The Protective Effects of Mindfulness in Helping a Student Sample Tolerate Distress.

Francesca Mia Lassman

June 2016

Research submitted in partial fulfilment of the requirements for the degree of Doctor in Clinical Psychology (DClinPsy), Royal Holloway, University of London.

Acknowledgements

I would like to thank my first supervisor, Dr Jessica Kingston, for her knowledge, advice and input with the project. I would also like to thank Dr Olga Luzon for taking over the supervisory role and helping me with the final stages of the project. Thank you to "The Car et al." for the constant support and humour, Camilla for her superb mediation advice, and Ben for putting up with it all. Finally, thank you to the participants who took part in this research.

Abstract

Distress tolerance is defined as the capacity to withstand aversive emotional states. Deficits in distress tolerance are common in both clinical and non-clinical populations and associated with a range of clinical symptoms in both. This is particularly problematic in the context of anger, potentially leading to aggressive or harmful behaviour towards the self and others. Clinicians and researchers have developed interventions to increase distress tolerance, and one with an emerging evidence base is mindfulness.

The current study assessed the influence of mindfulness as a mediator between trait anger and distress tolerance using a cross-sectional design. In addition, it compared a mindfulness intervention with a relaxation intervention on increasing peoples' distress tolerance when in an angry mood.

Using a mixed experimental design, university students (N = 70) completed measures of distress tolerance, trait anger and trait mindfulness at baseline. They were randomised to a one-week mindfulness or relaxation intervention. At one-week follow-up they underwent an angry mood induction before completing a behavioural measure of distress tolerance. State anger and mindfulness were assessed at baseline and follow up to assess the efficacy of the intervention and manipulation.

As predicted, trait mindfulness mediated the relationship between trait anger and distress tolerance. Furthermore, participants in the mindfulness intervention demonstrated greater distress tolerance than those in the relaxation intervention. However, state mindfulness did not increase following either intervention.

In conclusion, trait mindfulness partially explained the relationship between trait anger and distress tolerance in student samples. Furthermore, mindfulness was more effective than relaxation in increasing students' distress tolerance when angry; however, the mechanism by which this occurred needs further exploration. This may have important clinical implications for developing mindfulness interventions to target distress tolerance. However, further research using clinical samples is needed.

List of Tables

Table 1. Sociodemographic Characteristics of Sample and Between-Group (Mindfulness versus Relaxation) Comparisons…… 76

Table 2. Mean (SD) and Between-Group Comparisons for Baseline Trait and State Variables ……. 79

Table 3. State Variables at Baseline and Follow up, Split by Group……..... 82

Table 4. Correlations of Mindfulness Facets with Trait Anger and Distress Tolerance…… 87

Table 5. Bootstrapped Point Estimates and CI for the Indirect Effects of Anger on Distress Tolerance Through the Facets of Mindfulness as Mediators ..…… 88

List of Figures

Figure 1.	Lynch and Mizon's (2011) three-factor model of distress tolerance……	17
Figure 2.	Overview of design and procedures…….	53
Figure 3.	Illustration of mediation model…….....	85

List of Contents

1. Introduction……..... 12

1.1. Overview……... 12

1.2. Distress Tolerance……..... 14

1.2.1. Defining distress tolerance……..... 14

1.2.2. Theoretical basis of distress tolerance…..... 15

1.2.3. Measuring distress tolerance……. 21

1.2.4. Dimensionality of distress tolerance……. 24

1.2.5. Distress tolerance and anger……..... 26

1.3. Mindfulness …….. 31

1.3.1 Operationalising mindfulness……..... 32

1.3.2. Mindfulness and distress tolerance……..... 34

1.3.2.1.Cross-sectional evidence……..... 37

1.3.2.2. Experimental evidence……..... 38

1.3.3. Mindfulness and relaxation……..... 44

1.3.4. Home-based mindfulness practice……... 46

1.4. Using a non-clinical sample…… 47

1.5. Overview of gaps in the literature……..... 48

1.6. The current study……..... 49

2. Method…….. 51

2.1. Overview……..... 51

2.2. Design……... 51

2.2.1. Cross-sectional design……. 51

2.2.2. Experimental design……. 51

2.3. Power analysis and effect sizes……. 54

2.4. Participants……..... 55

2.5. Recruitment……... 56

2.6. Measures……... 57

2.6.1. Demographic details…… 57

2.6.2. Trait measures…….. 57

2.6.3 State measures……... 60

2.6.4. Behavioural distress tolerance task…….. 61

2.7. Manipulations……..... 62

2.7.1. Interventions……. 62

2.7.2. Autobiographical story recall……... 63

2.8. Procedure…….. 64

2.8.1. Ethical approval…… 64

2.8.2. Piloting……. 64

2.8.3. Randomisation……. 65

2.8.4. Protocol…… 65

3. Results…….. 69

3.1. Overview…….. 69

3.2. Preliminary Data Analysis……... 70

3.2.1. Missing data…… 70

3.2.2. Outliers…… 71

3.2.3. Distribution of variables……... 72

3.3. Descriptive Statistics…… 74

3.3.1. Randomisation checks…….. 78

3.3.2. Intervention adherence……. 80

3.3.3. Manipulation checks…… 80

3.4. Hypothesis Testing……... 83

3.4.1. Hypothesis 1…… 83

3.4.2. Hypothesis 2……. 85

3.5. Exploratory Analyses…… 86

3.6. Summary of Results…….. 89

4. Discussion…….. 90

4.1. Overview……. 90

4.2. Main Findings in the Context of Research and Theory……... 90

4.2.1. Hypothesis 1: mindfulness as a mediator between anger and distress tolerance……. 90

4.2.2. Hypothesis 2: The effects of a mindfulness intervention on distress tolerance…… 96

4.3. Implications for Clinical Practice and Suggestions for Future Research……... 103

4.3.1. Clinical practice…… 103

4.3.2. Future research……. 106

4.4. Strengths and Limitations……. 111

4.4.1 Strengths…… 111

4.4.2 Limitations…… 113

4.6. Conclusions……..... 116

5. References……. 118

6. Appendices…… 141

1. ‘Message of the Day’ advertisement…….. 141

2. Measures……. 142

3. Interventions…….. 155

4. Ethical Approval Email…….. 162

5. Experiment Script…….. 163

6. Information Sheet…….. 167

7. Record Form…….. 171

8. Debrief sheet……. 172

Introduction

1.1. Overview

Distress tolerance is defined as the capacity to experience and withstand negative aversive states (Simons & Gaher, 2005). Deficits in distress tolerance have been linked to the development and maintenance of various forms of maladaptive behaviours and psychological disorders (Leyro, Zvolensky, & Bernstein, 2010; Zvolensky, Leyro, Bernstein, & Vujanovic, 2011). In recent years, there has been an increasing interest in exploring individual differences underlying distress tolerance to develop models of risk and resilience that have associated clinical implications (Zvolensky et al., 2011). Furthermore, there has been an increase in the development of interventions to directly target distress tolerance in both clinical and non-clinical populations (Leyro et al., 2010; Zvolensky et al., 2011).

Research has found that high trait anger is associated with low distress tolerance (Ali, Ryan, Beck, & Daughters, 2013; Ellis, Vanderlind, & Beevers, 2013; Hawkins, Macatee, Guthrie, & Cougle, 2013; Martin & Dahlen, 2004). Problematic anger can present as an intense and uncontrolled emotional state, leading to interpersonal aggressiveness and other harmful behaviours toward the self and others (Conger, Conger, Edmondson, Tescher, & Smolin, 2003; Greene, Coles, & Johnson, 1994; Kroner & Reddon, 1995). This emphasises the importance of exploring potential variables that might underpin the relationship between anger and distress tolerance.

Empirical evidence of a strong relationship between mindfulness and distress tolerance (e.g. Pearson, Lawless, Brown, & Bravo, 2015) suggests individual

variations in trait mindfulness may account for some of the relationship between high anger and low distress tolerance. Theoretically, taking a mindful approach to anger might reduce its effect on distress tolerance. However, to date, this has not been explored. Additionally, research has found that interventions targeted to increase mindfulness skills may increase an individual's tolerance of distress when angry (e.g. Sauer & Baer, 2012). This has important clinical implications. However, the evidence base is limited by a paucity of adequately controlled and ecologically valid trials.

The current thesis had two aims: (1) to investigate whether trait mindfulness accounted for some of the relationship between trait anger and distress tolerance in students, and (2) to investigate whether a mindfulness intervention would help students tolerate distress when angry.

This chapter will begin by providing an overview of the definition, theory, and measurement of distress tolerance. It will continue by discussing the dimensional nature of distress tolerance in clinical and non-clinical samples, before considering the importance of investigating low distress tolerance in the context of anger specifically. The chapter will go on to consider the concept of mindfulness, and review empirical evidence of the relationship between mindfulness and distress tolerance. Through considering the limitations of the current evidence base as well as any key gaps of knowledge within the literature, it will outline the specific aims and hypotheses of the current study.

1.2. Distress Tolerance

1.2.1. Defining distress tolerance. The most commonly accepted definition of distress tolerance is that described by Simons and Gaher (2005) and it refers to the capacity to experience and endure negative emotional states. This includes the extent a person can withstand and not impulsively or habitually attempt to alter or escape aversive emotional experiences, either consciously or unconsciously. Within the literature, two ways of measuring distress tolerance have been developed: (1) self-report measures of the ability to withstand negative emotional and/or aversive states and (2) behavioural tasks, which measure the length of time a person can withstand an aversive state elicited by a stressor (Leyro et al., 2010; Lynch & Mizon, 2011; Zvolenksy & Hogan, 2013). Research has used these measurements interchangeably; however, they have not been found to consistently correlate (Kiselica, Rojas, Bornovalova, & Dube, 2015; McHugh, Daughters et al., 2011), which has led to confusion regarding whether they are measuring the same underlying construct or whether they are measuring different constructs (Bernstein, Vujanovic, Leyro, & Zvolensky, 2011; Leyro et al., 2010). Therefore, for clarity, in this thesis the distinctions of (1) self-report distress tolerance and (2) behavioural distress tolerance will be used.

The distress tolerance literature has focused on various types of distress, for example, cognitive (e.g. difficult thoughts) and emotional (e.g. difficult feelings) (Leyro et al., 2010). However, the different perspectives broadly relate to some form of subjectively aversive or threatening experiential state (Zvolensky et al., 2011). The degree to which they are experienced as aversive suggests individual differences in tolerance of such states (Zvolensky et al., 2011). Most perspectives define and

operationalise tolerance as an individual difference in the extent to which a person withstands a certain type of personal discomfort or threat, encompassing cognitive, affective and behavioural features (Zvolensky et al., 2011).

1.2.2. Theoretical basis of distress tolerance. There lacks a unified, established theoretical model of distress tolerance (Leyro et al., 2010). This may be because low distress tolerance has been implicated in multiple diagnostic categories (Leyro et al., 2010) and approached from various literatures, such as personality, addictions, self-regulation, anxiety and eating disorders. In addition, as self-report and behavioural measures of distress tolerance do not consistently correlate (Kiselica et al., 2015; McHugh, Daughters et al., 2011), concerns have arisen as to whether they are measuring theoretically different constructs (Leyro et al., 2010). To date, models have not accounted for these distinctions. This section will outline the two main perspectives that have contributed towards an understanding of the broad distress tolerance construct.

Simons and Gaher (2005) describe distress tolerance as a meta-emotion construct, consisting of one's evaluations and expectations of experiencing negative emotional states. These include: the aversiveness of negative emotional states, or how tolerable they are perceived to be; the appraisal of negative states; the tendency for negative emotional states to absorb attention and disrupt functioning; and the regulation of negative emotional states. They suggest that individuals with low distress tolerance are expected to report that they cannot tolerate being distressed and that distress is unbearable. Second, their appraisal of distress is expected to reflect a lack of acceptance, being ashamed of being distressed and perceiving their coping abilities as inferior to others. Third, they regulate emotions by great efforts to avoid

negative affect and rapidly alleviate any they do experience. Fourth, if unable to alleviate negative emotion, they are expected to report being consumed by the experience and their functioning disrupted.

According to Simons and Gaher (2005), distress tolerance includes antecedent processes to regulate affect (e.g. tendencies to approach or avoid potentially distressing situations, efforts to make situations less distressing, proneness to become absorbed by focusing on distressing aspects of a situation or avoid attending to them) as well as behavioural process to respond to affect (e.g. suppressing the expression of emotion or using substance, for example, to dampen the emotional response). Elements of distress tolerance are related to the intensity and nature of the experience, and other elements related to the behavioural tendencies for dealing with distress (Simons & Gaher, 2005).

This theoretical understanding of distress tolerance has been widely used across diagnostic categories. In the addictions literature (Simons & Gaher, 2005), for example, substance use has been considered an emotion-focused coping strategy that results in rapid alleviation of negative emotions (Simons & Gaher, 2005). There is evidence that affective distress may be elicited by withdrawal symptoms during abstinence, which can serve as a significant stressor (Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005; Richards, Daughters, Bornovalova, Brown, & Lejuez, 2011). The severity of these withdrawal symptoms can predict treatment outcome and relapse across different types of drugs (Richards et al., 2011). However, there is not a consistent pattern between heightened negative affect during abstinence and relapse, with some individuals able to resist the urge to relapse to substance use in the face of high affect and others resorting to substance use with only slight rises in

negative affect (Richards et al., 2011). As such, this highlights the key role of the ability to tolerate distress in predicting substance use initiation and relapse outcomes (Brown et al., 2005).

The other widely used conceptualisation of distress tolerance comes from the literature on biosocial theories of affect dysregulation. Lynch and Mizon (2011) present a three factor theoretical model of distress tolerance (Figure 1.) which considers: (1) biological predispositions for distress tolerance or traits that might lead to it; (2) sociobiographic feedback that may set up conditions for distress (in)tolerant behaviour to evolve and be reinforced; and (3) learned maladaptive coping to distress eliciting contexts. They suggest that these three factors reciprocally influence one another (Lynch & Mizon, 2011).

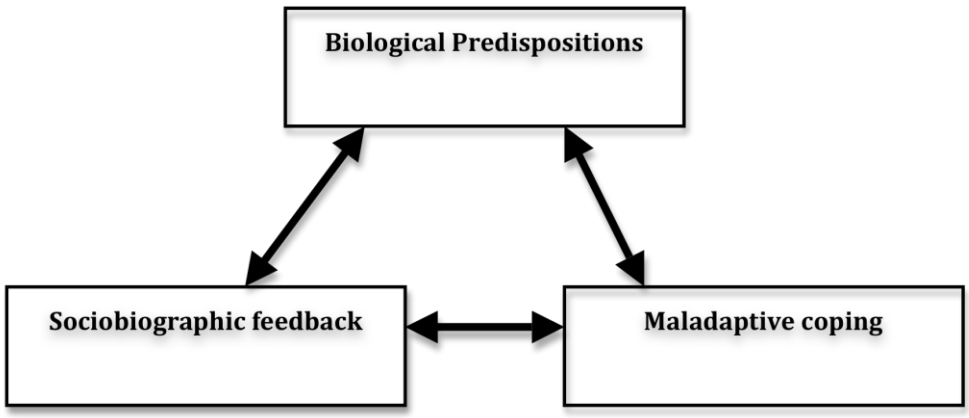

Figure 1. Lynch and Mizon's (2011) three-factor model of distress tolerance

Biological vulnerability refers to an individual's predisposition to emotional reactivity (Lynch & Mizon, 2011). High emotional reactivity is defined as: (a) increased sensitivity to emotion; (b) inability to regulate intense emotional responses; and (c) slow return to emotional baseline (Crowell, Beauchaine, & Linehan, 2009). Individuals with heightened emotional reactivity are theorised to experience emotional distress more potently and frequently than those with lower emotional reactivity. A large body of evidence suggests people with reduced distress tolerance also have heightened emotional reactivity (e.g. Brown, Lejuez, Kahler, & Strong, 2002; Kiselica et al., 2015; Simons & Gaher, 2005). However, as research is largely cross-sectional, it is difficult to decipher whether high emotional reactivity leads to lower distress tolerance or whether low distress tolerance leads to greater reactivity to emotional states. It is also very difficult to measure biological differences in emotional reactivity independent of the effects of environmental factors.

The sociobiographic element of this model refers to what an individual learns from social interactions and the behavioural patterns that result from them. If a child's communication of emotion is met by inappropriate, erratic or extreme negative responses, for example, punishment, dismissal, or trivialisation, this might be experienced as highly invalidating. As a result that child may not learn how to understand emotions, regulate emotional arousal, or tolerate emotional distress (Gratz & Tull, 2011). This may lead to unwillingness to experience, and rigid attempts to avoid, emotional distress (Gratz & Tull, 2011). For individuals with a predisposition to emotional reactivity, this invalidating feedback might be particularly painful and confusing. It may impair the awareness and understanding of

emotions as well as one's judgement of how to respond to them. For example, it may be adaptive for a child to inhibit or suppress emotional reactions because of the feedback they have received and, as a result, fail to learn the meaning of their emotions or how to regulate them (Lynch & Mizon, 2011).

The third part of Lynch and Mizon's (2011) model focuses on the situational factors hypothesised to be influencing distress tolerance. This element draws on behaviour theory, whereby responses to distress eliciting contexts are maintained through negative reinforcement (Lynch & Mizon, 2011). Individuals with lower distress tolerance may not have learnt how to regulate emotion and, consequently, may be prone to maladaptive responding to distress and distress-eliciting contexts (Leyro et al., 2010). Conversely, individuals with higher distress tolerance may be more able to respond in more adaptive ways (Zvolensky, Vujanovik, Bernstein, & Leyro, 2010). Maladaptive responding may refer to a wide range of behaviours in response to aversive states, for example, low distress tolerance has been implicated in: self-harm or drug and alcohol use to escape from unwanted moods; avoidant coping styles; emotion and thought suppressing; avoidance of contexts that elicit particular thoughts and moods; disordered eating patterns; and aggressive behaviour (Anestis, Fink, Smith, Selby, & Joiner, 2011; Chapman, Gratz, & Brown, 2005; Richards et al., 2011). In avoiding or escaping from negative emotions, and thus successfully terminating the aversive state, the maladaptive response becomes a negatively reinforced strategy likely to be repeated (Chapman et al., 2005; Richards et al., 2011).

Linehan's (1993) biosocial theory of borderline personality disorder (BPD) draws on very similar ideas in understanding distress tolerance. She theorises that

individuals with this diagnosis have an innate predisposition to greater emotional reactivity and a slower return to baseline arousal, which increase difficulties in regulating emotions (Linehan, 1993). Her model proposes that when this is combined with a persistently and pervasively invalidating environment, people may develop maladaptive coping strategies as a way of dealing with emotions that they have not learnt how to understand or manage effectively (Linehan, 1993).

In summary, although approached from different perspectives, theoretical accounts of distress tolerance include the processes that influence the experience of emotion, as well as the ways of responding to emotion that influence their outcome. However, these accounts of distress tolerance have several limitations. They do not account for the different measurements of distress tolerance that have evolved and how they theoretically relate (or do not relate) to each other (Bernstein et al., 2011). This has led to conceptual ambiguity in the literature. The theories also imply that individuals with low distress tolerance might be at increased risk for developing maladaptive beliefs and behaviours relating to emotions; however it might be that beliefs and behaviours about emotions increase the risk of developing maladaptive levels of distress tolerance (Vujanovic, Bernstein, & Brett, 2011); in reality the relationships are likely transactional and complex. Furthermore, these theoretical accounts imply that distress tolerance is a relatively stable, trait-like variable. They do not specify anything about contextual or cultural variability; nor do they account for how rigid and inflexible levels of distress tolerance might predispose individuals to develop maladaptive ways of relating to and regulating emotion (Vujanovic et al., 2011). Finally, they do not unpick how the construct relates to numerous potentially overlapping and related risk factors and processes, for example, anxiety sensitivity,

experiential avoidance or pain tolerance (Bernstein et al., 2011). Although addressing these concerns is beyond the scope of this study, it is important that they are held in mind.

1.2.3. Measuring distress tolerance. As discussed, there are two main ways that distress tolerance has been measured in the literature: through self-report and behavioural measures. In line with Simons and Gaher's (2005) multidimensional conceptualisation of distress tolerance, they developed the Distress Tolerance Scale (DTS), which is the most widely used self-report measure of distress tolerance. This 15-item measure captures how an individual perceives their tolerance of distress, with four sub-scales: (1) Tolerability; (2) Appraisal; (3) Absorption; and (4) Regulation. The full scale is widely used in the literature as a measure of perceived capacity to withstand negative psychological states (e.g. Bernstein, Marshall et al., 2009; Bernstein, Zvolensky et al., 2011).

A study by Cougle, Bernstein, Zvolensky, Vujanovic, and Macatee (2013) aimed to examine the type of distress that the DTS might be capturing. Undergraduate students completed the DTS and were then shown four film clips that were intended to induce anger, fear, disgust or sadness respectively. Following each film clip participants rated peak fear, disgust, sadness and anger experienced during the film. They also rated their perceived tolerance for, and perceived threat of, emotion experienced during the film. Authors found the total DTS score significantly related to perceived tolerance and perceived threat of emotions for each film clip, which remained when controlling for the target emotion that each film was supposed to elicit. This provides some support that the DTS applies to multiple

emotions and measures something distinct from just emotional reactivity (Cougle et al., 2013).

A number of behavioural approaches have also been developed to measure individual differences in tolerance of aversive stimuli. Specifically, experimental tasks have evolved that measure the duration of time an individual can withstand exposure to specific types of difficult or frustrating tasks (Zvolensky et al., 2011). The time taken to quit such tasks is taken as a measure of tolerance of the distress experienced (Zvolensky et al., 2011). These tasks relate to the behavioural aspect of distress tolerance theory in that they assess an individual's ability to withstand tasks in the face of affective distress. Two of the most commonly used behavioural measures of distress tolerance are the Mirror-Tracing Persistence Task-Computerised version (MTPT-C; Quinn, Brandon, & Copeland, 1996; Strong et al., 2003) and the Paced Auditory Serial Addition Task (PASAT; Lejuez, Kahler, & Brown, 2003).

In the MTPT-C, participants are asked to trace the outline of geometric shapes on a screen using a computer mouse; however, the movement of the cursor is in the opposite direction to the mouse. Each time the cursor moves outside the lines of the shape, or hesitates, negative feedback in the form of a loud explosion sound is emitted and the cursor moves back to the beginning of the shape. There are typically several levels to the task, which increase in difficulty (as the shape gets thinner). On the final level participants can quit the task whenever they choose, but are instructed to give their maximum effort. Distress tolerance is measured as latency to quit the task on this final level. In the PASAT, participants are presented with a series of single digit numbers and are instructed to continually sum the two most recently

presented digits (Zvolensky et al., 2011). Similar to the MTPT-C, incorrect answers are met with a loud error sound. There are different levels, which increase in difficulty, and participants can quit at any point on the final level.

An important consideration previously mentioned is that evidence of overlap between self-report and behavioural measures of distress tolerance is mixed. This has led to confusion in the literature, because they have been used as interchangeable indices of distress tolerance. Some research has found self-report and behavioural indices to be small to moderately correlated (Ameral, Palm Reed, Cameron, & Armstrong, 2014; Bernstein, Marshall, & Zvolensky, 2011), suggesting they may be related but distinct aspects of the same construct. However, other research has found there to be no association between the different measurements of distress tolerance in either clinical or non-clinical samples (Kiselica et al., 2015; McHugh, Daughters et al., 2011).

Several possible explanations for this inconsistency can be speculated: the different measurements might be capturing distinct constructs and processes; they might be lower order factors of an overarching higher order factor; they might relate differently to specific outcomes; or they might be prone to inherent differences in the methodology, for example, self-report measures being subject to social desirability bias (Ameral et al., 2014; Bernstein, Marshall et al., 2011; McHugh, Daughters et al., 2011). Alternatively, it may call into question the ecological validity of the behavioural measures (Bernstein, Marshall et al., 2011). Until this can be established, it emphasises the importance of using both self-report and behavioural measures when studying distress tolerance (McHugh, Daughters et al., 2011) and of clarity in distinguishing between the two measurements.

1.2.4. Dimensionality of distress tolerance. There has been a shift within the mental health field from conceptualising clinical entities as dichotomous, to conceptualising them as on a continuum with 'normality' (e.g. van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009). This represents a move away from the more traditional, medically driven, diagnostic approach (Verdoux & van Os, 2001). It implies that the same symptoms that are seen in clinical populations are evident in non-clinical populations. If clinical disorders are dimensional, ranging from no symptoms through to subclinical symptoms and finally to symptoms severe enough to meet a diagnostic criteria, then the study of non-clinical samples is highly relevant as it can provide insights into the psychological mechanisms and risk factors of clinical disorders (Abramowitz et al., 2014).

Research supporting this approach has found that psychotic experiences and paranoid beliefs, symptoms of depression and anxiety, eating disorder presentations, and obsessions and compulsions are common in non-clinical samples (Abramowitz et al., 2014; Angst & Merikangas, 1997; Angst, Merikangas, & Preisig, 1997; Fairburn & Bohn, 2005; van Os et al., 2009; Verdoux & van Os, 2001). Furthermore, symptoms that fall below clinical cut off thresholds for anxiety and depression have significant clinical relevance in terms of functional impairment, mortality, treatment and prognosis (Angst & Merikangas, 1997; Maier, Gansicke, & Weiffenbach, 1997).

Research into distress tolerance similarly demonstrates that it is best viewed on a continuum. Low distress tolerance is seen at both ends of the continuum and associated with negative affect and symptoms common in clinical disorders in both clinical and non-clinical samples. For example, Kiselica et al. (2015) found that self-

reported distress tolerance was significantly associated with the tendency to experience stress and negative emotions and to be impulsive in a large sample of undergraduate students and a large sample from a residential substance abuse treatment facility. Low distress tolerance was also related to features of BPD, depression and anxiety across both samples (Kiselica et al., 2015).

