Mindfulness: An Investigation as to the Relationship with Emotional Reactivity

Thesis submitted for the degree of

Doctor of Philosophy

At the University of Leicester

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University of Leicester

2018

"…Be mindful to protect one's own mind…"

Lord Buddha

Abstract

Mindfulness has demonstrated its benefits in being able to enrich human mental health through its negative association with negative emotion and positive with positive emotion. Yet, it is necessary to improve the quality of the measurements employed in studying mindfulness and its relationship with emotion due to the traditional subjective mindfulness scales demonstrating substantial drawbacks. Such drawbacks involve the understanding of Westerners in mindfulness being rooted in Buddhism, an eastern religion. Consequently, the concept held as to mindfulness is diverse and related to the background of the western scale developers. Additionally, respondents differ in their interpretation of items within mindfulness scales due to their background and understanding of mindfulness. Thus, an objective measure of mindfulness and emotion is needed to improve the robustness of such investigation. The main purpose of this thesis is therefore to explore the association between mindfulness and emotional reactivity as assessed via subjective and objective scales.

Two surveys undertaken with US and Thai samples have been performed to explore the general association between trait mindfulness, cognitive emotion regulation and emotional states (anxiety and depression). Moreover, three laboratory studies have been conducted in the UK and Thailand to investigate the relationship between mindfulness and emotional reactivity as elicited by affective stimuli (pictures, non-intense video and sound clips and intense video clips).

The main findings demonstrate a significant association between mindfulness and emotional reactivity, with this varying upon the dimension of mindfulness and emotional reactivity explored. Here, it has been found that the present self-awareness facet is negatively associated with emotional reactivity induced by non-intense stimuli, but positively associated with emotional reactivity induced by stressful affective stimuli. The decentering facet has been found to have a meaningful negative association with negative emotion but that it enriches positive emotion. Mindful attention awareness has been found to have a negative association with emotional reactivity induced by non-stressful affective stimuli. Moreover, cognitive emotion regulation mediates the association between mindfulness and emotional reactivity. Mind wandering, as might be involved with the maladaptive emotion regulation strategy, has a positive association with negative emotion. Overall, the results contribute to expanding upon the understanding held as to the relationship between mindfulness and emotional reactivity and could imply how these elements can be used to improve mental health.

Declaration

I am declaring that this thesis has been composed by myself, under a standard term, and has been carried out to ensure ethical and scientific credibility. I have submitted an original piece. Additionally, this thesis has not been submitted for any other degree or at any other institution.

2018
Chatwiboon Peijsel

Acknowledgements

"Life is like a dream and finally my dream comes true"

My dream arose whereupon I first attended a mindfulness retreat in Chiang Mai, Thailand, in 2001. From that point, mindfulness absolutely changed my aimless and empty life and has led me to gain a passionate and meaningful existence. This precious mindfulness experience inspires me to set, as my life goal, a path of being a potential person who can bring mindfulness to suffering people in any place in the world who can then live happily in their modern chaotic lives. To attain a PhD in mindfulness studies is one of the most important steps of my dream. I am grateful for everyone who has given me their hands, head and heart in assisting me towards this achievement. With gratitude and humbleness, I write my acknowledgements.

Thanks, firstly, to my Lord Buddha – as taught mindfulness to the world and as gives humans realistic hope that we can live beyond suffering if we live mindfully.

My dream would not have been possible without the support and nurturing of **Prof. John Maltby**, the best supervisor I have ever had. He is the one and only person who has revived my life from the tragic loss of my partner a few months before I began my studies. His encouragement with kindness, understanding, patience and immense wisdom has led me to the path of success in meeting my life's goal.

I am deeply indebted to Chiangmai University and the Thai people who support me with a full PhD scholarship and gave me an invaluable opportunity to study for a PhD in Leicester.

My gratefulness also extend to my respectful dharma mentors – Phra Ajahn Sang Sangkijjo, my dharma father, as always supports me with his ultimate compassionate mind; Phra Ajahn Plian Panya-Pathee-Po, as taught me to be humble and patient with unconditioned love to any person surrounding me; Phra Ajahn Opas Opa-So, as teaches me to live and work wisely with different people; Phra Ajahn Suphap Kittiko; Ajahn Kamphol Thongboonnum, as is my incredible model of a mindful life; Ajahn Pichai and Ajahn Siriporn Kankulsuntorn, as were my first mindfulness mentors. These figures all polished my dharma life and allowed me to transition from naivety to be a more skilful learner of mindfulness.

My deepest heartfelt appreciation goes to Ben, Mr. Bernardus L. Peijsel, my dearest husband, who has devoted his life to me. He always supported and encouraged me with his best – as if my smile was his smile. Also, my thanks go to my beloved little angels who are always by my side, to my Dutch family, my three stepdaughters and their families; Lesleymay, Amberleyjune, and Kelleyjoy Peijsel, as understood and supported me in regard to me achieving my PhD, especially when I faced the loss of their father.

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Chapter One

1.1 Introduction

Mindfulness, present self-awareness of the inner experiences of individuals with non-elaboration, was first mentioned and taught in Buddhism, an Eastern religion, approximately 2600 years ago. Within Buddhism, mindfulness pertains to awareness and remembering (Phra Thēpwēthī (Prayut), 1995; Thanissaro, 2000). The function of mindfulness is to act as an anchor of the mind in tying it to present moment experiences, achieved by focusing on the "here and now" moment. As a consequence, mindfulness could allow the human mind to be free from attachment to suffering induced via elaborating thought, with this thus being an essential aspect to promote quality of life in terms of well-being (Phra Thēpwēthī (Prayut), 1995).

In 1990, Jon Kabat-Zinn introduced mindfulness to the clinical field in terms of a mindfulness-based stress reduction programme (MBSR; Kabat-Zinn, 1990). The MBSR programme recommends mindfulness by practicing trainees to be attentive and aware of inner present experiences (including any physical and mental feelings, sensations and thoughts) with less effort. Moreover, in being aware of such experiences, practitioners convey acceptance or a non-judgemental attitude towards such encounters. This is in line with the definition of mindfulness given by Jon Kabat-Zinn (1990, p. 4), as holds mindfulness to be "…paying attention in a particular way: on purpose, in the present moment and nonjudgmentally…"

MBSR has shown the promising benefit to promote the well-being of human being documented in previous investigations (e.g., Dobkin, 2008; Gayner et al., 2012; Grossman et al., 2004; Klatt, Buckworth & Malarkey, 2009; Khoury et al., 2015; Melloni et al., 2013). Subsequent to this, interest in mindfulness has proliferated in clinical and non-clinical sectors among western countries (Chiesa et al., 2017). In addition, the relationship between mindfulness and emotion is a significant and widely-explored topic due to the latter being a crucial variable in it impacting upon human mental health (Eberth & Sedlmeier, 2012; Giluk, 2009; Gu et al., 2015).

However, mindfulness research encounters a major problem in understanding and interpreting the mindfulness concept in different ways due to it being based on the

different backgrounds of Eastern and Western cultures, with this being particularly important due to its religious aspects. As mindfulness is a central discipline of Buddhism, generally Buddhists are more familiar and understand mindfulness through their religious socialisation than non-Buddhists (Chiesa, 2013; Gethin, 2011; Grossman & Van Dam, 2011; Malinowski, 2008; Purser & Milillo, 2015). This difference could lead to two significant shortcomings within mindfulness research in regard to the subjective assessment of mindfulness (Grossman & Van Dam, 2011; Malinowski, 2008).

The first shortcoming here is that the measurement of mindfulness varies among the mindfulness concepts used to develop the scales employed. Although the mindfulness concept commonly utilised by researchers is similar to that given within Buddhism, the constructs vary due to the subjective interpretation of developers (Park, Reilly-Spong & Gross, 2013). For example, the Mindful Attention Awareness Scale: MAAS (Brown, & Ryan, 2003) focuses on attentional awareness while the Five Facet Mindfulness Questionnaire: FFMQ (Baer et al., 2006) emphasises five mindfulness facets (i.e., non-judging, acting with awareness, describing, non-reactivity and observing present inner experiences). Due to this occurrence, the results of the similar investigations as to mindfulness may be different as it may be impacted upon by the measurements with different concepts of mindfulness (Andrei, Vesely & Siegling, 2016; Baer, 2016; Chiesa, 2013; Hart, Ivtzan & Hart, 2013; Park, Reilly-Spong & Gross, 2013; Purser & Milillo, 2015; Rau & Williams, 2016; Sauer et al., 2013). To date, no consensus as to the concept or definition of mindfulness has emerged. The second shortcoming relates to the factors pertaining to the respondents of the employed scales (Rau & Williams, 2016; Sauer et al., 2013; Van Dam, Earleywine & Boders, 2010). As described in the Tipitaka, Buddhist discourse, right mindfulness (namely Samma-Sati) is one of the eight practices required to pursue enlightenment. Here, mindfulness can be cultivated through practice with perseverance given towards being self-aware of inner present experiences (Thanissaro Bhikku, 2000). In this context, it is understood that, in regard to what the Buddha taught, mindfulness is an internal state of mind that learns solely from experience and/or practice rather than from thinking or from intellectual knowledge (Grossman, 2008; Grossman & Van Dam, 2011). Thus, individuals with different backgrounds, knowledge and experiences of mindfulness may

possess different understandings and interpretations of mindfulness scale items (Grossman, 2008; Chiesa, 2013). As a result, this may affect the self-evaluations given.

In light of the shortcomings mentioned above, it can be concluded that the results of the undertaken mindfulness investigations could be impacted upon either by the use of mindfulness scales with different concepts or by utilising participants with different backgrounds (Baer, 2016; Chiesa, 2013; Park, Reilly-Spong & Gross, 2013; Rau & Williams, 2016; Sauer et al., 2013). This may have led to the inconsistency of the findings. For example, Kohls, Sauer and Walach (2009) found that the facet of acceptance in the Freiburg Mindfulness Inventory (FMI) was completely negatively associated with anxiety and depression, yet other facets (such as being present) were not associated with anxiety and depression. Thus, the authors mentioned that the multi-facet concept of the mindfulness scale could reveal the mechanism of mindfulness on anxiety and depression, yet the uni-facet concept (such as employed in the Mindful Attention Awareness Scale (MAAS)) could better assess mindfulness as a general investigation rather than as a mechanism of mindfulness. In the same study, Kohls and colleagues (2009) also noted that individuals without mediation experiences might be mistaken as to the item of the FMI as the scale was developed from a sample with meditation experience. As a consequence, this can impact upon the scores gained. In a similar way, Baer and colleagues (2008) have investigated the relationship between mindfulness and wellbeing in participants with mindfulness experience (practice mindfulness meditating at least once or twice a week) and without mindfulness experience (never or discontinued mindfulness meditating). Here, the results showed that the relationship between the mindfulness measured by FFMQ and well-being varies in relation to mindfulness experience. Due to these shortcomings, potential solutions through which to improve the quality of mindfulness investigations have been proposed by various researchers – for example, Chiesa (2013) and Sauer et al., (2013). One of those proposed solutions is the development of mindfulness measurements, specifically objective mindfulness scales. In addition, as the different backgrounds of participants could impact upon mindfulness investigations, as described previously, the present study thus employed samples from different countries (i.e., Buddhist and non-Buddhist countries) in an effort to decrease the shortcomings of subjective mindfulness assessments – especially in terms of understanding one's mindfulness state when assessing oneself. This could thus increase the robustness of any gained results.

In the present PhD thesis, 'Mindfulness: An Investigation as to the Relationship with Emotional Reactivity', the main purpose is to explore the relationships that exist between mindfulness and emotional reactivity. Here, specific attention is given to the relationship between mindfulness, mind wandering and emotional reactivity by using both traditional subjective and objective measures. The subjective measures pertain to mindfulness being measured by the Mindful Attention Awareness Scale; MAAS, the Toronto Mindfulness Scale-Trait version; Trait TMS (Davis, Lau, & Cairns, 2013) and mind wandering being measured by probing a breath counting programme (Levinson et al., 2014), while emotional reactivity is measured via an emotional intensity rating scale. The objective measures pertain to mindfulness being measured by a breath counting programme (Levinson et al., 2014) and emotional reactivity being measured by skin conductance response; SCR). This thesis has acted as the first attempt to thoroughly examine mindfulness via objective or behavioural assessments, undertaken with the aim of diminishing one of the significant shortcomings of subjective mindfulness assessments. Data was also collected dat in sample groups in different countries; the United Kingdom, the United States and Thailand. The results of these studies provide empirical evidence as to these interactions and thus contributes to our understanding of the associations that exists between mindfulness and emotional reactivity. This contribution is strengthened as a result of the diversity of measurement approaches employed and the research samples spanning both Western and Eastern countries.

1.2 The Structure of PhD Thesis

The report comprises eight chapters. Chapter One is an introduction to the PhD thesis. This chapter gives a concise rationale, necessary background and an outline of the objectives of the thesis. In this section, a brief description is given of each chapter of the thesis including the five studies (i.e., the two surveys and three laboratory studies) which have been performed as part of the PhD project. Chapter Two reviews the literatures of mindfulness by focusing on the concept and measurement of mindfulness. This chapter is a discussion of mindfulness-related studies and also invokes the problematic issues encountered within mindfulness investigations. Chapter Three describes emotional reactivity and its associated theories, the study of emotional reactivity and the theoretical associations held with mindfulness. From Chapter Two and Chapter Three, readers will gain an overview as to the background of the thesis and

the research gaps faced. In regard to the associations found between mindfulness and emotional reactivity, such information is necessary for this project in improving the robustness of the findings of this area.

Chapter Four contains a general description of investigations undertaken in this research which are pertinent to the relationship between mindfulness (including emotion regulation, a cognition-related variable) and emotional reactivity. Here, it is identified how subjective self-report scales have been used via two surveys, Survey One and Survey Two, as pertain to samples in the US and in Thailand respectively. The results of these surveys correspond with the findings of previous research in regard to the negative association found between trait mindfulness and emotional reactivity (anxiety and depression). The main current findings reveal that mindful attention awareness and the decentering facet was negatively correlated with anxiety and depression, while curiosity has been found to have a positive association with depression. Cognitive emotion regulation strategy is a significant mediator of these associations. In light of these findings, a stronger understanding may be gained as to the mechanism of mindfulness on negative emotional states. Additionally, the results reveal potential confounding variables such as, cultural factor, mediation experience, as relate to the correlation between mindfulness and emotional reactivity.

Chapter Five, Six and Seven describe, in detail, the investigations that have been undertaken as to the relationship between mindfulness and emotional reactivity. These allow the addressing of the research gaps found in previous mindfulness studies and those found in the two surveys analysed in Chapter Four. Here the measures used are employed via an objective approach in order to decrease the shortcomings of the subjective measures employed in relation to the mindfulness scales. This corresponds to the three studies that have been conducted. These three laboratory studies have been undertaken to broaden and deepen our understanding held as to the relationship between mindfulness and emotional reactivity with different affective stimuli. Such stimuli include pictures (Laboratory 1), video clips and sound clips (Laboratory 2) and intense affective video clips (Laboratory 3). Different samples have also been used to gain a more comprehensive understanding, with a UK sample being used (in Laboratory 1 and 2) alongside a Thai sample (Laboratory 3). The findings of these three laboratory studies support the results of the previous explorations while also deepening the understanding held as to the relationship between mindfulness and emotional reactivity

in terms of the dimensions of emotional reactivity and of mindfulness. Chapter Eight, the closing chapter, discusses the overall findings of the research including its implications, limitations and suggestions for future works.

