead of a commentary or story about what it is”. Awareness of emotions was emphasised less frequently as a mechanistic process, and was typically discussed in the context of being triggered by cognitive-evaluative processes. Thus, in summary, mindfulness practice was primarily purported to be beneficial for emotional well-being by encouraging people to step out of automatic thought processes and into conscious engagement with their bodies.

Attitude

In addition to a present-moment attentional focus, an attitude of non-judgemental acceptance has also been described as core to mindfulness (Bishop et al., 2004; Kabat-Zinn, 2003). In the current study, an attitude of acceptance was said to be beneficial for well-being by facilitating a willingness to be with various experiences, rather than struggling against them, thus corresponding with the idea that aversion and attraction can exacerbate mental proliferation and suffering (Grabovac et al., 2011). Similarly, an attitude of gentle curiosity was also reported, which has previously been described as core to mindfulness

(Bishop et al., 2004; Lau et al., 2006), and which was said to benefit well-being by countering self-judgement and reactivity, as per previous accounts (Segal et al., 2013). Furthermore, compassion towards others was said to arise in the group context of sharing and “honouring” experiences, thus corresponding with the idea that, through learning about the universality of suffering, one may come to develop greater compassion, empathy, and pro-sociality (Vago & Silbersweig, 2012), and thus potentially better relationships. Self-compassion was also described as an attitude of honouring and attending to one’s own experiences (Holzel et al., 2011; Segal et al., 2013), which may be beneficial to well-being by countering self-criticism, over-identification with thoughts and feelings, and the personalisation of suffering (Neff, 2003). Overall, it appears that cultivating a stance of kindness and friendliness towards various experiences is not only core to mindfulness, but also beneficial to psychological well-being more broadly.

One’s stance towards mindfulness practice also appeared to be beneficial mechanistically. That is, moving from an orientation of achievement-focus towards non-striving was described as facilitative to mindfulness practice, and more generally as an antidote to chronic busyness. Thus, non-striving appears to represent a crucial experiential shift from *doing* to *being* (Kabat-Zinn, 2017), and may be one avenue by which mindfulness practice can attenuate arousal (e.g., see Holzel et al., 2011). Seemingly in contrast to the attitude of non-striving, a stance of perseverance was also discussed, but not perseverance towards achieving a particular outcome, rather persevering with mindfulness practice despite difficulties. Indeed, having a firm commitment is said to increase one’s ongoing embodiment and cultivation of mindfulness (Kabat-Zinn, 2005), and intentions for practicing have previously been linked to subsequent gains (Shapiro, 1992).

While not explicitly outlined by facilitators, cultivating qualities of perseverance and non-striving may also be adaptive beyond meditation practice. Nonetheless, findings from the current study suggest that approaching mindfulness practice with commitment, irrespective of achieving any particular outcomes, may cultivate mindfulness, and therefore also the associated correlates of healthy psychological functioning.

Responding

While increasing awareness and cultivating particular attitudes were both said to be beneficial processes in-and-of themselves, these processes were also described as intermediary steps in facilitating changed patterns of relating and responding to various experiences. That is, developing adaptive ways of responding to body-sensations, emotions, thoughts, and life events were the most frequently discussed mechanistic processes. Indeed, aligning with one of the fundamental mechanistic tenets of MBSR (Kabat-Zinn, 2005), mindfulness into the various processes that exacerbate suffering is said to facilitate more conscious and adaptive responding.

A core mechanism identified was that of being with and befriending body-based experiences, which was said to increase tolerance of physical sensations and associated emotions, and decrease reactivity. Thus aligning with principles of exposure therapy, staying with uncomfortable emotional and body-felt experiences, without attempting to avoid or escape them, can increase tolerance of and/or desensitization to negative emotional states (Baer, 2003; Brown et al., 2007; Shapiro et al., 2006). Despite similarities with exposure therapy, mindfulness training was distinctly described as an avenue to develop a friendly, safe, and grounding relationship with the body.

Another fundamental process identified was that of a shifted relationship with one's cognitive processes. That is, the process of cognitive defusion, whereby thoughts are viewed as merely mental events that are not necessarily truthful, important, or harmful, can attenuate the subjective experience of distress, in line with previous theorising (Kabat-Zinn, 1982; Teasdale et al., 1995). Defusion was described as helpful by decreasing the tendency to over-identify with negative thoughts or self-views that can escalate distress (e.g., see Farb et al., 2014; Teasdale et al., 1995). De-identifying from thoughts may also be helpful by generating new patterns of non-reactive behavioural responding (Kabat-Zinn, 1982).