The same pattern has been found with symptoms of other mood and anxiety disorders. In a study with 169 adults recruited from the general population, the Structured Clinical Interview-Non-Patient Version for DSM-IV (SCID-N/P) was administered alongside the DTS (Bernstein, Marshall et al., 2011). Lower scores on the DTS were significantly associated with a lifetime prevalence of all the psychological disorders that they assessed using the SCID- major depressive disorder, generalised anxiety, social anxiety, obsessive-compulsive disorder and non-clinical panic attacks. Other studies using non-clinical samples have demonstrated that low scores on the DTS are significantly and negatively correlated with obsessive-compulsive symptoms and symptoms of panic, worry and social anxiety (Keough, Riccardi, Timpano, Mitchell, & Schmidt, 2010).

In both clinical and non-clinical samples, low distress tolerance has demonstrated relationships with maladaptive behaviours, such as non-suicidal self-injury (Anestis et al., 2012; Nock & Mendes, 2008), disordered eating (Anestis, Selby, Fink, & Joiner, 2007; Corstorphine, Mountford, Tomlinson, Waller, & Meyer, 2007) and substance abuse. For example, lower persistence on behavioural measures of distress tolerance has correlated with problematic alcohol use, substance abuse history and relapse (Brown et al., 2002); premature attrition from a substance abuse disorder treatment (Bornovalova et al., 2008); shorter duration of substance

abstinence attempt (Daughters, Lejuez, Kahler, Strong, & Brown, 2005); and to prospectively predict relapse to drug abuse (Richards et al., 2011). In non-clinical samples, behavioural distress tolerance has been found to moderate the relationship between depression scores and harmful alcohol use, in that this relationship was only significant for people with low distress tolerance (Gorka, Ali, & Daughters, 2012).

The same pattern has been seen with self-report measures of distress tolerance. In clinical samples, lower scores on distress tolerance measures significantly relate to coping related motives for marijuana use (Semcho, Bilsky, Lewis, & Leen-Feldner, 2016) and smoking addiction (Quinn et al., 1996). In non-clinical samples low self-report distress tolerance has been associated with increased alcohol consumption and more alcohol and cannabis related problems and coping motives (Buckner, Keough, & Schmidt, 2007); to predict alcohol-related problems at six months follow-up among student male substance users (Simons & Gaher, 2005); and to mediate the relationship between depression and alcohol and cannabis problems (Buckner et al., 2007).

These are just some examples from a vast literature that strongly supports that deficits in distress tolerance, which are linked to maladaptive behaviours and psychopathological symptoms, are seen in both clinical and non-clinical samples. Viewing distress tolerance on a continuum may provide important insight into how deficits in this construct can be a risk factor for psychological disorders.

1.2.5. Distress tolerance and anger. Of the various emotions in which distress tolerance has been implicated, anger has received relatively little attention. Anger is an internal experience that consists of emotional, cognitive and physiological processes that co-occur and rapidly interact with one another (Deffenbacher, 2011).

It is also associated with behavioural responses to anger-provoking situations (Deffenbacher, 2011). It has been defined as both a trait-like (individual differences in anger proneness as a personality trait) and state-like (the intensity of anger as an emotional state) construct, with high trait anger representing a tendency to experience state anger with higher frequency and in response to a wider range of situations (Spielberger, 1999).

Anger in itself is not necessarily problematic. It may be the result of an accurate appraisal of a threatening or aversive condition, which can lead to increased self-efficacy, empowerment and positive outcomes (Deffenbacher, 2011; Kuppens, Van Mechelen, & Meulders, 2004). However, high levels of trait anger have been found to have harmful consequences both for the self and others (Conger et al., 2003; Greene et al., 1994; Kroner & Reddon, 1995). These include aggression, negative health factors and interpersonal problems (Baron et al., 2007; Deffenbacher, 2011; McIntyre, 2014). Empirical and conceptual research suggests that low distress tolerance might be particularly problematic in the context of high levels of anger, in terms of leading to aggression and maladaptive responding (e.g. Ali et al., 2013; McIntyre, 2014). This emphasises the importance of understanding these relationships further.

According to a cognitive-behavioural framework, anger arises from the combination and interaction of: (a) triggering events; (b) an individual's pre-anger state, including cognitive interpretative processes; and (c) appraisals of the anger trigger and of one's coping resources (Lazarus, 1991, as cited in Deffenbacher, 2011). Deffenbacher (2011) suggests that triggers might include external frustrating or provocative events. These might in turn provoke a network of anger-related

memories and images, which intensify and increase the anger experience. Triggers may also include internal events, for example, ruminations about past unfairness, wrongdoing or maltreatment. Anger rumination is a particular cognitive style that refers to repeatedly thinking about anger (Peled & Moretti, 2010). It is theorised to consist of three processes thought to exacerbate the anger experience: memories of past anger experiences, absorption in the immediate anger experience and counterfactual thinking about the anger experience (Sukhodolsky, Golub, & Cromwell, 2001). Evidence has found that individuals high in measures of trait anger ruminate more about upsetting events than those low in trait anger (Sukhodolsky et al., 2001). This can extend the duration and intensity of their angry states.

An individual's pre-anger state may include their mood at the time of provocation, but has also been theorised to include the way one thinks about the world, for example, if an individual has overly rigid and inflexible cognitions and rules for living, anger is likely to be triggered by violations of these standards (Deffenbacher, 2011). Furthermore, drawing on Bower's (1981) network models of emotion bias, individuals who are high in trait anger tend to have an attentional focus towards threatening environmental stimuli, which are likely to trigger anger episodes (Eckhardt & Cohen, 1994; van Honk et al., 2001).

Anger appraisals are theorised to include primary and secondary ones (Deffenbacher, 2011). Primary appraisals are directed towards the trigger. Evidence has found that people with high trait anger appraise more situations as annoying, frustrating and anger-provoking (Deffenbacher, 2011; Hawkins et al., 2013); make attributions of unfairness, blameworthiness and intentionality (Kassinove & Sukhodolsky, 1995); and attribute hostile intent to situations (Averill, 1983).

Secondary appraisals are directed towards personal coping resources. If flexible and varied coping repertoires are available, anger is more likely to be adaptive. However if there is a sense of being overwhelmed and unable to cope, anger is likely to escalate (Deffenbacher, 2011). At these points anger might lead to maladaptive or harmful behaviours, which in the long term may reduce an individual's perceived coping abilities and become negatively reinforced anger responses.

Anger is a prominent emotion in many of the clinical disorders in which distress tolerance is implicated, for example, BPD (Kramer et al., 2016), depression (Painuly, Sharan, & Mattoo, 2005), post-traumatic stress disorder (McHugh, Forbes, Bates, Hopwood, & Creamer, 2012) and substance abuse (Barrett, Mills, Teesson, & Ewer, 2015). Research has found that in both clinical and non-clinical samples, people who are high in trait anger also have lower distress tolerance (Ali et al., 2013; Ellis et al., 2013; Hawkins et al., 2013; Martin & Dahlen, 2004) and that individuals have less tolerance of distress when in an angry state (Ellis et al., 2013; Sauer & Baer, 2012). Research has also found that in student samples, the relationship between anger related variables and problematic alcohol use was only significant among individuals with low distress tolerance (Ali et al., 2013). This suggests the key role of distress tolerance in leading to problematic responses to anger.

Based on the suggested frameworks, high trait anger might affect distress tolerance in that: (1) individuals have heightened emotional reactivity, which influences the nature of distress; (2) for those without rich and flexible coping repertoires to draw from, this heightened emotion might be experienced as more aversive and intolerable; (3) ruminating on anger de-contextualises it from the situation at hand, thereby potentially exacerbating the strength and intensity of the

anger episode (Bushman, 2002; Peled & Moretti, 2010; Rusting & Nolen-Hoeksema, 1998; Wright, Day & Howells, 2009); and (4) dysfunctional responding might terminate aversive states, thereby becoming negatively reinforced strategies. These are tentative suggestions and anger and distress tolerance are likely to have a more complex bi-directional relationship with one another. Further research is needed to clarify their relationship as well as other individual difference factors underlying this relationship.

One such factor that might account for some of the relationship between anger and distress tolerance is mindfulness. Mindfulness originates in eastern philosophy and has been incorporated into a developing 'third wave' trend in cognitive behavioural therapies that focuses more on changing the function of psychological events as opposed to their form and frequency (Hayes, Villatte, Levin, & Hildebrandt, 2011). Mindfulness has been described as a particular way of paying attention that originated in Eastern meditation practices but is increasingly discussed and practiced in Western culture (Baer, 2003).

Research has demonstrated strong inverse associations between anger-related variables and mindfulness (Borders, Earleywine, & Jajodia 2010; Brown & Ryan, 2003; Eisenlohr-Moul, Peters, Pond Jr., & DeWall, 2016; Feltman, Robinson, & Ode, 2009; Heppner et al., 2008). Brown and Ryan (2003) found that lower self-reported anger was associated with higher levels of mindfulness in undergraduate students. Heppner et al. (2008) found that lower self-reported anger, hostility and verbal aggression, as well as less angry responses to hypothetical anger-provoking vignette situations were associated with higher mindfulness in undergraduate students.

Mindfulness has also received increasing academic and clinical interest as an individual difference factor underlying distress tolerance, as well as a target for increasing distress tolerance. Theoretically, the ability to access mindful states when angry might influence the relationship between anger and distress tolerance, in terms of how angry cognitions, emotions and physiological reactions are appraised and responded to. However, to date, research has not explored mindfulness as a potential mediator of this relationship. The following section will provide an overview of mindfulness, including how it is defined and measured. It will then go on to explore the theoretical and empirical relationship between mindfulness and distress tolerance, before narrowing down to this relationship in the context of anger.

1.3. Mindfulness

There is heterogeneity in the literature regarding how mindfulness is defined and operationalised (Dimidjian & Linehan, 2003). A commonly used description is intentionally focusing one's attention on the present moment, in a non-judgemental or accepting way (Kabat-Zinn, 1990). However, others describe it solely as the state of being attentive to, and aware of, what is taking place in the present (Brown & Ryan, 2003).

Despite the lack of a consensual definition of the core construct, mindfulness has become a very popular treatment in Western mental health. A range of interventions have been developed to assess mindfulness skills in both clinical and community populations. The most well-known and evaluated are the Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1990) and Mindfulness-Based Cognitive Therapy (MBCT; Teasdale, Segal, & Williams, 1995) programmes. Mindfulness has also been incorporated into 'third wave' cognitive therapies

including Dialectical Behaviour Therapy (DBT), commonly used in the treatment of BPD (Linehan, 1993) and Acceptance and Commitment Therapy (ACT) (Hayes, Strosahl, & Wilson, 1999). Mindfulness practice typically involves various formal mediation practices, as well as teaching mindfulness as an everyday activity and out of session practice (Hayes et al., 2011).

1.3.1 Operationalising mindfulness. The heterogeneity in the literature of mindfulness relates to whether it is defined as unidimensional or multidimensional. This conceptual debate is reflected in how it is practiced and operationalised by various measures. In DBT mindfulness is described as comprising six elements: three relating to what one does when being mindful (i.e. observing, describing and participating in the present moment) and three relating to how one does it (i.e. non-judgementally, one-mindfully, and effectively) (Dimidjian & Linehan, 2003). Lau et al. (2006) conceptualise mindfulness as consisting of two elements: (1) curiosity, which reflects curious awareness of the present moment; and (2) de-centering, which reflects an awareness of one's experience with some distance and de-identification. They developed the Toronto Mindfulness Scale (TMS; Lau et al., 2006) to capture this. Baer, Smith, and Allen (2004), however, developed the Kentucky Inventory of Mindfulness Skills (KIMS) to capture four facets of mindfulness: (1) observing; (2) describing; (3) acting with awareness; and (4) accepting without judgement.

On the other hand, Brown and Ryan (2003) propose that mindfulness consists of a single factor, described as attention to and awareness of the present. Based on this, they developed the single-factor Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003). Although acceptance is considered important to mindfulness, they argue that it is subsumed within the capacity to pay full attention in

the present moment (Brown & Ryan, 2003). Others have criticised this approach, arguing that in normal human behaviour emotion-driven behavioural reactions are automatic and intentional effort would be needed to suppress judgemental or evaluative thinking (Sauer et al., 2013). From this viewpoint, acceptance is seen as a key component of mindfulness.

In order to explore and clarify this heterogeneity, Baer, Smith, Hopkins, Krietemeyer, and Toney (2006) examined the factor structure of the mindfulness construct in large samples of meditators and non-meditators. They combined items from all available mindfulness questionnaires and conducted an exploratory factor analysis to examine the factor structure of the combined pool. This indicated a hierarchical, five-factor structure of mindfulness, consisting of facets relating to the ability to observe one's inner experiences (Observe), the ability to apply descriptive labels to them (Describe), acting with an awareness of the present moment (Awareness), being non-judgemental of one's inner experiences (Non-Judging), and not reacting to inner experiences (Non-Reacting). However, this five-factor structure only fit with the sample with previous meditation experience. In the full sample of people with and without meditation experience, Observe did not fit the overarching mindfulness construct. Furthermore, it positively correlated with absent-mindedness, dissociation, thought suppression and psychological symptoms in a non-meditating sample, but did not in a meditating sample. This indicates that Observe has a different relationship with other variables depending on meditation experience, which was not the case for the other four facets.

Mindfulness has also been conceptualised as a trait – meaning a between person difference in the capacity for, and engagement of, mindful processes (Baer et

al., 2004) - and as a state - referring to variations in an individual's engagement of mindful processes at any given time (e.g. Brown & Ryan, 2003; Lau et al., 2006). Developing mindfulness skills through meditation practice is thought to allow one to choose a mindful state more often (Lau et al., 2006).

Research has shown the skill of mindfulness, as assessed by self-report questionnaires, increases with the practice of mindfulness (Baer et al., 2006) and is associated with changes in relevant outcomes such as reduced stress and mood disturbances (Carmody, Baer, Lykins, & Olendzki, 2009; Lau et al., 2006; Shapiro, Brown, & Biegel, 2007; Shapiro, Oman, Thoreson, Plante, & Flinders, 2008). However, mindfulness has also been conceptualised as an inherent human capacity that is present at varying levels regardless of one's meditation experience (Baer, 2014). In summary, there lacks a definitive consensus regarding what mindfulness is and how to measure it; however, it has demonstrated beneficial effects on a range of important outcomes.

1.3.2. Mindfulness and distress tolerance. There are several potential ways the practice of mindfulness might increase an individual's distress tolerance. One element of low distress tolerance is theorised to be the appraisal of emotions as distressing (Simons & Gaher, 2005) and the subsequent need to escape from them, which acts a negatively reinforced strategy (Lynch & Mizon, 2011). Mindfulness involves noticing, observing and accepting all thoughts and emotions non-judgementally, including those perceived as negative (Kabat-Zinn, 1990). It teaches individuals to not react to distressing internal experiences and not engage in behaviours designed to alter or avoid the experience of them. Theoretically, prolonged exposure to aversive emotional states, in the absence of catastrophic

consequences, might lead to a desensitisation process, whereby over time people are able to tolerate distressing or aversive states without having to react to them (Baer, 2003).

Mindfulness might also target distress tolerance through enhancing acceptance. Acceptance involves experiencing events fully and without defence (Hayes et al. 2011; Keng, Smosi, & Robins, 2011). It involves experiencing the present moment as it is and not trying to hold on to positive states and get rid of negative ones, which are believed to lead to increased or prolonged distress (Williams, 2010). In DBT, Linehan (1994) teaches 'radical acceptance' to promote an acceptance that sometimes reality is as it is and cannot be altered. Fostering acceptance is proposed to reduce the need to engage in maladaptive behaviour, such as self-harm and drug abuse, which functions to reduce pain or escape aversive experience. Baer (2003) discusses how an individual who experiences panic attacks might engage in maladaptive behaviours in an attempt to avoid future panic attacks, for example drug and alcohol use or avoidance of important activities. If the individual could rather accept that panic attacks occur, are temporary, and not dangerous, they would become unpleasant but brief experiences to be tolerated, as opposed to dangerous events to be avoided at significant cost (Baer, 2003).

Several authors have described how the practice of mindfulness may lead to changes in thought patterns (Baer, 2003; Kabat-Zinn, 1990, 1994). Kabat-Zinn (1990) describes how the non-judgemental awareness of the cognitions and emotions associated with pain and anxiety leads to an understanding that they are 'just thoughts' and 'just feelings' as opposed to facts or truths to cling on to. Linehan (1993) also discusses how bringing awareness to thoughts and feelings and applying

descriptive labels to them fosters an understanding that they are not always accurate reflections on reality. In this way, aversive thoughts do not warrant escape or avoidant behaviour- that can often be maladaptive- and can instead be tolerated (Baer, 2003).

It has been suggested that an awareness of thoughts and feelings in the present moment may interfere with ruminative thought patterns (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Teasdale, 1999), which are characteristic of anger episodes (Sukhodolsky et al., 2001). Through noticing thoughts and feelings as passing events rather than reflections of reality, people may be able to redirect attention to other aspects of the present moment, thereby avoiding ruminative thought cycles. Anderson, Lau, Segal, and Bishop (2007), for example, found that in a randomly allocated sample of 86 people from the general population, those taking part in an 8-week MSBR programme demonstrated greater reductions in anger and anger rumination from pre to post intervention, compared with those in a wait-list control.

This section has outlined the various ways mindfulness might influence distress tolerance, including teaching a non-judgemental relationship with experience, enhancing acceptance and changing ruminative thought patterns. Given the theoretical and empirical associations between anger and distress tolerance, it might be that accessing mindful states when angry is an important determinant of the relationship between these variables. The following section will review the cross-sectional and experimental evidence of the relationship between mindfulness and distress tolerance before narrowing down to the context of anger.

1.3.2.1. Cross-sectional evidence. Existing empirical evidence has found that higher trait mindfulness is positively associated with greater distress tolerance in clinical and non-clinical samples (e.g. Feldman, Dunn, Stemke, Bell, & Greeson, 2014; Hsu, Collins, & Marlatt, 2013; Luberto et al., 2014; Pearson et al., 2015).

Interestingly, different findings suggest the efficacy of different aspects of mindfulness. For example, in 100 female undergraduates, Feldman et al. (2014) found that the Awareness subscale of the FFMQ significantly correlated with greater distress tolerance, as measured by duration of time spent on the MTPT-C. This was not the case for the other mindfulness facets, although they only measured Non-Judging and Non-Reacting. These results suggest that it might specifically be greater mindful awareness that is associated with greater distress tolerance. However, they measured behavioural distress tolerance in a female-only college, which might not generalise elsewhere.

Studies using much larger samples have found strong positive relationships between facets of mindfulness and the DTS (Bravo, Boothe & Pearson, 2016; Pearson et al., 2015). Pearson et al. (2015) found that the four mindfulness facets of Describe, Awareness, Non-Judging and Non-Reacting (as measured by the FFMQ) were all significantly positively correlated with the DTS in nearly a thousand students. Bravo et al. (2016) also found strong associations between the DTS and Non-Judging, Awareness and Describe in just under 700 students. Interestingly, in both studies the reverse pattern was found for the Observe facet, which correlated negatively with the DTS. This supports Baer's (2006) findings that this facet has a different relationship with the rest of the mindfulness construct, as well as with measures of wellbeing.

Similar relationships between mindfulness and distress tolerance have been found in clinical samples. In a sample of 168 people with alcohol and other drug-use disorders, scores on the DTS positively correlated with higher scores on all five facets of the FFMQ, with the weakest association being between the DTS and Observe (Hsu et al., 2013). In a sample of 125 adult smokers, the mindfulness skills of acting with awareness and accepting without judgement, as measured by the KIMS, were positively associated with higher scores on the DTS, whereas observing and describing inner experiences were not (Luberto et al., 2014).

These studies collectively suggest that individuals who are more mindful also have a greater capacity to tolerate distress. It might be that taking a mindful reaction to anger experiences, involving a non-reactive awareness of the thoughts, feelings and sensations that arise, rather than a judgemental, ruminative or avoidant reaction, helps people tolerate aversive states.

1.3.2.2. Experimental evidence. There has been a growth in psychological interventions designed to increase distress tolerance (Bornovalova, Gratz, Daughters, Hunt, & Lejuez, 2012; Brown et al., 2013; Leyro et al., 2010; Zvolensky et al., 2010). Many of these interventions incorporate mindfulness-based components. The evidence base includes pragmatic treatment trials, specific treatment component studies and lab-based studies (e.g. Bornovalova et al., 2012; Brown et al., 2013; Lotan, Tanay, & Bernstein, 2013; Macatee & Cougle, 2015; Medina, Hopkins, Powers, Baird, & Smits, 2015).

Pragmatic treatment trials have indicated that mindfulness-based treatments might be effective in increasing distress tolerance. Bornovalova et al. (2012) developed an intervention for people with low distress tolerance in a substance use

treatment facility that taught skills in acceptance, healthy distraction and interpersonal effectiveness. In a sample of 76, those in the intervention group evidenced significantly greater improvements in distress tolerance (as measured behaviourally), compared with those in a treatment as usual (medium effect size) and supportive counselling group (large effect size). This was not due to a general reduction in negative affect (Bornovalova et al., 2012). However, this study is limited by its use of non-active controls that did not include empirically supported elements. The supportive counselling group actually resulted in a lowering of distress tolerance, which may have inflated the positive effects of the intervention.

Mindfulness has also been incorporated into distress tolerance interventions targeting smoking cessation (Brown et al., 2008; Brown et al., 2013). Brown et al. (2013) compared a standard smoking cessation treatment with a distress tolerance treatment in 51 smokers with difficulties quitting smoking. The distress tolerance treatment incorporated elements of exposure-based therapies and ACT, including mindful acceptance exercises. Post-treatment, those in the distress tolerance group were significantly more likely to be abstinent that those in the control group, with a large effect size. However, the two treatment programmes were not well matched. The control condition comprised six weeks of group sessions and the distress tolerance intervention comprised eight weeks of individual sessions in addition to group sessions. This discrepancy between the two groups may have overinflated the beneficial effects of the intervention. It is also difficult to know which specific treatment component was effective, which highlights the importance of testing specific treatment components.

Other researchers have begun exploring the effects of mindfulness-based interventions on distress tolerance and associated clinical outcomes. For example, Rees, Hasking, Breen, Lipp, and Mamotte (2015) have published plans to compare an MBCT group with a supportive counselling group in young adults who engage in non-suicidal self-injury. They will be testing the effects of the intervention on reducing non-suicidal self-injury via increased distress tolerance. They are proposing to measure outcomes post-treatment and at three and six months follow-up. It is unfortunate they are not including an empirically supported treatment control, but findings may provide some insight into the long-term effects of mindfulness training on distress tolerance.

Conducting pragmatic trials of therapies have a strong advantage in demonstrating whether the treatment in question can be used in practice. However, they reveal little about the specific benefits of the treatment, as any positive finding can be attributed to non-specific effects, such as therapist contact, just doing 'something', or to the negative effect of being randomised to a waiting list, TAU or ineffective control group (Coelho, Canter, & Ernst, 2013). This raises the question of whether it is logical to conduct pragmatic trials of complex therapies prior to testing for specific effects of treatment components.

In light of this, a body of research has begun to explore the potential to experimentally increase distress tolerance through mindfulness training in laboratory settings (Hayes et al., 2011). Such designs have the benefit of isolating the specific components of mindfulness hypothesised to be of benefit. Interventions typically comprise short audio or written instructions on mindful practice. They do not claim to analogise a mindfulness treatment, but to bring about short-term changes that

could be consolidated over a longer period of time in order to bring about long-term benefit (Williams, 2010). In studying them in laboratory settings, they enable greater control in isolating the key aspects of mindfulness from non-specific factors, as well as enabling stronger inferences on causal effect.

Several of these studies have looked at the effects of short-term mindfulness-based interventions on distress tolerance in the context of an angry mood specifically. As previously discussed, theory would suggest that relating to anger experiences mindfully might influence a person's ability to tolerate aversive states. Sauer and Baer (2012) induced an angry mood in 40 people with a diagnosis of BPD and then exposed them to either a short mindfulness intervention or a short intervention that asked them to ruminate. The interventions were both eight-minutes long and consisted of 16 mindfulness-consistent (e.g. 'notice any sensations in your body without judging them as good or bad') or rumination-consistent (e.g. 'think about why people treat you the way they do') statements presented one at a time on a computer screen. Following the interventions, those in the mindfulness intervention participated for significantly longer on a behavioural measure of distress tolerance compared with those in the rumination condition, with a very large effect size. However, in using a rumination comparison, known to have harmful consequences, it is not possible to decipher whether the results reflect the beneficial effects of mindfulness, or rather the harmful effects of rumination.

Other studies have found no effects of short acceptance- or mindfulness-based interventions on behavioural distress tolerance. Ellis et al. (2013) randomised 74 people with major depressive disorder (MDD) and 104 people without MDD to one of three conditions: a mindful acceptance condition, a reappraisal condition and a no

instruction control. Participants then completed the MTPT-C, as well as baseline and post task measures of state anger. The conditions comprised of two-sentence, written instructions that directed people to either accept emotions (acceptance) or to take an unemotional and detached attitude towards the task (reappraisal). They found no significant differences between the time taken to quit the MTPT-C across conditions among depressed or non-depressed students. Furthermore, when they looked at the condition by time interaction on anger, participants in the acceptance condition were significantly angrier than those in the other two conditions.

This study has several limitations. First, they used a very brief intervention. It is questionable whether it would be possible to manipulate mindful acceptance through such simple instructions (Hayes et al., 1999; Marcks & Woods, 2005); it may not give people enough time to digest or understand the techniques. Second, the instructions were delivered immediately prior to the distress tolerance task, which limits the ecological validity of the study. Third, prior to delivering the instructions for each condition, participants were told to clear their minds of thoughts, feelings and memories and to relax. This is more akin to 'suppression', which is the very antithesis of acceptance, and has been found to have paradoxical consequences in increasing the thought or emotion being suppressed (Marcks & Woods, 2005). This may have impacted upon the efficacy of the acceptance instructions.