General Introduction & Literature Review:

Mindfulness & Emotional Reactivity

Part One: Surveys

Trait Mindfulness and Cognitive Emotion Regulation:

An Investigation as to the Relationship with Emotional States

Survey 1

US Residents via M-Turk Survey

Survey 2

Thai Students in Thailand Survey

Part Two: An Analogue Laboratory Study

The Relationships That Exist between Mindfulness and Emotional Reactivity

Laboratory 1

Relationships That Exist between Mindfulness and Emotional Reactivity via the Use of Affective Pictures

Laboratory 2

The Relationships That Exist between Mindfulness and Emotional Reactivity via the Use of Affective Visual and Audio Clips

Laboratory 3

The Relationships That Exist between Mindfulness and Emotional Reactivity via the Use of Intense Affective Clips

Figure 1. The Structure of PhD Thesis

Mindfulness: An Investigation as to the Relationship with Emotional Reactivity.

Chapter Two

Mindfulness

2.1 Definition of Mindfulness and Related Aspects

2.1.1 Mindfulness in Buddhism

Mindfulness is rooted in Buddhism. Within the religion, mindfulness is referred to by a Pāli word, "Sati", a term whose original meaning pertains to the act of remembering or awareness (Phra Thēpwēthī (Prayut), 1995; Thanissaro, 2000). Mindfulness is not as same as memory, but it promotes capability of memory (Anālayo, 2013). The function of mindfulness pertains to interconnecting or monitoring an individual's mind with their own present experiences, this being distinctly different from merely memorising the past.

2.1.1.1 Mindfulness and Mindlessness

In regard to the Buddha's teachings, mindfulness is directly opposite to absent-mindedness or mindlessness (Anālayo, 2013). Mindlessness is a mental state when a person is not aware of their present experiences due to them being distracted by internal and/or external stimuli. Consequently, their mind wanders to that stimulus and fails to be aware of the present moment experiences. As their attention is caught by such stimulus, the mind becomes a narrow state (Anālayo, 2013). As a consequence, the elaborative thought could be conducted. Hence, mindfulness is also parallel with attention, but attention does not always facilitate mindfulness. To be mindful at the present moment is needed to be panoramic and fully vigilant to the present-moment experience, so attention is essential. However, if attention is paid to focus on some specific things, it will not broaden and alert to the present experiences therefore such attention is not related with mindfulness (Anālayo, 2013).

2.1.1.2 Mindfulness and Meditation

Mindfulness is also closely related with meditation. Meditation was introduced in Hindu and Buddhism as the ancient method to train the mind to focus or pay attention on one specific object (Anālayo, 2003). The goal of meditation is to increase stability of mind leading to peaceful state of mind (Lutz et al., 2008; Payutto, 1995). It is different from the goal of mindfulness which leads to increase awareness. Meditation

can be practiced in various ways. Regarding western view, Lutz et al., (2008) categorised meditation into two types based on the traditional approach and neuroscience. The first type is focus attention (FA) meditation. A person practicing FA must sustain attention and focus on a particular object with effort until the mind is not distracted. The second type called open monitoring (OM) meditation emphases on monitoring skill to observe the exposing current experiences. OM meditation is required FA meditation first to set stable mind, then the meditator can be attentively aware of or monitor the present occurrence without paying attention on a specific matter. As to Buddhism, several approaches involved in cultivating mindfulness were described in the Mahāsatipatāna Sutta, with this acting as a strong frame of reference as to the approach of cultivating mindfulness as taught by the Buddha (Anālayo, 2013; Keng, Smoski & Robins, 2011; Thanissaro, 2000). Mindfulness meditation is a significant approach here. In terms of mindfulness meditation, developing mindfulness requires two types of meditation; concentration meditation (samatha) and insight meditation (vipassana) (Anālayo, 2003; Batchelor, 2011; Payuto, 1995). Concentration meditation is the same as FA meditation. Insight meditation is similar to OM meditation, namely as it leads a meditator to gain and appreciate knowledge of the true nature of existence and thus leads to freedom from suffering through the monitoring of experience (Batchelor, 2011; Payuto, 1995). This, notably, is the ultimate goal of Buddhism (Payuto, 1995). Mindfulness meditation is the main approach in Theravada Buddhism, the oldest Buddhist school (Olson, 2005). The significant method of mindfulness meditation in Theravada is mindfulness of breath, focusing on breath as an anchor of awareness (The detailed was described in the section of Breathing and Mindfulness). This method is taught and practiced widely at communities; schools, temples in Theravada Buddhism country such as Thailand (Olson, 2005). In contrast, Mahayana, the other Buddhist tradition, which is mainly located in the Eastern Asia, for example Japan, Tibet, China focuses on meditation for emptiness such as no thought (Olson, 2005). Mindfulness meditations can be practiced in several methods however all methods use the same regulation that is the meditator keeps anchoring mind in the present moment (Anālayo, 2013). This regulation is applied to all mindfulness meditation practice among Buddhists in different schools and bring the same result that mindfulness meditators can improve meaningful mindfulness as was described in the work of Batchelor (2011).

2.1.2 Mindfulness Concept in Western Psychology

Throughout recent decades, mindfulness-related studies have increased dramatically in the West and can be found within a number of academic disciplines (Chiesa et al., 2017). As a result, the concept of mindfulness, as held by researchers, can often be significantly disparate. In the West, mindfulness-related issues began to be recognised in the 1970's, predominantly in clinical and cognitive sectors (Baer, 2003; Bishop et al., 2004) – for example, Jon Kabat-Zinn (1990) looked at Mindfulness-Based Stress Reduction whereas 1978 saw Ellen Langer introduce the concept to Social Psychology and non-clinical settings (Valorinta, 2009). It can be seen in this regard that although these two schools have become leaders in terms of mindfulness in Western Psychology, their definition of the concept is different. Langer (2014) stresses the definition of mindfulness in light of it being a state of openness, a novelty to external stimuli and environment. In contrast, Kabat-Zinn (1990, p.4) holds mindfulness to be closer to the Buddhist concept, noting it to be "…paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally…". This latter definition emphasises an individual's inner experiences (for example, sensation, feeling, emotion and thought) as are stimulated by external environments. It is this approach that is cited in many mindfulness-related studies within the health sciences (Chiesa et al., 2017).

In reference to behavioural sciences, the operational definition of mindfulness was proposed by Bishop et al. (2004) as the two components models in order that mindfulness can be investigated in terms of cognitive psychology. Regarding the model, the first component is the self-regulation of attention to maintain self-awareness of the experiences of the body and mind – sensation, affection and thought at the present moment. To be mindful, it is needed to control a cognitive process (regulate the attention) and monitor the consciousness flow. Sustained attention (attention to focus on a specific stimulus over the long period without distraction) and a capability to shift the attention from distracted stimuli back to the current experience are required. As a consequence, the elaboration towards stimuli could be inhibited, in the other words, individuals do not elaborate or judge their experiences by self -references (decentering). The second component of mindfulness is an opened attitude towards the present experiences. That is curiosity, receptive, and accepting (Bishop et al., 2004). Curiosity includes the awareness of mind wandering from the present experience, and awareness of the other experiences which distracts individual to be swayed from the present

experience. The openness to the present experience also allows persons to accept the actual circumstances they face without avoiding. They just put the effort to observe the internal sensation, feeling and thought at the present moment.

Aside from the definition of mindfulness provided by Kabat-Zinn (1990) and Bishop et al., (2004), various conceptualisations of mindfulness have been proposed. Although all such definitions are based on the original definition as derived from Buddhism, mindfulness might be defined in different aspects due to the abstract concept being a state of mind and one that is understood through experiences and learning. Table 1 illustrates the various definitions held as to mindfulness, as have been used to develop disparate mindfulness scales. It can be seen here that the definitions of mindfulness proposed by Western authors emphasise two key aspects of mindfulness; awareness at the present moment and equanimous orientation. However, such authors have invoked these aspects with different terminology. In terms of awareness at the present moment, this is stated in relation to giving attention at the present moment by observing. In contrast, equanimous orientation is identified via the presence of notions such as openness, non-judging, receptive, curiosity non-elaboration, acceptance and non-reacting. Nonetheless, no consensus exists among secular research as to the definition of mindfulness.

2.1.3 The difference concept of mindfulness between Buddhism and Western Psychology

As described above, the original concept of mindfulness in Buddhism describes a mental quality as present moment awareness (Analāyo, 2003; Keng, Smoski & Robins, 2011), with this having been interpreted and elaborated upon by Western researchers. Although the key concepts of mindfulness are similar, two differences between the Buddhist and Western conceptualisations can be identified. The first issue is that the terminology used in describing or clarifying the key concepts within the Western approach are narrow and various. Within the Behavioural Sciences, the concept of mindfulness as proposed by Western authors mainly involves and focuses only on the cognitive process or information process (Adrei, Vesery & Siegling, 2016). Furthermore, various terminologies depend on the interpretation of the authors – such as in relation to paying attention and non-elaboration. In contrast, mindfulness as based on the Buddhism approach, is derived from the gaining of an insightful state of mind

through which to access and understanding wisdom as to the truth of nature (such as in regard to no-self and impermanence). Thus, this approach is complex to describe and subjective (Holas & Jankowski, 2013; Keng, Smoski & Robins, 2011). The second issue is that the original mindfulness concept pertains to the awareness held as to present internal experiences, yet the Western secular approach emphasises both internal and external experiences. For example, the Five Facet of Mindfulness Questionnaire (FFMQ) includes mindfulness content which includes the observing of internal and external present moment stimuli, physiological sensation, thought, emotion, sight, sound and scent (Baer, 2016) – e.g., "I notice the smells and aromas of things." (Baer et al., 2006). These differences could thus affect the quality of undertaken mindfulness assessments in terms of their validity and reliability. In this study, the definition of mindfulness is rooted in its original concept and Western Cognitive Psychology, doing so in order to maintain content validity and a capacity to investigate mindfulness via a behavioural and psychological approach. Mindfulness, in the present study, is defined as an attentive awareness being held of body and mind experiences without bias (decentering) being given to the present moment. The assessment methods utilised include present moment awareness and non-elaborative attitudes (decentering). However, the assessment methods are both subjective and objective in order to increase the robustness of the findings,

2.2 Benefits and Limitations of Mindfulness

Mindfulness is used to promote the well-being and potential of humans. Several documents, including meta-analyses (e.g., Alsubaie et al., 2017; Gu et al., 2015; Khoury et al., 2015), show that mindfulness is beneficial to both physical and psychological conditions, especially in the promising effectiveness of the MBSR programme as has been revealed in several studies. For example, the Mindfulness Based Stress Reduction programme demonstrates the great influence of decreasing negative emotion (including stress, anxiety, distress and burnout) but also of improving the quality of life in non-clinical persons (Khoury et al., 2015). In addition, individuals attaining Mindfulness-Based Intervention could develop adaptive cognitive and emotional reactivity as they may accept personal affective experiences – consequently encountering decreased rumination and worrying and improved mental health (Gu et al., 2015). The positive results of the MBSR programme, as has led to increasing

mindfulness-related studies, have been applied in diverse areas such as management, social psychology, educational psychology, developmental psychology, family and child psychology, neurosciences, cognitive psychology and other areas of mental and physical health (Chiesa et al., 2017).

Nowadays, research pertinent to mindfulness has been explored beyond the MBSR programme. Mindfulness has been applied to disparate topics such as mindful relationships (e.g., Kozlowski, 2013; McMullen et al., 2006), mindfulness parenting (e.g., Lippold et al., 2015) and mindfulness-based interventions for specific groups. Currently, research in this area has shifted from the benefits of mindfulness and its effects upon individuals with stress or depression to different clinical patients, for example, patients with obsessive-compulsive disorders (e.g., Key et al., 2017). There are also mindfulness-based programmes for specific groups such as a Mindfulness-Based Cognitive Approach for Seniors: MBCAS (Keller, Singh, & Winton (2014).

In terms of limitation of mindfulness, no significant adverse effects of the mindfulness intervention programmes including the mindfulness based stress reduction (MBSR), and the mindfulness based cognitive therapy (MBCT) programme were reported from meta-analysis based on 25 trials using MBSR and 11 trials using MBCT (Wong et al., 2018). Yet mindfulness has also some limitations indicated in previous studies. For example, Johnson et al. (2016; 2017) has investigated mindfulness programme in early adolescents. The results failed to show the effectiveness of mindfulness programme to improve depression, stress and wellbeing. The authors mentioned that mindfulness programme should be consider optimal age of participants and circumstances of schools. As mindfulness is widely applied in non-clinical and clinical sectors, the limitation of mindfulness is necessary to be explored in various dimensions in order to maximise the effectiveness of mindfulness which could be beneficial for human wellbeing.

Due to the promising benefit of mindfulness, the concept has gain increasing interest in clinical and non-clinical sectors, with this having been shown in the meta-analysis report produced by Chiesa et al., (2017). As a consequence, several mindfulness scales have been developed since 2001 (Baer, 2016). In the following section, the existing mindfulness measurements and strongly-related topics, including the problematic issues that have led to the purpose of the present thesis, are addressed.

2.3 The Measurement of Mindfulness

Mindfulness has, for a number of decades, been a topic of study across many fields (Chiesa et al., 2017). However, various understandings have arisen as to this notion, primarily as mindfulness is rooted in Buddhism, an Eastern religion, and researchers may fail to possess the diversity of background required to understand and interpret this concept. As a result, measures of mindfulness vary significantly, often on the basis of the theoretical foundations and conceptualisations given in each respective school of thought.

The following section describes a number of significant topics, as include the category of mindfulness measures, the contemporary and existing mindfulness scales, the problems of mindfulness scales and the objective measures (namely the breath counting programme) as acts as a potential solution through which the drawbacks of the subjective scales employed in the present investigations can be challenged.

2.3.1 Categories of Mindfulness Measures

The utilised measures of mindfulness can be divided into several types, as depend upon the following criterion; constructs, approaches and characteristics or nature.

The first aspect is the construct of mindfulness. Here, two concepts – including the single-dimension and the multi-dimensions of mindfulness – have been proposed by authors as to the construct of mindfulness. The first concept of the construct is single-dimensional mindfulness. Under this construct, mindfulness is an attentive receptive awareness of present self-experience. Notably, this has only one dimension. The scales based upon this concept thus assess the general and overall quality of the mindfulness level. An example of a single-dimension scale is the Mindful Attention Awareness Scale: MAAS (Brown & Ryan, 2003), as has been widely applied to explorations of mindfulness (Park, Reilly-Spong & Gross, 2013; Rau & Williams, 2016). The other concept is multi-dimensional mindfulness. This concept has been developed to measure mindfulness operationally in behavioural sciences – such as psychology (Baer et al., 2006; Bishop et al., 2004). Here, the utilised scales have been developed to evaluate mindfulness elements, aspects that vary in accordance with the overarching constructs of mindfulness. This concept has been tested and supported by a number of meta-

analysis investigations or reviews (Baer, 2015; Park, Reilly-Spong & Gross, 2013; Quaglia et al., 2016; Rau & Williams, 2016). An example of this approach is found in the Five Facet Mindfulness Questionnaire: FFMQ, where five facets are observed – the present internal and external self-experience, the verbal description of these experiences, the undertaking of action with awareness, the ensuring of non-judgement and the focusing on non-reactivity to internal experiences (Baer et al., 2006).