More globally, mindfulness training was also said to facilitate behavioural change that is congruent with well-being and personal values, in line with previous accounts (Shapiro et al., 2006). This may encompass differential responding to thoughts and physical sensations, in addition to other life domains, such as changed ways of behaving in relationships (e.g., see Gambrel & Keeling, 2010). Changing one's patterns of responding was frequently described as an empowering process that can create a sense of personal agency or self-efficacy. Thus, increased self-efficacy may be a distinct mechanistic process in-and-of itself, however to the author's knowledge this has not previously been discussed in the theoretical literature. Overall, findings from the current study suggest that befriending the body, distancing oneself from cognitive-evaluative processes, and gaining a greater sense of agency, may all be cultivated through mindfulness training, and be key processes implicated in improved well-being.

Group Processes

While not frequently outlined in the theoretical literature, the experiential, enquiry-based, and reflective atmosphere generated in MBSR (Crane et al., 2016; Kabat-Zinn, 2017) was also linked with positive outcomes. That is, learning about other participants' difficulties may generate a sense of shared humanity (Crane et al., 2016). Indeed, MBSR participation was also linked with a feeling of social inclusion and community, in line with previous accounts emphasising mindfulness as an inherently social practice (Stanley, 2012). Relatedly, the environment of sharing and reflection generated in MBSR was associated with the normalisation of psychological distress, and thus reduced isolation, as has previously been reported (Mackenzie, Carlson, Munoz, & Speca, 2007).

Crucially, these beneficial group processes were said to be cultivated through the facilitator's presence, and particularly the embodiment of the key qualities of mindfulness. Indeed, ongoing experiential engagement with mindfulness practice is said to be crucial to both learning and teaching mindfulness, as practitioners come to embody mindfulness through experiential rather than conceptual understanding (Crane et al., 2016). In summary, practicing, reflecting, and sharing ones experiences within the MBSR practice space appears to facilitate well-being by generating a powerful sense of shared experience.

Insight

The subcomponents of insight discussed in the introduction were also present throughout facilitator's narratives, even if they did not form distinct themes. For example, connection to values (Shapiro et al., 2006) was expressed in the context of changed behavioural responding. Insight into impermanence, or the changing nature of experience (Bishop et al., 2004; Crane et al., 2016), was

also implied when facilitators discussed awareness of body-sensations, emotions, and thoughts. Insight into the universality of suffering (Crane et al., 2016) was also discussed with reference to increased compassion. Thus, overall, the findings in the current study align with commonly identified adaptive mechanistic processes associated with mindfulness practice.

Strengths, Limitations, Implications, and Future Directions

Various interdependent mechanisms are implicated in mindfulness practice, and the current qualitative investigation allowed for a detailed and nuanced exploration into how these processes, and their interactions, may affect well-being. The current analysis benefited from the perspectives of experienced mindfulness facilitators, who possess extensive experiential engagement with mindfulness practice, and thus are well-placed to comment on corresponding associations with psychological health.

Nonetheless, sample characteristics may have biased the results and limited the generalisation of findings, including the largely female sample, discrepancies between facilitators with regards to years of personal practice, number of MBSR groups taught, and occupational profile, as well as other factors that were not ascertained, such as facilitators' knowledge of the theoretical and empirical literature. In addition, the primary interview question was broad and follow-up prompting was minimal, thus, combined with varied time constraints between facilitators, responses varied in depth and breadth, and important mechanisms may not have been discussed. Furthermore, the data comprised facilitator's consciously constructed narratives about perceived mechanistic processes, and identified themes were not checked for inter-rater reliability; thus, the reported findings may have been influenced by biases or

expectations. Nonetheless, various important themes were identified which largely aligned with existing theoretical accounts. Future research would benefit from continued qualitative investigations into these conceptually complex factors, for example, by comparing understandings between experienced and novice meditators, or by elucidating themes that are less extensively discussed in the theoretical literature, such as group processes and self-efficacy. Continued qualitative investigations into key mechanistic processes may also inform quantitative investigations, such as scale development and refinement. Overall, given the reported beneficial effects of MBSR participation on various areas of psychological functioning, MBSR may represent a potent intervention for people experiencing a varied range of psychological symptoms.