Szasz, Szentagotai, and Hofmann (2011) induced an angry mood in 73 undergraduate students, by instructing them to think of an unresolved situation in the past two weeks in which they experienced anger towards another person. They then received one of three written instructions, directing them to reappraise, accept or suppress their emotions. Participants then completed the MTPT-C. Measures of

anger were taken at baseline, post anger induction, post intervention and post the MTPT-C. Participants in the reappraisal group evidenced greater reductions in anger throughout the study that those in the other two groups. Furthermore, those in the reappraisal group persisted for significantly longer with the task than those in the suppression group and the acceptance group, between which there were no significant differences.

This study also has notable limitations. First, similar to the Ellis et al. (2013) study, the interventions were very short, and delivered just prior to the task, thereby impacting upon their strength and ecological validity. Second, the anger manipulation relies on participants having experienced an angry situation within the previous two weeks. They were also not asked to write the situation down, which may have impacted upon the strength with which the situations were brought to mind and the extent their attention remained on task. Furthermore, the reappraisal instructions were taken from an intervention designed specifically for anger, whereas the suppression and acceptance instructions were adapted. This may have unfairly inflated the effects of reappraisal.

In light of these limitations, it is important that appropriately robust control groups for mindfulness are used to ensure beneficial findings cannot be attributed to nonspecific effects. Mindfulness interventions need to be of sufficient length and potency to ensure participants are actually practising what they are supposed to be. Developing mindfulness skills takes practice, and one-off short audio or written instructions may not be adequate. Studies should also aim to avoid assessing outcomes immediately post-intervention; this limits real life applicability and makes it difficult to decipher any lasting effects beyond the immediacy of the intervention.

The following section will outline two important areas of research that have tried to address these limitations.

1.3.3. Mindfulness and relaxation. Researchers have begun to use more robust control comparisons for mindfulness, for example, relaxation (Feldman, Greeson, & Senville, 2010; Jain et al., 2007; Lancaster, Klein, & Knightly, 2016). Traditional relaxation methods vary, but all differ from mindfulness in that there is an intention to relax, either through physical relaxation or imagery techniques. Tension is thereby released, which leads to a psycho-physiological state of lowered arousal, which is experienced as a calming state.

However, relaxation also shares many components with mindfulness including restful alertness, physical inactivity, mental activity and self-relaxation. Furthermore, some authors have noted that mindfulness often induces relaxation, which may contribute to its efficacy (Baer, 2003). However, it is important to emphasise that the purpose of mindfulness is not to induce relaxation (although this could be a beneficial by-product) but instead to teach non-judgemental observation of the present moment, which might include a racing heart, thoughts, muscle tension and other things incompatible with relaxation (Baer, 2003). The point is not to attempt to change or 'relax' a tense muscle, or a thought, for example, but simply to notice it as it arises in a non-critical way.

As the two interventions share many components, except for the specific mindfulness components, a comparison enables the key and unique aspects of mindfulness that are hypothesised to be of benefit to be isolated: present focused awareness and non-judgemental acceptance. A relaxation control is therefore

important to separate out the specific mindfulness components from mere relaxation or resting (Jain et al., 2007).

Research comparing mindfulness with relaxation has produced mixed findings. Jain et al. (2007) compared a one-month mindfulness intervention and a somatic relaxation intervention on symptoms of psychological distress, positive psychological states, and distractive and ruminative thoughts in a sample of 81 undergraduate students. Both interventions led to a reduction in distress, but the mindfulness intervention was unique in its ability to reduce rumination, which the authors proposed was the mediating factor in the relationship between group (mindfulness versus relaxation) and psychological distress.

Feldman et al. (2010) compared a mindful breathing exercise with a loving kindness meditation and a progressive muscle relaxation on repetitive thoughts (defined as the process of thinking attentively, repetitively or frequently about one's self and one's world) and negative reactions to repetitive thoughts. The interventions were 15-minutes in length and were tested in female undergraduate students. They found weaker associations between frequency of repetitive thoughts and negative reactions to repetitive thoughts in the mindful breathing group compared with the other two groups, which they interpreted as evidencing greater de-centering from thoughts.

However, other research has found relaxation to be more effective than mindfulness. For example, Lancaster et al. (2016) compared the same mindful breathing and relaxation interventions as Feldman et al. (2010) on cognitive anxiety and positive and negative affect in undergraduate students. Following the interventions, both groups showed reductions in self-reported cognitive anxiety, but

this was lower in the relaxation group than the mindfulness group. There were no post-intervention differences between groups on positive or negative affect.

To date, no research has compared the effects of a mindfulness intervention with a relaxation intervention on distress tolerance. As the findings of mindfulness-based interventions on behavioural distress tolerance have been mixed, rigorous controls are especially important in this area.

1.3.4. Home-based mindfulness practice. Addressing the validity of short lab-based component studies, researchers have begun to look at more ecologically valid methods of assimilating the practice of mindfulness. These include low-intensity mindfulness-based self-help interventions, such as self-help books/workbooks, audio guides, online programmes and mindfulness smart phone apps (Cavanagh et al., 2013; Gluck & Maercker, 2011; Moritz et al., 2015). These have demonstrated beneficial outcomes, including reduced anxiety, depression, stress and negative affect (Cavanagh et al., 2013; Gluck & Maercker, 2011). They also have several benefits, including reduced costs and increased ease and parsimony of intervention delivery (Cavanagh et al., 2013). In being delivered over a longer period, they allow participants time to practice mindfulness. They also allow the study of the non-immediate effects of mindfulness interventions, which increases ecological validity.

Cavanagh et al. (2013) compared an online mindfulness resource to a waiting-list control group in undergraduate students. The programme encouraged participants to listen to a daily ten-minute mindfulness recording over a two-week period. Following this, those in the intervention group reported significantly higher

mindfulness scores, and reduced stress, anxiety and depression compared with the control group. This study showed that a brief intervention practised outside of a lab, including the daily invitation to practice mindfulness, is effective in student samples. However, it was limited by a high attrition rate of nearly 50%, which might be accounted for by the fact that all measures were online. It also used an inactive control group, which did not control for the non-specific effects of the intervention. They also did not report exactly how many times people listened to the recording, only if they listened to it more than once a week or once a day. This makes it difficult to know the extent to which the intervention was adhered.

Cavanagh, Strauss, Forder, and Jones (2014) conducted a meta-analysis of 15 randomised controlled trials evaluating mindfulness and acceptance-based self-help interventions. Five of these included non-clinical samples and the remainder used clinical samples. Results are interpreted cautiously as the majority of studies used inactive or unsupported controls. However, findings demonstrated significant benefits of mindfulness-based self-help on self-reported mindfulness skills and anxiety and depression (Cavanagh et al., 2014). None of these studies explored the effects of home-based mindfulness practice on distress tolerance; however, they provide initial tentative support for this approach. This parsimony of delivery and widespread reach of such interventions make them particularly appealing given the pervasiveness and problematic nature of distress tolerance across the broad continuum of clinical and non-clinical populations.

1.4. Using a Non-Clinical Sample

Based on the dimensional approach to studying mental health phenomena previously discussed, the use of non-clinical samples for studying distress tolerance in

the context of anger may have several important benefits. First, research demonstrates that deficits in distress tolerance are present in both clinical and non-clinical samples. Second, evidence has found that in both samples, low distress tolerance may be an important factor in the aetiology and maintenance of maladaptive behaviours. Therefore, studying it in non-clinical samples may provide useful information regarding clinical samples. Third, lab-based non-clinical studies allow the careful control and manipulation of a relevant sample, application of an intervention without too many confounding variables, use of an active and robust control comparison, control of contextual variables, and more precision with assessment methods and lab manipulations (Levin, Hildebrandt, Lillis, & Hayes, 2012). This makes it possible to test the theoretical underpinnings of a particular intervention, in a way that is difficult to achieve in clinical treatment outcome research due to pragmatic and external validity issues (Hayes et al., 2011; Levin et al., 2012).

A traditional concern with laboratory-based studies is whether results will generalise to clinical settings and populations (Kazdin & Wilson, 1978). Although non-clinical studies cannot generalise to clinical populations, they can instigate an iterative process, whereby findings can inform further treatment and theory innovation, which can then be used to guide clinical studies (Levin et al., 2012).

1.5. Overview of Gaps in the Literature

This literature review has highlighted important gaps in knowledge. First, research has demonstrated that people who are high in trait anger are also less able to tolerate distress, and this might lead to problematic anger reactions. Theoretically, the ability to relate to anger mindfully, with a non-judgemental, aware and non-reactive

perspective, might enable people to tolerate aversive states. Important relationships have been found between self-report measures of mindfulness and trait anger and distress tolerance and, but the mediating effect of mindfulness between these variables has not been explored.

Second, studies comparing the effects of mindfulness interventions with controls on increasing distress tolerance in the context of anger have been mixed; some studies have found mindfulness has a large effect and other studies have found no effect. However, often studies are limited by their lack of robust controls, which may over-estimate or under-estimate the effects of the intervention. Finally, research has often employed very short and brief mindfulness interventions that are delivered just prior to completing measures or behavioural tasks. Such designs limit ecological validity and may not be long enough for participants to practice the strategy they are supposed to be using.

1.6. The Current Study

The current thesis aimed to extend theoretical knowledge of the relationship between trait anger and distress tolerance, by exploring the mediating effect of trait mindfulness. Specifically, it aimed to explore whether trait mindfulness mediated the relationship between trait anger and distress tolerance in a student sample. This component was non-experimental and therefore did not aim to prove a causal mediation model, but to rather explore the first steps in establishing a mindfulness-mediated link. A second aim was to investigate whether a mindfulness intervention, delivered over a one-week period and outside of the lab, would lead to greater behavioural distress tolerance in the context of an angry mood compared with a relaxation control.

The current study had the following two hypotheses:

Hypothesis 1: trait mindfulness would mediate the relationship between trait anger and self-report distress tolerance in students.

Hypothesis 2: students taking part in a mindfulness intervention delivered over a one-week period would persist for longer in a behavioural measure of distress tolerance (MTPT-C) following an anger manipulation, compared with those taking part in a relaxation intervention also delivered over a one-week period.

2. Method

2.1. Overview

This chapter begins by describing the current study's design, followed by a description of the demographic details for the sample, the power analysis and recruitment strategies. A description of all measures will then be provided, followed by an overview of the interventions and mood induction procedure. Finally, the full procedure of the study is described.

2.2. Design

2.2.1. Cross-sectional design. The study had a cross sectional component. Self-report measures of Trait Mindfulness, Trait Anger and Distress Tolerance were obtained from participants at baseline, to explore whether mindfulness mediated the relationship between anger and distress tolerance (Hypothesis 1).

2.2.2. Experimental design. This study employed a longitudinal mixed experimental component with two manipulations (please refer to Figure 2). First, participants were randomised at baseline to either a mindfulness or relaxation intervention. Both interventions comprised of ten-minute audio recordings, which participants were asked to listen to at least four times over a one-week period. The second manipulation, delivered to all participants when they returned to the lab at follow up, aimed to induce an angry mood utilising the autobiographical mood recall task (Turnbull, Evans, & Owen, 2005).

As illustrated in Figure 2, a within subject measure of state mindfulness was taken at baseline (State Mindfulness T1) and after the mindfulness/relaxation

intervention at follow up, before the anger manipulation (State Mindfulness T2). A within subject measure of state anger was taken at baseline (State Anger T1), before the anger manipulation (State Anger T2) and following the anger manipulation T3 (State Anger T3), which was after the anger manipulation. The between-subjects dependent variable was time taken to quit the distress tolerance task, measured once at follow up. Skill level on the behavioural task was assessed to see whether it needed to be controlled for in the analysis.

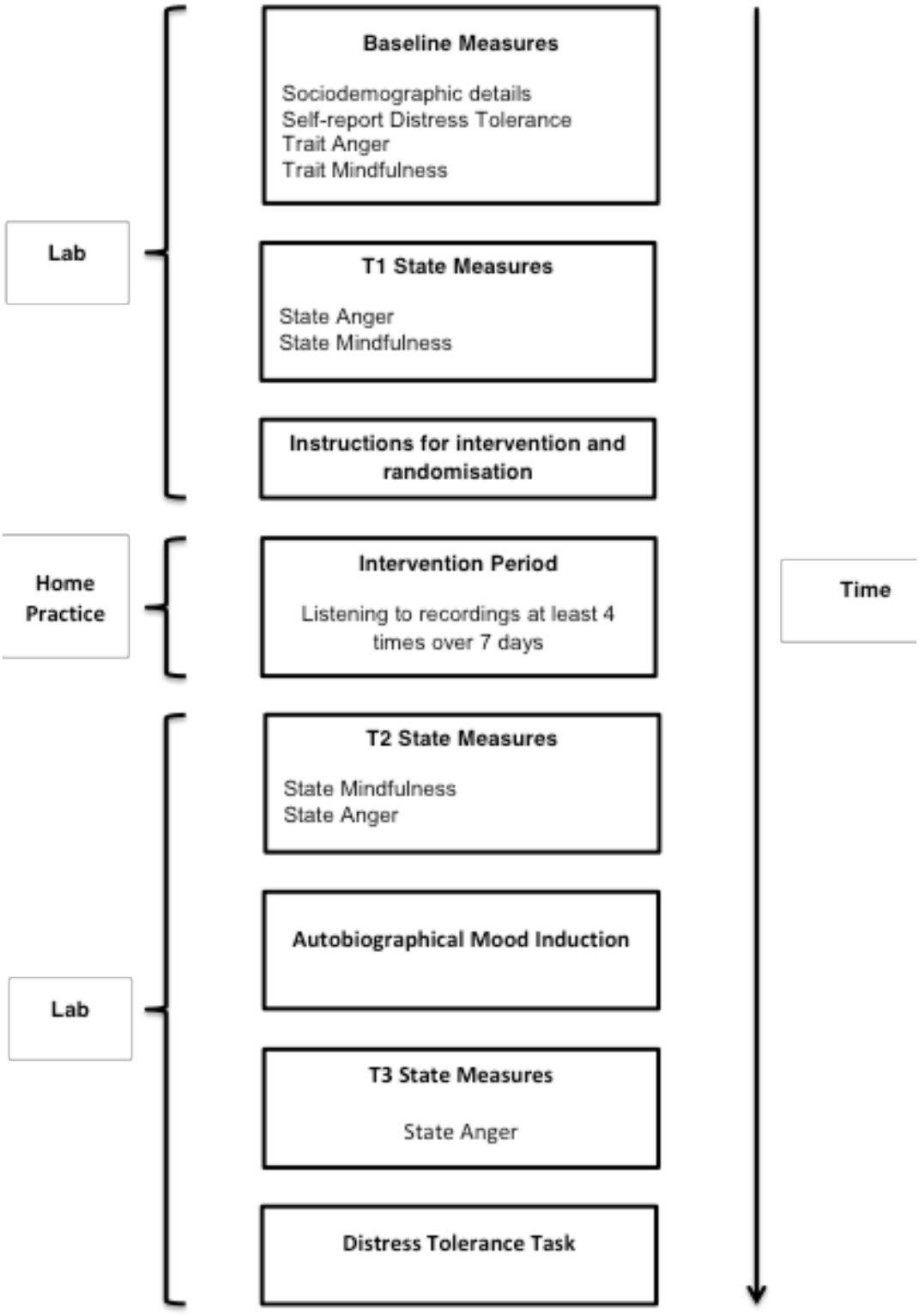

Figure 2. Overview of design and procedures

2.3. Power Analysis and Effect Sizes

Power analyses were conducted to obtain the sample size for the research. The power analysis for the mediation hypothesis was based on studies using students, which have found medium effects for the relationship between anger and mindfulness (r = -.37; Feltman et al., 2009) and the relationship between mindfulness and distress tolerance (r = .43; Bravo et al., 2016). Based on Fritz and Mackinnon's (2007) recommendations on required sample sizes to detect mediation effects, finding a medium effect size, with .8 power in a bias-corrected bootstrap test of mediation would require a sample of 71.

For the experimental hypothesis, the effect size was estimated from a review of other studies. Sauer and Baer (2012) obtained a large effect size when they compared a ten-minute mindfulness intervention with a rumination intervention on a behavioural measure of distress tolerance in a clinical sample (d = 1.10). Levin et al. (2012) conducted a systematic review of laboratory based component studies targeting different aspects of acceptance and mindfulness. This review found that short lab-based mindfulness interventions obtained small to medium effect sizes in clinical and non-clinical samples (g = 46 - .64) on a range of outcomes including persistence on a distressing task or one's relation to internal experiences. They also found that when active controls were used, effects sizes were small (g = .48). To be conservative, the sample size estimation was based on a medium effect size of d = 0.6 (Cohen, 1992). Estimating this effect size, power analysis for an independent samples t-test with alpha at 0.05 and power at 0.80 (Cohen, 1992) indicated a total sample of 70. Based on aiming for equal numbers between groups, 70 participants were recruited to the study.

Effects sizes are reported for all analyses except for the mediation effects, as it is not common practice to report these (Hayes, 2013). The following formulas or statistics were used:

T-value (Field, 2005; Rosenthal, 1991):

$$R = \sqrt{\frac{t^2}{t^2 + df}}$$

Nonparametric tests (Rosenthal, 1991):

$$R = \frac{z}{\sqrt{N}}$$

Chi squared (Field, 2005):

Cramer's *V* statistic, which is calculated by SPSS.

According to Cohen's (1992) criteria, $r = 0.1$ was considered a 'small' effect size, $r = .3$ was considered a 'medium' effect size and $r = .5$ was considered a 'large' effect size. Cramer's *V* criteria are comparable to Cohen's *r* (Field, 2005).

2.4. Participants

Participants for Hypothesis 1 comprised of 70 undergraduate and postgraduate students recruited from Royal Holloway, University of London (RHUL). There were 58 females and 12 males with a mean age of 19.47 (ranging between 18 and 41). For Hypothesis 2, 63 completed the study (33 in the mindfulness group and 30 in the

relaxation group). Participants had to speak English to be included in the study and also had to be a student at RHUL. Further details about the sample, across groups, are provided in the Results section.

2.5. Recruitment

Participants were recruited in one of two ways. Fifty-five (78.6%) participants were recruited from the RHUL psychology department's online 'Experiment Management System'. This is a credit-based system, in which all first-year psychology students are required to participate in a certain amount of research as part of their course requirements. The participation scheme advertises all psychology studies to first year psychology undergraduates and offers them credits towards their undergraduate degree for taking part. The advertisement provided a summary of the study and time slots for the two parts of the study.

The remaining 15 participants were recruited by advertising on RHUL's online notice board: 'Message of the Day' (please refer to Appendix 1). Both approaches invited participants to participate in a two-part study exploring, 'The effects of relaxation techniques on mood'. As an incentive to participate, students recruited outside of the credit system were entered into a prize draw with three prizes- one £50 prize and two £25 prizes. All participants were recruited from the main RHUL campus and took part in this location. Recruitment took place between October 2015 and February 2016.

Participants were provided with written information about the study. They were given the chance to ask questions and were informed that they were under no

obligation to consent and could withdraw at any time. They were given the option to think about the study before providing written consent.

2.6. Measures

2.6.1. Demographic details. Participants were asked to provide sociodemographic information, including their age, gender, ethnicity, and undergraduate/postgraduate degree title. As previous findings indicate mindfulness experience affects responses in experimental conditions (Thompson & Waltz, 2007), as well as scores on trait mindfulness (Baer et al., 2006), participants were asked whether they practiced any form of relaxation (e.g. yoga, meditation). They were not specifically asked about mindfulness so that the aims of the study were not transparent. Those who had been practising some form of relaxation were asked for further details, such as type of practice, length of time of practice and competency level (for all measures please refer to Appendix 2).

2.6.2. Trait measures

Distress Tolerance Scale (DTS; Simons & Gaher, 2005): The DTS is a 15-item trait measure of ability to tolerate psychological distress. Items are scored on a 5-point Likert scale ranging from 1 - strongly agree to 5 - strongly disagree, with higher scores indicating greater distress tolerance. One item is reverse scored. Factor analysis has indicated that the DTS has four subscales: Appraisal (reflecting the extent to which an individual accepts distress, is ashamed of being distressed, or perceives their coping abilities as inferior to others); Tolerance (the extent to which distress is perceived as bearable); Absorption (the extent to which an individual is consumed by the experience of distress); and Regulation (the extent to which an

individual attempts to avoid negative emotions and alleviate any they do experience). However, the total score is used as a global measure of distress tolerance (Bernstein, Zvolensky, Vujanovic, & Moos, 2009). Construct validity of the DTS in students is evidenced by the fact that elevated scores are related to greater positive affect and to less affective distress and lability (Simons & Gaher, 2005), as well as coping-oriented substance use (Simons, Gaher, Oliver, Bush, & Palmer, 2005). In addition, higher distress tolerance is related to lower levels of eating psychopathology, anxiety, and depression as well as less problematic substance use (Anestis et al., 2007; Simons et al., 2005). Simons and Gaher (2005) found that the total scale had good internal consistency in students ($N = 817$, $\alpha = .82$) and also demonstrated adequate six-month test-retest reliability ($r = .61$; Simons & Gaher, 2005). Internal consistency in the current sample was good ($N = 70$, $\alpha = .87$).

The Five Facets Mindfulness Questionnaire (FFMQ; Baer et al., 2006): The FFMQ was used to assess trait mindfulness. This is a 39-item measure and items are scored on a 5-point Likert scale ranging from 1 – never or very rarely true to 5 – very often or always true, with higher scores indicating greater mindfulness skills. Reverse scoring applies to 19 items. The scale assesses five facets of mindfulness: Observe, which includes noticing or attending to internal and external experiences; Describe, which refers to labelling internal experiences with words; Awareness, which refers to attending to one's activities in the moment and can be contrasted with behaving mechanically while attention is focused elsewhere; Non-Judging, which refers to taking a non-evaluative stance towards thoughts and feelings; and Non-Reacting, which represents the tendency to allow thoughts and feelings to come and go without getting caught up in or carried away by them. Williams, Dagleish, Karl, & Kuyken

(2014) recently reported that the Observe factor did not load significantly on to the overarching mindfulness factor in student samples, and Baer et al. (2008) reported that Observe engages in a different pattern of association with psychological adjustment in meditating versus non-meditating samples. Following the recommendations of Williams et al. (2014) the four-factor version was used (i.e. excluding Observe). The FFMQ has demonstrated good predictive validity of psychological symptoms (Baer et al., 2006) and correlates with life satisfaction and emotional intelligence (Cristopher, Neuser, Michael, & Baitmangalkar, 2012). The FFMQ has demonstrated adequate to good internal consistency in a large student sample (α = .75 to .91; Baer et al., 2006). In this sample the internal consistency of subscales was adequate to good (Describe: α = .90; Non-Judging: α = .84; Non-Reacting: α = .70; Awareness: α = .88) and the internal consistency of the full scale was good (α = .87).

The State Trait Anger Expression Inventory (STAXI; Spielberger, 1999) – Trait Scale (T-Anger): The STAXI T-Anger scale is a 10-item measure of trait anger with two subscales: Anger Temperament, measuring individual differences in the disposition to experience angry feelings without provocation and Anger Reaction, which measures how often a person feels angry when unfairly criticised or otherwise treated unjustly. The total score is used as a global measure of trait anger (Spielberger, 1999). Participants indicate how they generally feel and react, using a 4-point Likert scale ranging from 1 - almost never to 4 - almost always, with higher scores indicating higher trait anger. The scale has demonstrated adequate to good internal consistency in student samples (α = .70 and .89; Hawkins et al., 2013;

Spielberger, 1999). In the current sample internal consistency of the full subscale was good (α = .86).

2.6.3. State measures

The Mindful Attention Awareness Scale- state (MAAS; Brown & Ryan, 2003: The MAAS is a 5-item measure of state mindfulness, which is an adaptation of the full 15-item Mindful Attention Awareness Scale (Brown & Ryan, 2003). Participants indicate the degree to which, at this exact moment, they are having each of the experiences described. Items are scored on a 7-point Likert scale ranging from 0 - not at all to 6 - very much. Scores are then reversed with higher scores reflecting higher states of mindful awareness. In a sample of students, Brown and Ryan (2003) found that the state scale had high internal consistency (α = .92) and a strong predictive relationship was found between scores on the state measure and scores on the 15-item MAAS (B = .46, t = 4.57, p = .00). In this sample the internal consistency was excellent (α = .93) and test-retest reliability was adequate (r = .61).

The Positive Affect Negative Affect Scale- Expanded version (PANAS; Watson & Clark, 1994): The PANAS-X - hostility subscale was used as measure of state anger. This has been used as a measure of state anger in other research (Eisenlohr-Moul et al., 2016; Sauer & Baer, 2012). The hostility subscale is one of the lower order factors of the higher order negative affect scale in the PANAS-X. Participants are presented with six words describing feelings and emotions (i.e. angry, hostile, irritable, scornful, disgusted and loathing) and asked to indicate the extent to which they feel this way 'right now (that is, at the present moment)'. Responses are picked from a five-point Likert scale ranging from 1 - very slightly or not at all to 5 - extremely, with higher scores representing higher state anger. In a sample of over a

thousand undergraduates, the hostility subscale showed good internal consistency (α = .82; Watson & Clark, 1994). In this sample internal consistency was good (α = .81) and test-retest reliability adequate (r = .54). The hostility subscale of the PANAS demonstrated a highly significant correlation (r = .91) with the Anger-Hostility subscale of the Profile of Mood States (POMS; McNair, Lorr & Droppleman, 1971), indicating good construct validity.

2.6.4 Behavioural distress tolerance task

The Mirror Tracing Persistence Task- Computerised Version (MTPT-C; Strong et. al., 2003): The MTPT-C (Strong et. al., 2003) is a validated measure of behavioural distress tolerance. In the MTPT-C participants trace outlines of star-shaped geometric figures using a mouse that moves a dot in the reverse direction to that which the participant directs it in. If the dot is moved outside the perimeter of the shape, or if it stops moving for two seconds, a loud buzzer sounds and it returns to the starting position. There are four rounds and the shape becomes thinner with each round to increase difficulty. The first round is two minutes and the second two rounds are one minute each. On the fourth round participants are told they can terminate the task at any point, but are instructed to use their maximum effort. Consistent with prior studies assessing the association of task persistence with indices of psychopathology in students (Ellis, Fischer, & Beevers, 2010; Feldman et al., 2014), no monetary incentive for persistence was offered. The task terminated itself if participants had not quit after seven minutes (Feldman et al., 2014). Distress tolerance was measured by the latency in seconds to task termination during the final level. Other researchers have assessed how skilled participants are at the task, to ensure this is not the reason for longer participation (Bornovalova et al., 2008). Skill was assessed by dividing the

time spent on the last shape by number of errors made on the last shape (Bornovalova et al., 2008).