The second aspect is the approach of the measures. Traditionally, in the general measurement of psychological variables, mindfulness can be evaluated via two approaches – subjective and objective. The first approach is the subjective or self-rating scales. In most publications, the primarily-used mindfulness scales are subjective due to mindfulness being an inner state of mind that individuals may be best placed to evaluate, for example, the MAAS. To evaluate mindfulness, respondents are thus asked to assess their own mindfulness in accordance with the items of the given scale(s). Previous investigations (see Mitchell, Bach & Cassisi, 2013) have highlighted the prominent subjective mindfulness scales as being The Mindful Attention Awareness Scale (Brown & Ryan, 2003), the Kentucky Inventory of Mindfulness Skills: KIMS (Baer, Smith & Allen, 2004), the Five Factors Mindfulness Questionnaire: FFMQ (Baer et al., 2006) and the Freiburg Mindfulness Inventory: FMI (Walach et al., 2006). The second approach is the objective or behavioural scales. Objective mindfulness scales have been developed in recognition of the problems of using subjective mindfulness scales. The main problems to have been identified in literature as to subjective mindfulness scales are the overestimation or bias of respondents and the difficulty in understanding /interpreting content or words (Baer, 2015; Chiesa, 2013; Grossman & Van Dam, 2011; Rau & Williams, 2016). Consequently, objective tests of mindfulness have been recently developed in order to address these issues and to reduce such vulnerabilities - including the Meditation Breath Awareness Score: MBAS (Frewen et al., 2014) and the breath counting programme (Levinson et al., 2014). These two behavioural mindfulness measures are similar as they focus on the awareness given or held towards breathing and the assessing of mind-wandering and task-unrelated thoughts in an attempt to reflect mindfulness. However, the sensitive nature of these measures pertains to them potentially being able to assess attention more than awareness, the latter being the essential element of mindfulness (Baer, 2015).

The third aspect is the characteristics of mindfulness. Generally, mindfulness is classified as belonging to trait or state mindfulness, with this influencing the development of scales and the items that are used within them. The first scale type here pertains to trait/dispositional mindfulness, with this evaluating a person's propensity towards mindfulness. Trait mindfulness responds to individuals possessing an average level of mindfulness despite having no experience of mindfulness practice. There are several trait mindfulness scales, including the trait version of the Toronto Mindfulness Scale: Trait TMS (Davis, Lau & Cairns, 2009). The second scale type here pertains to state, situational or cultivated mindfulness. In contrast to scales responding to trait mindfulness, this second scale type assesses mindfulness that arises as a result of mindfulness training or other forms of intervention. In other words, here, state mindfulness is positioned as having likely been cultivated through the learning of mindfulness skills (Mitchell, Bach & Cassisi, 2013). However, theoretically, although state mindfulness is different from trait mindfulness, it has been shown in previous literature that state mindfulness is significantly positive correlated with trait mindfulness (see, for example, Mitchell, Bach & Cassisi (2013)). Examples of such state mindfulness scales include the Toronto Mindfulness Scale: TMS (Lau et al., 2006) and the State Mindfulness Scale: SMS (Tanay & Bernstein, 2013).

2.3.2 Contemporary Measures of Mindfulness

To date, as has been clearly shown above, the primary standardised mindfulness measures have related to the quality, reliabilities and validities of the scales employed. However, drawbacks and gaps have also been identified in these approaches. As such, several new mindfulness scales have, in the last decade, been invented to respond to these problems.

For example, some mindfulness measures have been developed for specific populations – for example, the Mindfulness In Parenting Questionnaire: MIPQ for parents of children and youths (McCaffrey, Reitman & Black, 2017) or for adolescent (Pallozzi et al., 2017) – undertaken in an attempt to improve the suitability of these scales for the target respondents. Furthermore, measures of mindfulness have been developed in terms of specific mindful activities or behaviours – for instance, the Mindfulness Inventory for Sport: MIS (Tienot et al., 2013) or the Mindfulness In Teaching Scale: MTS (Frank, Jennings & Greenberg, 2016). In addition, mindfulness

has recently been assessed as a process and in relation to its outcomes. (Erisman & Roermer, 2011; Hadash et a*l*., 2016; Li et al., 2016) – for example, the Mindfulness Process Questionnaire: MPQ (Erisman & Roermer, 2012). Moreover, some dimensions of mindfulness – especially those based on the original Buddhist construct, such as decentering – have been deeply measured with separate specific scales or related tasks. This can be seen, for example, with the self-distance task (Hadash et al., 2016) and the Experiences Questionnaire: EQ (Fresco et al., 2007), as are employed in order to increase the content validity of the scales.

2.3.3 The Existing Mindfulness Measures

The existing standardised scales, as have been published in various studies, can be classified into four groups according to the characteristics of mindfulness being assessed. The first group is that containing trait mindfulness scales – namely the End State Mindfulness: ESM (Noguchi, 2017), the Mindful Attention Awareness Scale: MAAS (Brown & Ryan, 2003), the Five Factors Mindfulness Questionnaire: FFMQ (Baer et al., 2006), the Freiburg Mindfulness Inventory: FMQ (Walach et al., 2006), the Mindfulness/Mindlessness Scale: MMS / Langer Mindfulness Scale: LMS (Haigh et al., 2011), the Philadelphia Mindfulness Scale: PHLMS (Cardaciotto et al., 2008), the Southampton Mindfulness Questionnaire: SMQ (Chadwick et al., 2008), and the trait version of The Toronto Mindfulness Scale: TMS-Trait (Davis, Lau & Cairns, 2009). The second group is that containing state mindfulness scales – namely the Cognitive and Affective Mindfulness Scale-Revised: CAMS-R (Feldman et al., 2007), the Comprehensive Inventory of Mindfulness Experiences: CIME- β (Bergomi, Tschacher & Kupper, 2014), the Kentucky Inventory of Mindfulness Skills: KIMS (Baer, Smith & Allen, 2004), the State Mindfulness Scale: SMS (Tanay & Bernstein, 2013) and the Toronto Mindfulness Scale: TMS (Lau et al., 2006). The third group is that containing measures of the mindfulness process – namely the Applied Mindfulness Process Scale: AMS (Li et al., 2016) and the Mindfulness Process Questionnaire: MPQ (Erisman & Roemer, 2012). The final group is that containing behavioural measures of mindfulness that focus on awareness of breathing - namely the Meditation Breath Awareness Scores: MBAS (Frewen et al., 2011) and the Breath-Counting Programme (Levinson et al., 2014). Although all such scales were designed to measure mindfulness, their different constructs are based on specific underlying concepts – this being detailed in Table 1

(below). As revealed here, the five categories give an overview of existing standardised mindfulness measures.

Table 1

Existing Standardised Mindfulness Measures

Approach	Scales (Reference)	Concept of Mindfulness defined by the author	Dimension(s)	Items	Significant Psychometric Validity and Reliability
Subjective (Trait)	End-State Mindfulness: ESM (Noguchi, 2017)	"…seeing things as they are moment by moment without any judgment…" (p.305)	Uni-dimensional, with the neutrality of a non-judgmental moment-to-moment perception	10	- High internal consistency: alpha coefficients = 0.78 - Concurrent validity: This has a positive and significant correlation with nonjudging (r = 0.23, p = 0.023) and nonreactivity (r = 0.33, $p < .001$), but a negative correlation with observing (r = −0.31, p = .003) of FFMQ
	Five Facet Mindfulness Questionnaire: FFMQ (Baer et al., 2006)	"…Bringing one's complete attention to the experiences occurring in the present moment, in a non-judgmental or accepting way…"	Multi-dimensional, with observing, describing, acting with awareness, nonjudging and non-reacting	39	- High internal consistency; alpha coefficients for nonreactivity (r = .75, observing r = .83, acting with awareness r = .87, describing r = .91 and nonjudging r = .87) - High incremental validity for predicting psychological symptom level with acting with awareness, nonjudging and describing facet (R2 = .37)
	Freiburg Mindfulness Inventory: FMI (Walach et al., 2006)	"…An alert mode of perceiving all mental contents—perceptions, sensations, cognitions, affects and warm and friendly, accepting and non-judgmental attitude towards those elements of our mind…"	Uni-dimensional with acceptance, and nonjudging	14	- -High internal consistency; alpha coefficients = .86 - Construct validity: This is related (but not completely) to self-awareness and dissociation.

	Mindful Attention Awareness Scale: MAAS (Brown & Ryan, 2003)	"…The state of being attentive to and aware of what is taking place in the present…"	Uni-dimensional, with attentive awareness as to the present moment	15	- Test-Retest reliability = Time 1 (3.78) and Time 2 (3.77) mean scale scores were not significantly different, (59) = .11, ns., - the intraclass correlation = .81 (p <.001) - High criterion validity with the Mindfulness/Mindlessness Scale (Mindful engagement, r = .39, p <.001.); state mindfulness, (r = .92, p <.001); day-to-day autonomy (r = .28, p <.001)
	Mindfulness/Mindlessness Scale: MMS/ Langer Mindfulness Scale: LMS (Haigh et al., 2011)	"…a general style or mode of functioning through which the individual actively engages in reconstructing the environment through creating new categories or distinctions, thus directing attention to new contextual cures that may be consciously controlled or manipulated as appropriate…" (Langer, 1989, p. 4)	Multi-dimensional, with novelty seeking, novelty producing, engagement and flexibility	21	- Internal consistency; total alpha coefficients = .85, flexibility = .54, novelty producing = .83, engagement = .63 and novelty seeking = .74 (Bodner & Langer, 2001 cited in Haigh et al., 2011) - Convergent validity; MMS was positively associated with reappraisal, an emotion regulation strategy.
	Philadelphia Mindfulness Scale: PHLMS (Cardaciotto et al., 2008)	"…the tendency to be highly aware of one's internal and external experiences in the context of an accepting, non-judgmental stance toward those experiences…" (p. 205)	Bi-dimensional, with awareness and acceptance	20	- High internal consistency; alpha coefficients for awareness subscale= .81, acceptance subscale = .85 - Convergent validity; The acceptance subscale is correlated more strongly with MAAS than the awareness subscale in nonclinical samples. - Discriminant validity; The awareness subscale was not correlated with social desirability, but social desirability was weakly correlated with the acceptance subscale.

Scales (Reference)	Concept of Mindfulness defined by the author	Dimension(s)	Items	Significant Psychometric Validity and Reliability
Southampton Mindfulness Questionnaire: SMQ (Chadwick et al., 2008)	"…four related bipolar constructs. These are (1) 'decentred awareness' of cognitions as 'mental events in a wider context or field of awareness' versus being lost in reacting to them, (2) allowing attention to remain with difficult cognitions versus experiential avoidance, (3) accepting difficult thoughts/images and oneself, versus judging cognitions and self (4) letting difficult cognitions pass without reacting versus rumination/worry. (p.452)	Uni-dimensional, with decentered awareness, letting go of reactions, acceptance and opening awareness to difficult experiences	16	- High internal consistency; alpha coefficients = .89 - Concurrent validity; This has a significant and positive correlation with MAAS (r = .61, p <.001), a negative correlation with negative affect (r = -.62, p <.001) and a positive correlation with positive affect (r = .27, p <.05).
State Mindfulness Scale: SMS (Tanay & Bernstein, 2013)	"… a meta-cognitive process-specific approach toward experiences orthogonal from the content of the experience itself…" (p. 1287)	Uni-dimensional, with meta-awareness to bodily sensation and mental events via two levels of mindfulness (the object of mindful attention, and the quality of mindfulness)	21	-High internal consistency; alpha coefficients = .95 - Convergent validity: This has a significant and moderately positive correlation with curiosity and the decentering facet of TMS (range = .31–.43, p < .01), yet it has no significant correlation with MAAS (r = .00-.07).

	Scales (Reference)	Concept of Mindfulness defined by the author	Dimension(s)	Items	Significant Psychometric Validity and Reliability
	Toronto Mindfulness Scale-Trait Version: TMS-Trait (Davis, Lau & Cairns, 2009)	The definitions of mindfulness is based on the definition proposed by Bishop et al., (2004).	Multi-dimensional, with curiosity and decentering	13	- High internal consistency; alpha coefficients for Curiosity =.91, Decenter = .85 - Concurrent validity; In general, Decenter has a more significant and positive correlation with MAAS, FMI, SMQ and CAM-R than with Curiosity. (Decenter: r = .47-.74; Curiosity: r = .22-.48)
Subjective (State/Situation)	Cognitive and Affective Mindfulness Scale-Revised: CAMS-R (Feldman et al., 2007)	The definitions of mindfulness is based on the definition proposed by Bishop et al., (2004) and Kabat-Zinn (1990).	Multi-dimensional, with attention, present-focus, awareness and acceptance	12	- Adequate internal consistency; alpha coefficients = .74-.77 in two samples (i.e., a clinic background and a non-clinic background) - High criterion validity with FMI (r = .66, p <.001) and MAAS (r = .51, p <.001)
	Comprehensive Inventory of Mindfulness Experiences: CIME- β (Bergomi, Tschacher & Kupper, 2014)	The definition is based on the definition proposed by Kabat-Zinn (1990), but the construct was based on nine aspects of mindfulness derived from eight mindfulness scales (CAMS-R, FFMQ, FMI, KIMS, MAAS, PHLMS, SMQ, TMS) to set a balanced concept	Multi-dimensional, with 1) accepting, non-reacting, insightful orientation, 2) present awareness, 3) describing, open and 4) non-avoidant orientation	36	- High internal consistency; alpha coefficients = ≥ 0.85 except the open non-avoidant orientation factor (r = .65) - Criterion validity: This has a strong and significant correlation with FFMQ (.46-.88, p <.001)