Summary and Conclusion

The current study sought to explore the key processes by which MBSR participation can benefit psychological health and well-being, through the perspective of experienced MBSR trainers. Increased awareness of internal experiences, including thoughts, body-sensations, and emotions, were said to be beneficial, and particularly shifting from automatic thought processes towards body-based awareness. Attitudinal change embodying various qualities of mindfulness were also emphasised, including acceptance, curiosity, and compassion, in addition to a stance towards meditation encompassing non-striving and perseverance. Increased awareness and attentional change were said to facilitate the fundamental mechanism of changed responding, and particularly increased friendliness towards and tolerance of body-sensations, de-identification with thoughts, and overall behavioural change through increased personal agency. Finally, a sense of shared humanity was said to be generated through the group

format, and in particular through facilitator presence, the normalisation of distress, and a developing sense of community. Thus, engagement with MBSR training appears to impact multiple areas of functioning simultaneously, and thus may be a powerful trans-diagnostic intervention.

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Appendix G: Research Practicum Participant Information Sheet



Participant Information Sheet

Researchers:

This research is being conducted by Ms Monique Wilson, Doctor of Psychology (Clinical) candidate, Research School of Psychology, College of Medicine, Biology and Environment at the Australian National University. This research is being supervised by A/Prof Rhonda Brown, Research School of Psychology, the Australian National University.

Project Title: Mechanisms of Mindfulness: A Qualitative Analysis.

General Outline of the Project:

Engaging in mindfulness training is associated with decreases in depression, anxiety, stress and sleep disturbance (Chiesa & Serretti, 2009; Hofmann, Sawyer, Witt, & Oh, 2010; Khoury et al., 2013; Winbush, Gross, & Kreitzer, 2007). This project seeks to understand experienced mindfulness facilitator's perspectives about how engaging in mindfulness training might contribute to improved psychological outcomes. This qualitative study will be based on interview data derived from approximately six Australians who are experienced in delivering Mindfulness-Based Stress Reduction (MBSR) and/or Mindfulness-Based Cognitive Therapy (MBCT).

Participant Involvement:

Participating in this study is completely voluntary. You are not under any obligation to participate, and if you do consent, you can withdraw from the study without affecting your relationship with staff at the Australian National University. You can withdraw at any point by simply informing the researcher. If you choose to withdraw prior to completion of the interview, your data will be destroyed. If you withdraw after completion of the interview, the data you have provided will be retained and utilised for publication.

The interview will take place either via phone or Skype, depending on the participant's preference. It is expected that the interview will last 30 minutes. Participants will be asked to undertake a one-on-one interview with the researcher and will be asked some general questions about themselves, their experience with mindfulness, as well as their perceptions about how mindfulness training might benefit psychological health.

The audio of the interview will be recorded so that it can be transcribed for analysis. Recording will only commence after consent is given from participants. On request, participants will be given a copy of their transcript before analysis is finalised.

There are no significant risks associated with participating in this study. If any of the survey questions cause distress you are encouraged to discontinue participation in the study. Alternatively, you may wish to contact Lifeline on 13 11 14.

Participants may benefit from participating in this study by learning about how research is conducted or through learning about themselves via a process of self-reflection that is encouraged in the interviews. However, we cannot guarantee or promise that you will receive any benefits from participating in this study.

Inclusion Criteria:

A sample of six Australian MBSR or MBCT facilitators are sought for participation in this study. You must be an Australian Resident and 18 years or older to participate.



Confidentiality:

Data will be kept confidential as far as the law allows. Only the researchers will have access to information on participants, and data will not be stored with information that could identify participants. Study results will be presented in the student's doctoral thesis project, as well as scientific journal articles and conference presentations; however, individual's participant data will not be identifiable.

Privacy Notice:

In collecting your personal information within this research, the ANU must comply with the Privacy Act 1988. The ANU Privacy Policy is available at https://policies.anu.edu.au/ppl/document/ANUP_010007 and it contains information about how a person can:

- Access or seek correction to their personal information;
- Complain about a breach of an Australian Privacy Principle by ANU, and how ANU will handle the complaint.

Data Storage:

Audio files will be deleted after transcription is complete. Data will be stored on the researcher's password-protected computer. In accordance with ANU guidelines, data will be stored for five years after the study has finished and will then be deleted.