In undergraduate students, the MTPT-C has been shown to increase skin conductance, negative affect and self-reported anger (Ellis et al., 2010; Feldman et al., 2014) and dysphoric students terminated the task significantly sooner than non-dysphoric students (Ellis et al., 2010). The construct validity of this task is supported by findings that it correlates with scores on another well-used behavioural measure of distress tolerance; the PASAT (Bornovalova et al., 2012; Daughters et al., 2005). Unwillingness to persist through the task has been found to predict treatment dropout for substance abusers (Daughters, et al. 2005).

2.7. Manipulations

2.7.1. Interventions. To ensure that the mindfulness and relaxation manipulations were as equally matched as possible on non-specific factors (e.g. voice, duration etc.), both the mindfulness and the relaxation scripts were recorded in the experimenter's own voice (female voice) and were approximately 10 minutes in length (please refer to Appendix 3 for full scripts).

The mindfulness practice was based on the guided mindfulness meditation used by Cavanagh et al. (2013), which was adapted from the Chadwick (2006) mindfulness protocol for people with psychosis. It has been shown to increase mindfulness and reduce perceived stress in student groups (Cavanagh et al, 2013). The practice began by inviting individuals to focus their attention on their bodies. They were guided to notice any sensations in their bodies and then to focus on the breath and a point of contact for the breath in the body. They were encouraged to just notice thoughts,

feelings and sensations in the present moment, without trying to change anything or getting caught up in any experience. If they got distracted, they were encouraged to notice the distraction and then bring attention gently back to the breath. They were also invited to notice any judgement, for example, towards the practice or not doing it right; and then let the judgement go. The exercise ended with participants coming back to an awareness of the body.

The relaxation exercise was a Guided Visual Imagery (GVI) practice based on the intervention developed in Kingston, Chadwick, Meron, and Skinner (2007). The GVI practice began by centering participants with guided deep breathing. Participants were guided to release tension from their bodies and to try and relax. Participants were then encouraged to evoke mental images of a journey through a garden. Throughout the exercise, participants were reminded to try and release any tension and to relax.

2.7.2. Autobiographical Story Recall (ASR; Turnbull, Evans & Owen, 2005). In order to induce an angry mood in participants, the current study used the ASR task. In this induction participants are asked to recall personal experiences from events in their life, related to specific emotions. In this particular study we were just interested in the emotion of anger. The recall was prompted by the phrase: 'Please try and recall an event in your life that has caused you to feel angry. Please provide as many details as you can and recall events as vividly as possible. Please write about this event in the space below. You have ten minutes to complete this task'.

Several studies have found autobiographical recall effective in inducing anger as measured by both self-report and physiological markers (Lobbestael, 2008; Salas, Radovic, & Turnbull, 2012). Empirical research also suggests this technique is more

effective than a combined mood induction of music and guided imagery in inducing an angry mood in undergraduate students (Jallais & Gilet, 2010). Furthermore Salas et al., (2012) demonstrated in a sample of 40 undergraduate students that the ASR task increased participants' anger significantly greater than other emotions of fear, sadness and joy ($F(3,37) = 25.03$, $p < .01$), suggesting it is specifically suited to inducing anger.

2.8. Procedure

2.8.1. Ethical approval. Ethical approval was obtained from the RHUL Ethics Committee (please refer to Appendix 4) prior to any participant being recruited to the study. Ethical consideration was given to the fact that the study was inducing an angry mood in participants and also engaging participants in a distressing task. A literature review of previous studies using these procedures, and advice from students participating in a pilot (see 2.8.2. Piloting), suggested that there have been no lasting negative effects beyond the duration of the study. In the current study, participants were also fully debriefed at the end of the study and given contact details for student counselling services.

2.8.2. Piloting. This study was initially piloted on a member of staff and on three students from the RHUL clinical psychology course. Their involvement was to ensure the study was feasible, accessible and relevant. They were asked to comment on the length, clarity of the information sheet and debrief sheet, ease of instructions, experience of the distress tolerance task and anger induction, and anything else that came to mind. They all said they found the study manageable and, although the task was experienced as very frustrating, no one felt unduly distressed afterwards. Based on their recommendation, it was decided that the experimenter should leave the room

during the distress tolerance task as participants reported her presence was distracting. Session 1 was completed in 20 - 25 minutes and session 2 was completed in 25 - 30 minutes. Two of these students listened to the interventions (one in each group). Based on their advice, it was decided that the interventions should be recorded as MP3 files in addition to CDs.

In addition the data of the first five undergraduate participants were used as a pilot; however, as no further changes were deemed necessary, their data was used in the main analysis.

2.8.3. Randomisation. To ensure that allocation to intervention (mindfulness versus relaxation) was random, an on-line website (www.randomisation.org) was used to randomise 70 participation slots by a researcher not involved in the experiment. The files were stored as CDs and MP3 files and were then numbered 1-70 according to the pre-randomised order and given to the experimenter. These were then distributed to participants in this order.

2.8.4. Protocol. The experimental procedures were standardised using a script (please refer to Appendix 5) in order to reduce the potential influence of experimenter effects. The experimenter was also blind to which intervention participants were randomised to.

The study was described as investigating the effects of different relaxation techniques on mood but did not specify that it was comparing mindfulness with relaxation so as not to bias the study in any way. Participants expressing interest in the study met the researcher at a specified time in the clinical psychology premises at RHUL. They were informed that it was a two-part study, with one week in between

baseline and follow up assessments. They were told that each part would take no longer than 30 minutes. Participants were also informed that they would be expected to practice the 10-minute relaxation technique at least four times during the one-week period. This was based on research that has found six self-help mindfulness practices over a 13-day period to be effective in reducing perceived stress and negative affect (Gluck & Maercker, 2011) and research that found undergraduate students enrolled in a mindfulness programme completed home-practice on average three and a half times per week (Astin, 1997). Participants were also informed that all information would be stored confidentially and they were under no obligation to consent and could withdraw at any time. Participants were then given an information sheet (please refer to Appendix 6), which repeated these instructions. They were given the option to go away and think about the study before consenting, or to provide written consent at that point.

Consenting participants completed baseline measures using the RHUL online survey tool. Participants were given a choice of taking a CD away with them or receiving their pre-randomised mindfulness or relaxation MP3 recording via email. All participants chose the latter. Participants were instructed to listen to the recording as many times as possible over the next week, and at least four times. They were provided with a record sheet to record when they listened to the recording (please refer to Appendix 7) as well as any comments they had about their experience following each time they listened. Participants were urged to record home practice honestly. They were also told that there were two types of recording and, in order to maintain blinding, they were asked to refrain from revealing to the experimenter what

was on their recording at follow up. To minimise potential contamination, they were asked not to share the audio files or discuss the content with anyone.

Seven days later, participants visited the laboratory again. They completed follow up measures of state mindfulness and anger, followed by the anger manipulation. To check the efficacy of the anger manipulation, participants then recompleted the state anger measure. Participants were then asked the following: 'Given the recordings that you have been using in the past week how might you respond to the thoughts and feelings that may have arisen whilst writing about an event that made you feel angry?' The aim of this was two-fold: to cue participants into using the method of relaxation that they had been practising over the week, and to assess whether participants were able to recall the method that they had been practicing.

Participants then completed the MTPT-C. They were told that the task has four levels and that on the final level they can quit at any point; however, they were told that it is important they use their maximum effort. The researcher left the room at this point and returned once the task was complete.

After completing all procedures participants were debriefed verbally and in writing (please refer to Appendix 8 for debrief sheet). Those participants randomised to the relaxation control were offered a copy of the mindfulness intervention. The researcher checked whether participants were feeling distressed by the task or any other part of the experiment. No one reported feeling distressed at the end of the study, however one participant reported feeling very stressed generally. They said this was not to do with the experiment but with their studies and personal relationships. The experimenter suggested they contact the student counselling service or their GP

and showed them where to find the contact details on the debrief sheet. Participants recruited via the prize draw were told they would be contacted if they were successful. All participants were asked if they wished to receive a summary of the findings and, if so, whether they were happy to receive this via email. Each session was completed within 30 minutes.

3. Results

3.1. Chapter Overview

This chapter is divided into four sections: the first outlines the procedures used to explore the data; the second includes socio-demographic characteristics and details of the main measures; the third includes the statistical analyses used to test the hypotheses; and the fourth outlines further exploratory analyses that were conducted.

Initially, the data were screened for missing values and outliers. The normality of the distribution for each study variable was assessed, using histograms and values of skew and kurtosis. Any parametric violations were transformed, and, where it was not possible to normalise the data, nonparametric tests were used.

Preliminary analyses explored the socio-demographic and baseline trait characteristics of the sample to test for significant differences between groups on study variables at baseline (i.e. to test the success of the randomisation procedures). Each hypothesis is then outlined, accompanied by details of the analytic strategy employed and their outcomes.

The measures of state mindfulness were taken at two time points, once before the mindfulness/relaxation intervention (State Mindfulness T1) and once following the intervention (State Mindfulness T2). The measures of state anger were taken at three time points, once before the mindfulness/relaxation intervention (State Anger T1), once following the intervention, but before the anger manipulation (State Anger T2) and once following the anger manipulation (State Anger T3).

All data analyses were computed using the Statistical Package for Social Sciences (SPSS, version 21.0). Figures are reported to two decimal places, except percentages, which are reported to one decimal place. Statistical significance was set at a value of $p < .05$.

3.2. Preliminary Data Analysis

The data was initially screened for any missing values and outliers. The distributions of study variables were also formally tested.

3.2.1. Missing data. The following guidelines were used for dealing with missing data: for cases when participants had missed a small number (≤ 10%) of items for any one questionnaire, the mean substitution method was used (Roth, 1994). This method computes an estimation of the missing value from an individual's mean score (rounded to one decimal point) for the remaining items of that questionnaire (or subscale). This method does not reduce the power of the study by reducing the sample size, unlike other techniques such as listwise deletion (Hill & Lewicki, 2006). It also produces data that are internally consistent with a respondent's other scores (Hill & Lewicki, 2006). However, the limitation of this method is that it can potentially generate biased estimates and artificially decrease variance (Hill & Lewicki, 2006; Roth, 1994). As the effects of the limitations are proportional to the amount of missing data, a second criterion was set such that in instances where >10% of an individual's data was missing for any one scale, listwise deletion was employed. This means their responses for that scale were not used in the analysis. This criterion was set because the mean substitution was no longer considered to be a good estimate for instances where there was >10% of missing data and because the reduction in variance would be greater than is desirable (Hill & Lewicki, 2006; Roth, 1994).

Inspection of the raw data indicated that four participants had missed ≤ 10% of items on the trait anger scale. An additional four participants had missed ≤ 10% of items on the DTS. Based on the criterion set, these participants were included in the analysis and the mean substitution method was used. No one had >10% of missing data on any one questionnaire.

One participant (mindfulness group) did not return for the follow up session and did not give a reason. Data was not recorded for the follow up questionnaires for one participant (relaxation group) due to a technical error, and the sound malfunctioned during the MTPT-C for one participant (relaxation group). The data for these three participants were not used in the experimental analysis.

3.2.2. Outliers. Outliers are data points that deviate markedly from the rest of the data. They may indicate error in measurement, data entry, or data recording (Field, 2005). Alternatively, they may represent a legitimate extreme value, perhaps because the participant differed from the rest of the sample in a meaningful way (Field, 2005). Outliers are important to detect because they may increase the error variance and reduce the power of statistical tests, they can impact upon the normality of a distribution, and they can bias the mean (Osborne & Overbay, 2004). However, there is no clear consensus regarding what to do with identified outliers (Cousineau & Chartier, 2010; Osborne & Overbay, 2004).

In the current study, a criterion of three standard deviations above or below the group mean was set for identifying univariate outliers (Osborne & Overbay, 2004). These were initially detected by visually inspecting box plots for each study variable and then exploring their means and standard deviations. For questionnaires relating to the mediation analysis, outliers were determined using the whole dataset. For

questionnaires relating to the experimental hypothesis, outliers were determined according to intervention (mindfulness or relaxation).

These analyses indicated that two participants' data (one in each group) could be defined as outliers on State Anger T1; one participant's data (relaxation group) could be defined as an outlier on State Anger T2; and one (relaxation group) on State Anger T3. Their scores on state anger were >3 SD's above the total sample mean, indicating that they had particularly high levels of anger. It was decided that the data of these participants should be removed from the experimental analysis (Osborne & Overbay, 2004). As their scores were not skewed on trait measures, they remained in the mediation analysis.

After removing the above outliers, the total sample for Hypothesis 1 was $N = 70$ and the total sample for Hypothesis 2 was $N = 63$ ($N = 33$ in the mindfulness intervention and $N = 30$ in the relaxation intervention).

3.2.3. Distribution of variables. The main assumptions for the reliable use of parametric tests are that: 1) data are measured at the interval level; 2) data from different participants are independent; 3) data are normally distributed; and 4) the variance from different groups are homogeneous (Field, 2005). The first and second of these requirements were met and did not require testing. The homogeneity of variance was assessed for each analysis using Levene's Test for Equality of Variance (Field, 2005). For instances where this was found to be significant, t-tests using t-values where equal variance had not been assumed are reported.

The distribution of study variables included in the between-group analyses were assessed per group. For variables included in the total sample analyses, distributions

were assessed using the whole data set. Initially, the distribution of each study variable was assessed by plotting histograms with bell curves (Field, 2005). Having visually examined the distributions, normality was tested by computing values of skew and kurtosis. As the sample was < 100, to test the significance of skew and kurtosis z-scores were calculated using the following formulas (Field, 2005):

$$z_{skewness} = \frac{s - 0}{SE_{skewness}}$$

$$z_{kurtosis} = \sqrt{\frac{k - 0}{SE_{kurtosis}}}$$

Distributions were considered normal if $z < 2.58$ ($p < .05$; Field, 2005).

These analyses indicated that in the mindfulness group only, State Mindfulness T1 was negatively skewed ($z = -2.78$, $p > .05$) as well as State Mindfulness T2 ($z = -2.83$, $p > .05$), indicating that participants in the mindfulness group had a skew towards higher mindfulness scores. Scores were initially reflected and then a squareroot transformation was performed (Osborne & Overbay, 2004). This successfully corrected the skew. To enable comparisons across groups, the scores in the relaxation group were also reflected and transformed.

State anger was positively skewed at all time points: State Anger T1 ($z = 8.03$, $p > .05$), State Anger T2 ($z = 6.89$, $p > .05$) and State Anger T3 ($z = 5.57$, $p > .05$), meaning there was a tendency towards lower anger scores. The skew remained after testing several transformations (e.g. squareroot transformation, log transformation and reciprocal transformation) (Field, 2005). Therefore, for analysis that compared state anger scores across groups (independent samples), the Mann-Whitney test was used and medians reported instead of means (Field, 2005). For analysis that compared state anger scores across different time points within the same sample, the Wilcoxon signed-rank test was used (Field, 2005).

Analyses also indicated that time taken to quit the MTPT-C was positively skewed in the relaxation group, ($z = 2.92$, $p > .05$). A squareroot transformation (SQRT) successfully normalised this distribution. To enable comparison across groups, scores for the mindfulness group were also transformed.

Where data has been transformed, means and standard deviations of untransformed data will be reported; however, test statistics will be based on transformed data.

3.3. Descriptive Statistics

The sociodemographic characteristics of the total sample for Hypothesis 1 and the subgroups used in Hypothesis 2 are shown in Table 1. As can be seen, the majority of participants were from one of the undergraduate courses at RHUL and identified their ethnicity as White British ($N = 40$), with a further 14 identifying themselves as White Other. For the remaining participants, a small number identified themselves as Black or Black British- African ($N = 2$), Chinese ($N = 4$), Asian or

Asian British- Indian (*N* = 3), Asian or Asian British- Pakistani (*N* = 2), Other Asian (*N* = 3), Other Mixed (*N* = 1) and Other (*N* = 1). Based on the fact that there are small numbers in each category, and in order to allow statistical analysis, the groups were collapsed into one BME group.

Table 1.

Sociodemographic Characteristics of the Sample and Between-Group Comparisons.

Variables	Total (N = 70)	Mindfulness (N = 33)	Relaxation (N = 30)	Mindfulness vs Relaxation
Gender				
Male	12 (17.1%)	7 (21.2%)	4 (13.3%)	$\chi^2_{(1)}$= .68, p = .41, Cramer's V = .1
Female	58 (82.9%)	26 (78.8%)	26 (86.7%)	
Age				
Mean (SD)	19.47 (3.17)	19.61 (4.22)	19.30 (1.86)	$t_{(61)}$= .37, p = .72, r = .05
Range	18-41	18 - 41	18 - 26	
Ethnicity				
White British	40 (52.1%)	25 (75.8%)	14 (46.7%)	$\chi^2_{(1)}$= 6.84, p = .03, Cramers V = .33
Asian/Black British/Chinese/Other	16 (22.9%)	3 (9.1%)	10 (34.5%)	
White other	14 (20%)	5 (15.2%)	6 (20%)	
Degree				
Undergraduate	66 (94.3%)	33 (100%)	27 (90%)	p = .10

Postgraduate	4 (5.7%)	0	3 (10%)	
Incentive				
Credits	55 (78.6%)	28 (84.8%)	23 (76.7)	$\chi^2_{(1)}$= .68, p = .41
Prize Draw	15 (21.4%)	5 (15.2%)	7 (23.3)	
Relaxation				
Yes	26 (37.1%)	13 (39.4%)	11 (36.7%)	$\chi^2_{(1)}$= .10, p = .75
No	44 (62.9%)	20 (60.6%)	19 (63.3%)	

3.3.1. Randomisation checks. Before testing Hypothesis 2, a series of independent sample *t*-tests, chi-square tests and Fisher's exact tests (where frequencies were too small for a chi-squared) were computed to assess group (mindfulness versus relaxation) equivalence across socio-demographic and study variables at baseline. This was to check findings were not confounded by non-equivalence at baseline. As depicted in Table 1, groups did not differ significantly on gender, age, degree, incentive for taking part in the study or practice of relaxation. However, there was a significant difference in ethnicities between the two groups, with 75.8% of participants in the mindfulness group identifying as White British compared with 46.7% of those in the relaxation group.

As shown in Table 2, there were no significant differences between the two groups at baseline on any of the state or trait measures, as well as no significant differences between how skilled participants were at the task. Therefore, none of these variables were controlled for in the between groups analysis.

Table 2.

Means (SD) and Between-Group Comparisons for Baseline Trait and State Variables

Study variables	Group		Mindfulness Vs. Relaxation
(*M*, SD or *Mdn*)	Mindfulness	Relaxation	
	N = 33	*N* = 30	
Trait Variables			
DTS	2.93 (.60)	2.99 (.55)	$t_{(61)}$ = -.35, *p* = .73, *r* = -.05
FFMQ	2.58 (.45)	2.53 (.47)	$t_{(61)}$ = .43, *p* = .66, *r* = .05
STAXI-Trait	1.96 (.63)	1.90 (.46)	$t_{(61)}$ = .44, *p* = .66, *r* = .06
State Variables			
MAAS	4.75 (1.45)	4.66 (1.07)	$t_{(61)}$ = .03, *p* = .97, *r* < .001
PANAS	1.00	1.00	*U* = 431, *p* = .32

Skill	.08 (.08)	.11 (.25)	$U = 419$, $p = .32$, $r = -.12$

Note. For state anger and skill, the Mann Whitney test statistic is reported and medians instead of means. DTS = Distress Tolerance Scale, FFMQ = Five Facets Mindfulness Questionnaire, STAXI-2 = State-Trait Anger Inventory- Trait scale, PANAS = Positive Affect Negative Affect Schedule- Hostility subscale

3.3.2. Intervention adherence. The number of times participants listened to the recording ranged from three (one participant) to ten (one participant). Twenty-eight participants (42.4%) listened to it four times and 27 participants (40.9%) listened to it five times. There were no significant differences ($U = 391.5$, $p = .12$, $r = .19$) on the number of times participants listened to the recordings between the mindfulness group ($Mdn = 5$) and the relaxation group ($Mdn = 4$).

The majority of participants ($N = 60$, 95.2%) completed their follow up session seven days after the baseline and three participants (4.5%) completed it between 10 and 20 days post baseline. These participants continued listening to the recordings until follow up. There were no significant differences on time taken to quit the task between participants who had their follow up seven days post baseline and those who had it more than seven days post baseline ($t_{(60)} = -.65$, $p = .52$, $r = .08$).

3.3.3. Manipulation checks. To assess whether the anger manipulation successfully induced anger in all participants, a Wilcoxon signed-rank test was used, which is not based on the assumptions of normally distributed data (Field, 2005). This

demonstrated that state anger was significantly higher ($T = 43.5$, $p < .001$, $r = .66$) at T3 ($Mdn = 1.33$) compared with T2 ($Mdn = 1$).

To assess whether the mindfulness intervention successfully increased mindfulness in the mindfulness group and not in the relaxation group, paired sample t-tests were computed for each group. On average, there was no difference in scores on state mindfulness in the mindfulness group ($t(32) = 00$, $p = 1.00$, $r = 0$) at T1 ($M = 4.75$, SD = 1.45) compared with T2 ($M = 4.80$, SD = 1.19). There were also no differences in state mindfulness in the relaxation group ($t(29) = 1.47$, $p = .15$, $r = .26$) at T1 ($M = 4.66$, SD = 1.07) compared with T2 ($M = 4.94$, SD = .98). Mindfulness scores were slightly higher at T2 in both groups, although this was not significant. All state anger and mindfulness scores are shown in Table 3.

Table 3.

State Variables at Baseline (T1) and Follow Up (T2 and T3), Split by Intervention

State Variables				Intervention					
(M, SD)	Total Sample			Mindfulness			Relaxation		
	N = 63			*N* = 33			*N* = 30		
	T1	T2	T3	T1	T2	T3	T1	T2	T3
Anger	1.13 (.21)	1.13 (.21)	1.47 (.55)	1.17 (.26)	1.18 (.25)	1.66 (.67)	1.09 (.15)	1.08 (.15)	1.27 (.27)
Mindfulness	4.70 (1.27)	4.87 (1.08)	_	4.75 (1.45)	4.80 (1.19)	_	4.66 (1.07)	4.94 (.98)	_

3.4. Hypothesis testing

3.4.1. Hypothesis 1. Trait mindfulness will mediate the relationship between trait anger and self-report distress tolerance.

Correlations: Pearson's correlations indicated that, consistent with prediction, trait mindfulness (as measured by the four combined subscales of the FFMQ: Describe, Awareness, Non-Judging and Non-Reacting) was significantly negatively correlated with trait anger (r = -.29, p = .02) and positively correlated with self-report distress tolerance (r = .53, p < .001).

Mediation analysis: To test this hypothesis, a mediation analysis was conducted using bias-corrected bootstrapped confidence intervals. This is considered the best all-round method to test mediation (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). It is recommended over the more traditional causal steps approach (Baron & Kenny, 1986) on the grounds that it has higher power, while maintaining reasonable control over the Type 1 error rate (Preacher & Hayes, 2008). The causal steps approach has also been widely criticised on the basis that it does not quantify the indirect effect, but rather infers it logically from the outcome of a set of hypotheses, each of which carries with it the possibility of a decision error (Hayes, 2013).

The mediation model is illustrated in Figure 2 where mindfulness is a mediator (M) between trait anger (X) and distress tolerance (Y). From the original sample, a bootstrap sample was generated by drawing from the sample with replacement, and the product of 'a' (the effect of anger on mindfulness) and 'b' (the effect of mindfulness on distress tolerance controlling for anger) were calculated in the bootstrapped sample. This process was repeated 5,000 times, yielding 5,000 bootstrap

estimates of 'ab' (difference between the direct (anger on distress tolerance) and indirect (anger on distress tolerance accounting for mindfulness) path (Hayes, 2013). A bias-corrected bootstrapped confidence interval (CI) for 'ab' was constructed by finding the two bootstrap estimates of 'ab*'* in the sample of 5,000, which defined the 2.5^{th} and 97.5^{th} percentiles of the distribution. If the confidence intervals do not contain zero (e.g. they are entirely above or below zero), a mediation effect is indicated (Hayes, 2013). Unstandardised regression coefficients are reported, as is the norm in mediation testing (Hayes, 2013).

In support of the hypothesis, mindfulness emerged as a significant mediator of the relationship between trait anger distress tolerance. Higher levels of trait anger were associated with lower levels of trait mindfulness (a = -.23, p = .02), and higher levels of trait mindfulness were associated with higher levels of distress tolerance when controlling for anger (b = .66, p < .001). A bias-corrected bootstrapped CI for the indirect effect (ab = -.15) based on 5,000 bootstrapped samples was entirely below zero: (CI range: -.32, -.03). There was no evidence that trait anger influenced distress tolerance independent of its effect on trait mindfulness (c' = -.11, p = .4). Overall, this showed that a significant proportion of the relationship between anger and distress tolerance is mediated by mindfulness.