Scales (Reference)	Concept of Mindfulness defined by the author	Dimension(s)	Items	Significant Psychometric Validity and Reliability
Kentucky Inventory of Mindfulness Skills: KIMS (Baer, Smith & Allen, 2004)	"…focusing one's attention in a nonjudgmental or accepting way on the experience occurring in the present moment….It can be contrasted with states of mind in which attention is focused elsewhere, including preoccupation with memories, fantasies, plans, or worries, and behaving automatically without awareness of one's actions…" (p. 191)	Multi-dimensional, with observing, describing, acting with awareness and acceptance without judgment	39	- High internal consistency; alpha coefficients for Observe (.91), Describe (.84), Act With Awareness (.83), and Accept Without Judgment (.87) - Construct validity with MAAS; Act With Awareness has a strong correlation ($r = .57$, $p < .0001$), but Observe has a non-significant correlation ($r = .02$), Describe and Accept Without Judgement has a moderate correlation ($r = .24$, $p < .05$, $r = .30$, $p < .001$, respectively)
State Mindfulness Scale: SMS (Tanay & Bernstein, 2013)	"… a meta-cognitive process-specific approach toward experiences orthogonal from the content of the experience itself…" (p. 1287)	Uni-dimensional, with meta-awareness to bodily sensation and mental events via two levels of mindfulness (the object of mindful attention, and the quality of mindfulness)	21	-High internal consistency; alpha coefficients = .95 - Convergent validity: it has a significant and moderately positive correlation with curiosity and decentering facet of TMS (range = .31–.43, $p < .01$). but it has no significant correlation with MAAS ($r = .00$-.07).
Toronto Mindfulness Scale: TMS (Lau et al., 2006)	"…A mode, or state-like quality, that is maintained only when attention to experience is intentionally cultivated with an open, non-judgmental orientation to experience..." (p. 1447)	Multi-dimensional, with curiosity and decentering	13	-High internal consistency; alpha coefficients = .95 - Adequate to high construct validity with absorption (curiosity $r = .31$, $p < .001$; decentering $r = .22$, $p < .01$), and awareness of one's surroundings (curiosity $r = .16$, $p < .05$; decentering $r = .21$, $p < .01$) - Decentering has incremental validity in predicting perceived stress and distress (partial $r_p = .36$)

Approach	Scales (Reference)	Concept of Mindfulness defined by the author	Dimension(s)	Items	Significant Psychometric Validity and Reliability
Subjective (Process)	Applied Mindfulness Process Scale: AMPS (Li et al., 2016)	"…a present-centered non-judgmental attention to experience liberated from cognitive–emotional abstractions and preoccupations…" (p.6)	Multi-dimensional, with decentering, positive emotion regulation and negative emotion regulation as an application of the mindfulness process	15	- High internal consistency; alpha coefficients = .91 - Construct validity; Total score was positively correlated with MAAS ($r = 0.29$, p < 0.01) and FMI ($r = 0.52$, $p < 0.01$). Decenter was most strongly correlated with MAAS ($r = 0.30$, $p < 0.01$), and FMI ($r = -0.50$, $p < 0.01$).
	Mindfulness Process Questionnaire: MPQ (Erisman & Roemer, 2012)	"…a way of relating to oneself and the world that is characterized by curiosity, openness, and acceptance…" (p.31)	Multi-dimensional, with awareness and acceptance as a process of mindfulness (how people react to their lives)	7	- Adequate internal consistency; alpha coefficients = .70 - Construct validity: This has a moderate and significant correlation with MAAS ($r = .39$) and with FFMQ ($r = .49$)
Objective (State)	Meditation Breath Awareness Scores: MBAS (Frewen et al., 2014)	"…operationalize mindfulness as a performance variable having to do with meditative concentration… ability to sustain their attention toward the breathing process during meditation practice, and accordingly their capacity to disengage from mind wandering…" (p.161-162)	Multi-dimensional, with awareness and attention	-	- Test-Retest reliability: T1 and T2was not significantly different from T2 and T3 (Z = 1.54, $p = 0.12$) - MBAS were sensitive to practice effects ($\eta^2 = .20$). - Criterion validity: MBAS has inconsistent correlations with FFMQ and TMS.
	Breath counting Programme (Levinson et al., 2014)	"…present moment awareness…" (p.1)	Uni-dimensional, with awareness as to the present moment	-	- Convergent validity with mind wandering ($r = -0.38$, $p < .001$). - Criterion validity with meta-awareness ($r = 0.42$, $p < 0.001$), with MAAS ($r = 0.20$, $p < .05$) and FFMQ ($r = 0.21$, $p < .05$). - Discriminant validity with working memory ($r = 0.04$, $p = ns$)

2.3.4 The Problems of Subjective Mindfulness Measures

Mindfulness measures have been used in several psychology-related studies. Unsurprisingly, the results of such studies have often disclosed problems or weaknesses within the subjective traditional mindfulness scales, especially in terms of their effectiveness in measuring mindfulness (Grossman & Van Dam, 2011; Malinowski, 2008). This corresponds strongly to the problems inherent in understanding mindfulness, with both the developers and respondents of Western scales being liable to misunderstand or give divergent interpretations as to what mindfulness is. Notably, here, the differences of Western understandings of mindfulness from the initial meaning held under Buddhist conceptualisations or by Eastern scholars is frequently neglected (Chiesa, 2013; Gethin, 2011; Grossman & Van Dam, 2011; Malinowski, 2008; Purser & Mililo, 2015). Nonetheless, some scholars have given due attention to the different aspects of mindfulness found between the Western and Eastern world (e. g., Christopher, Woodrich & Tiernan, 2010; Zeng et al., 2013), whereby it is understood that mindfulness is an internal state of mind that learns solely from experiences and/or practice rather than from thinking or intellectual knowledge (Grossman, 2008; Grossman & Van Dam, 2011).

Upon Mindfulness having been introduced and applied in the field of clinical psychology, namely via the Mindfulness Based Stress Reduction (MBSR) approach of Kabat-Zinn (1990), promising results began to proliferate. The results of the MBSR research have shown that mindfulness decreases negative emotions (such as stress, anxiety and depression) alongside helping to promote a better quality of life. (Khoury et al., 2015). Subsequently, researchers within the field of psychology began to devote significant attention to this area, a result of the principle approaches of psychology studying the human mind and human behaviour corresponding with the need to utilise such scientific frameworks when gaining an understanding of mindfulness (Grossman & Van Dam, 2011; Chiesa, 2013). From this, it is clear that an operational concept or definition of mindfulness must be gained for research to produce comprehensive results as to this area - witnessed. For example, Bishop et al. (2004) propose the operational definition of mindfulness as a two components model (a process of regulating attention at the present moment and a decentered attitude). This model is based on behavioural, experiential and psychological process in order that mindfulness could be investigated in terms of cognitive process and mechanism of action.

As scholars have brought with them diverse experiences of mindfulness practice and the teachings of different schools, they have proposed several definitions or concepts of mindfulness (Grossman & Van Dam, 2011; Chiesa, 2013). As such, it remains difficult to find a consensus as to the most appropriate definition or concept of mindfulness (Malinowski, 2008; Sauer et al., 2013), although some findings are evidently found across a number of mindfulness inventories (Kotze & Nel, 2016). Consequently, across the recent decades, reflection has been given to the inconsistency encountered among mindfulness-related investigations in both clinical and nonclinical settings (Andrei, Vesely & Siegling, 2016; Baer, 2016; Chiesa, 2013; Hart, Ivtzan & Hart, 2013; Park, Reilly-Spong & Gross, 2013; Purser & Milillo, 2015; Rau & Williams, 2016; Sauer et al., 2013) – a result of misunderstanding mindfulness leading to major problems in the utilisation of mindfulness measures.

The first problematic issue pertains to scales and the quality of the tests in terms of reliability and validity (Grossman & Van Dam, 2011; Park, Reilly-Spong & Gross, 2013; Rau & Williams, 2016). As no consensus has been reached among scholars or scale developers in relation to the conceptual framework of mindfulness or the definition of mindfulness, various understandings, interpretations and mindfulness scales have been developed in light of each author's own conceptualisation of the topic (Park, Reilly-Spong & Gross, 2013).

In regard to the dimensions or structures of the utilised mindfulness measures, it has been found that scales can be constructed as uni-dimensional or multi-dimensional – for example the Mindful Attention Awareness Scale (as focused on attentive awareness in daily life or mindlessness) is a uni-dimensional scale (Brown & Ryan, 2003) while the Five Factors Mindfulness Questionnaire views mindfulness as multi-dimensional (and comprises describing, acting with awareness, non-judging of experience, non-reacting and observing (Baer et al., 2006). Furthermore, although some scales have similar multidimensional constructs – namely in relation to the dimensions of awareness and attitude – different terminology is used. For the dimension of attitudes, different scales and terminology (such as acceptance, receptive, decentering and non-reacting) have been used (Andrei, Vesely & Siegling, 2016; Chiesa, 2013; Rau & William, 2016) depending on the interpretation of the respective author(s). Moreover, although different scales may share a common conceptualisation or dimensions, different characteristics may be used. For instance, the Freiburg Mindfulness Inventory

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stresses clinical signs due to its theory being rooted in Kabat-Zinn work, namely in relation to the Mindfulness Based Stress Reduction: MBSR (Walach et al., 2006). The Mindful Attention Awareness Scale, in contrast, focuses on attentive awareness in daily life or mindlessness among non-clinical participants (Brown & Ryan, 2003).

The second problematic issue relates to the respondents of the scales (Rau & Williams, 2016; Sauer et al., 2013; Van Dam et al., 2010). As mindfulness is an internal state of mind and can be cultivated through individuals' experiences (Grossman, 2008; Grossman & Van Dam, 2011), thus different backgrounds of mindfulness could have influences on the assessing mindfulness. Firstly, the interpretations of the mindfulness items (as are designated to rate mindfulness) depend upon the respondents' respective mindfulness experiences. For example, respondents without any experience of mindfulness training or practice may interpret words or terminology (such as nonjudging or non-reacting) in ways divergent to expert meditators (Grossman, 2008; Chiesa, 2013). Additionally, individual experience may also affect the self-evaluations given. For example, the scores given as to the observing dimension by individuals who have no mindfulness meditation experience are not consistent with other dimensions under the Five Factors Mindfulness Questionnaire, thus, contrasting with its underlying concept (Baer, 2016; Duan et al., 2015; Rau & William, 2016). This could be explained that meditation is necessary for mindfulness as it can stabilise emotional mind and promote self-awareness through observing. Secondly, subjective mindfulness scales are also understood to suffer from the general weaknesses of traditional subjective questionnaires and/or self-evaluation (Chiesa, 2013; Grossman & Van Dam, 2011; Rau & William, 2016). The main shortcoming here is the potential bias of those tasked with rating the held measures (Chiesa, 2013; Grossman & Van Dam, 2011). This can be seen, for instance, in the phenomenon of "response shift" whereby individuals alter their internal self-standards following practice or experience (Chiesa, 2013). As a result, respondents might change their self-evaluation post-mindfulness practice (Sauer et al., 2013). Moreover, social desirability has a crucial role in relation to self-rated scales (Chiesa, 2013; Grossman & Van Dam, 2011; Sauer et al., 2013), where respondents may rate themselves higher than their actual level in seeking to serve the purpose of the researcher or to be accepted or perceived as accomplished by others. This could produce inaccurate results in the studies of mindfulness using subjective scales.

Although subjective mindfulness measures clearly have weaknesses, they remain crucial when studying mindfulness as mindfulness is an internal state of mind. To improve upon the quality of mindfulness studies while using subjective mindfulness scales, the credibility of such findings must be enhanced – for example, via objective or behavioural measurements, as have been accepted nowadays as being able to identify the relationship between breathing and mindfulness.

2.3.5 Breathing and Mindfulness

2.3.5.1 The Role of Breathing as a Method of Mindfulness Cultivation

In regard to religious tradition, breathing has played a crucial role in mindfulness practice – namely as "Anapanasati-sutta" (Buddhadasa, 1980) whereby breathing awareness and attention is an essential method in practicing mindfulness meditation. This is mentioned in the Tripitaka, the 2600-year-old Buddhist Pali canon of the Buddha's teachings (Buddhadasa, 1980). Here, individuals can practice mindfulness by being aware of when breathing in and out, whether it is deep or shallow or the vibrations at that present moment (Buddhadasa, 1980; Grossman & Van Dam, 2011; Levinson et al., 2014). When they are awakened, individuals can be aware of their breath via their sensations and perceptions, both in terms of physiology and psychology (Grossman & Van Dam, 2011; Levinson et al., 2014). Breathing functions as an anchor of the mind – for example, if the mind becomes absent or wanders from the breathing anchor to somewhere else, that individual becomes mindless or unaware of their breathing, this being the present experience. Awareness of breathing is thus a reflection of mindfulness and those that practice breathing awareness regularly can develop their mindfulness levels gradually.

Breathing tasks, as a tool of mindfulness meditation, is now widely applied as an intervention or treatment for clinical sectors (e.g., Mindfulness Based Stress Reduction: MBSR (Kabat-Zinn, 1990); Mindfulness Based Cognitive Therapy: MBCT (Williams et al., 2007)) and for non-clinical sectors (e.g., mindfulness for adolescent life programmes (Broderick & Frank, 2014); a Mindfulness-Based Kindness Curriculum (Flook et al., 2015)). In improving wellbeing or related aspects, the benefits of mindfulness meditation through breath tasks has been robustly evidenced (e.g., Dobkin, 2008; Grossman et al., 2004; Klatt, Buckworth & Malarkey, 2009; Melloni, Margherita et al., 2013; Reibel et al., 2001). While breathing has, for 2600 years, been used to cultivate

mindfulness, it has recently developed as a measure of mindfulness (Frewen et al., 2011; Levinson et al., 2014).

2.3.5.2 The Role of Breathing in Measuring Mindfulness

Breathing is not only an essential tool in developing mindfulness, it is also applied as a valuable tool to measure mindfulness – the two main functions of this latter approach being an object of breathing awareness (Grossman & Van Dam, 2011; Levinson et al., 2014) and an anchor of mind (Buddhadasa, 1980; Grossman & Van Dam; 2011). For the first function, a mindful person is aware of their breath at the present moment via their perceptions and sensations – for instance in relation to movement and the temperature of their breath. For the second function, mindful individuals are those who pay attention to their breath, as it is in the present experience, as this will ensure their mind is not swept away from the anchoring breath (mind wandering). Through these two functions, breathing manifests as a major objective mindfulness benchmark measure. A number of behavioural mindfulness measures have been introduced recently – such as the Meditation Breath Attention Scores (MBAS) (Frewen et al., 2008, 2011) and the breath counting programme that evaluates mindfulness via breath counting accuracy (Levinson et al., 2014). The procedural task of the MBAS is similar to a breath counting programme in term of its use of breath counting. However, to evaluate mindfulness, respondents are asked to evaluate and report their mindfulness in MBAS tasks, while the mindfulness level is calculated from the accuracy of the breath counting based on the key pressing of participants without the self-reporting of a breath counting programme.

2.3.6 Breath Counting Accuracy as a Behavioural Measure of Mindfulness

In the laboratory studies of this thesis, I have replicated the breath counting programme of Levinson and colleagues (2014), doing so to assess mindfulness in terms of breath counting accuracy. The advantage of using this programme is the potential to improve upon the validity of the mindfulness measurements. This programme measures mindfulness via a behavioural or objective approach (as does not encounter the drawbacks of the subjective approach which have been discussed earlier in this thesis). Moreover, a behavioural or objective approach also assesses the opposite aspects of mindfulness (namely mind-wandering) and thus mindfulness is evaluated in various

aspects. As a consequence, the robustness of the assessment of mindfulness-related results may increase. Prior to employing the breath counting programme in the present investigation, it is necessary to address its significant details in the following section.