Queries and Concerns:

If you have questions or would like to know more about the study at any stage, please feel free to contact the researcher, Ms Monique Wilson of the Research School of Psychology, College of Medicine, Biology and Environment, at monique.wilson@anu.edu.au or + 61 2 6125 5585. Alternatively, please contact the chief supervisor A/Prof Rhonda Brown of the Research School of Psychology, College of Medicine, Biology and Environment at rhonda.brown@anu.edu.au or + 61 2 6125 0635.

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee. If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager
 The ANU Human Research Ethics Committee
 The Australian National University
 Telephone: +61 2 6125 3427
 Email: Human.Ethics.Officer@anu.edu.au

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Appendix H: Research Practicum Email Invitation

Subject: Seeking mindfulness facilitators to participate in a qualitative study about the mechanisms of mindfulness

Dear esteemed colleagues,

As part of my candidature towards a Doctor of Psychology (Clinical), I hope to complete a modest qualitative study investigating practitioner's perceptions of the mechanisms by which mindfulness training influences psychological well-being.

As such I am seeking Australian MBSR and MBCT facilitators to share their experiences in a brief 30 minute interview with myself via phone or Skype.

If you are interested or would like more information, please click the following link:

https://anupsych.col.qualtrics.com/SE/?SID=SV_57Jnc5G4CzRCwjH

Alternatively, please do not hesitate to contact me if you have any questions.

This research has been approved by Australian National University Human Ethics (protocol: 2016/762).

Thank you!

Warm regards,

Monique Wilson
Psychologist
Doctor of Psychology (Clinical) candidate
Research School of Psychology
Psychology Building 39, Room 218
The Australian National University
Canberra ACT 2601
Email: monique.wilson@anu.edu.au

Appendix I: Research Practicum Consent

In giving consent I acknowledge that:

- I have read and understood the Participant Information Sheet provided about this research study, and I fully understand the nature of the project and its likely outcomes.
- I have been provided with the researchers' contact details in order to discuss any questions or concerns about the study.
- I agree to participate in the study.

Consent:

- I consent to participating in this study
- I do not consent to participating in this study

Audio-recording consent:

- I give consent to audio-recording of my interview
- I do not consent to audio-recording of my interview

Appendix J: Research Practicum Pre-Survey and Interview Schedule***Pre-Survey***

How old are you? _____

Are you an Australian citizen or permanent resident?

- Yes
 No

Do you have experience delivering group-based mindfulness interventions?

- Yes
 No

What type(s) of group-based mindfulness interventions have you delivered?
You may select multiple responses.

- Mindfulness-Based Stress Reduction (MBSR)
 Mindfulness-Based Cognitive Therapy (MBCT)
 Another mindfulness-based intervention, please provide a brief description:

Approximately how many group-based mindfulness interventions have you delivered? _____

What is your name? _____

What is your email address?: _____

Please re-enter you email address: _____

Please enter your phone number (optional): _____

Please indicate how you found out about this survey:

- Email listserv, please specify: _____
 Community website, please specify: _____
 Research participation website, please specify: _____
 Other, please specify: _____

Thank you for your responses. The researcher will contact you shortly to arrange a convenient time for you to participate in the interview.

Interview Schedule

1. *Acknowledge this question was asked in the pre-survey.* Can I confirm how old you are?
2. *Acknowledge this question was asked in the pre-survey.* Can I confirm you are an Australian resident or citizen?
3. What is your gender identity?

4. What is your highest level of education?
5. What is your primary occupation and/or professional title (e.g., psychologist, social worker, GP).
6. How many years have you worked in this profession?
7. *Acknowledge this question was asked in the pre-survey.* Confirm mindfulness group taught (e.g., MBSR, MBCT, other – specify details)
8. Approximately how many MBSR groups have you taught?
9. What was the standard duration of the groups (e.g., traditional MBSR 8 weeks with a one day silent retreat, altered program?)
10. Approximately how many participants per group?
11. How many years have you been teaching mindfulness groups?
12. When was the last time you facilitated a mindfulness group?
13. Do you have a personal mindfulness practice?
14. How long have you had a regular mindfulness practice?
15. How often do you practice (e.g., average number of times per week, duration (minutes) for each sitting)

Interview Questions

What is your understanding of how mindfulness training influences mental health and well-being? What are the core mechanisms by which mindfulness training does this?