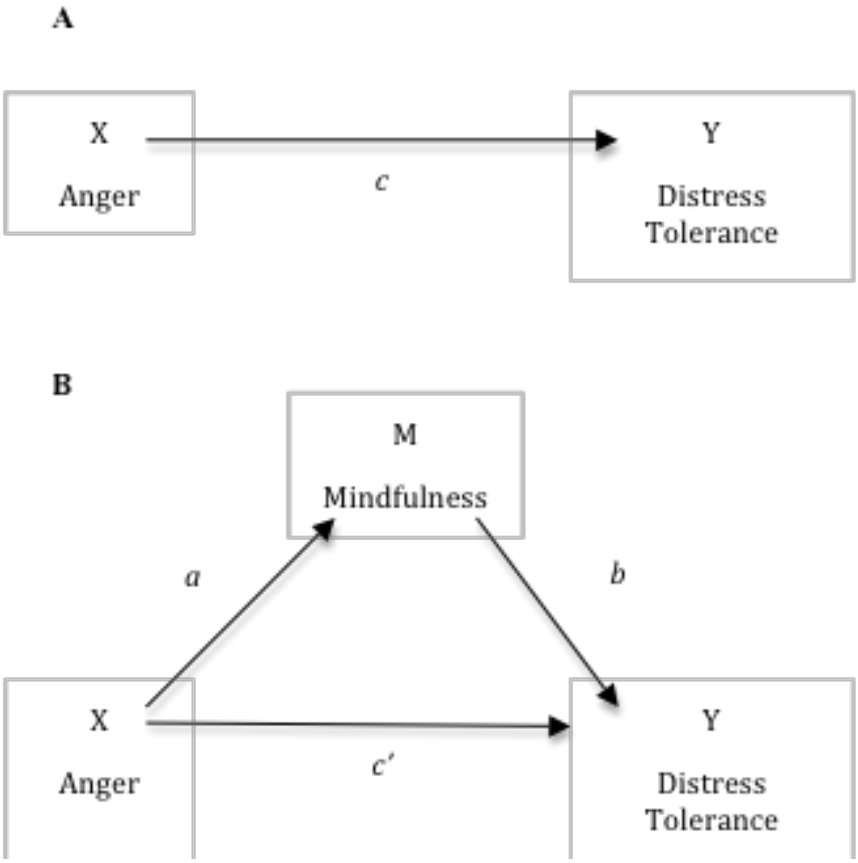

Figure 3. Illustration of mediation model

(A) Illustrates the direct effect (c) of anger (X) on distress tolerance (Y); (B) Illustrates the mediation design, whereby anger (X) exerts an indirect effect (c') on distress tolerance (Y) through mindfulness (M).

3.4.2. Hypothesis 2. Participants taking part in a mindfulness intervention delivered over a one-week period would persist for longer in a distress tolerance task (MTPT-C) following an anger manipulation, compared with participants taking part in a relaxation intervention also delivered over a one-week period.

As there were significant differences in ethnicities between groups, a one-way ANOVA was conducted to determine whether there were differences between ethnicities on time taken to quit the MTPT-C. This illustrated a non-significant difference, $F(2, 65) = 1.05$, $p = .36$, $r = .18$. Therefore, it was not deemed necessary to control for ethnicity in the main analysis.

The hypothesis was therefore tested using an independent samples t-test, with group (Mindfulness vs. Relaxation) as the independent variable and time taken to quit the MTPT-C as the dependent variable. The results of this analysis demonstrated a significant between group difference between time taken to quit the task, ($t(61) = 2.10$, $p = .04$, $r = .26$), with participants in the mindfulness intervention persisting on the task for longer ($M = 209.44$, SD = 112.88), than participants in the relaxation intervention ($M = 152.48$, SD = 106.25). Based on Cohen's (1992) criteria, the size of this effect was medium.

3.5. Exploratory Analyses

3.5.1. Subscales of mindfulness as mediators. Exploratory analyses were conducted to explore whether the specific subscales of the FFMQ all mediated the relationship between anger and distress tolerance.

Correlations: Pearson's correlations between the individual mindfulness facets with trait anger and distress tolerance are shown in Table 4. These showed that trait anger was only significantly negatively correlated with the mindfulness facets of Awareness and Non-Reacting. Distress tolerance significantly correlated with Awareness, Non-Judging, and Non-Reacting, but not with Describe.

Table 4.

Correlations of Mindfulness Facets with Trait Anger and Distress Tolerance.

	FFMQ			
	Aw	NJ	NR	Des
Trait anger	-.31*	-.02	-.33*	-.08
DTS	.39**	.43**	.36**	.13

Note. * = significant at the $p < .05$ level ** significant at the $p < .001$ level. DTS = Distress Tolerance Scale, FFMQ = Five Facets Mindfulness Questionnaire, Aw = awareness, NR = Non-Reacting, NJ = Non-Judging, Des = Describe

Mediation analysis: A multiple-mediation model was used to test which of the four facets of mindfulness mediated the relationship between trait anger and distress tolerance. Each mindfulness facet was entered as a separate mediator in the bootstrapping analysis. Results (see Table 5) indicated that Awareness emerged as a significant mediator of the relationship between anger and distress tolerance, as evidenced by a bias-corrected bootstrap confidence interval for the indirect effect (*ab* = -.11) that was entirely below zero (CI range: -.25, -.02). Non-Reacting also emerged as a significant mediator, as demonstrated by a bias corrected bootstrap confidence interval for the indirect effect (*ab* = -.12) that was also below zero (CI range: -.29, -.02). As can be seen in Table 5, none of the other mindfulness facets were found to mediate the relationship between trait anger and distress tolerance. Overall, results showed that a significant proportion of the relationship between anger and distress

tolerance was mediated by an awareness of, and a non-reactive stance to, inner experiences.

Table 5.

Bootstrapping Output for Multiple-Mediation Model Examining the Mediating Role of Mindfulness Facets on the Association Between Trait Anger and Distress Tolerance.

Mediator (FFMQ facet)	*a* path (X to M)		*b* path (M to DV)		*c'* path (Direct)		*ab* (Indirect)		
	B	*SE*	*B*	*SE*	*B*	*SE*	*ab*	*SE*	95% CI
Aw	-.44*	.16	.27*	.09	-.09	.13	-.12	0.6	(-.27, -.02)
NR	-.34*	.12	.35*	.12	-.09	.13	-.12	0.7	(-.29, -.02)
NJ	-.03	.16	.35	.09	-.20	.12	-.01	0.5	(-.1, 0.1)
Des	-.11	.17	.13	.09	-.19	.13	-.01	-.01	(-.11, .02)

Note. * = significant at the $p < .05$ level ** significant at the $p < .001$ level. FFMQ = Five Facets Mindfulness Questionnaire, Aw = awareness, NR = Non-Reacting, NJ = Non-Judging, Des = Describe

3.6. Summary of Results

In summary, the results of this study indicate that both of the hypotheses were met. In a sample of undergraduate university students, the relationship between trait anger and distress tolerance was mediated by trait mindfulness. That is, the ability to access mindful states accounted for some of the relationship between trait anger and distress tolerance. However, further exploratory analysis demonstrated that it was only the Awareness and Non-Reacting facets of mindfulness that mediated this relationship; Non-judging and Describe did not mediate the relationship between anger and distress tolerance independently.

Additionally, participants taking part in a mindfulness intervention over a one-week period demonstrated higher behavioural distress tolerance (as measured by the time taken to quit the MTPT-C) compared with participants taking part in a relaxation intervention over the same period. The effect size for this difference was medium (Cohen, 1992). However, this was not due to expected increases in mindfulness in the mindfulness group.

4. Discussion

4.1. Overview

The aims of the present study were to: (1) investigate whether trait mindfulness mediated the relationship between trait anger and distress tolerance, and (2) investigate whether participants who had taken part in a mindfulness intervention, delivered over a one-week period, would participate for longer in a behavioural measure of distress tolerance following an anger manipulation, compared with participants who had taken part in a relaxation intervention. Based on a dimensional approach to understanding distress tolerance, these hypotheses were tested using a non-clinical, student sample.

This chapter is divided into four main sections: the first section will discuss the main findings in relation to existing theory and research; the second section will discuss implications for clinical practice and ideas for future research; the third section will discuss the strengths and limitations of the current study; and the fourth and final section will consider the conclusions that can be drawn from these findings.

4.2. Main Findings in the Context of Theory and Research

4.2.1. Mindfulness as a mediator of the relationship between anger and distress tolerance.

The current findings supported Hypothesis 1: mindfulness mediated the relationship between trait anger and distress tolerance in a sample of university students. This suggests the ability to access mindful states was a significant determinant of the relationship between anger proneness and distress tolerance. Anger did not have an independent relationship with distress tolerance when the levels of mindfulness were statistically controlled for. No previous research has looked at

mindfulness as a mediator between these variables. This is therefore a novel contribution to the literature, providing important insight into our understanding of distress tolerance in the context of trait anger.

Theoretically, individuals who are prone to experience anger more frequently and more intensely have a tendency toward higher emotional reactivity (Wilkowski & Robinson, 2008); reduced and less flexible coping resources (Deffenbacher, 2011); and are more likely to ruminate (Sukhodolsky et al., 2001). When the intensity, duration and frequency of anger states are increased, this can lead to maladaptive behaviours (Deffenbacher, 2011). These factors might impact upon an individual's perception of their ability to tolerate aversive experiences. For those with reduced and less flexible coping mechanisms, heightened emotion might be experienced as particularly distressing and intolerable. It is also more likely to absorb attention and disrupt functioning to a greater degree. Behavioural responses to anger might serve to alleviate the aversive state, thus reducing one's perceived ability to tolerate distress in the long term. The current findings, however, suggest that a mindful reaction to anger experiences might help people tolerate aversive states.

The role of mindfulness in understanding this relationship represents a general transition in cognitive and behavioural psychological models, from focusing on the content of cognitions and emotions towards focusing on the way people relate to their experiences (Hayes et al., 2011). It implies that the processes involved in relating to distress are important and not just the experience of distress itself (Simons & Gaher, 2005). In this particular case, the results showed that it was not necessarily that individuals high in trait anger have a lower tolerance of distressing or aversive states; but that their way of relating to the anger plays an important role.

Interestingly, however, exploratory analyses found only the acting with awareness and not reacting to inner experiences facets of mindfulness exerted this mediating influence. These measured the awareness one has of the present moment and the tendency to allow thoughts and feelings to come and go without getting caught up or reacting to them. It was unexpected that the other mindfulness facets of being able to describe and not judge inner experiences did not mediate this relationship. It may have been because no mediation effect existed, or the analysis may have been underpowered to detect an effect. As hypotheses for the individual mindfulness facets were not made a priori, power analyses were not conducted and therefore it is not known whether the sample size was large enough to detect an effect.

This finding is nonetheless interesting amidst the lack of consensual agreement in understanding and measuring mindfulness (Dimidjian & Linehan, 2003). Some researchers consider its core aspect to be the self-regulation of awareness, such that it is maintained on immediate experience (Brown & Ryan, 2003). Others have given equal priority to the accepting and non-judgemental way that one pays attention to the immediate experience (Baer et al., 2006; Kabat-Zinn, 1990; Linehan, 1993). The current findings suggest that in the context of trait anger and distress tolerance, Brown and Ryan's (2003) focus on the attentional aspect of mindfulness might be the most salient. They propose that the foundation of mindfulness is specifically the presence or absence of attention and the awareness of what is going on in the present, rather than on taking a non-evaluative or judgemental stance towards one's inner experience (Brown & Ryan, 2003). For people who are less mindful, emotions occur outside of their awareness and drive responses before they are clearly acknowledged (Brown & Ryan, 2003).

Whilst bearing in mind the speculative nature of these suggestions, there are several proposed pathways through which a heightened awareness and tendency to not get caught up in inner experiences might influence the relationship between anger proneness and distress tolerance. Heightened awareness of the environmental context and reactions to potentially triggering situations might enhance self-management and perceived coping and reduce emotion-driven behaviour (Hayes et al., 2011). This idea fits with self-regulation theories, which view awareness of potentially problematic states as a necessary condition for regulating the tendency towards problematic outcomes (Bandura, 1991). For example, awareness might help individuals notice any discrepancies between their current and desired states of functioning, thereby providing opportunity to regulate urges toward emotion driven behaviour before it occurs (Feltman et al., 2009).

Another possibility is that heightened awareness of the present moment might help individuals contain upsetting or angering thoughts, feelings, and experiences within the context they are in (Feldman et al., 2010). Bower's (1981) network models of emotion bias suggest that individuals selectively attend to mood congruent features in the environment. In the case of individuals prone to experience anger, this might increase the intensity and frequency of angry states. However, a tendency toward mindful awareness may enable one to attend to other aspects of the environment, as opposed to just the mood-salient features. This may reduce the intensity or escalation of angry states. In turn, this might influence how manageable and tolerable the experience of anger is perceived to be, and decrease the motivation to react to it.

Not reacting to or getting caught up in internal experiences might also interfere with ruminative processes. Simons and Gaher (2005) propose that one of the key

mechanisms driving low distress tolerance is how consumed one becomes by the distress or aversive state. They describe one of the features of low distress tolerance being an absorption in distress, to the extent that it disrupts functioning (Simons & Gaher, 2005). In the case of high trait anger, becoming absorbed in the emotion is proposed to propel one into ruminative thought patterns (Wright et al., 2009). This has been found to exacerbate anger episodes, and also to maintain them (Bushman, 2002; Peled & Moretti, 2010; Rusting & Nolen-Hoeksema, 1998; Wright et al., 2009). If one is able to rather perceive angry thoughts and feelings as passing events and not truths or realities to cling on to, they may be prevented from entering into potentially harmful ruminative thought cycles (Baer, 2003). In doing so, the relationship between anger and distress tolerance may be attenuated.

As discussed, the ability to not judge internal experiences has been considered fundamental to the essence of mindfulness by some authors (e.g. Baer et al., 2006; Kabat-Zinn, 1990), yet less so by others (Brown & Ryan, 2003). Theoretically, it would have been expected that this facet had an important relationship with distress tolerance in the context of trait anger. According to Simons and Gaher (2005), a key aspect of distress tolerance is the appraisal of emotions as distressing (Simons & Gaher, 2005). The non-judgemental element of mindfulness teaches one to accept thoughts and emotions without judging them as good or bad. One would expect that taking a non-evaluative stance toward angering events would reduce the motivation to ruminate about the causes, symptoms and consequences. In this way, the emotion and one's reaction to it might be contained within the context of the present.

In support of this, some research has found that the non-judging aspect of mindfulness has an important synergistic relationship with awareness on anger

rumination (Peters, Eisenlohr-Moul, Upton, & Baer, 2013). Peters et al. (2013) found that in a sample of 227 students, those with greater awareness were less likely to ruminate on anger; however this was only the case for those who were able to take a non-judging stance. However, other research points to the key role of awareness specifically in reducing anger rumination. Eisenlohr-Moul et al. (2016) explored relationships between trait mindfulness at baseline (as measured by three subscales of the FFMQ: Awareness, Non-Judging and Non-Reacting) and daily anger rumination over a 35-day period in 86 university students. Awareness was the only facet of mindfulness that significantly predicted daily anger rumination. Being non-judgemental and not reacting to inner experiences did not demonstrate this relationship. This suggests that more research is needed to understand how the different facets of mindfulness relate to one another and to other variables of interest.

Interestingly, some argue that being non-judgemental of inner experiences and being able to describe experiences might represent a fundamental misunderstanding of the essence of mindfulness. A recent qualitative study by Christopher, Woodrich, and Tiernan (2014) aimed to assess the general cultural validity of the FFMQ and the Toronto Mindfulness Scale (TMS). They conducted cognitive interviews with 14 Zen Buddhist priests and laypersons residing in a monastery in the US. They presented participants with the measures and asked them to read through them, verbalising any thoughts while answering survey items. The participants expressed concern that the describe facet of the FFMQ is not an essential element of mindfulness because mindful awareness can be wordless. This facet also disadvantages those who are not good with words. Additionally they felt that items assessing non-judgmental awareness may not discriminate between individual levels of mindfulness, as having

judgement but being aware of the judging mind is a potentially mindful activity (Christopher et al., 2014).

As stated, results regarding the individual mindfulness facets as mediators need to be interpreted with caution. First, hypotheses about the mediating influence of the specific mindfulness facets were not made prior to testing the analyses. Second, as an a priori power analysis had not been conducted with the individual mindfulness facets as mediators, a plausible explanation might be that the mediation models were underpowered to detect an effect with the other subscales. Third, we cannot assume that the same pattern of mediation would be found in other samples, as this was only tested in a specific sample of undergraduate students. Fourth, as the mediation model was a cross-sectional assessment of the relationship between these variables, it is impossible to ascertain the temporal sequence of change in these variables over time. Although this does not preclude the use of mediation models (Hayes, 2013), it does mean findings have to be interpreted with caution.

4.2.2. The effects of a mindfulness intervention on distress tolerance. The current findings also supported the second hypothesis: students who took part in a mindfulness intervention over a one-week period persisted for longer in a behavioural measure of distress tolerance when in an angry mood, compared with students who took part in a relaxation intervention over a one-week period.

Theoretical accounts of distress tolerance all feature the behavioural response to distress and distress-eliciting contexts (Linehan, 1993; Lynch & Mizon, 2011; Simons & Gaher, 2005). This idea is rooted in behaviour theory, which suggests that maladaptive responding is maintained through negative reinforcement. If responses to distress successfully alleviate an aversive state they may become a negatively

reinforced strategy, likely to be repeated. They may also impact upon one's perceived coping and ability to tolerate distress in the long term. In the context of an angry state distress tolerance might be impacted by the felt intensity and nature of the anger experience, the perceived ability to self-regulate and cope with the situation, and previously learned reinforcement strategies (Deffenbacher, 2011). Whilst responses to anger can be harmful and maladaptive, responses can also be prosocial, problem-solving, assertive, and constructive (Kuppens et al., 2004).

Mindfulness is theoretically proposed to influence distress tolerance through teaching the present-focused awareness and acceptance of all experiences, including those perceived as negative (Kabat-Zinn, 1990). In the context of an angry state, this involves not reacting to or getting caught up in the experience, but allowing it to be within the context of the present moment. Over time, this might lead to a process of desensitisation whereby individuals can tolerate aversive states without having to react to them (Baer, 2003). The current findings support this theoretical account, in that the mindfulness training led people to withstand the distress tolerance task. In demonstrating that mindfulness was more effective than relaxation, findings suggest the specific benefit of present-focused mindful awareness in the context of anger.

Previous research has been mixed with regards to the effects of mindfulness-based interventions on behavioural distress tolerance in the context of an angry state. Some studies have found that lab-based mindfulness interventions increase participants' distress tolerance compared with controls (e.g. Sauer & Baer, 2012); however, other studies have found no such effects (e.g. Ellis et al., 2013; Szasz et al., 2011). These mixed findings might be explained by design limitations, including harmful control comparisons for mindfulness, for example, rumination (Sauer & Baer,

2012); inactive control groups that might overinflate the beneficial effects of mindfulness (Lotan et al., 2013); brief interventions that might not actually be teaching mindfulness skills (Ellis et al., 2013; Szasz et al., 2011); or weak anger inductions that may not sufficiently be inducing an angry state (Szasz et al., 2011). By overcoming these limitations, the current findings present a clearer picture of the specific effects of mindfulness. Furthermore, the current design provided a more ecologically valid representation of mindfulness and its effect beyond the immediacy of delivery.

Additionally, the content of the mindfulness interventions used in some of these studies might explain why mindfulness was not effective. The instructions used by Ellis et al. (2013) and Szasz et al. (2011) focused solely on the acceptance aspect of mindfulness. Participants were instructed to accept and experience their anger fully and not try and change it in any way. In addition to encouraging acceptance, the current intervention also focused on paying attention, becoming aware of thoughts and feelings, and relating to them in a de-centered and non-reactive way. As previously discussed in relation to Hypothesis 1, awareness and not reacting to thoughts and feelings might be an essential aspect of mindfulness in this context, in terms of potentially reducing the intensity of the anger experience, the motivation to ruminate and increasing one's perceived ability to cope. Again, this assertion can only be made tentatively until process of change mechanisms are established. Furthermore, as there is not yet a theoretical understanding of distinctions between self-report and behavioural measures of distress tolerance, it is difficult to know precisely how mindfulness exerted its influence in each measurement context; this is an important area for future research to consider.

Although Hypothesis 2 was supported, there are caveats for consideration. State mindfulness was negatively skewed in the mindfulness group only at baseline, meaning that the distribution of mindfulness scores was skewed toward higher scores. Although there were not significant differences in state mindfulness scores between groups at baseline, the slightly higher scores in the mindfulness group may have meant these participants were more mindful to begin with, thus biasing the study at baseline. This further emphasises the need to replicate this study before drawing any conclusions confidently.

Interestingly, there were no significant changes in state mindfulness following either the mindfulness or the relaxation interventions. This is contrary to expectations, based on other research that has demonstrated that training in mindfulness leads to increases in self-reported mindfulness skills (Gu, Strauss, Bond, & Cavanagh, 2015; Ortner, Kilner, & Zelazo, 2007; Shapiro et al., 2008). Shapiro et al. (2008), for example, found that students undergoing an eight-week mindfulness intervention had increased mindfulness eight weeks post-intervention, as measured by the Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003). Furthermore, a systematic review of the mediators tested in mindfulness-based interventions found that generally mindfulness mediated the effect of mindfulness interventions on psychological outcomes (Gu et al., 2015). It is therefore interesting that changes in self-reported state mindfulness were not detected here.

Results may differ for short interventions, which research has found do not consistently lead to changes in self-reported mindfulness. For example, Ortner and Zelazo (2014) found that mindfulness scores, as measured by the TMS, were higher following a short ten-minute distraction instruction compared with a ten-minute

mindfulness instruction. When Lancaster et al. (2016) compared a brief lab-based mindfulness intervention with a progressive muscle relaxation in undergraduate students, those in the mindfulness group reported significantly higher scores on the curiosity subscale of the TMS (i.e. awareness of the present moment with curiosity), but there were no between group differences on the de-centering subscale (i.e. not getting caught up in internal experiences) (Lancaster et al., 2016). Conversely, using these same interventions in students, Feldman et al. (2010) found increased de-centering following the mindfulness condition compared with the progressive muscle relaxation (Feldman et al., 2010). However, they used an indirect and unvalidated measure of de-centering and also did not seem to employ true randomisation procedures. Overall, these studies suggest that further research is needed to understand the mechanism by which short interventions in mindfulness are effective.

Another possible explanation that warrants consideration is that the state mindfulness measure (MAAS) did not sufficiently capture changes in mindfulness. The MAAS is the most widely used measure of mindfulness, as evidenced by citations in the literature (Grossman, 2011). Research has found it distinguishes between meditators and non-meditators. For example, Brown and Ryan (2003) compared scores on the 15-item MAAS between a sample of Zen students, whose central practice involves training the mind to become aware and attentive of the present moment, and a control group of community adults. They found higher scores in the Zen sample compared with the community sample. Furthermore, the MAAS positively correlated with the number of years in practice, suggesting it does capture differences in mindfulness skills.

However, a study comparing a large sample (N = 385) of Thai students with a large sample (N = 365) of American students, found no significant between-group differences on scores on the MAAS (Christopher, Charoensuk, Gilbert, Neary, & Pearce, 2009). This was despite significantly more people engaging in mediation practice in the Thai group than the American group, as well as the pervasive influence of Buddhism on Thai society. This suggests the scale does not consistently capture differences in mindfulness and that it may not measure mindfulness cross-culturally. Additionally, Grossman (2011) argues that the MAAS correlates very poorly with other mindfulness measures, based on research that shows an inconsistent pattern of shared variance between the MAAS and other scales. Arguably another mindfulness measure may have detected changes that were not identified by the MAAS.

More broadly, however, this reflects an inherent criticism of assessing mindfulness by self-report measures. Grossman (2008) argues that as self-report questionnaires rely on introspective self-perception, both a novice and a highly proficient meditator might rate their ability to be mindful as the same, given that the novice is not familiar with the concept and the meditator has a heightened awareness of their internal states of mindfulness. This is similar to the concerns raised by the Zen Buddhist priests in Williams et al. (2014). It may be that through practicing mindfulness, those in the mindfulness group were more accurately assessing how mindful they actually were. This is not a phenomenon unique to mindfulness; in quality of life research it is known as 'shifting baseline' or 'response shift', which occurs due to a change in internal reference standards (e.g. Sprangers & Schwartz, 1999).

It may also be that the mindfulness intervention was not effective in increasing mindfulness because it was recorded by a Trainee Clinical Psychologist and not by a trained mindfulness instructor meeting the UK network good practice guidelines for mindfulness teaching. Although the mindfulness script used in the study has been found to increase mindfulness and reduced perceived stress in other studies (Cavanagh et al., 2013), it is possible that a trained mindfulness facilitator might have been more effective in increasing mindfulness in the current study.

Finally, as discussed, it might be that the mindfulness intervention impacted some other mechanism other than mindfulness, which led people to persist for longer in the task. For example, when Jain et al. (2007) compared a mindfulness intervention with a relaxation intervention, reductions in stress levels were seen following both, but the mindfulness intervention was unique in its ability to reduce rumination. The reductions in stress for the mindfulness group may have been mediated by reductions in rumination. In the systematic review conducted by Gu et al. (2015), all of the eight studies that included repetitive negative thinking[1] as a mediator of the effects of mindfulness-based interventions on clinical outcomes found this to be the case. A plausible explanation is that participants in the mindfulness group did not ruminate on their anger following the induction, which enabled them to participate for longer in the task. The effect of mindfulness interventions on rumination in the context of anger is an important area for consideration and future research should include rumination measures.

[1] Repetitive negative thinking included rumination and worry, which findings generally suggest are closely related constructs.

This emphasises the importance for future research to establish the mechanism by which mindfulness is effective. According to Kazdin (2007), establishing how an intervention is efficacious is crucial. It enables specific beneficial treatment components to be enhanced to optimise therapeutic effect, and treatment moderators to be identified (i.e. variables upon which treatment efficacy may depend). Understanding the mechanisms of change make it possible to match specific therapies to individuals, depending on a formulation of needs. Future research should aim to include mediators in experimental designs in order to understand the mechanism of mindfulness (Kazdin, 2007).

Overall, these findings suggest mindfulness had an important role in increasing distress tolerance in a student sample. Trait mindfulness mediated the relationship between trait anger and self-report distress tolerance, although exploratory analyses suggested this was only through the facets of awareness and not reacting to inner experience. A mindfulness intervention delivered over a one-week period led to increased behavioural distress tolerance when compared with a relaxation control, although it is unknown whether this was via an increase in state mindfulness. Further investigation is needed to establish the mechanisms by which mindfulness exerted this influence. Having considered these findings in the context of existing research and theory, the following section will consider the clinical implications and any suggestions for future research.