2.3.6.1 Theory and Concept

This programme has developed by using breath counting accuracy as an index level of mindfulness. Here, Levinson et al. (2014) proposed a core concept that mindfulness increases accuracy of breath counting, despite counting not being important for mindfulness. Thus, the more accurate individuals count, the more mindful they are held to be. They focus on mindfulness being self-awareness at the present moment, notably by referring to the meaning of mindfulness relating to the Buddhist notion of "Sati". Buddhism, in this regard, denotes two characteristics of a mindful person; that they are not distracted from the present moment by any internal and external stimuli and that they are aware of their present experiences (including moments of mind-wandering). Hence, the operational definition of mindfulness is identified in terms of practicing "mindfulness of breathing" as focuses on two characteristics of mindfulness; being aware of one's breathing at the present moment without shifting away from the breath anchoring and being aware of mind wandering when attention is lost and regained during the counting of breaths. However, it is worth considering other significant components of mindfulness not emphasised here – such as nonjudgment and nonattachment (Levinson et al., 2014).

2.3.6.2 Procedures

The breath counting programme is developed in the form of a computer programme, whereby the raw data (in the form of a CSV file) is the recorded key pressing of each breath. Participants are required to count their breathing for 18 minutes with a six-minute resting baseline period. Prior to commencing the breath counting, the participants can practice this to ensure they understand and can undertake this task correctly. Participants are required to breath naturally and to be aware of their breath without controlling it. Here, they are asked to press the down arrow key (↓) after breath number 1 to 8 but to press the right arrow key (→) for breath number 9. The cycle then resets. Should participants realise that they have miscounted, they must press the upward arrow key (↑) and this resets the cycle (Appendix A). While counting their breath, participants are asked three questions to evaluate their state of mind wandering.

Task unrelated thought (TUT) is here tested with the question "Just now, where was your attention?" (rated from completely on-task to completely off-task), and the checking of their count is tested with the question "Which number was your last breath count?" The counting set with questions is called a probe set. The respondents are asked these questions every 90 seconds approximately and between 60 -120 seconds.

2.3.6.3 What Do the Scores Look Like?

The breath counting accuracy scores are calculated from the recorded key pressing by a computer programme in a CSV file, with this being illustrated in Figure 2.

Figure 2. Example of Breath Counting Set Recorded by a Breath Counting Programme

Accuracy of breath counting is calculated as a percentage of the number of correct counting sets from the total number of counting sets. As show in Figure 2, the correct counting set is the set where the participant counts and presses the correct key according to the commands (a down arrow key (↓) for breath 1 to 8 and a right arrow key (→) for breath 9). Incorrect counting sets are sets in which the participants failed to follow the key pressing commands, did not maintain an ongoing 9-count, witnessed self-identified miscounting or where wrong count probe answers were given. The formula for this is 100 percent minus the results of the sum of the incorrect counting sets divided by the total number of count sets. The programme therefore produces breath counting accuracy scores that reflect the mindfulness of breathing in terms of the respondent's awareness at the present moment.

2.3.6.4 Quality of the Breath Counting Programme

The quality of this breath counting programme has been examined in four studies by Levinson et al. (2014), with the construct validity of this measure being tested in terms of its convergent validity, criterion validity, discriminant validity and incremental validity. As breath counting accuracy refers to mindfulness as the presence of the present moment awareness, not state of absent minded induced by stimuli, here, it was found that it has convergent validity with mind wandering, a mind distracted to stimuli ($r = -0.38$, $p < .001$). As well, it has criterion validity with meta-awareness which is clear recognition of the present states of consciousness ($r = 0.42$, $p < 0.001$). For discriminant validity with working memory, breath counting accuracy was not significant correlated the scores of the automated operation span task OSPAN which focuses on the tasks using working memory to maintain previous information ($r = 0.04$, $p = $ ns.), this refers that mindfulness is different from working memory. In terms of the criterion validity, it has significant correlation with other standardised trait mindfulness scales; MAAS ($r = 0.20$, $p < .05$) and FFMQ ($r = 0.21$, $p < .05$).

2.3.6.5 Related Aspects of Self-Reported Mindfulness

As described in the previous section, as an objective or behavioural measure of mindfulness, the breath counting programme described here has a relationship with subjective mindfulness scales. According to the criterion validity, the accuracy of the breath counting measured by this programme is significantly and positively correlated with the trait mindfulness scale; MAAS ($r = 0.20$, $p < 0.05$) and FFMQ ($r = 0.21$,

$p < 0.05$). Moreover, in regard to the concept of mindfulness, researchers have identified clearly that the mindfulness of breathing assessed via this programme pertains to the awareness of the present moment yet excludes the facet of nonjudgement or nonattachment (Levinson et al., 2014, p. 1). Notably, it is mentioned that:

"…mindfulness practice may importantly include facets (e.g. nonjudgment, nonattachment) that may not be as emphasized in mindfulness of breathing as in other mindfulness styles…".

Thus, it could be assumed that the accuracy of breath counting indicates the level of awareness held in regard to the self-reported measuring as to the mindfulness scale.

Overall, mindfulness in the investigations in this thesis has been evaluated not only by the traditional subjective scales (MAAS, Trait TMS), but also through the behavioural or objective scale of breath counting accuracy. In order to cover aspects of mindfulness both uni and multi-facet of mindfulness, MAAS and Trait TMS were used as the instrument in the present study. MAAS ((Brown & Ryan, 2003) is widely used and standardised to assess mindfulness in terms of uni-facet, and its scores indices mindfulness as mindlessness, the opposite state of mindfulness as was described in Buddhist Pali Canon (Anālayo, 2013). Trait TMS is multi-facet of trait mindfulness which was developed based on Buddhism concept and validated with Buddhists with mindfulness meditation (Lau et al., 2006). Furthermore, the breath counting programme (Levinson, et al., 2014) was utilised to assess mindful present awareness as an objective approach. The purpose of using these two methods is to improve the quality of the mindfulness investigation results by employing various measures.

Chapter Three

Emotional Reactivity

It is accepted that emotion is a crucial topic of investigation within the field of psychology, especially in terms of the areas pertinent to human wellbeing – with this having been highlighted in several studies (e.g., Boyes et al., 2017). In a similar vein to the World Health Organisation report (2017), negative emotion, particularly, anxiety and depression is a significant and influential factor of human mental health. Emotion has thus been frequently explored in various dimensions – including in relation to emotional reactivity and in regard to the effects of emotion in both healthy populations and clinical groups. Emotion reactivity is the experience of emotion whereupon a person is facing affective stimuli which may elicit emotional disturbance and where time is needed to recover and to re-find an emotional balance (Nock et al., 2008). Evidence is available to demonstrate that emotional reactivity plays a crucial role in wellbeing. For instance, in a meta-analysis conducted by Houben, Van Den Noortgate and Kuppens (2015), as surveyed 79 papers and 793 effect sizes, consistent relationships were reported between emotion-related variables including emotional change and the valence of emotion (positive and negative emotion) and psychological well-being. Hence, this thesis has focused on investigating emotional reactivity. Prior to proceeding towards the examination of emotional reactivity, it is necessary to provide an overview of emotional reactivity in the forthcoming sections.

3.1 The Definition of Emotion

Previous studies have identified the complexity of emotion and its associated phenomena, with the definitions given to emotion thereby varying across different fields and schools of thought (Frijda, 2008; Sander, 2013). Kleinginna and Kleinginna (1981), in investigating the existing definitions and concepts held as to emotion, found 11 distinct categories. Those are 1) the affective category as focuses on positive and negative feeling, 2) the cognitive category as focuses on cognitive processes such as reappraisal, 3) the external- stimuli category as focuses on affective stimuli derived from external circumstances, 4) the physiological category as focuses on the physiological mechanism related to emotion, 5) the emotional/expressive behaviour

category as focuses on emotional expression as an overt behaviour, 6-7) the disruptive and adaptive categories as focus on emotional impact due to its functions, 8) the multi-aspect category as focuses on various emotional components such as affective and cognitive factors, 9) the restrictive category as focuses on the effort involved in identifying the differences between the emotion concept and other psychological variables –for example, motivation, 10) the motivational category as focuses on motivation-related emotion and 11) the sceptical statements category as focuses on the rejection of the emotion concept. Although the definitions given to emotion continue to vary significantly, and it remains difficult to find a complete definition of emotion being universally-held among theorists (Kleinginna & Kleinginna, 1981), some typical characteristics of emotion can be found in this regard. For example, Sander (2013) has proposed four crucial criterions as to the definition of emotion, with these being detailed below.

The first criterion is that emotion is multidimensional, and includes physiological, cognitive and expressive facets (e.g., Ekman, 1992; Frijda, 2008; Scherer, 2000). In earlier models of emotion, focus was placed on physiological and social-related factors, with more recent models having included more specific details within their frameworks. For example, Sander (2013) has identified five main components within the mechanisms of emotion elicitation – namely appraisal, expression, autonomic reaction, action tendency and feeling.

The second criterion is that the process of emotion has two phases – emotion elicitation and emotional response. It should be noted that some theories have included more specific factors within their understandings of the process of emotion (such as appraisal components, reflexes and instincts – see, Sander, 2013). Both phases respond to the five components mentioned above.

The third criterion is that emotion relates to significant objects or matters. This relevance could stimulate emotion in terms of motivation alongside the mechanism of the appraisal component (e.g., Frijda, 2008; Lang, 1995; Scherer, 2000). The affective objects or matters could possibly induce positive (pleasant) emotion by satisfying the goal or needs of an individual – for instance, in relation to the need for security. In contrast, this could induce negative (unpleasant) emotion by failing to satisfy the goal or needs of an individual (Sander, 2013).

The final criterion is that the duration of emotion is short when compared with other types of affective aspects. According to Sander (2013), emotion appears promptly and remains for a short time when induced by affective stimuli, whereas other affective states (such as mood plausibly) exist for a longer duration than emotion as they are induced repeatedly by the cognitive reappraisal process.

Hence, the definition of emotion emphasises the consensus that emotion is a subjective phenomenon which comprises multiple facets – as includes subjective inner experiences (feeling), physiological processes and consequences, cognitive processes and expressive behaviours. These aspects are produced via the process of emotion (emotional elicitation and emotional responses). Still, in regard to emotional reactivity, various theories or models of emotion have been proposed.

3.2 Theories of Emotion Involving Emotional Reactivity

The theoretical issue of emotion has been a topic of discussion for 2000 years (Scherer, 2000; Solomon, 2008; Strongman, 1996). Here, a number of diverse disciplinary theories or models of emotion (e.g., neuroscience-based, computer-based and psychology-based models) have been proposed. These disparate approaches have initiated numerous controversies among philosophers and theorists (Sander, 2013), with the historical theories or models as to this area having had significant influence upon the contemporary models of emotion (Scherer, 2000). The current context of psychology witnesses four main theories of emotion as to the process of emotion – a classical theory of emotion (namely James-Lange theory) and contemporary theories (as pertains to the structure of emotion theory including dimension theory, category theory and cognitive theory (appraisal theory).

Classical theories – James-Lange Theory (i.e., the William James and Carl Lange Theory) developed the theory of emotion by stating the relationship between physiological change and emotion, as contrasts with the traditional way that perception will affect an individual's mental state (namely emotion) and will then produce bodily expression (Strongman, 1996).

William James (1884 as cited in Strongman, 2003, p. 14) gave a significant and influential statement on emotion whereupon he asserted that "…*bodily changes follow*

directly the PERCEPTION of the existing fact, and that our feeling of the same changes as they occur Is the emotion…"

James-Lange Theory has noted that if a human organ is stimulated by perception, it will give afferent feedback and a feeling will subsequently be formed. The stimulation of the cerebral cortex of the brain will produce emotion through viscera and skeletal muscles (Lang, 1994; Strongman, 1996). This theory has become the root of emotion theory and continues to influence contemporary emotion theory, with this being especially true for affective psychology-based and psychophysiology-based theories (Scherer, 2000; Strongman, 1996), despite philosophers and theorists having continued to argue about these theories for over a century (Strongman, 1996; Cannon, 1987).

In regard to contemporary theories of emotion, the study of emotional reactivity has to date focused on two main factors that influence emotional elicitation – the endogenous factor and exogenous factor (Scherer, 2000). The internal endogenous factor pertains to the biological system of individuals while the external exogeneous factor responds to the experiences of individuals, events or circumstances, with both relating to physiological-based and cognitive-based theories.

In respect of physiological-based theory, theorists have focused upon emotional phenomena on a biological or physiological level. In exploring the involvement of emotion and physiology, emphasis has been given to the nervous system and endocrine system (Strongman, 1996) including behaviours and the reaction of the body (e.g., Plutchik, 2001; Panksepp, 1992). Physiological-based theories focus on the structure of emotion via two groups – dimensional theory and category theory (Kragel & LaBar, 2013).

Dimensional Theory, as a theory of emotion, focuses on two dimensions of emotion. The first dimension is valences; negative (unpleasant) and positive (pleasant). The second dimension is arousal of emotion; relaxed to intense. This theory addresses the notion that the valance dimension is interrelated with the arousal dimension in specific emotions (Kragel & LaBar, 2013). For example, the theory as to the motivation organisation of emotion, as proposed by Peter Lang (Lang, 1995; Lang, Bradley & Cuthbert, 1998), asserts an evolutionary foundation of emotion with a two-factor motivational organisation**.** Here, the system of the human brain organises an emotional

response in reflection of a given stimulus, be it appetitive or aversive. These two motivational systems (appetitive and defensive), as found in the brain, oscillate between activation and arousal. Emotional state, in having different levels of arousal or intensity based upon this motivational system, can thus be investigated.

Category Theory is the other crucial physiological-based theory and, in contrast to the dimensional theory, this focusses on the distinction between emotions. The predominant theorists in this area are Paul Ekman, Carroll Izard and Jaap Pankseep (Tracy & Randles, 2011). Ekman (1992), for example, has identified that particular basic emotions have different responding patterns within the Autonomic Nervous System. Although Ekman does not deny the influences of culture or of individual experience, emphasis is given to biological factors. A number of diverse models of basic emotion have been proposed, however in general basic emotions are held to refer to primitive emotional phenomena that originate from some brain areas (such as the subcortical area) and are noted as being involved in the emotional process (Tracy & Randles, 2011).

The other crucial theory of emotion is related to the cognitive approach, with this having arisen due to the widespread empirical evidence that highlights how cognitive factors influence human emotion (Tong & Jia, 2017). Cognitive-based theories pertain to the nature and process of the appraisal theory (Strongman, 1996). In contrast to the physiological-based theory of emotion, appraisal or cognitive theorists argue that emotions relate to other processes rather than solely to the physiological process. The process of perception witnesses a person evaluate a present stimulus in order to prepare for action, while the cognitive process sees the individual validate the stimulus and judge it (Clore & Ortony, 2008). In general, theorists have considered physiological and behavioural changes to arise from cognition (Strongman, 1996), with emotion thus having the potential to relate to individual experience and cognition (Clore & Ortony, 2008). Emotional response is thus adaptive towards affective stimuli regarding appraisal for individual wellbeing (Moors et al., 2013). Consequenctly, various cognitive theories (from simple to complex) have been developed (Strongman, 1996). The basic concept here focuses on the mechanisms of the cognitive process in terms of emotion elicitation, emotion meaning and/or labelling by the cognitive appraisal process (Sander, 2013; Strongman, 1996; Frijda, 2008; Ochsner & Schacter, 2000).