4.3. Suggestions for Clinical Practice and Implications for Future Research

4.3.1. Implications for clinical practice. The current findings join a developing empirical base for the role of mindfulness in distress tolerance in both clinical and non-clinical populations. They suggest that developing mindfulness interventions to

help individuals tolerate distress in the context of anger proneness as an individual trait, and in dealing with angry episodes, might be particularly beneficial. This has potentially important clinical relevance, given the role of anger in many of the disorders in which low distress tolerance is implicated, for example, BPD (Kramer et al., 2016) and substance abuse (Barrett et al., 2015).

Mindfulness is already incorporated into treatments that target distress tolerance, for example, DBT. The efficacy of DBT in reducing anger has been demonstrated in treatment trials (Koons et al., 2001; Linehan, 1993; Linehan, Armstrong, Suarez, Allmon, & Heard, 1991; Telch, Agras, & Linehan, 2001). However, these studies have not directly measured changes in distress tolerance, making it difficult to establish which treatment component might be targeting specific outcomes. In clarifying the potentially important role of mindfulness in targeting distress tolerance in the face of high anger, findings imply this might be a key target for treatment in this context.

Although the interpretations are tentative until more research is conducted, enhancing awareness of the present moment and teaching a de-centered and non-reactionary relationship with thoughts and feelings might be a particularly useful clinical area to focus on. This is already a focus of 'third wave' cognitive therapies, such as ACT, DBT and mindfulness-based interventions, which teach a more 'open, aware and active approach' to dealing with psychological difficulties (Hayes et al., 2011, p.162). Such treatments target how experiences are related to and not just the nature or frequency of experiences (Hayes et al., 2011). Interventions are also being developed and tested that specifically teach the awareness of anger, on important outcomes such as physical pain (Slavin-Spenny, Lumley, Thakur, Nevedal, & Hijazi,

2013). These findings therefore fit within an already evolving body of research and suggest that more clinical research into focusing on anger awareness and present-focused attentional processes is warranted.

Notwithstanding this need for further testing in clinical samples, another possible implication is for the development of low-intensity, self-help mindfulness interventions in targeting distress tolerance. In terms of treating mild to moderate mental health difficulties, this idea fits with treatment guidelines from the National Institute for Health and Clinical Excellence (NICE) in the UK, which recommends CBT-based guided self-help interventions for people with mild to moderate anxiety and depression (NICE, 2011). An evidence base for self-help mindfulness practice is developing, although it is in its infancy (Cavanagh et al., 2014). These interventions are being studied for their important clinical benefits including: (i) wider access to interventions, which might usually have long waiting lists; (ii) extended reach to people who may not have access to such interventions; (iii) cost effectiveness; (iv) ability to update material as new evidence becomes available; and (v) increasing self-efficacy by not being dependent on therapist presence (Cavanagh et al., 2013).

It could be that low-cost self-help mindfulness interventions are used to manage lengthy waiting lists for more complex treatment programmes. Brief waiting list interventions have been shown to enhance treatment outcomes and could potentially improve treatment engagement, although evidence for this has not yet been found (Brown, Parker, & Godding, 2002). A self-help mindfulness intervention should also only be given following an assessment and formulation that weighs up benefits with any potential risks of harm. More research would clearly need to be conducted in clinical samples before such an approach is considered.

Although these findings have potentially important clinical implications, they should not be overstated. Even though distress tolerance might best be conceptualised as a dimensional construct, the current study cannot draw conclusions as to whether results would generalise to clinical samples. More research will be needed in various clinical samples to identify whether these findings are replicated. Although bearing this in mind, it is worth noting that some empirical evidence already supports the beneficial effects of mindfulness on increasing distress tolerance (Bornovalova et al., 2012; Brown et al., 2008; 2012). There is also growing empirical support for home-practice mindfulness interventions both in clinical and non-clinical samples (Cavanagh et al., 2014). Therefore, the current findings add to a body of promising research into the beneficial clinical effects of mindfulness on distress tolerance.

4.3.2. Suggestions for future research. In addition to assessing whether these findings can be replicated in clinical samples, there are several other important areas for future investigation. As highlighted previously, because this study cannot make temporal claims for the mediation effect of mindfulness, future research should employ longitudinal experimental designs. For example, it would be beneficial to manipulate the mediator of mindfulness and then assess its impact upon distress tolerance in the context of anger over time. This would enable an examination of the causal and temporal relationship between these variables, which cannot be provided by the current study. Testing mindfulness as a mediator also needs to be replicated across studies and with different samples (Kazdin, 2007). Only in doing so can we confidently draw conclusions about its mediation effect.

The suggestions regarding the role of anger rumination in both Hypotheses 1 and 2 are tentative, because a direct assessment of rumination was not included in the

study. Measures of anger rumination should be included in future research designs in order to establish whether: (1) the awareness and non-react facets of mindfulness mediated the relationship between anger and distress tolerance through anger rumination and (2) reducing anger rumination was the mechanism by which the mindfulness intervention was effective. This is vital in terms of strengthening our understanding of how mindfulness is demonstrating an effect, so that interventions can be targeted appropriately.

Future research should seek to clarify, and develop consistency, in the understanding and conceptualisation of mindfulness. Mindfulness is an Eastern, Buddhist concept that has been adapted relatively recently for Western purposes (Grossman, 2008). Researchers have acknowledged the difficulty of defining and measuring it in the theoretically discursive way we can do with other constructs, such as anxiety and depression (Baer, 2015; Grossman, 2008). Consequently there exists a wide range of mindfulness interventions that vary in how mindfulness is practiced, as well as conceptually distinct measures proposing to capture it (Chiesa & Malinowski, 2011). It has been argued that the way mindfulness is conceptualised in psychological research is reductionist and does not correspond to the original Buddhist meaning (Grossman, 2008). This calls into question what has been termed 'cultural validity' (Christopher et al., 2014). In defence of this, others argue that Buddhist ancient texts describe mindfulness in a variety of ways. According to the Buddhist scholar, Dreyfus (2011), "Buddhism is a plural tradition that has evolved over centuries to include a large variety of views about mindfulness. Hence, there is no single view that can ever hope to qualify as the Buddhist view of mindfulness" (p. 42).

Furthermore, Baer (2015) argues that the utility of measurement tools and

interventions depends on their intended purpose, which might be quite different in a Western mental health culture compared with a Buddhist culture. If mindfulness interventions are demonstrating benefits and measurement tools are enabling us to determine that participants are learning the skills being taught, then cultural adaptation should not matter (Baer, 2015). However, nonetheless, the variability in existing interventions and measurements across the literature makes it difficult to build up a reliable evidence base and to draw conclusions based on comparable and consistent findings across studies.

As has been highlighted throughout this study, the distress tolerance literature has been characterised by some confusion and conceptual uncertainty (Bernstein, Vujanovic et al., 2011). The relationship between self-report and behavioural measures of distress tolerance needs clarification, as it is currently unclear how they relate to one another or to an overarching construct of distress tolerance (Leyro et al., 2010). It is important to understand whether they are measuring different aspects of the same overarching construct, or whether they are entirely unique constructs altogether. Furthermore, mindfulness might be influencing distress tolerance via different mechanisms, depending on which measurement is being used. As suggested by Leyro et al. (2010), there needs to be a systematic investigation to develop a measurement of a common distress tolerance construct, or specific facets of this construct. Doing so will facilitate a more rigorous investigation of individual differences in this variable. This will then enable a more thorough and internally valid exploration of the relationship between distress tolerance and clinical disorders. Mindfulness interventions can then be targeted accordingly in order to have the maximum clinical benefit.

Research also needs to determine the construct validity of behavioural measures of distress tolerance (McHugh, Daughters et al., 2011). These measures are only a proxy measure of the actual issue at hand, which is the way people cope with emotional distress in their daily lives. It is important to know how these measures actually generalise to real life settings. Future research may benefit from exploring ways to modify these tasks to increase their ecological validity, for example, through the use of more emotionally salient or personally relevant distressing stimuli, such as interpersonal distress (Gratz & Tull, 2011; Lynch & Mizon, 2011). This might be difficult to assess using behavioural indices and may be best measured using a self-report assessment of the extent to which intolerance of distress causes problems in an individual's life.

Finally, this study was based on the assumption in the literature that low levels of distress tolerance are maladaptive, based on research that has focused on the associations of low distress tolerance with symptoms seen in clinical disorders (Leyro et al., 2010). However, it is important that the role of flexibility and context sensitivity is considered in future research (Lynch & Mizon, 2011). Adaptive emotion regulation involves the flexible, context-specific application of different strategies to modulate emotions in the face of personal goals (Gross & Thompson, 2007). Low distress tolerance may not be maladaptive in certain contexts; conversely high distress tolerance may not be adaptive in others (Clen et al. 2011; Leyro et al., 2010; Lynch & Mizon, 2011). For example, in a situation whereby an individual tolerates protracted abuse in a relationship because of fear of abandonment, high levels of distress tolerance may lead to ongoing interpersonal maltreatment and suffering (Lynch &

Mizon, 2011). In this context, overly high and inflexible tolerance of distress might be maladaptive and be linked to vulnerability (Leyro et al., 2010).

Lynch and Mizon (2011) coined the term 'distress over-tolerance'. This refers to overly high levels of distress tolerant behaviour in a manner that does not fit with long-term values or interests, resulting in adverse long-term consequences. High levels of distress over-tolerance might be detrimental to an individual's wellbeing to the same degree as low distress tolerance might be. The awareness one has of distress might be particularly important in both contexts, enabling an individual to determine their personal boundaries within which tolerating distress is appropriate for them (Lynch & Mizon, 2011). The role of mindful awareness in both distress intolerant and over-tolerant behaviour is an important area for future research.

Furthermore, distress tolerance and emotions generally are constructs that are embedded within cultural and societal norms and may serve different functions cross-culturally and across genders. For example, different 'display rules' for emotions exist in Eastern and Western cultures (Fischer & Manstead, 2000). In Japan, studies have shown that displays of negative emotions in public are frowned upon, whereas this is less the case in American cultures (Ekman & Frieson, in Fischer & Manstead, 2000). Studies have also found different emotion 'display rules' between males and females, which also vary according to emotion categories (Brody, 2000). For example, in Western cultures, males expressing sadness, fear and shame have been found to be evaluated more negatively than females, yet anger and the expression of anger viewed as more acceptable in males compared with females (Brody, 2000). It is highly likely that distress tolerance may be more normative within certain cultures and sub-cultures compared with others. It is important to understand the adaptive or maladaptive

function of distress tolerance (or over-tolerance), especially in the context of anger, across these cultural and individual difference factors.

In summary, further research is needed to unpick and clarify the theoretical basis of the distress tolerance construct and how its measurement relates meaningfully to real world phenomena. Nonetheless, the current research found that mindfulness had an important role in understanding distress tolerance. Although findings cannot be extrapolated to clinical samples, they add to a growing body of research that supports the use of mindfulness as an intervention for distress tolerance. The following section outlines the methodological strengths and limitations of the current research.

4.4. Strengths and Limitations

4.4.1. Strengths. This piece of research had a number of methodological qualities that strengthened its internal validity. First, participants were randomised to groups and a number of measures were taken at baseline to ensure group equivalence. The purpose of this was to ensure findings were not confounded by non-equivalence at baseline. The randomisation procedure did produce equivalence on all measures and baseline characteristics, with the exception of ethnicity. In order to account for this, differences between ethnic categories on outcome were assessed, and no differences were identified.

Second, randomisation was conducted by a third-party and the experimenter was blind to which group participants had been allocated. The purpose of this was to eliminate experimenter bias, by ensuring participants in different groups did not experience the procedure differently in some systematic way. Third, all of the

experimental procedures were standardised to eliminate any potential for variability across participants. Fourth, the study attempted to choose well-validated measures and procedures. All measures had good psychometric properties and had been validated in student samples and the anger manipulation had been shown to be robust in inducing an angry mood. Fifth, the study used a robust control for mindfulness. Weak control comparisons for mindfulness have previously made it difficult to decipher how over-inflated some of the findings are in favour of mindfulness. In using relaxation, which shares many components with mindfulness (Jain et al., 2007), we were able to isolate the key and unique aspects of mindfulness hypothesised to be of benefit. These design features increased the internal validity of the study.

As well as being internally valid, the study was strengthened by elements of ecological validity. Participants listened to the mindfulness intervention several times over a one-week period, as opposed to just during a brief one-off lab induction. A criticism of lab-based mindfulness studies is that the brief audio or written instructions given to participants may not be sufficient to foster mindfulness. There is no time to understand the essence of mindfulness practice. Furthermore, by delivering an intervention just prior to testing an outcome, you are not able to draw any inferences regarding the lasting or long-term effect of that intervention. This study demonstrated that a more ecologically valid practice of mindfulness had beneficial effects on increasing distress tolerance in students.

Another strength of the current study was its use of both self-report and behavioural measures of distress tolerance. The construct of distress tolerance is often operationalised in the literature using behavioural or self-report measures interchangeably, which has led to confusion as to whether these are distinct or

overlapping constructs (Leyro et al., 2010). The current study distinguished clearly between the two measurements and chose to study both in the context of mindfulness and anger. Although further research is needed to understand how the two measurements of distress tolerance are theoretically linked, a strength of the current study was in demonstrating the importance of mindfulness in understanding both.

4.4.2. Limitations. Despite these strengths there were also several limitations that impact upon the conclusions that can be drawn. Mediation models are designed to make causal claims. The cross-sectional design used for the mediation analysis was not ideally suited to this purpose as the temporal relationship between variables could not be ascertained (Hayes, 2013). Hypothesis 1 was limited in not being able to make any causal claims between anger, mindfulness and distress tolerance. Furthermore, the mediation model was a simple one. The relationship between these variables is undoubtedly far more complex and this can only be ascertained through more complex mediation designs.

The reliance on self-report trait and state measures is another limitation. Although self-report measures have several strengths (e.g. efficiently and anonymously summarising information about broad constructs), they also have many associated limitations. For example, there are likely to have been several sources of systematic and unsystematic measurement error, arising from factors such as fatigue, carryover effects, social desirability, and the accuracy with which people are able to report on internal states and experiences (e.g. Nisbett & Wilson, 1977). They also do not account for cultural norms or expectations, for example, familial or cultural messages about anger and anger expression (Deffenbacher, 2011), as well as gender differences previously discussed (Brody, 2000). The words used for emotional

concepts may translate differently cross-culturally and convey different meanings from what was intended (Elfenbein & Ambady, 2002). Mindfulness questionnaires have their own specific limitations, including content validity, cultural validity and shared variance between measures (Grossman, 2008, 2011; Williams et al., 2014). Such factors are likely to have influenced the accuracy of the findings and could partly have been overcome by measuring potential confounds where possible (e.g. social desirability) or including another mindfulness measure.

Another potential limitation concerns whether the imagery-based relaxation technique used in the current study was compatible with the behavioural distress tolerance task. It might be that using a guided imagery technique is unsuitable when performing a visual cognitive task, and something more physically relaxing, such as deep breathing, would have been more compatible with performing the task. Future research should seek to compare mindfulness with a deep breathing relaxation exercise on distress tolerance.

Furthermore, we do not know whether the relaxation technique used in the current study was in fact detrimental to distress tolerance, as opposed to the mindfulness technique increasing distress tolerance. As the current study did not compare the time-to-termination data in the current sample with other studies that have measured behavioural distress tolerance in student samples, we do not know whether the relaxation training reduced distress tolerance rather than the mindfulness intervention increasing distress tolerance. For example, it is plausible that relaxation may have increased day-dreaming or made people so relaxed that they were unmotivated to persist in the task.

The MTPT-C has been frequently used in the literature as a measure of distress tolerance; however, there are several limitations with its use. Although other studies have demonstrated the validity of the MTPT-C in non-clinical samples, the current study did not include a validation check. We therefore do not know how aversive participants found the task, or whether there were differences between the two groups in their experience of the task. It is possible that individuals may have tolerated the task for longer simply because they did not find it aversive, rather than because they had higher distress tolerance. Furthermore, despite being standardised, there is a lot of variability in the task. Because people can choose when they terminate, they may quit too early and not experience the same amount of distress as someone who continues, or, conversely, they may quit because of the amount of distress they are experiencing. Lynch and Mizon (2011) advise that studies using the MTPT-C include a manipulation check to ensure it is found to be aversive and, additionally, that they obtain a separate measure of distress to use as a covariate in the analysis.

Although the current study used robust randomisation procedures to achieve equivalence in baseline variables across groups, there ended up being significantly higher numbers of people who identified as 'White British' in the mindfulness group, compared with the relaxation group. The implications of this are that there may have been other important reasons for differences in distress tolerance between groups that are not attributable to the interventions. For example, there may have been cultural variations between groups with differing cultural messages on tolerating distress or complying with instructions; or instructions may have been interpreted differently by people whose native language was not English. Although a relationship between

ethnicity and distress tolerance was not found, there may be a non-specified difference that was not accounted for.

Finally, the use of a student sample was based on a dimensional approach to distress tolerance; however, this nonetheless limits the generalisability of the findings. Students are a particular sub-category of the general population and the findings can therefore not be generalised to other non-clinical groups or to clinical samples. Furthermore, the sample was predominantly female, well-educated and over half identified as being from a 'White British' background. This homogeneity limits our ability to generalise beyond the studied sample. Although studies have found patterns of dispositional mindfulness to be similar between males and females (e.g. Lavendar, Jardon, & Anderson, 2009), the generalisability of mindfulness research has been criticised for using largely white, middle class, female participants (Hickey, 2010). Additionally, participants self-selected for a study on 'relaxation'. There are various reasons why people might have done so, including high stress levels or a pre-existing interest in relaxation techniques; these reasons might differentiate this particular sample from the general population of students. These are all considerations that limit the generalisability of findings to other populations.

4.5 Conclusions

Whilst bearing these limitations in mind, important conclusions can be drawn from this study, which include novel contributions to the literature. First, in a student sample, the relationship between trait anger and distress tolerance was mediated by trait mindfulness; that is, the ability to access mindful states was found to influence the relationship between anger proneness and distress tolerance. However, when the mindfulness facets were investigated independently as mediators, it was only the

awareness and non-reacting facets that mediated this relationship. This suggests that both the awareness one has of anger, and the ability to see emotional experiences as passing events rather than truths, might play a key role in determining how distress is tolerated.

A second conclusion is that a mindfulness intervention, delivered outside of the lab and over a one-week period, was more effective in helping students tolerate distress when angry than a relaxation intervention. However, the mechanism by which this occurred needs further exploration. Collectively, these results provide evidence of the important role of mindfulness in distress tolerance, and a foundation for future research using other non-clinical and clinical samples. From this, interventions can be effectively designed and tailored to target specific clinically-relevant outcomes.

5. References

Abramowitz, J. S., Fabricant, L. E., Taylor, S., Deacon, B. J., McKay, D., & Storch, E. A. (2014). The relevance of analogue studies for understanding obsessions and compulsions. *Clinical Psychology Review, 34,* 206-217.

Ali, B., Ryan, J. S., Beck, K. H., & Daughters, S. B. (2013). Trait aggression and problematic alcohol use in college students: the moderating effect of distress tolerance. *Alcoholism: Clinical and Experimental Research*, *37 (12),* 2138-2144.

Ameral, V., Palm Reed, K. M., Cameron, A., & Armstrong, J. L. (2014). What are measures of distress tolerance really capturing? A mixed methods analysis. *Psychology of Consciousness: Theory, Research and Practice, 1 (4),* 357-369.

Anderson, N. D., Lau, M. A., Segal, Z. V., & Bishop, S. R. (2007). Mindfulness-based stress reduction and attentional control. *Clinical Psychology and Psychotherapy*, *14,* 440-463.

Angst, J., & Merikangas, K. (1997). The depressive spectrum: diagnostic classification and course. *Journal of Affective Disorders*, *45,* 31-40.

Angst J., Merikangas K. R., & Preisig, M. (1997). Subthreshold syndromes of depression and anxiety in the community. *Journal of Clinical Psychiatry, (Suppl. 8),* 6–10.

Anestis, M. D., Fink, E. L., Smith, A. R., Selby, E. A., & Joiner, T. E. (2011). Eating disorders. In M. J. Zvolenksy, A. Bernstein, and A. A. Vujanovic (eds).

Distress Tolerance: Theory, Research and Clinical Implications (pp. 245-260). New York, NY: The Guildford Press.

Anestis, M. D., Lavender, J. M., Marshall-Berenz, E. C., Gratz, K. L., Tull, M.T., & Joiner, T. E. (2012). Evaluating distress tolerance measures: interrelations and associations with impulsive behaviours. *CognitiveTherapy Research*, *36,* 593-602.

Anestis, M. D., Selby, E. A., Fink, E. L., & Joiner, T. E. (2007). The multifaceted role of distress tolerance in eating disorders. *International Journal of Eating Disorders*, *40 (8),* 718-726.

Astin, J. A. (1997). Stress reduction through mindfulness meditation. Effects on psychological symptomatology, sense of control and spiritual experiences. *Psychotherapy and Psychosomatics, 66 (2),* 97-106.

Averill, J. R. (1983). Studies on anger and aggression. Implications for theories of emotion. *American Psychologist*, *38 (11),* 1145-1160.

Baer, R. A. (2003). Mindfulness training as a clinical intervention. A conceptual and empirical review. *Clinical Psychology: Science and Practice*, *10 (2),* 125-143.

Baer, R. A. (2015). Assessing mindfulness in multiple contexts: A comment on Christopher, Woodrich, and Tiernan (2014). *Mindfulness, 6 (3),* 687-692.

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. *Assessment*, *11 (3),* 191-206.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*, 27–45.

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S...Williams, J. M. (2008). Construct validity of the Five Facets Mindfulness Questionnaire in meditating and nonmeditating samples. *Assessment, 15 (3),* 329-342.

Bandura, A. (1991). Social cognitive theory of self-regulation. Organisational Behaviour and Human Decision Processes, 50, 248-287.

Baron, R. M., & Kenny, D. (1986). The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51 (6),* 1173-1182.

Baron, K. G., Smith, T. W., Butner, J., Nealey-Moore, J., Hawkins, M. W., & Uchino, B. N. (2007). Hostility, anger, and marital adjustment: concurrent and prospective associations with psychosocial vulnerability. *Journal of Behavioural Medicine, 30 (1)*, 1-10.

Barrett, E. L., Mills, K. L., Teesson, M., & Ewer, P. (2015). Mental health correlates of anger and violence among individuals entering substance abuse treatment. *Mental Health and Substance Use*, *6 (4),* 287-302.

Bernstein, A., Zvolensky, M. J., Vujanovic, A. A., & Moos, R. (2009). Discomfort intolerance: A hierarchical model of affect sensitivity and tolerance. *Behaviour Therapy*, *40 (3),* 291-301.

Bernstein, A., Marshall, E. C., & Zvolensky, M. J. (2011). Multi-method evaluation of distress tolerance measures and construct: concurrent relations to mood and anxiety pathology and quality of life. *Journal of Experimental Psychopathology*, *2 (3),* 386-399.

Bernstein, A., Vujanovic, A. A., Leyro, T. M., & Zvolensky, M. J. (2011). Distress Overtolerance and Distress Intolerance. A Behavioural Perspective. In M. J. Zvolenksy, A. Bernstein, and A. A. Vujanovic (eds). *Distress Tolerance: Theory, Research and Clinical Implications* (pp. 263-279). New York, NY: The Guildford Press.

Borders, A., Earleywine, M., & Jajodia, A. (2010). Could mindfulness decrease anger, hostility and aggression by decreasing rumination? *Aggressive Behaviour*, *36*, 28-44.

Bornovalova, M. A., Gratz, K. L., Daughters, S. B., Bettina, N., Delany Brumsey, A…Lejuez, C. W. (2008). A multimodal assessment of the relationship between emotion dysregulation and borderline personality disorder among inner-city substance users in residential treatment. *Journal of Psychiatric Research*, *42 (9),* 717-726.

Bornovalova, M. A., Gratz, K. L., Daughters, S. B., Hunt, E. D., & Lejuez, C. W. (2012). Initial RCT of a distress tolerance treatment for individuals with substance use disorders. *Drug and Alcohol Dependence*, *122,* 70-76.

Bower, G. H., (1981). Mood and memory. *American Psychologist, 36 (2),* 129-148.

Bravo, A. J., Boothe, L. G., & Pearson, M. R. (2016). Getting personal with mindfulness: A latent profile analysis of mindfulness and psychological outcomes. *Mindfulness, 7 (2),* 420-432.

Brody, L. R. (2000). The socialisation of gender differences in emotional expression: Display rules, infant temperament, and differentiation. In A. H. Fischer (ed). *Gender and Emotion: Social Psychological Perspectives* (pp. 24-47). UK: Cambridge University Press.

Brown, R. A., Lejuez, C. W., Kahler, C. W., & Strong, D. R. (2002). Distress tolerance and duration of past smoking cessation attempts. *Journal of Abnormal Psychology*, *111 (1),* 180-185.

Brown, R. A., Lejuez, C. W., Kahler, C. W., Strong, D. R., & Zvolensky, M. J. (2005). Distress tolerance and early smoking lapse. *Clinical Psychology Review*, *25 (6),* 713-733.

Brown, S., Parker, J. D. & Godding, P. R. (2002). Administrative, clinical, and ethical issues surrounding the use of waiting lists in the delivery of mental health services. *The Journal of Behavioural Health Services and Research*, *29 (2),* 217-228.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological wellbeing. *Journal of Personality and Social Psychology*, *84 (4),* 822-848.

Brown, R. A., Palm, K. R., Lejuez, C. W., Kahler, C. W., Zvolensky, M. J., Hayes...Gifford, E. V. (2008). Distress-tolerance treatment for early-lapse smokers. Rationale, programme description and preliminary findings. *Behaviour Modification*, *32 (3),* 302-332.