One of the significant appraisal theories is transactional theory, as involves the cognitive process and emotional coping (see as proposed by Lazarus and Folkman (1984)). Here, when individuals are exposed to affective situations (stressors), they will consider such experiences to influence their emotion and wellbeing. The interpretation and evaluation of a situation is a cognitive appraisal which has three appraisal stages; primary, secondary and tertiary. The primary appraisal is based on the motivational relevance of the affective stimuli or stressors (i.e., harm, threat, challenge and benefit). Thus, the different personalities and/or backgrounds of individuals might lead them to interpret stressors differently. The secondary appraisal is the evaluation of capacity as to whether a person can handle it and how they cope with emotional situations. Lazarus (1991) has asserted that when stress emerges, individuals tend to cope with emotion in two ways – via problem-focused coping as relies on actions to improve that situation and emotion-focused coping as relies on adapting attention or the interpretation given towards the stressful situation. The tertiary appraisal is a cognitive reappraisal where evaluation is given to the results of the coping strategy employed, as provides that individual with experiences through which to learn how they are to regulate their emotion in the future. Individuals perform cognitive reappraisal via various strategies to regulate their emotions (Gross & Thompson, 2009), as will be described in the next section.

Recently, bio-physiological theory and social psychological-based theory has been bridged through social cognition theory, namely via social cognitive neuroscience (Ochsner & Schacter, 2000). This approach emphasises two main aspects that impact upon human emotion; the mechanism of inform processing based on cognitive neurosciences and personal goals and motivations influenced by memory from social learning or experiences. Through the social cognitive neuroscience approach, emotion can be better understood in terms of the direction and process (Ochsner & Schacter, 2000).

Such theories of emotion can be classified into different groups as to their criteria. For example, Scherer (2000) has classified the current psychological-based models of emotion into four groups. The first group consists of dimensional models, as comprise uni-dimensional and multidimensional models. Dimensional models focus on the dimensions of emotion; valence and arousal as elicited during the physiological emotion process. The second models are discrete with circuit models and basic emotion

models. Discrete models emphasise the expression of emotion, particularly the physiological responses witnessed among emotion types. The third models are meaning-oriented (a so-called lexical model) and stress the labelling of emotion types influenced by the cultural interpretation of individuals. Finally, componential models focus on the appraisal mechanism as influenced by culture and individual differences. All models or theories of emotion, as described, could possibly be applied to study emotional reactivity in terms of the process of emotion.

During recent decades, several theories as to emotion have been proposed, with controversies having arisen as a result. For example, Zajonc (1984) proposed that emotion can be induced without cognitive appraisal, in opposition to Lazarus (1984), who asserted that cognitive appraisal is a significant factor in inducing emotion. In the current study, the association between mindfulness and emotional reactivity emphasises cognitive appraisal theory as mindfulness involves the cognitive process directly in terms of the appraisal given and indirectly in regard to the attentional awareness held towards affective stimuli which influences emotional reactivity (as described earlier). However, it could be said that the physiological theory of emotion possibly relates to the relationship between mindfulness and emotional reactivity as mindfulness also includes self-awareness of physical sensation at the present moment. Furthermore, in regard to the definition of mindfulness, being self-aware of present sensation without appraisal or with appraisal is a mindful state of mind.

3.3 The Study of Emotional Reactivity

3.3.1 Process of Emotion

In order to investigate emotion reactivity, emotional processing, as begins when an individual perceives internal or external affective stimuli, can be explored. Such perception will subsequently stimulate a physiological state (such as in relation to the nervous system) and will finally impact upon the cognitive process (Gainotti, 2000; Kordsachia, Labuschange & Stout, 2017; Scherer, 2000). In terms of a working definition of the emotional process, Rachman (1980) has identified the need for three conditions in the operational emotional process; an emotional disturbance must be shown, a declination of that emotional disturbance must be shown, and the normal emotional condition or behaviour must then be restored. Here, the emotional process can be measured by using affective stimuli to evoke emotional reactivity (Rachman,

1980). When studying emotional reactivity, researchers can thus focus on two main issues; emotion elicitation and emotion expression (including measuring emotion).

In studying emotional reactivity in relation to psychology, two main approaches can be utilised (Feldman et al., 2014). The first, that of laboratory-based study, witnesses a participant's emotional reactivity being elicited by affective stimuli and measured in relation to the emotional reactivity change from their normal emotion state or baseline. The second approach assesses the long-lasting or stable duration of a participant's emotional reactivity – such as by recording mood (Borod et al., 2000). Here, emotional events in daily life are utilised (e.g., Shallcross et al., 2013). Both healthy participants and clinical populations have been widely utilised in such research (e.g. Britton et al., 2006; Feliu-Soler et al., 2014). As a result, the strategies of emotion elicitation have been diversely developed. Affective stimuli in such studies include pleasant and unpleasant stimuli being presented to participants in order to induce positive and/or negative emotions or moods. Different kinds of emotional stimuli (in relation to senses and perceptions) have now been developed and while affective stimuli are mainly visual and audio media, new emotion-inducing stimuli has been developed to improve the effectiveness of such materials.

3.3.2 Emotional Stimuli

Generally, affective stimuli contain various characteristics, yet emotion-inducing stimulus has focused on three main sensory and cognition types; visual, auditory and words.

Visual Affective Stimuli: Composed of verbal and non-verbal stimuli (Borod et al., 2000). Those are as follows:

Affective pictures are a static visual stimulus and, in general, are presented in different categories (such as pictures of human faces or objects). All pictures can induce different yet main dimensions of emotion – such as valence (negative to positive), intensity or arousal (relaxed to aroused) and dominance (approach to avoid). This technique, originally created by Ross Buck in 1978 as a slide presentation for use in clinical investigations (Borod et a*l*., 2000), has subsequently been employed in other fields of study (such as social psychology and cognitive psychology) (Colden, Bruder &

Manstead, 2008). To date, affective pictures have thus been widely used to evoke emotions (e.g., Garrett & Maddock, 2006; Güntekin & Başar, 2014). One standardised resource of such affective pictures, as is widely applied in emotion studies among nonclinical populations, was developed by Lang, Bradley & Cuthbert (1998) and is now mainly referred to as IAPS (the International Affective Pictures System). At present, new resources as to affective pictures have been developed – for example, The Geneva Affective Picture database (GAPED) (Dan-Glauser & Scherer, 2011), The Nencki Affective Picture System (NAPS) (Marchewka et al., 2014) and The Besançon Affective Picture Set-Adolescents (the BAPS-Ado) (Szymanska et al., 2015). Pictures of facial expressions have also been developed in terms of a specific affective set of pictures. For example, the Nimstim Set (Tottenham et al., 2009) has now been widely used in experimental research (e.g., Dricu & Frühholz (2016).

The other visual affective stimulus is emotional film clips, this representing dynamic visual stimuli (Garbert-Quillen et al., 2014). Such material has been used for decades to induce emotional states such as mood, anger or sexual intensity (Uhrig et al., 2016) and has been shown to be effective in invoking emotion in regard to ecological validity (Rottenberg, Ray & Gross, 2007). This has thus been widely utilised in laboratory settings (e.g., Bos et al., 2013; Brumbaugh et al., 2013; Carlin & Ahrens, 2012; Erisman & Roemer, 2010).

Affective Audio – Audio stimulus is the other effective material through which to elicit emotion (Brodal, Osnes & Specht, 2017) and is similar in effectiveness to affective visual stimuli (Sokhadze, 2007; Zhou et al., 2013). Affective audio has various forms including affective sound (e.g., the International Affective Digitized Sound System), music (Grewe et al., 2009; Koelsch, 2013), or voice as can convey plenty of nonverbal information through variances such as pitch and loudness (Brück et al., 2013). Prosodic cues or voice signals can trigger brain processes and responses (Brück et al., 2013) and can thus be applied in emotion related experiments (e.g., Dricu & Frühholz, 2016; Eich et al., 2008; Sokhadze, 2007; Tsai, Chen & Tsai, 2013; Zhou et al., 2013).

Affective Words – Language is a symbol system of emotion (Kissler, 2013) and can be employed as an emotion stimulator due to the ability of words to trigger emotion through the referential process and emotion schema of its content (Bucci, Maski &

Murphy, 2016; Kissler, 2013; Tabibna, Lieberman & Craske, 2007). A link between language and the emotional process has been proposed by Kissler (2013), with previous emotion-related investigations having used writing tasks to evoke emotions (e.g., Fogarty et al., 2015; Hinojosa et al**.**, 2009).

Miscellaneous Affective Stimuli - Other forms of stimuli, aside from those aforementioned, have also been employed – for example, disgusting stimuli (e.g., a stoma bag – Reynolds et al., (2014)), a stress-inducing computer game (Singh, Sharma & Talwar, 2012), affective autobiographical memory (van den Hout et al., 2011), odours (Croy, Olgun & Joraschky, 2011; Mohanty & Gottfried, 2013) and Affective face (Way et al., 2010).

Affective visual and audio stimuli were applied in the present investigation (three analogue laboratories) as, in previous documents, this has been indicated as effective in eliciting emotional reactivity. Moreover, in comparing affective words and miscellaneous affective stimuli, the standardised resources of the affective visual and audio stimuli are accessible while no standardised affective words or miscellaneous content is available. In addition, affective words can be interpreted differently based on the individual differences of the readers. As a consequence, this may impact upon the way that individuals respond to the affective words.

3.3.3 Emotion Assessment

As emotion is so complex and can be expressed through many channels (including via physiological, behavioural and cognitive responses), it can be assessed through various methods (Gardhouse & Anderson, 2013; Kassem & Mendes, 2013). In terms of psychology, measuring emotion could be traditionally classified into two groups; a) the subjective assessment or the observing of the internal state of emotion and b) the objective assessment or the observing of external expression (Borod et al., 2000; Gardhouse & Anderson, 2013).

The Subjective Assessments. Emotion reactivity is measured via the subjective assessment of standardised self-report. Here, respondents are required to evaluate their own mental state in terms of emotion (Gardgouse & Anderson, 2013). Subjective

measures of emotion can be divided into two types; the self-report of one's current emotional reactivity (state) and through the standardised emotion-related scales (trait).

The self-report of emotional reactivity has been used in experimental studies of emotion for decades. Generally, respondents are asked to evaluate their own emotion state, as has been evoked by affective stimuli, in terms of valance (positive, negative or neutral), arousal or intensity (relaxed to aroused) via a Likert-type scale (Borod et al., 2000; Gardhouse & Anderson, 2013). For example, the Self-Assessment Manikin: SAM (Backs, Silva & Hans, 2005; Bradley & Lang, 1994) uses semantic differentials to evaluate feeling states. The Emotion Reactivity Scale: ERS (Nock et al., 2008), in contrast, has 21 items measuring sensitivity, intensity and persistent facets of emotion.

The second subjective measure is the standardised emotion-related scales. Various scales have been developed to measure the emotional traits of individuals (Gardhouse & Anderson, 2013). For example, the Positive and Negative Affect Schedule: PANAS Scale (Watson, Clark & Tellegen, 1988) is used to investigate the relationship of emotional reactivity and mortality (Mroczek et al., 2015), while the mood scale is used to investigate the relationship between dispositional mindfulness and depressed mood through self-report. (Fishbein et al., 2016). However, some scales have been developed to measure emotional reactivity towards specific factors – such as the Emotional and Behavioural Reactions to Intrusions Questionnaire (EBRIQ) (Berry et al., 2010).

Objective Measures or Assessment - To measure emotional reactivity via an objective approach, I can assess bodily reactions as triggered by emotion through neuropsychological-based processes (Central Nervous System: CNS, and Autonomic Nervous System: ANS). In regard to psychophysiology, emotion is involved with the nervous system, as is composed of the central nervous system (CNS), including the brain and spinal cord, and the peripheral nervous system (PNS) (Larsen et al., 2008). Upon the nervous system being stimulated by affective stimuli, autonomic motor, striated motor, endocrine and neuromodulator responses will be initiated and will affect the emotional body state (Adolphs & Damasio, 2000; Sander, 2013). Emotion can thus be assessed through the central and peripheral nervous system.

In regard to CNS-based assessment, the expression of emotion has typically been observed and recorded by technology such as EEG, EMG and MRI.

Electroencephalography (EEG) is an electrophysiological measure (Keil, 2013) and is widely applied in measuring emotional reactivity in terms of brain activity in experimental research – for instance, in Balconi, Grippa & Vanutelli (2015) and Sokhadze (2007). Electromyogram (EMG), as another assessment of CNS activity (Larsen et al., 2008), records facial muscle movement upon a brain being triggered by affective stimuli (Gardhouse & Anderson, 2013) – for instance, in Bos et al (2013), Lang, Bradley & Cuthbert (1998) and Zhou et al. (2013). Emotional reactivity is now investigated via neuroimaging (MRI), a modern technology that directly images brain activity during emotional elicitation (George et al., 2000; Iordan et al., 2013).

In terms of the peripheral nervous system or autonomic nervous system (ANS), a widely-used ANS-based assessment is related to the measure of electrodermal activity (Gardhouse & Anderson, 2013). Electrodermal activity has been investigated for over a century and is widely applied in studies as to psychological topics (especially those pertinent to emotion and its psychological effects upon human skin (Bach et al., 2009; Braithwaite et al., 2013; Kreibig, 2010; Dawson, Schell, & Filion, 2007). Skin conductance response (SCR) is a form of electrodermal activity (EDA) or galvanic skin response (GSR) that reflects electrical changes in the eccrine sweat glands of skin (notably in the hands and is induced by the sympathetic autonomic nervous system (ANS) (Figner & Murphy, 2011; Kreibig, 2010; Mendes, 2008). SCR refers to *"…the phasic change in electrical conductivity of skin…"* (Braithwaite et al., 2013, p. 4) and can therefore be measured by passing a slight current from two electrodes through a person's skin. From this, resistance to the current can be assessed (Mendes, 2008). In general, SCR is calculated in terms of the amplitude of change in the unit of microSiemen (µS) (Figner & Murphy, 2011). SCR is thus widely applied to assess emotional reactivity (Bach et al., 2009; Braithwaite et al., 2013; Kreibig, 2010), primarily as it is related to the sympathetic emotional process (Bach et al., 2009; Kreibig, 2010). From affective pictures system (APS) research, variations of emotional intensity, in it being indicated via the amplitude of skin conductance, has been shown to be influenced by the respective types of image viewed – be it pleasant, unpleasant or neutral (Alpers, Adolph & Pauli, 2011; Pastor et al., 2008).

Aside from these approaches, other psychophysiological related-measures are also used to evaluate emotional reactivity (Coan & Allen, 2008). The psychophysiological aspects that reflect emotion reactivity are, for example, respiration

rate, heart rate (e.g., Kreibig, 2008; Brumbaugh et al., 2013; Sokhadze, 2007), bodily temperature (e.g., Tsai, Chen & Tsai, 2014) and facial action (e.g., Xie & Zhang, 2016).

To improve the quality of such studies as to emotion, it is crucial to measure emotion from both subjective and objective approaches as emotion is multidimensional and various emotion facets must thus be accessed through respectively suitable measures (Gardhouse & Anderson, 2013). In the present study, in terms of the emotional subjective experiences, emotional reactivity was assessed by the traditional subjective scales including the emotional trait (the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983)) in two surveys, and the state of emotional reactivity (a self-reported scale) in the laboratory. In terms of the objective assessment of physiological response, Skin conductance response (SCR) was evaluated in laboratory as SCR is a responsive biomarker of emotional reactivity involving sympathetic nervous system (Braithwaite, 2015, *Naqvi* & Bechara, 2006) as SCR is produced through the emotion process involving cognition, and closely related to the autonomic nervous system (Braithwaite, 2015) - as described in the previous section.

3.4 Link between Mindfulness and Emotional Reactivity through Emotion Regulation

Mindfulness could be involved with emotion, a complex phenomenon that comprises personal experiences, behaviour and physiological changes (Gross & Thompson, 2009). This is in line with the emotional process, namely as the aspect of mindfulness has two cognition-related aspects; awareness with attention given to present inner self experiences and non-elaborating towards such experiences. Here, the emotional process is involved with emotional reactivity and, importantly, with emotion regulation (del Piero, Saxbe & Margolin, 2016). Gross and Thompson (2009) have proposed a model of emotion regulation that could arise as an explicit and implicit strategy. Explicit emotion regulation requires effort, on a conscious level, to initiate and monitor when emotion is regulated. Furthermore, this regulation involves awareness and insight. In contrast, during implicit emotion regulation, individuals regulate their own emotion, as induced via stimuli, automatically and without awareness, insight or monitoring (Braunstein, Gross & Oschner, 2017; Gyurak, Gross & Etkin, 2011). The process of emotion regulation has antecedent-focused forms – including situation

selection (to avoid or approach a situation), situation modification (to modify a situation to change its emotional impact), attentional deployment (to change attention towards or away from emotional experiences) and cognitive change (to reappraise emotional experiences) – and response-focused forms, namely response modulation (to use diverse strategies to manipulate emotional responses) (Gross & Thompson, 2009). Antecedent-focused emotion regulation pertains to cognitive reappraisal whereas response-focused emotion regulation corresponds to expressive suppression (Gross, 1998). Within the Gross and Thompson model of emotion regulation, individuals regulate their emotion by manipulating cognition or suppressing emotional response – as described above.

However, theoretically, in relation to the aspects of mindfulness, mindful persons can engage with emotional situations without manipulating their emotional experiences as induced by external situations. In reference to the emotion regulation process, mindful people tend not to select emotional situations via their bias or judgement, tend not to modify situations to alter their emotional impact and instead pay attention to present experiences without changing their attention to avoid experience or evaluate/appraise/suppress their feelings or emotional responses. Mindfulness could thus be associated with emotion through the process of emotion regulation. Yet, the exploration as to the relationship between mindfulness, emotion regulation and emotion is needed to clarify and expand upon the held understanding whether the association between mindfulness and emotion is influenced by strategies of emotion regulation. The present study has thus investigated the relationship among these three variables.

Chapter Four

Trait Mindfulness and Cognitive Emotion Regulation: An Investigation as to the Relationship with Emotional States.

4.1 Abstract

The aim of the study was to explore the relationship between trait mindfulness, cognitive emotion regulation strategy and emotional states, anxiety and depression in two cultural groups. Previous studies largely focus on state mindfulness, but few have investigated the impact of trait mindfulness on emotional states. Moreover, there was a few studies exploring the predicting power of trait mindfulness and strategies of cognitive emotion regulation for emotional states in diverse cultural groups. A total of 155 US residents and 1,800 healthy Thai university students were recruited for this study. Trait Mindfulness was measured by two scales; Mindful Attention Awareness Scale (MAAS) and Toronto Mindfulness Scale- Trait version (Trait TMS), while cognitive emotional regulation was measured by the Cognitive Emotion Regulation Questionnaire (CERQ), and Emotional states was measured by the Hospital Anxiety and Depression Scale (HADS). The results demonstrated that various forms of mindfulness, and CER strategies exhibited different strength and direction of correlations with anxiety and depression. Mindful attention awareness and Catastrophizing (a sub-strategy of CER) distinctly predicted anxiety and depression. Moreover, cognitive emotion regulation was a significant mediator on the negative association between mindfulness (mindful attention awareness, decentering) and anxiety and depression. Therefore, it can be concluded that the relationship between trait mindfulness and emotional regulation strategies is limited to mindful attention awareness and Catastrophizing strategy for anxiety and depression despite differences among these cultural groups. Mindful attention awareness and decentering was negatively associated with anxiety and depression through cognitive emotion regulation. The finding could expand understanding on this topic and beneficial for human mental health.

4.2 Introduction

To date, a growing body of literature has suggested that mindfulness plays a pivotal role in human wellbeing, especially in relation to emotional states (Eberth & Sedlmeier, 2012; Giluk, 2009). Mindfulness has been examined as to its association

with emotional states since Kabat-Zinn's (1990) work in this area. A pioneering programme of Mindfulness-Based Stress Reduction (MBSR) being introduced to a clinical group as a treatment to decrease stress has, in several studies, demonstrated robust evidence of its effectiveness, with this being found with samples in both clinical and non-clinical conditions (e.g., Dobkin, 2008; Grossman et al., 2004; Klatt, Buckworth & Malarkey, 2009; Khoury et al., 2015; Melloni et al., 2013). Following the MBSR programme, mindfulness has been applied in a clinical approach for depression via Mindfulness-Based Cognitive Therapy (MBCT) by Segal, Teasdale & Williams (2002). MBCT has been developed from the MBSR programme and has equally reported effectiveness in decreasing depression (Chiesa et al., 2017; Edenfield & Saeed, 2012). As a consequence, State Mindfulness cultivated via practice has been explored in regard to several issues involving emotion – including its association with emotion and the effect of mindfulness on negative emotions (Chiesa et al., 2017).

In terms of the relationship held with emotional states, several studies suggest a meaningful relationship between State Mindfulness. For example, a meta-analysis of 29 studies performed by Khoury et al. (2015) reported that mindfulness cultivated by MBSR has a great effect upon stress and a moderate effect upon anxiety. Despite this, in order to expand upon the understanding held as to mindfulness and emotional states, it may be beneficial to further examine the correlation between trait mindfulness and emotional states as trait mindfulness – i.e., an individual's mindfulness in everyday life (Brown & Ryan, 2003; Kiken et al., 2015) – could be associated with state or cultivated mindfulness. However, previous research has established that the correlation between trait and state mindfulness is inconsistent (e.g., Bravo et al., 2018; Davidson, 2010; Grossman, 2008), thus the association between trait mindfulness and emotional states should be reinvestigated, especially with other substantial variables (including emotion regulation) in order to expand the understanding held as to this association.

4.2.1 Overview of Mindfulness

Originally, mindfulness was mentioned in Buddhist Pali canyon as Buddha taught. Regarding Buddhism, mindfulness refers to the holding of self-awareness as to the experiences of mind and body at the present moment with equanimity (Phra Thēpwēthī (Prayut), 1995; Thanissaro, 2000). In Western psychology, a widely used definition of mindfulness has been given by Kabat-Zinn (1990, p.4) as "…paying

attention in a particular way: on purpose, in the present moment and nonjudgmentally". Due to the rapid growth in mindfulness-related studies being conducted (Chiesa et al., 2017), mindfulness has thus far been described in diverse ways, as possessing disparate contents and as being conceptualised in many different ways. For example, in regard to the types of mindfulness available, this is primarily classified between Trait Mindfulness (i.e., an individual tendency or stability of being mindful – Brown et al., 2007; Glomb et al., 2011) and State Mindfulness (i.e., a mental state of being mindful that could be developed by experiences – Bishop et al., 2004; Glomb et al., 2011). Despite the disparate forms, two main models of mindfulness facets have been proposed. The first, as a concept proposed by Brown and Ryan (2003), holds that mindfulness is uni-dimensional and applies to the overall awareness employed in daily life in terms of the demonstration of open and receptive awareness as to the present moment. This concept was applied to develop the Mindful Attention Awareness Scale (MAAS), as is widely used in the study of mindfulness (Park, Reilly-Spong & Gross, 2013; Rau & Williams, 2016). Alternatively, some assert mindfulness to be multi-dimensional, a notion supported by a number of studies (Baer, 2016; Park, Reilly-Spong & Gross, 2013; Quaglia et al., 2016; Rau & Williams, 2016). Multi-dimensional mindfulness was strongly established by Bishop and colleagues (2004). Under this model, operationally mindfulness comprises two dimensions; self-regulation of attention as to present mental experiences and curiosity, openness and acceptance towards those experiences (Bishop et al., 2004). This operational concept has been applied to develop several mindfulness scales – such as the Trait Version of the Toronto Mindfulness Scale (Davis, Lau & Cairns, 2009). However, both models emphasise the key aspect of attentive self-awareness being given as to the present moment and with non-elaborative attitudes.

4.2.2 Overview of Emotional State

Emotion is a phenomenon with multidimensional elements, with several definitions thus having arisen here (Cacioppo & Gardner, 1999; Plutchik, 2001). Kleinginna & Kleinginna (1981, p. 355), having reviewed 92 definitions of emotions, as included 9 related statements since the 18th Century, stated that "…Emotion is a complex set of interactions among subjective and objective factors, mediated by neural~hormonal systems, which can (a) give rise to affective experiences such as feelings of arousal, pleasure/displeasure; (b) generate cognitive processes such as

emotionally relevant perceptual effects, appraisals, labelling processes; (c) activate widespread physiological adjustments to the arousing conditions; and (d) lead to behaviour that is often, but not always, expressive, goal directed, and adaptive...". Within Psychology, emotions are phenomena which focuses on feelings, cognition, behaviours and bodily reactions (Frijda, 2008).

Theoretically, in general, the components of emotion comprise a physiological facet (biological process and bodily consequences induced by affective stimuli), a cognitive facet (cognitive appraisal towards affective stimulus) and an expressive facet (behavioural expression elicited by affective stimulus) (e.g., Ekman, 1992; Frijda, 2008; Scherer, 2000). Emotions are produced by these components through the emotion process (Frijda, 2008; Gainotti, 2000; Kordsachia, Labuschange & Stout, 2017; Rachman, 1980; Scherer, 2000). To date, several models of emotion process are proposed – see, for example, the modal model of emotion produced by Gross and Thompson (2009). In this model, individuals are initially exposed to situations to which they give their attention, subsequently appraising or giving meaning to this situation before, finally, potentially witnessing the results of this appraisal impacting upon the emotion responses that emerge (Gross & Thompson, 2009).

In addition, Gross and Thompson (2009, p. 7) suggest that, for humans, whereupon emotions are generated, individuals will employ strategies of emotion regulation, this being "…the heterogeneous set of process[es] by which emotions are themselves regulated…" in regard to its theoretical aspects. Gross and Thompson further assert that both the internal and external processes of individuals can affect their emotional responses to stimuli (Gross & John, 2003). Individuals generally regulate their emotions via two strategies; via cognitive reappraisal by focusing on changing one's thought towards the emotional stimulus in order to alter its influences upon their emotion and via expressive suppression by inhibiting their emotional response (Gross & John, 2003). Additionally, Garnefski and colleagues (2002) have divided such cognitive emotion regulation into nine strategies – Self-Blame, Other-Blame, Rumination, Catastrophising, Putting into Perspective, Positive Refocusing, Positive Reappraisal, Acceptance and Planning. According to appraisal theory, cognitive reappraisal has a crucial role to play due to emotion being induced through an evaluation of events and situations. Thus, appraisals (both positive and negative) can impact upon the form of emotional response given (Gross & John, 2003; Roseman & Smith, 2001). Similarly, a

number of studies have reported that emotion regulation influences emotional states (e.g., Webb, Miles & Sheeran, 2012).

Emotional states are outcomes of the emotion responses evoked by affective stimuli. Here, emotional states may be classified into two main types; positive emotions and negative emotions. However, such positive and negative emotions may be combined with distinct categories of emotion. For example, Plutchik (2001) proposes a wheel of emotions comprising eight primary categories – including happy, excited, tender, scared, angry and sad. These eight categories of emotion comprise different emotions. For example, anxiety is one emotion categorised under the scared emotion group within this wheel. Anxiety is induced by threatening situations, especially as to expectations of the future. As a result, this may impact upon the individual's bodily response and strong negative feelings (Öhman, 2008). In contrast, depression is situated in the sad emotion category (Plutchik, 2001). Individuals with depression have an obstinately distressed mood (Klainin-Yobas, Cho & Creedy, 2012). Anxiety and depression are negative emotional states and thus excessive anxiety could have a negative influence upon an individual's wellbeing (Greeson & Brantley, 2009). In a similar way, depression could interfere with the psychological and physiological functions of people (Barnhofer & Crane, 2009). The health problems associated with anxiety and depression are becoming a growing and global public health concern according to the World Health Organisation (2017). Thus, several investigations have been conducted as to these negative emotional states in order to improve human wellbeing. Mindfulness is one frequent variable which has been explored in various dimensions – including in relation to its association with anxiety and depression (Chiesa et al., 2017).

4.2.3 Associations between Mindfulness, Emotion Regulation and Emotional States: Previous Studies and Limitations.

4.2.3.1 Mindfulness and Emotional States

Notably, a large number of studies have described the link between mindfulness and emotional states (e.g., Feldman et al., 2016; Khoury et al., 2015; Lyvers et al., 2014), while many findings have derived from meta-analysis reports. The meta-analytic review as to 163 studies by Giluk (2009) established that mindfulness is positively

associated with positive emotion, while negatively associated with negative emotion. Similarly, Mesmer-Magnus et al., (2017), having performed meta-analysis as to the relationship between trait mindfulness and affect (positive or pleasant affect, and negative affect or unpleasant affect) in a sample of 270 studies among healthy persons affirmed that there is a significant positive correlation between mindfulness and mental health (including general mental health, psychological well-being, worry, and psychological flexibility). In contrast, the negative emotions of anxiety and depression are negatively correlated with mental health. Moreover, a number of investigations (e.g., Desrosiers, Klemanski & Nolen-Hoeksema, 2013; Ostafin, Brooks & Laitem, 2014; Nezlek et al., 2016; Raphiphatthana, Jose & Kielpikowski, 2016) have highlighted the significant correlations that lay between mindfulness constructs and emotional states. For example, in terms of attentive present awareness, Nezlek et al. (2016) have examined whether the level of held awareness of the present moment and Trait Mindfulness is related to positivity and stress. Here, it was found that attentive present awareness, trait mindfulness and a positive feeling towards daily life is positively associated, while such mindfulness is negatively correlated with stress. Furthermore, in the matter of attitude-related constructs – such as non-elaborating – previous studies have also demonstrated the substantial negative association held with an individual's emotional state. This is exemplified in the work undertaken by Raphiphatthana, Jose and Kielpikowski (2016) where it was found that non-judging and non-reactivity predicted negative affect.