Brown, R. A., Palm Reed, K. M., Bloom, E. L., Minami, H., Strong, D. R., Lejuez, C. W...Hayes. S. C. (2013). Development and preliminary randomised controlled trial of a distress tolerance treatment for smokers with a history of early lapse. *Nicotine & Tobacco Research*, *15 (12),* 2005-2015.

Buckner, J. D., Keough, M. E., & Schmidt, N. B. (2007). Problematic alcohol and cannabis use among young adults: The role of depression and discomfort and distress tolerance. *Addictive Behaviours*, *32,* 1957-1963.

Bushman, B. J. (2002). Does venting anger feed or extinguish the

flame? Catharthis, rumination, distraction, anger and aggressive responding. *Personality and Social Psychology Bulletin, 28 (6),* 724-731.

Carmody, J., Baer, R. A., Lykins, E. L. B., & Olendzki, N. (2009). An empirical study of the mechanisms of mindfulness in a mindfulness based stress reduction program. *Journal of Clinical Psychology*, *65*, 613-626.

Cavanagh, K., Strauss, C., Cicconi, F., Griffiths, N., Wyper, A., & Jones, F. (2013). A randomised controlled trial of a brief online mindfulness based intervention. *Behaviour Research and Therapy*, *51,* 573-578.

Cavanagh, K., Strauss, C., Forder, L., & Jones, F. (2014). Can mindfulness and acceptance be learnt by self-help? A systematic review and meta-analysis of mindfulness and acceptance-based self-help interventions. *Clinical Psychology Review*, *34 (2),* 118-129.

Chapman, A. L., Gratz, K. L., & Brown, M. Z. (2005). Solving the puzzle of deliberate self-harm: The experiential avoidance model. *Behaviour Research and Therapy*, *44 (3),* 371-394.

Chiesa, A., & Malinowski, P. (2011). Mindfulness-based approaches: are they all the same? *Journal of Clinical Psychology*, *67 (4),* 404-424.

Christopher, M. S., Charoensuk, S., Gilbert, B. D., Neary, T. J., & Pearce, K. L. (2009). Mindfulness in Thailand and the United States: A case of apples versus oranges? Journal of Clinical Psychology, 65 (6), 590-612.

Christopher, M. S., Neuser, N. J., Michael, P. G., & Baitmangalkar, A. (2012). Exploring the psychometric qualities of the Five Facets Mindfulness Questionnaire. *Mindfulness, 3,* 124-131.

Christopher, M. S., Woodrich, L. E., & Tiernan, K. A. (2014). Using

cognitive interviews to assess the cultural validity of state and trait measures of mindfulness among Zen Buddhists. *Mindfulness*, *5,* 145-160.

Coelho, H. F., Canter, P. H., & Ernst, E. (2013). Mindfulness-based cognitive therapy: evaluating current evidence and informing future research. *Psychology of Consciousness: Theory, Research and Practice, 1 (s),* 97-107.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112 (1),* 155-159

Conger, J. C., Conger, A. J., Edmondson, C., Tescher, B., & Smolin, J. (2003). The relationship of anger and social skills to psychological symptoms. *Assessment*, *10 (3),* 248-258.

Corstorphine, E., Mountford, V., Tomlinson, S., Waller, G., & Meyer, G. (2007). Distress tolerance in the eating disorders. *Eating Behaviours, 8,* 91-97.

Cougle, J. R., Bernstein, A., Zvolensky, M. J., Vujanovik, A. A., & Macatee, R. J. (2013). Validation of self-report measures of emotional and physical distress tolerance. *Journal of Psychopathology and Behaviour Assessment*, *35*, 76-84.

Cousineau, D., & Chartier, S. (2010). Outliers detection and treatment: a review. *International Journal of Psychological Research, 3 (1),* 2011-2084.

Crowell, S. E., Beauchaine, T. P., & Linehan, M. M. (2009). A biosocial developmental model of borderline personality: elaborating and extending Linehan's theory. *Psychological Bulletin*, *135 (3),* 495-510.

Daughters S. B., Lejuez C. W., Kahler C. W., Strong D. R., & Brown R. A. (2005). Psychological distress tolerance and duration of most recent abstinence attempt among residential treatment-seeking substance abusers. *Psychology of Addictive Behaviours*, *19 (2),* 208-211.

Deffenbacher, J. L. (2011). Cognitive-behavioural conceptualisation and treatment of anger. *Cognitive and Behavioural Practice*, *18 (2),* 212-221.

Dimidjian, S., & Linehan, M. (2003). Defining and agenda for future research on the clinical application of mindfulness practice. *Clinical Psychology: Science and Practice*, *10 (2),* 166-171.

Dreyfus, G. (2011). Is mindfulness present-centred and non judgemental? A discussion of the cognitive dimensions of mindfulness. *Contemporary Buddhism, 12:01,* 41-45.

Eckhardt, I. E., & Cohen, D. J. (1997). Attention to anger-relevant and irrelevant stimuli following naturalistic insult. *Personality and Individual Differences*, *23*, 619-929.

Eisenlohr-Moul, T. A., Peters, J. R., Pond Jr, R. S., & DeWall, C. N. (2016). Both trait and state mindfulness predict lower aggressiveness via anger rumination: a multilevel mediation analysis. *Mindfulness, 7,* 713-726.

Elfenbein, H. A., & Ambady, N. (2002). On the universality and cultural specificity of emotion recognition: A meta-analysis. *Psychological Bulletin, 128 (2),* 203-235.

Ellis, A. J., Fischer, K. M., & Beevers, C. G. (2010). Is dysphoria about being red and blue? Potentiation of anger and reduce distress tolerance among dysphoric individuals. *Cognition and Emotion*, *24 (4),* 596-608.

Ellis, A. J., Vanderlind, W. M., & Beevers, C. G. (2013). Enhanced anger reactivity and reduced distress tolerance in major depressive disorder. *Cognitive Therapy Research*, *37,* 498-509.

Fairburn, C. G., & Bohn, K. (2005). Eating disorder NOS (EDNOS): an

example of the troublesome “not otherwise specified” (NOS) category in DSM-IV. *Behaviour Research and Therapy*, *43,* 691-701.

Feldman, G., Greeson, J., & Senville, J. (2010). Differential effects of mindfulness breathing, progressive muscle relaxation, and loving-kindness meditation on de-centering and negative reactions to repetitive thoughts. *Behaviour Research and Therapy*, *48,* 1002-1011.

Feldman G., Dunn E., Stemke C., Bell K., & Greeson J. (2014). Mindfulness and rumination as predictors of persistence with a distress tolerance task. *Personality and Individual Differences*, *56,* 154-158.

Feltman, R., Robinson, M. D., & Ode, S. (2009). Mindfulness as a moderator of neuroticism-outcome relations: A self-regulation perspective. *Journal of Research in Personality, 43*, 953-961.

Field, A. (2005). *Discovering SPSS Statistics Using SPSS*. London: Sage Publications.

Fischer, A. H., & Manstead, A. S. R. (2000). The relation between gender and emotions in different cultures. In A. H. Fischer (ed). *Gender and Emotion: Social Psychological Perspectives* (pp. 24-47). UK: Cambridge University Press.

Fritz, M. S., & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science, 18 (3)*, 233-239.

Gluck, T. M., & Maercker, A. (2011). A randomised controlled pilot study of a brief web-based mindfulness training. *BMC Psychiatry, 11:175,* DOI: 10.1186/1471-244X-11-175

Gorka, S. M., Ali, B., & Daughters, S. B. (2012). The role of distress

tolerance in the relationship between depressive symptoms and problematic alcohol use. *Psychology of Addictive Behaviours, 26,* 621-626.

Gratz, K. L., & Tull, M. T. (2011). Borderline personality disorder. In M. J. Zvolenksy, A. Bernstein, and A. A. Vujanovic (eds). *Distress Tolerance: Theory, Research and Clinical Implications* (pp. 198-220). New York, NY: The Guildford Press.

Greene, A. F., Coles, C. J., & Johnson, E. H. (1994). Psychopathology and anger in interpersonal violence offenders. *Journal of Clinical Psychology*, *50 (6),* 906-912.

Gross, J. J., & Thompson, R. A. (2007). Emotion regulation: conceptual foundations. In Gross, J. J. (Eds), *Handbook of Emotion Regulation*. New York, NY: Guildford Press.

Grossman, P. (2008). On measuring mindfulness in psychosomatic and psychological research. *Journal of Psychosomatic Research*, *64 (4),* 405–408.

Grossman, P. (2011). Defining mindfulness by how poorly I think I pay attention during everyday awareness and other intractable problems for pyschology's (re)invention of mindfulness: Comment on Brown et al. (2011). *Psychological Assessment, 23 (4)*, 1034-1040.

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical Psychology Review, 37,* 1-12.

Hawkins, K. A., Macatee, R. J., Guthrie, W., & Cougle, J. R. (2013). Concurrent and prospective relations between distress tolerance, life stressors and anger. *Cognitive Therapy Research*, *37*, 434-445.

Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis. A Regression-Based Approach*. New York: The Guildford Press.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and Commitment Therapy*. New York, NY: Guildford Press.

Hayes, S. C., Villatte, M. Levin, M., & Hildebrandt, M. (2011). Open, aware and active: contextual approaches as an emerging trend in the behavioural and cognitive therapies. *Annual Review Clinical Psychology, 7,* 141-168.

Heppner, W. L., Kernis, M. H., Lakey, C. E., Campbell, W. K., Goldman, B. M., Davis, P. J…Cascio, E. V. (2008). Mindfulness as a means of reducing aggressive behaviour: Dispositional and situational evidence. *Aggressive Behaviour*, *34*, 486–496.

Hickey, W. S. (2010). Meditation as medicine: a critique. *Crosscurrents, 60 (2),* 168-184.

Hill, T., & Lewicki, P. (2006). *Statistics Methods and Applications*. Tulsa: Statsoft.

Hsu, S. H., Collins, S. E., & Marlatt, G. A. (2013). Examining psychometric properties of distress tolerance and its moderation of mindfulness-based relapse prevention effects on alcohol and other drug use outcomes. *Addictive Behaviours*, *38*, 1852-1858.

Jain, S., Shapiro, S. L., Swanick, S., Roesch, S. C., Mills, P. J., Iris, B...Schwartz, G. E. R. (2007). A randomised controlled trial of mindfulness meditation versus relaxation training: effects on distress, positive states of mind, rumination and distraction. *Annals of Behavioural Medicine, 33 (1),* 11-21.

Jallais, C., & Gilet, A.L. (2010). Inducing changes in arousal and valence. Comparison of two mood induction procedures. *Behaviour Research Methods, 42,* 318-325.

Kabat-Zinn, J. (1990). *Full Catastrophe Living: Using the Wisdom of your Body and Mind to Face Stress, Pain and Illness*. New York: Delacorte.

Kabat-Zinn, J. (1994). *Wherever You Go, There You Are: Mindfulness Meditation in Everyday Life*. New York, NY: Hyperion.

Kassinove, H., & Sukhodolsky, D. B. (1995). Anger disorders: basic science and practice issues. *Issues in Comprehensive Paediatric Nursing*, *18 (3),* 173-205.

Kazdin, A. E., & Wilson, G. T. (1978). *Evaluation of behaviour therapy: issues, evidence and research strategies*. Oxford, England: Ballinger

Kazdin, A. E. (2007). Mediators and mechanisms of change in psychotherapy research. *Annual Review of Clinical Psychology, 3,* 1-27.

Keng, S-L., Smosi, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: a review of empirical studies. *Clinical Psychology Review*, *31 (6),* 1041-1056.

Keough, M. E., Riccardi, C. J., Timpano, K. R., Mitchell, M, A., & Schmidt, N. B. (2010). Anxiety symptomatology: The association with distress tolerance and anxiety sensitivity. *Behaviour Therapy*, *41*, 567-574.

Kingston, J., Chadwick, P., Meron, D., & Skinner, T. C. (2007). A pilot randomised control trial investigating the effect of mindfulness practice on pain tolerance, psychological well-being, and physiological activity. *Journal of Psychosomatic Research, 62 (3),* 297-300.

Kiselica, A. M., Rojas, E., Bornovalova, M. A., & Dube, C. (2015). The

nomological network of self-reported distress tolerance. *Assessment*, *22 (6),* 715-729.

Koons, C. R., Robins, C. J., Tweed, J. L., Lynch, T. R., Gonzalez, A. M., Morse, J. Q…Bishop, K. G. (2001). Efficacy of dialectical behaviour therapy in women veterans with borderline personality disorder. *Behaviour Therapy, 32*, 371-390

Kramer, U., Pascual-Leon, A., Berthoud, L., De Roten, Y., Marquet, P., Kolly, S…Page, D. (2015). Assertive anger mediates effects of dialectical behaviour-informed skills training for borderline personality disorder: a randomised controlled trial. *Clinical Psychology & Psychotherapy*, DOI: 10.1002/cpp.1956

Kroner, D. G., & Reddon, J. R. (1995). Anger and psychopathology in prison inmates. *Personality and Individual Differences*, *18 (6),* 783-788.

Kuppens, P., Van Mechelen, I., & Meulders, M. (2004). Every cloud has a silver lining: Interpersonal and individual differences determinants of anger-related behaviours. *Personality and Social Psychology Bulletin*, *30 (12),* 1550-1564.

Lancaster, S. L., Klein, K. P., & Knightly, W. (2016). Mindfulness and relaxation: a comparison of brief, laboratory based interventions. *Mindfulness*; *7 (3),* 614-621.

Lau, M. A., Bishop, S. R. Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L…Devins, G. (2006). The Toronto Mindfulness Scale: development and validation. *Journal of Clinical Psychology*, *62 (12),* 1445-1467.

Lavendar, J. M., Jardin, B. F., & Anderson, D. A. (2009). Bulimic symptoms in undergraduate men and women: Contributions of mindfulness and thought suppression. *Eating Behaviours, 10 (4)*, 228-231.

Lejuez, C. W., Kahler, C. W., & Brown, R. A. (2003). A modified computer version of the Paced Auditory Serial Addition Task (PASAT) as a laboratory-based stressor. *Behaviour Therapist*, *26,* 290-293.

Levin, M. E., Hildebrandt, M. J., Lillis, J., & Hayes, S. C. (2012). The impact of treatment components suggested by the psychological flexibility model: A meta-analysis of laboratory-based component studies. *Behaviour Therapy, 43,* 741-756.

Leyro, T. M., Zvolensky, M. J., & Bernstein, A. (2010). Distress tolerance and psychopathological symptoms and disorders: A review of the empirical literature among adults. *Psychological Bulletin*, *136 (4),* 576 600.

Linehan, M. M. (1993). *Cognitive-Behavioral Treatment of Borderline Personality Disorder*. New York: Guilford Press.

Linehan, M., Armstrong,H. E., Suarez, A., Allmon, D., & Heard, H. L. (1991). Cognitive-behavioural treatment of chronically parasuicidal borderline patients. *Archives of General Psychiatry, 48 (12),* 1060-1064.

Lobbestael, J., Arnstz, A., & Wiers, R. W. (2008). How to push someone's buttons: a comparison of four anger-induction methods. *Cognition and Emotion, 22,* 353-373.

Lotan, G., Tanay, G., & Bernstein, A. (2013). Mindfulness and distress tolerance: relations in a mindfulness preventive intervention. *International Journal of Cognitive Therapy*, *6 (4),* 371-385.

Luberto, C. M., McLeish, A. C., Robertson, S. A., Avallone, K. M., Kraemer, K. M., & Jeffries, E. R. (2014). The role of mindfulness skills in terms of distress tolerance: a pilot test among adult daily smokers. *The American Journal on Addictions, 23,* 184-188.

Lynch, T. R., & Mizon, G. A. (2011). Distress Overtolerance and Distress Intolerance. A Behavioural Perspective. In M. J. Zvolenksy, A. Bernstein, and A. A. Vujanovic (eds). *Distress Tolerance: Theory, Research and Clinical Implications* (pp. 52-79). New York, NY: The Guildford Press.

Macatee, R. J., & Cougle, J. R. (2015). Development and evaluation of a computerised intervention for low distress tolerance and its effect on performance on a neutralisation task. *Journal of Behaviour Therapy and Experimental Psychiatry*, *48*, 33-39.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variables. *Psychological Methods, 7 (1),* 83-104.

Maier, W., Gansicke, M., & Weiffenbach, O. (1997). The relationship between major and sub threshold variants of unipolar depression. *Journal of Affective Disorders*, *45*, 41-51.

Marcks, B. A., & Woods, D. W. (2005). A comparison of thought suppression to an acceptance-based technique in the management of personal intrusive thoughts: a controlled evaluation. *Behaviour Research and Therapy*, *43,* 433-445.

Martin, R. C., & Dahlen, E. R. (2004). Irrational beliefs and the experience and expression of anger. *Journal of Rational-Emotive & Cognitive-Behaviour Therapy*, *22 (1),* 3-20.

McHugh, R. K., Daughters, S. B., Lejuez, C. W., Murray, H. W., Hearon, B. A., Gorka, S. M…Otto, M. W. (2011). Shared variance among self-report and behavioural measures of distress intolerance. *Cognitive Therapy and Research, 35 (9),* 266-275.

McHugh R. K., Hearon, B. A., Halperin, D. M., & Otto, M., W. (2011). A novel method for assessing distress intolerance: adaptation of a measure of willingness to pay. *Journal of Behavior Therapy and Experimental Psychiatry*, *42*, 440-446.

McHugh, T., Forbes, D., Bates, G., Hopwood, M., & Creamer, M. (2012). Anger in PTSD: Is there a need for a concept of PTSD-related posttraumatic anger? *Clinical Psychology Review, 32*, 93-104.

McIntyre, A. W. (2014). The role of distress tolerance in aggressive behaviour. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 75 (3-B)*.

McNair, D. M., Lorr, M., & Droppleman, L. F. (1971). *Revised manual for the Profile of Mood States*. San Diego, CA: Educational and Industrial Testing Services.

Medina, J., Hopkins, L., Powers, M., Baird, S. O., & Smits, J. (2015). The effects of a hatha yoga intervention on facets of distress tolerance. *Cognitive Behaviour Therapy*, *44 (4),* 288-300.

Moritz, S., Cludius, B., Hottenrott, B., Schneider, B. C., Saathoff, K., Kuelz, A. K…Gallinat, J. (2015). Mindfulness and relaxation treatment reduce depressive symptoms in individuals with psychosis. *European Psychiatry, 30 (6),* 709-714.

National Institute of Clinical Excellence (2011). Common Mental Health Problems: Identification and Pathways to Care. London: Author

Nisbett, R., & Wilson, T. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Record, 84*, 231-259.

Nock, M. K., & Mendes, W. B. (2008). Physiological arousal, distress

tolerance, and social problem solving deficits among adolescent self-injurers. *Journal of Consulting and Clinical Psychology*, *76 (1)*, 28-38.

Nolen-Hoeksema, S. (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology*, *109 (3)*, 504-511.

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives of Psychological Science, 3 (5)*, 400-424.

Ortner, C. N. M., Kilner, S. J., & Zelazo, P., D. (2007). Mindfulness meditation and reduced emotional interference on a cognitive task. *Motivation and Emotion, 31,* 271-283.

Ortner, C. N. M., & Zelazo, P. D. (2014). Responsiveness to a mindfulness manipulation predicts affect regarding an anger-provoking situation. *Canadian Journal of Behavioural Science*, *46 (2)*, 117-124.

Osborne, J., & Overbay, A. (2004). The power of outliers (and why researchers should always check for them). *Practical Assessment, Research & Evaluation, 9 (6),* Retrieved from: http://pareonline.net/getvn.asp?v=9&n=6

Oser, M., Trafton, J. A., Lejuez, C. W., & Bonn-Miller, M. O. (2013). Differential associations between perceived and objective measurement of distress tolerance in relation to antiretroviral treatment adherence and response among HIV-positive individuals. *BehaviourTherapy*, *44 (3)*, 432-442.

Painuly, N., Sharan, P., & Mattoo, S. K. (2005). Relationship of anger and anger attacks with depression. *European Archives of Psychiatry and Clinical Neuroscience*, *255 (4),* 215-222.

Pearson, M. R., Lawless, A. K., Brown, D. B., & Bravo, A. J. (2015).

Mindfulness and emotional outcomes: identifying subgroups of college students using latent profile analysis. *Personality and Individual Differences*, *76*, 33-38.

Peled, M., & Moretti, M. M. (2010). Ruminating on rumination: Are rumination on anger and sadness differentially related to aggression and depressed mood? *Journal of Psychopathology and Behavioral Assessment, 32 (1),* 108-117.

Peters, J. R., Eisenlohr-Moul, T. A., Upton, B. T., & Baer, R. A. (2013). Nonjudgment as a moderator of the relationship between present-centered awareness and borderline features: synergistic interactions in mindfulness assessment. *Personality and Individual Differences*, *55,* 24-28.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behaviour Research Methods, 40 (3),* 879-891.

Quinn, E. P., Brandon, T. H., & Copeland, A. L. (1996). Is task persistence related to smoking and substance abuse? The application of learned industriousness theory to addictive behaviours. *Experimental and Clinical Psychopharmacology*, *4*, 186-190.

Ramel, W., Goldin, P. R., Carmona, P. E., & McQuaid, J. R. (2004). The effects of mindfulness meditation on cognitive processes and affect in patients with past depression. *Cognitive Therapy and Research*, *28 (4),* 433-455.

Rees, C. S., Hasking, P., Breen, L. J., Lipp, O. V., & Mamotte, C. (2015). Group mindfulness-based cognitive therapy vs group support for self-injury among young people: study protocol for a randomised controlled trial. *BMC Psychiatry*, *15:* 154; DOI: 10.1186/s12888-015-0527-5.

Rosenthal, R. (1991). *Meta-analytic procedures for social research (revised)*. Newbury Park, Ca: Sage.

Roth, P. L. (1994). Missing data: a conceptual review for applied psychologists. *Personnel Psychology, 47 (3),* 537-560

Richards, J. M., Daughters, S. B., Bornovalova, M. A., Brown, R. A., & Lejuez, C. W. (2011). Substance use disorders. In M. J. Zvolenksy, A. Bernstein, and A. A. Vujanovic (eds). *Distress Tolerance: Theory, Research and Clinical Implications* (pp. 171-197). New York, NY: The Guildford Press.

Rusting, C.L., & Nolen-Hoeksema, S. (1998). Regulating responses to anger: effects of rumination and distraction on angry mood. *Journal of Personality and Social Psychology*, *74,* 790–803

Salas, C. E., Radovic, D., & Turnbull, O. H. (2012). Inside-out: comparing internally generated and externally generated basic emotions. *Emotion, 12,* 568-578.

Sauer, S. E., & Baer, R. A. (2012) Ruminative and mindful self-focused attention in borderline personality disorder. *Personality Disorders: Theory, Research and Treatment*, *3 (4),* 433-441.

Sauer, S., Walach, H., Schmidt, S., Hinterberger, T., Lynch, S., Bussing, A…Kohls, N. (2013). Assessment of mindfulness: review on state of the art. *Mindfulness, 4,* 3-17.

Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2013). *Mindfulness-based Cognitive Therapy for Depression*. New York, NY: Guildford Press.

Semcho, S., Bilsky, S. A., Lewis, S. F., & Leen-Feldner, E. W. (2016). Distress tolerance predicts coping motives for marijuana use among treatment seeking young adults. *Addictive Behaviours*, *58*, 85-89.

Shapiro, S. L., Brown, K., & Biegel, G. (2007). Teaching self-care to

caregivers: effects of mindfulness-based stress reduction on the mental health of therapists in training. *Training in Education in Professional Psychology*, *1 (2),* 105–115

Shapiro, S. L., Oman, D., Thoreson, C. E., Plante, T. G., & Flinders, T. (2008). Cultivating mindfulness: effects on well-being. *Journal of Clinical Psychology*, *64 (7),* 840-862.

Simons, J. S., & Gaher, R. M. (2005). The distress tolerance scale: development and validation of a self-report measure. *Motivation and Emotion*, *29 (2),* 83-102.

Simons, J. S., Gaher, R. M., Oliver, M. N., Bush, J. A., & Palmer, M. A. (2005). An experience sampling study of associations between affect and alcohol use and problems among college students. *Journal of Studies on Alcohol and Drugs, 66 (4),* 459-469.

Slavin-Spenny, O., Lumley, M. A., Thakur, E. R., Nevedal, D. C., & Hijazi, A. M. (2013). Effects of anger awareness and expression training versus relaxation training on headaches: a randomised trial. *Annals of Behaviour Medicine, 46 (2),* 181-192.

Spielberger, C. D. (1999). *State-Trait Anger Expression Inventory-2 (STAXI- 2). Professional Manual*. Tampa, FL: Psychological Assessment Resources.

Sprangers, M. A. G., & Schwartz, C. E. (1999). Integrating response shift into health-related quality of life research: a theoretical model. *Social Science & Medicine*, *48 (11),* 1507-1515.

Strong, D. R., Lejuez, C. W., Daughters, S. B., Marinello, M., Kahler, C. W., & Brown, R. A. (2003). *Computerised mirror tracing task version 1*. Unpublished manual.

Sukhodolsky, D. G., Golub, A. & Cromwell, E. N. (2001). Development and validation of the anger rumination scale. *Personality and Individual Differences, 31,* 689-700.

Szasz, P. L., Szentagotai, A., & Hofmann, S. G. (2011). The effect of emotion regulation strategies on anger. *Behaviour Research and Therapy*, *49,* 114-119.

Teasdale, J. D., Segal, Z., & Williams, J. M. G. (1995). How does cognitive therapy prevent depressive relapse and why should attentional control (mindfulness) training help? *Behaviour Research and Therapy*, *33 (1),* 25-39.

Teasdale, J. D. (1999). Metacognition, mindfulness and the modification of mood disorders. *Clinical Psychology and Psychotherapy*, *6,* 146-155.

Telch, C. F., Agras, W. S., & Linehan, M. (2001). Dialectical behaviour therapy for binge eating disorder. *Journal of Consulting and Clinical Psychology, 69 (6),* 1061-1065.

Thompson, B. L. & Waltz, J. (2007). Everyday mindfulness and mindfulness mediation. Overlapping constructs or not? *Personality and Individual Differences, 43,* 1875-1885.

Turnbull, O. H., Evans, C. E., & Owen, V. (2005). Negative emotions and anosognosia. *Cortex, 41 (1),* 67-75

Van Honk, J., Tuiten, A., van den Hout, M., Putman, P., de Haan, E., &

Stam, H. (2001). Selective attention to unmasked and masked threatening words: relationships to trait anger and anxiety. *Personality and Individual Differences*, *30*, 711-720.

Van Os, J., Linscott, R., Myin-Germeys, I., Delespaul, P., & Krabbendam, L. (2009). A systematic review and meta-analysis of the psychosis continuum: Evidence for a psychosis proneness-persistence-impairment model of psychotic disorder. *Psychological Medicine*, *39*, 179-195.

Verdoux, H., & van Os, J. (2001). Psychotic symptoms in non-clinical populations and the continuum of psychosis. *Schizophrenia Research*, *54*, 59-65.

Vujanovic, A. A., Bernstein, A., & Litz, B. T. (2011). Traumatic Stress. In M. J. Zvolenksy, A. Bernstein, and A. A. Vujanovic (eds*). Distress Tolerance: Theory, Research and Clinical Implications* (pp. 126-148). New York, NY: The Guildford Press.

Watson, D., & Clark, L. A. (1994). *The PANAS-X. Manual for the Positive and Negative Affect Schedule- Expanded form*. Ames: The University of Iowa.

Wilkowski, B. M., & Robinson, M. D. (2008). The cognitive basis of trait anger and reactive aggression. An integrative analysis. *Personality and Social Psychology Review*, *12 (1),* 3-21.

Williams, J. M. G. (2010). Mindfulness and psychological process. *Emotion,10 (1),* 1-7.

Williams, M. J., Dagleish, T., Karl, A., & Kuyken, W. (2014). Examining the factor structure of the five-facet mindfulness questionnaire and the self-compassion scale. *Psychological Assessment, 26 (2),* 407-418.

Wright, S., Day, A., & Howells, K. (2009). Mindfulness and the treatment of anger problems. *Aggression and Violent Behaviour*, *14,* 396-401

Zvolensky, M. J. & Hogan J. (2013). Distress tolerance and its role in psychopathology. *Cognitive Therapy Research*, *37,* 419-420.

Zvolensky, M. J., Leyro, T. M., Bernstein, A., & Vujanovic, A. A. (2011). Historical perspectives, theory, and measurement of distress tolerance. In M. J. Zvolenksy, A. Bernstein, and A. A. Vujanovic (eds*). Distress Tolerance: Theory, Research and Clinical Implications* (pp. 3-27). New York, NY: The Guildford Press.

Zvolensky, M. J., Vujanovik A. A., Bernstein, A., & Leyro, T. (2010). Distress tolerance: theory, measurement and relations to psychopathology. *Current Directions in Psychological Science*, *19 (6),* 406-410.

6. Appendices

Appendix 1: Message of the day

Interested in learning more about ways to relax, as well as the chance to win £50?

I am a student from the Clinical Psychology Doctorate at Royal Holloway and am looking for people to participate in my study exploring how different relaxation methods may differentially affect mood. It is a two-part study, which involves completing some questionnaires and a computer task at a campus location. Each session will take no longer than 30 minutes. Between sessions you will be given a relaxation method to listen to in your own time…and you can keep the audio file afterwards!

If you decide to take part, you will be entered into a prize draw to win one of three cash prizes (either £25 or £50)!

If you are interested in taking part, or would like more information, please contact Francesca.lassman.2013@live.rhul.ac.uk

Appendix 2: Measures

Demographic information

1. What is today's date? _____

2. ID number _____

3. What is your age? _____ (years)

4. What is your gender?

- Male
- Female

5. What is your ethnicity?

- White British
- White Irish
- Any other white background
- Mixed- white and Black Caribbean
- Mixed- white and Black African
- Mixed- white and Asian
- Any other mixed background
- Asian or Asian British- Indian
- Asian or Asian British- Pakistani
- Asian or Asian British- Bangladeshi
- Any other Asian background
- Black or Black British- Caribbean
- Black or Black British- African

- Any other black background
- Chinese

6. What is the title of your undergraduate/postgraduate course?

_____

7. Have you ever, or are you currently practising any form of relaxation e.g. yoga, meditation activity?

- Yes
- No

8. If yes, please provide details (type of activity length of time, competence level).

_____

Distress Tolerance Scale

(Simons & Gaher, 2005)

Think of times that you feel distressed or upset. Select the item from the menu that best describes your beliefs about feeling distressed or upset.

1. Feeling distressed or upset is unbearable to me.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

2. When I feel distressed or upset, all I can think about is how bad I feel.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

3. I can't handle feeling distressed or upset.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree

5. Strongly disagree

4. My feelings of distress are so intense that they completely take over.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

5. There's nothing worse than feeling distressed or upset.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

6. I can tolerate being distressed or upset as well as most people.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

7. My feelings of distress or being upset are not acceptable
    1. Strongly agree

2. Mildly agree
3. Agree and disagree
4. Mildly disagree
5. Strongly disagree

8. I'll do anything to stop feeling distressed or upset.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

9. Other people seem to be able to tolerate feeling distressed or upset better than I can.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

10. Being distressed or upset is always a major ordeal for me.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree

5. Strongly disagree

11. I am ashamed of myself when I feel distressed or upset.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

12. My feelings of distress or being upset scare me.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

13. I'll do anything to stop feeling distressed or upset.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

14. When I feel distressed or upset, I must do something about it immediately.
    1. Strongly agree

2. Mildly agree
3. Agree and disagree
4. Mildly disagree
5. Strongly disagree

15. When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels.
    1. Strongly agree
    2. Mildly agree
    3. Agree and disagree
    4. Mildly disagree
    5. Strongly disagree

Five Facets Mindfulness Questionnaire

(Baer et al., 2006)

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1	2	3	4	5
Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true

1. _____ I'm good at finding words to describe my feelings.

2. _____ I criticise myself for having irrational or inappropriate emotions.

3. _____ I perceive my feelings and emotions without having to react to them.

4. _____ When I do things, my mind wanders off and I'm easily distracted.

5. _____ I can easily put my beliefs, opinions, and expectations into words.

6. _____ I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.

7. _____ I watch my feelings without getting lost in them.

8. _____ I tell myself I shouldn't be feeling the way I'm feeling.

9. _____ It's hard for me to find the words to describe what I'm thinking.

10. _____ I am easily distracted.

11. _____ I believe some of my thoughts are abnormal or bad and I shouldn't think that way.

12. _____ I have trouble thinking of the right words to express how I feel about things.

13. _____ I make judgements about whether my thoughts are good or bad.

14. _____ I find it difficult to stay focused on what's happening in the present.

15. _____ When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.

16. _____ In difficult situations, I can pause without immediately reacting.

17. _____ When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.

18. _____ It seems I am "running on automatic" without much awareness of what I'm doing.

19. _____When I have distressing thoughts or images, I feel calm soon after.

20. _____ I tell myself that I shouldn't be thinking the way I'm thinking.

21. _____ Even when I'm feeling terribly upset, I can find a way to put it into words.

22. _____ I rush through activities without being really attentive to them.

23. _____When I have distressing thoughts or images I am able just to notice them without reacting.

24. _____ I think some of my emotions are bad or inappropriate and I shouldn't feel them.

25. _____My natural tendency is to put my experiences into words.

26. _____When I have distressing thoughts or images, I just notice them and let them go.

27. _____ I do jobs or tasks automatically without being aware of what I'm doing.

28. _____When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.

29. _____I can usually describe how I feel at the moment in considerable detail.

30. _____I find myself doing things without paying attention.

31. _____ I disapprove of myself when I have irrational ideas.

The State Trait Anger Expression Inventory (STAXI) - Trait Scale

(Spielberger, 1999)

(Not included due to copyright restrictions)

State Mindful Attention Awareness Scale

(Brown & Ryan, 2003)

Instructions: Using the 0-6 scale shown, please indicate to what degree, AT THIS EXACT MOMENT, you are having each experience described below. Please answer according to what really reflects your experience rather than what you think your experience should be.

	0	1	2	3	4	5	6
	Not at all			Somewhat			Very much
1. I am finding it difficult to stay focused on what's happening in the present.	☐	☐	☐	☐	☐	☐	☐
2. I am rushing through activities without being really attentive to them.	☐	☐	☐	☐	☐	☐	☐
3. I am doing jobs or tasks automatically, without being aware of what I'm doing.	☐	☐	☐	☐	☐	☐	☐
4. I am finding myself preoccupied with the past or future.	☐	☐	☐	☐	☐	☐	☐
5. I am finding myself doing things without really paying attention.	☐	☐	☐	☐	☐	☐	☐

Positive and Negative Affect Schedule- Anger subscale

(Watson & Clark, 1994)

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

Use the following scale to record your answers:

1	2	3	4	5
Very slightly or not at all	A little	Moderately	Quite a bit	Extremely

_____angry

_____hostile

_____irritable

_____scornful

_____disgusted

_____loathing

Appendix 3: Interventions

Mindfulness Practice Script

When we practice mindfulness, it can be helpful to adopt a comfortable but upright sitting position.

So before you start the practice, find a place to sit. And if it feels comfortable to do so, sit with an upright posture. With your spine erect, but not stiff. Sit with your feet flat on the floor and your arms by your side.

And you can choose now whether to close your eyes, or sit with your eyes open, and rest your gaze on a spot on the floor or the wall.

And because it's so easy to get caught up with what's going on in our minds, we always begin mindfulness by bringing our attention to our bodies.

And to do this it can be helpful to bring attention to a point of contact.

So bringing attention, now, to the soles of your feet.

Noticing any sensations at all in this part of your body.

Perhaps noticing sensations of pressure, temperature

Maybe noticing tingling sensations that move around and come and go.

Now continuing this focus in your body, bringing your attention up very deliberately through your body, up through your legs, through the pelvic area, into your tummy and back, up into your shoulders… Just noticing whatever sensations are in your body, right now.

You're not trying to make yourself relaxed, just being aware of what you're experiencing, right now, in your body.

You might find there are some parts of your body where you don't notice any sensations at all. That's fine.

Bringing your attention up through your neck, just checking that your neck is aligned with your spine, supporting your head. And bringing awareness up into your head and jaw, face and scalp. Again, perhaps not being able to notice sensations in this part of your body. Which is fine.

And now bringing your attention to the sensations in your body as you sit here, breathing.

It can help to do this by finding a place where you can most easily notice the sensations of breathing in and breathing out. Resting your attention, wherever you notice the sensations of the breath in the body. Most comfortably, most vividly.

You may choose to focus on the rise and fall of your tummy or your chest, or you may prefer to focus on the air moving in and out through the tips of your nostrils.

Not trying to change or control your breathing in any way, not trying to make it slower or deeper. Mindfulness is about experiencing things just as they are… one breath just as it is.

And you may find that your attention moves naturally to other things. To sounds, thoughts, feelings. As best you can, for these few minutes practice, allow these experiences to come fully into awareness. Knowing that they're there. If you can,

allow them to fade and pass. Without getting caught up in them, thinking about them, struggling against them.

And as best you can, patiently allowing it into awareness, noticing it, allowing it to fade and pass into the background, without getting caught up.

In the spaces between thoughts and feelings, allowing your attention to come back to rest in the sensations as you breathe in and breathe out.

We're not trying to get rid of thoughts or feelings.

In mindfulness, we are seeing if we can develop the capacity to be with experiences… even difficult or painful experiences, without having to get caught up in them or having to react and struggle.

So if even once you can allow a difficult thought, or painful feeling to come into awareness, to notice it, to watch it fade and pass without getting caught up.

If you can do that, even once, notice how that feels

Often in mindfulness practice we realise that we've lost our full awareness. Maybe we've been caught up in struggling with thoughts and feelings… worrying about the future, perhaps dwelling on something from the past.

If that happens… bringing awareness to judgements that may come into your mind. And as best you can, allowing judgements to fade and pass without getting caught up with them.

Seeing if you can notice it, and let it go, and come back to the breath.

And if you lose your focus, bringing your attention back to the sensations of the breath. The movement of the breath in the body... The sensations of breathing in, and breathing out.

If you find yourself judging, maybe judging your experiences, or maybe judging mindfulness, am I doing it right?

If you become aware of that, as best you can, just notice your mind judging, see if you can let that go, and once again, bringing your awareness back to the sensations in your body, breathing in and breathing out.

So in the last minute, if you can, really try to embody openness and acceptance, being open to whatever you experience, whether it's pleasant… painful…

Allowing experiences to come into the mind, to notice them, to watch them fade and pass like clouds in the sky… and doing this if you can for the last minute

And now as you come to the end of your practice, bringing your awareness back to the body, the sensations at the point of contact of your body on the chair, or wherever you are sitting. Awareness of the room around. Bringing the attention, as best you can, to bring your more open, spacious awareness to the next moments of your day.

When you feel ready open your eyes if they have been closed, and back into the room.

Guided Visual Imagery Practice Script

Try to find a position and a place which is as comfortable as possible. This may be lying on a bed, sitting in a chair or a sofa, or indeed lying on the floor. Select a place which is the most comfortable for you.

Try first of all to allow any tension or discomfort to flow away from your body. Try to allow yourself to sink down onto the surface on which you are lying. Try to allow your arms and legs to become heavy, tranquil and relaxed, heavy and loose. Try to imagine that any tension or discomfort is flowing away from your arms and your legs. Try to allow your arms to become heavy, tranquil and relaxed.

Try to set up a pattern of breathing which is deep, slow, and regular. Breathe in… and out… in… and out… try to set up this pattern of breathing, try to continue to breathe in this way, as we move through the relaxation program.

I am going to take you on a short journey. To start with, I would like you to imagine that you are standing at the top of five stone steps. Stone steps lead down to a square green lawn. And as you stand at the top of the stone steps, you can feel the sun shining in a clear blue sky. You can feel the warmth of the sun on your skin.

There is a soft breeze. You can almost smell the scent of the countryside in the air. Imagine that you are moving down the steps one at a time. Imagine that you are floating down the first step, and the second step, and the fourth step. And finally, down the last step, so that you are standing on the green grass.

The grass is soft and springy under your feet. And as you stand, you look around the garden. There are flowerbeds which surround the lawn, and in the flower beds, there are many colours. As you look closely at some of the flowers, you will notice that they are tulips. Notice that the tulips gently move backwards and forwards in the sluggish breeze. Concentrate on one of these tulips. Notice how it moves to and fro in the soft, slow breeze. Concentrate on its movement, try to make it move as slowly as you can, try to make it move in slow motion. Follow it, follow the flower as it moves

to and fro, backwards and forwards, and as you follow the flower you feel calm, tranquil and relaxed. You feel heavy, loose and warm.

Notice how the soft, slow, movement, makes you feel sleepy, drowsy and relaxed. Remember that every time you breathe out, you breathe out a little bit more tension, a little bit more discomfort. Every time you breathe out, you become more and more relaxed. Your body feels heavier and heavier, relaxed. Relax. Try to allow any tension or discomfort to flow away from your body, leaving you feeling heavy, tranquil and calm.

I want you to look towards the centre of the square lawn, where there is an old stone fountain. The stone fountain sprays water, into the air. The water forms an arc, and then falls into the pool that surrounds it. As you look at the water, as it sprays into the air, try to make it move in slow motion. Notice how it glistens and gleams in the sunlight. You can almost hear the soft, tinkling sound the water makes, as it falls back into the pool that surrounds it. Follow the arc of water, make it move in slow motion, slow the movement of the water down. Follow it as it falls into the pool that surrounds the fountain.

As you look into the pool, you can see there are some large, golden coloured fish. The fish gently to and fro, their tails softly propel them through the green water. Try to follow one of the fish, as it gently swims through the water, and eventually disappears from view on the other side of the pool. Follow it as it moves in slow motion. As you look around the pool, there are some large, green lily leaves, and these too gently move in the sluggish breeze. The scene is calm, and relaxing. You feel heavy, loose and relaxed. Heavy and tranquil.

Try to allow yourself to sink down onto the surface on which you are lying. Try to allow your body to become heavy and loose. Feel calm and relaxed. Remember that every time you breathe out, you breathe out a little bit more tension, a little bit more discomfort. Every time you breathe out, you become more and more relaxed. Your body feels heavier, and heavier. Relax. Relax.

Imagine that you are moving back towards the old stone steps. Imagine that you are floating up the steps towards the top, one at a time. Up the first step, the second step. The third step. The fourth. And finally up the last step, so that you are standing at the top with the garden behind you. In front of you is a wooden garden seat on which there is a thick, soft cushion. Imagine that you are sinking down onto it. Sinking down into the thick, soft cushion. Try to allow your body to become heavy and loose. Try to continue to breathe deeply, slowly and regularly. Feel calm, tranquil and heavy. Notice how much nicer it is to feel calm and relaxed.

I am going to gradually bring you out of the relaxation. To do this I am going to count from one to five. One… Two… gradually becoming aware of your surroundings.

Three… Four… Gradually begin to open your eyes. Five… Open your eyes. Be aware of what is happening around you. As you go about your daily activities, try to remain as calm and relaxed, for as long as you possibly can.

Appendix 4: Ethical approval email

Application Details:	View the form click here Revise the form click here
Applicant Name:	**Francesca Lassman**
Application title:	**Exploring how relaxation can influence mood: Revision 2**
Comments:	Approved.

Appendix 5: Experiment script

Baseline

My name is Francesca and I am in my 3rd year of the clinical psychology training. Thank you so much for considering taking part in this research. We are aiming to explore the effects of different relaxation techniques on mood. It's a two-part study, one part today and another part in one week's time and there will be some things for you to do in between. Each session won't be any longer than half an hour and may take less. If you choose to sign up today, it is really important that you take part in all parts of the study so that we know if the study works and we can actually see if there's any effect of what we're testing!

All of your information is completely confidential and questionnaires will only be seen by myself and my supervisor and stored securely.

You are under no obligation to consent and taking part won't affect your studies at all. You're also free to withdraw at any point and without giving reason and this will not affect your studies in any way. However you would only receive credits for the part you had completed. I have an information sheet here, which explains what I have just said. Have a read and if anything doesn't make sense or you have any questions just ask me. You can either go away and think about the study before consenting, or if you're happy to go ahead today, you can sign the consent sheet at the back.

Today's session will involve answering some questions on this laptop and then I'll give you something at the end. Are you ready?

Here you go (hand laptop to participant). Your ID number is (X) - please try and remember this for next week but don't worry if you don't. Please take as much time as you need and just let me know when you have finished.

Post questionnaires

Between this session and our next session in one week's time, I am going to give you a relaxation recording to listen to. I can either give you a CD or email you an MP3 recording. Which would you prefer?

The file has a ten minute recording on it, which you should listen to as many times as possible over the next week, and at least four times. I am going to give you a record sheet to jot down when you have listened to the recording (give record sheet). There is space for you to comment on your experience following the recording if you wish to. It's really important that you listen to it at least four times for the study to work and for us to know if our findings are real. However, it's even more important that we have accurate information, so please only write down when you have actually listened to the recording! Please don't forget to bring back the record sheet next week.

As it is a relaxation technique, it is important that you listen to it somewhere quiet, on your own and without distractions.

There are two different types of recording and I don't know which one you have been given as you have been randomly allocated to one of two groups. Please try not reveal anything to me when we next meet. Please also try and not give the audio file

to anyone or discuss the contents as they might be thinking of taking part in the study too and that would spoil what we're looking at!

Does this all make sense? Thanks so much again for taking part and I look forward to seeing you again next week.

Follow up

Hello- nice to see you again. Thank you very much for returning for the final part of the study.

Did you bring back the record sheet? Just to remind you, I do not know which recording you were given so, for now, try not to tell me anything about it. Were there any problems with listening to the recording?

This part involves some more questions on the laptop, some of which will be similar to before and some of which will be different. Near the end, I am going to give you another task to do, also on the computer.

Before we begin, do you have any questions?

(Hand laptop for questionnaires)

(When finished)- That's great. As I mentioned, there is a task I am now going to give you to try. The task has four levels and on the final level you can quit the task at any point. However, it is really important that you use your maximum effort on the task. I am going to leave the room for this task, so please let me know when you have finished.

(Experimenter leaves room and participant completes task).

That was the final part of the study. Thank you so much for taking part. I have a debrief sheet here for you, which explains more about what we are trying to investigate. The purpose of this study was to look at whether there are any differences between mindfulness and relaxation on a person's ability to tolerate distress, which was measured by the final task you completed. We predicted that people who listened to the mindfulness intervention would participate for longer in the task.

As I mentioned, you were randomly allocated to either receive the mindfulness script or a relaxation one. As this was done blindly, I don't know which group you were in. Do you remember the content of the recording I gave you? Ok- that was (mindfulness/relaxation)- would you like a copy of the mindfulness intervention?

Sometimes people may feel distressed by the task or by the anger induction and I wondered how you are feeling? (If distressed, try and alleviate or refer to counselling).

Prize draw participants: As you took part in this study for entry into a prize draw, I will contact you if you are successful- good luck!

Would you like to receive a summary of the findings? Are you happy to receive this via email? Thank you once again for taking part in this study.

Appendix 6: Information sheet

Exploring how relaxation can influence mood.

First, thank you for your interest in this study!

My name is Francesca Lassman and I am a third year postgraduate student of Clinical Psychology at Royal Holloway, University of London. I am carrying out a study to explore how different relaxation techniques can influence mood. This study is being supervised by Dr Jessica Kingston (Lecturer in Clinical Psychology). If you would like to discuss any aspect of the study with Jessica Kingston, you can contact her by phone (01784 141105) or email (Jessica.kingston@rhul.ac.uk). If you need to contact me at any point, please email francesca.Lassman.2013@live.rhul.ac.uk. I would really appreciate your participation in this study, which I hope will increase our understanding of this important area.

What the study will involve?

If you decide to take part, you will meet with the same researcher- Francesca Lassman- on two occasions at a campus location. During each session you will complete a series of tasks on a computer. These will include questionnaires, a short written task and other computerised tasks. Each session should take no longer than 30 minutes.

You will then be randomly allocated to receive one of two relaxation interventions and given a relaxation audio file to use during the following week. You will be asked to listen to this recording as many times as possible between the two sessions, and at

least 4 times. The audio file will contain a ten-minute recording, and you will be asked to listen to it at a convenient time, when you are alone and without any distractions. Whilst listening, you may need to be seated or lying down.

Confidentiality

Nobody except myself and my supervisor will be allowed to see your questionnaires. These will be stored with an ID number and no personally identifiable information. This ensures that the information is completely confidential. If the research gets published, it will not contain any identifiable information.

Your rights

Even if you give your consent to take part now, you are completely free to withdraw consent at any time, without giving an explanation. You also have the right to withdraw consent after the completion of the study and request that all your data be destroyed, without giving any reason. This will not affect you or your university studies in any way and you will still receive course credits or entry into the prize draw for taking part. You can also omit or refuse to answer any question that is asked of you, without any consequences.

Please keep this part of the sheet yourself for reference. Please feel free to ask any questions before you complete the consent form and hand the completed consent form to the researcher. It will be stored separately from the anonymous information you provide for the research project. This study has been reviewed and approved by the Psychology Department internal ethical procedure at Royal Holloway, University of London.

……

……

ID Number……

Consent form

Exploring how relaxation can influence mood.

You have been asked to participate in a study exploring how relaxation can influence mood, which is being carried out by Francesca Lassman. Have you (please circle yes or no):

- Read the information sheet about the study?
  - yes
  - no
- Had an opportunity to ask questions?
  - yes
  - no
- Got satisfactory answers to your questions?
  - yes
  - no

- Understood that you're free to withdraw from the study at any time, and without giving reason and this will not affect your studies in any way.
  - yes

- no

- Do you agree to take part in the study ?
  - yes
  - no

Signature _____

Name (in block letters) _____

Date _____

NB: This consent form will be stored separately from the anonymous information you provide.

Appendix 7: Record sheet

Exploring how relaxation can influence mood.

Record sheet

Please enter the date and time that you listened to the recording. You can listen to it as many times as you wish over the next week, but please try to listen to it on at least four occasions. However, please only record honestly so our results are as accurate as possible!

Date	Time	Comments

Appendix 8: Debrief sheet

Exploring how relaxation can influence mood.

Debrief sheet

Thank you for taking part in this study.

In accordance with most psychological research, the main aims and hypotheses of this study were not made explicit prior to the experiment. This is to avoid the possibility that participants may alter their behaviour whilst in the study. A brief background to the study and the main aims are described below.

Background and aims of this study

The aims of this study were to explore factors affecting distress tolerance, defined as the ability to experience and withstand negative psychological states. This is an important construct as it has been linked to various mental health problems and psychological symptoms in students.

There is some evidence that mindfulness practice may increase peoples' ability to tolerate distress. Mindfulness involves intentionally focusing on the present moment in a non-judgemental or accepting way. However, it is unclear from the research to date, whether mindfulness is any more beneficial than relaxation. This study therefore compared the effects of a mindfulness intervention with a relaxation control on peoples' ability to tolerate distress.

We hypothesised that students trained in a mindfulness mediation would participate for longer in a distress tolerance task than those trained in a relaxation intervention.

All participants were randomly allocated to the mindfulness intervention or the relaxation control to explore what condition increased distress tolerance.

The effects of the mood induction and distress tolerance task

The effects of the anger mood induction and the distress tolerance task should wear off following the experiment. If you have felt distressed by the tasks, or continue to feel distressed following the experiment, I would advise that you contact the student counselling service on counselling@rhul.ac.uk or 01784 443128 and/or your GP.

If you would like to receive a copy of the mindfulness intervention, please ask Francesca. If you have any questions about the study or would like to receive a copy of the results, please contact us on Francesca.lassman.2013@live.rhul.ac.uk and we will provide you with a summary of the findings.

Once again, thank you for your participation in this study!