4.2.3.2 Mindfulness, Emotion Regulation and Emotional States

As mentioned in the previous sections, mindfulness has focused on the key phrases of 'self-awareness', 'at the present moment' and 'non-elaborative thought'. As an emotional state is the outcome of the emotion process (in relating to the cognitive informative process), there is thus a likelihood that these variables are associated with each other in terms of emotion regulation. In existing studies, two approaches are employed to look into the pertinent associations. The first approach is where consideration is given as to whether emotion regulation is a mediating variable in the relationship between mindfulness and emotional states. An example of this is the study of Desrosiers and colleague (2013) where 187 participants with depression and anxiety provided data via self-reported scales, the results of which demonstrated that the relationships that arise between mindfulness and anxiety are mediated significantly by

rumination and worrying while the association between mindfulness and depression was mediated by rumination and cognitive reappraisal. On the other hand, some scholars propose that mindfulness possibly mediates the association between emotion regulation and emotional states – witnessed, for example, in a model presented by Teper, Segal & Inzlicht (2013) where it is held that mindfulness might improve emotion regulation by increasing the capabilities of the executive control of the brain and that this could thus impact upon an individual's emotional state.

The second approach focuses on mindfulness-based emotion regulation, whereby it is held that mindfulness itself is an emotion regulation strategy (e.g., Chiesa, Serretti & Jakobsen, 2013; Chamber, Gullone & Allen, 2009; Guendelman, Moderios & Rampes, 2017). For example, Chamber, Gullone & Allen (2009) have presented a model of mindful emotion regulation by integrating the traditional fundamental strategies of emotion regulation (suppression and cognitive appraisal) with mindfulness. To regulate emotion mindfully, individuals are able to be aware of present experiences of emotion without using either suppression or cognitive appraisal towards the emotional experiences (Chamber, Gullone & Allen, 2009). Noticeably, mindfulness-based emotion regulation is different from traditional emotion regulation, where the latter strategies emphasise the manipulating of emotions via cognitive appraisal and expressive suppression while mindfulness-based emotion regulation focuses on the awareness of emotion without the intervention of all experiences. Thus, comparisons as to traditional emotion regulation strategies and mindful emotion regulation in terms of its association with emotional states have recently been performed. Here, some findings demonstrate that mindfulness has a greater association with positive emotional states but less correlation with negative emotional states. For instance, Keng et al., (2013) examined the influence of mindfulness (Trait and State) and cognitive reappraisal on sad mood among 129 participants, finding that a decrease in sad mood is better predicted by Trait Mindfulness than by cognitive reappraisal. Similarly, in exploring the advantages between Trait Mindfulness and emotion regulation strategies (cognitive reappraisal and suppression), Chamber et al., (2015) undertook an investigation as to young persons with depression, showing greater associations between Trait Mindfulness with lower depression-related symptoms (including anxiety, ruminative thought and maladjusted attitudes) while recovery from depression can be better predicted by Trait Mindfulness. This suggests that it is beneficial to regulate emotion

mindfully (Chamber *et al*., 2015). In addition, Quaglia, Goodman and Brown (2014) compared mindful emotion regulation with appraisal and suppression in terms of emotion in social interaction in daily lives among couples, finding that positive emotion during social interactions is predicted by mindful emotion regulation but not by cognitive reappraisal and suppression.

However, Brockman and colleagues (2017) investigated whether mindfulness, cognitive reappraisal and suppression influenced positive and negative emotion in daily lives. The findings demonstrated that mindfulness is correlated with lower negative emotion and higher positive emotion. Conversely, suppression and cognitive reappraisal was correlated only with positive emotion in daily life. However, all explored strategies indicated different variance in predicting emotional wellbeing. The authors thus suggested that an appropriate strategy through which to regulate emotion might involve specific contexts. It is yet to become clear what comprises the correlation between mindfulness, emotion regulation and emotional states – as mentioned previously. Thus, future investigation as to this issue is needed to extend the results of these previous studies.

4.2.3.3 The influential culture-related issues involving association between mindfulness, emotion regulation and emotional states.

To date, no exploration has been given as to the associations between mindfulness, emotion regulation and emotional states among a population with diverse cultures, despite cultural factors being able to influence individuals towards regulating their emotions (John & Gross, 2007). The cultural impacts upon emotion regulation have been studied by Gross and John (2003) in relation to four different ethnic groups; African American, Asian American, European American and Latino. Here, it was found that European Americans use the strategy of expressive suppression less than other groups, however there is no difference in terms of the cognitive reappraisal strategy. In addition, cultural factors might impact upon the correlation between emotion regulation and emotional states (Butler, Lee & Gross, 2007; Hu et al., 2014; Soto et al., 2011). Thus, in regard to previous reports (e.g., Hu et al., 2014) it is necessary to pay attention to culture-related variables in order to refine the understanding held as to emotion regulation.

In addition, a culture-related issue is also involved with the limitations of studying mindfulness in terms of the capabilities of understanding the mindfulness concept among research samples (Rau & Williams, 2016; Sauer et al, 2013; Van Dam, Earleywine & Boders, 2010). Importantly, culture can be indirectly related with the understandings held as to mindfulness through religion as the concept of mindfulness originated from Buddhism, an Eastern religion. Generally, Buddhists are familiar with and exposed to the notion of mindfulness in terms of knowledge and experiences (Christopher, Woodrich & Tiernan, 2014) as it represents a core teaching of the Buddha (Phra Thēpwēthī (Prayut), 1995). When compared with Buddhists, non-Buddhists, regardless of their experiences with mindfulness, might understand mindfulness-related contents less (Christopher, Woodrich & Tiernan, 2014). This shortcoming could influence the quality of mindfulness studies in terms of mindfulness measures, namely as respondents may understand the items of mindfulness scales based on their own experiences of mindfulness. Consequently, respondents might interpret the same items via different meanings, subsequently evaluating these with different criteria (Grossman, 2008; Chiesa, 2013). Hence, Baer (2015) suggested that investigation among different cultural groups – Western and Eastern samples – should be undertaken to find the commonality and differences relating to mindfulness in order to expand our held understanding as to genuine mindfulness. Therefore, in the present investigation, data from two samples from different countries (Thailand as a represent country of Buddhist group background, and the US as a represent country of non-Buddhist) were collected.

Furthermore, a search of the literature reveals the problematic issues in investigating mindfulness in terms of trait Mindfulness measures with different concepts (e.g., Baer, 2016; Giluk, 2009). The different scale concepts might exert influence on the results of any investigation – examined in the study of Handley, Baker and Garland (2017) whereby the Mindful Attention Awareness Scale (MAAS) assessing overall mindfulness and the Five Facets of Mindfulness Questionnaire (FFMQ) assessing five facets of mindfulness (including observe, describe, act with awareness, nonjudge and nonreact – Baer et al., 2006) were used to explore the associations encountered with the facets of personality (extraversion, openness to experience, conscientiousness, neuroticism and agreeableness) pertaining to the Big Five Model of Personality. In this study, the MAAS scores were correlated with three facets of the personality scores (conscientiousness, neuroticism and agreeableness)

while the FFMQ scores were correlated with all facets of personality (Handley, Baker & Garland, 2017). Previous studies of mindfulness have suffered from this shortcoming (see, for example, Grossman & Van Dam, 2011; Malinowski, 2008). Thus, it may be beneficial to assess mindfulness with diverse scales in order to improve the clarity of any gained results.

4.3. Rationale and Aims of the Present Investigation

As noted in a previous section, while many investigations as to the relationship between trait mindfulness and emotional states have been conducted (e.g., Feldman et al., 2016; Khoury et al., 2015; Lyvers et al., 2015), little has been published as to the relationship between mindfulness and emotional states in terms of emotion regulation strategies. In addition, the existing findings are unclear. In addition, some limitations and shortcomings in terms of cultural issues and the diversity of mindfulness measures are likely to affect investigations. Therefore, two surveys in the first part of this PhD were developed to explore mindfulness and emotion regulation in regard to the relationship with emotional states (anxiety and depression) by using two different inventories of trait mindfulness among a Western population (United States of America) and an Eastern population (Thailand) to expand and deepen the research results.

Research Questions

1. Is mindfulness negatively associated with emotional reactivity (anxiety and depression)?
2. Is unadjusted cognitive emotion regulation positively associated with emotional reactivity (anxiety and depression?
3. Is adjusted cognitive emotion regulation negatively associated with emotional reactivity (anxiety and depression?
4. If mindfulness is associated with emotional reactivity (anxiety and depression), is this association mediated by cognitive emotion regulation strategy?

Hypotheses

1. Mindfulness is negatively associated with emotional reactivity (anxiety and depression).
2. Unadjusted cognitive emotion regulation is positively associated with emotional reactivity (anxiety and depression).

3. Adjusted cognitive emotion regulation is negatively associated with emotional reactivity (anxiety and depression).

4. The association between mindfulness and emotional reactivity (anxiety and depression) is mediated by cognitive emotion regulation strategy

4.4 Method

4.4.1 Design*:* The present study is conducted by a survey design with questionnaires.

US: The Amazon Mechanical Turk (MTurk) online survey has been utilised in this investigation. MTurk is an Internet crowdsourcing provision serviced by Amazon via www.mturk.com. This study has applied MTurk due to its ability to access a wide research sample based in the US (Chandler & Shapiro, 2016; Levay, Freese & Druckman, 2016).

Thailand: In a similar way to the US study, I have applied a survey design with this sample group, however, I have used a traditional survey (with a paper and pencil questionnaire) to collect the research data because data could be collected effectively and directly through gatekeepers in classrooms in Thai university in short periods (two weeks). Additionally, access to the internet in Thailand is not as available and effective compared to the USA.

4.4.2 Participants*:* Two groups of samples were investigated; US residents and Thai residents.

US: 155 respondents, as based in the US, were collected via an MTurk online survey. All participants gave informed consent. 77 of the participants were male (49.70 %) and 78 (50.30%) were female. The age range of the sample spans from 19 to 46 years old (M = 35.12; SD = 8.25). In terms of religion, 71 participants had no religion (45.80%), 4 were Christian (2.60 %), 4 were Hindu (2.60%), 3 were Sikh (1.90%) and 73 (47.10%) had other religious beliefs. In regard to ethnicity, 7 were mixed race (4.50%), 4 were black (e.g., African American) (2.60%), 6 were Middle Eastern (e.g., Arabic) (3.9%), 7 were South Asian (e.g., Indian) (4.50%), 5 were Caucasian (3.20%) and 126 were Other (81.30%). After completing the survey, a monetary reward (of 10 cent) was offered to each respondent as an incentive to participate in the investigation.

Thailand: 1,800 students in two universities in Chiang Mai, Thailand, comprised the research volunteers for this survey. All of the respondents were either undergraduate or graduate students enrolled in either general psychology or psychology for daily life courses. These participants gave their cooperation and consent for this investigation via the lectures of the classes. Of the respondents, 1050 were women (58.30%) while 750 were men (41.70%), with all being aged between 17-53 (mean = 19; *SD* = 2.23). In terms of religious beliefs, 38 (2.10%) had no religion, 1,688 were Buddhist (93.80%), 65 (3.60%) were Christian, 9 (.50%) were Muslim. Finally, 498 (27.70%) had no experience of meditation while 1,298 (72.10%) had meditation experience.

4.4.3 Measure: The respondents were requested to complete the following scales.

The Mindful Attention Awareness Scale (MAAS) **(**Brown & Ryan, 2003**).** This scale has 15 items in order to evaluate overall mindfulness in everyday life. The concept of mindfulness within this scale focuses on open and receptive awareness as to the present moment. An example of an item is "I forget a person's name almost as soon as I've been told it for the first time" A respondent rated their frequency of the experience via a 6-point Likert scale – between 1 (almost always) and 6 (almost never). The result was calculated by reversing all of the scores and then producing a summation. An individual with a higher score is thus held to demonstrate a higher level of mindfulness. Previous examination was shown that Cronbach's alpha reliability was 0.78-0.92 (Medvedev et al., 2016).

The Trait Version of the Toronto Mindfulness Scale **(**Trait TMS**) (**Davis, Lau & Cairns, 2009**).** This measure consists of 13 items based on the original Toronto Mindfulness Scale (Lau et al**.,** 2006)**.** This scale has two components; curiosity **(**for example, "I am curious about each of my thoughts and feelings as they occur"**)** and decentering **(**for example, "I am more invested in just watching my experiences as they arise, than in figuring out what they could mean"**).** Each item is rated via a 5**-**point Likert scale from 0 **(**not at all**)** to 4 **(**very much**).** The internal consistency, Cronbach's alpha coefficients for curiosity facet were .91, and for decentering facet were .85 **(**Davis, Lau & Cairns, 2009**).**

The Short Version of the Cognitive Emotion Regulation Questionnaire (CERQ), with this measuring the specific cognitive emotion regulation strategies used by the

participants in response to threaten experiences or stressful life events (Garnefski, Kraaij & Spinhoven, 2002). This scale consists of 18 items with 9 subscales. Each subscale refers to the strategy of cognitive emotion regulation; self-blame (e.g., I feel that I am the one to blame for it), other-blame (e.g., I feel that others are responsible for what has happened), rumination (e.g., I often think about how I feel about what I have experienced), catastrophising (e.g., I continually think how horrible the situation has been), putting into perspective (e.g., I think that it hasn't been too bad compared to other things), positive refocusing (e.g., I think of pleasant things that have nothing to do with it), positive reappraisal (e.g., I think I can learn something from the situation), acceptance (e.g., I think that I have to accept the situation) and planning (e.g., I think what I can do best). Each subscale has 2 items. A respondent was asked to self-rate on a 5-point Likert scale from 1 (almost never) to 5 (almost always). The result of each subscale was calculated by summing the scores of two items in its own category. The Cronbrach's alpha coefficient in previous studies was from .75 to .86 among all subscales (Garnefski, Kraaij & Spinhoven, 2002).

The Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983). Anxiety and depression, as are an emotional state or affection, are evaluated by this scale. This type of questionnaire can measure a wide range of affections (Gray & Watson, 2007; Gardhouse & Anderson, 2013). In this scale, respondents are asked to identify their feelings according to 14 statements; 7 items focus on anxiety (for example, "I have lost interest in my appearance") and 7 items assess depression (for example, "I feel tense or "wound up""). The answer is given via multiple-choice options from 0 to 3, with each statement answer possessing different content. The result can be calculated by summing up the score of each answer in the group it belonged to.

All of the pertinent scales– MAAS, Trait TMS, HADS and CERQ – used in the MTurk survey were applied in the investigation in Thailand. However, as the sample comprised Thais, all of the scales were validated by translating the scales from English into Thai (undertaken by two bilingual experts), with the scales subsequently being translated back from Thai to English by two other bilingual experts. In this step, the original English version of the scales were compared with the scales of Thai version. Some differences were found. The possible explanation might involve with the experiences or background of translators in mindfulness and English related culture. For example, item 1 of the Trait TMS - I experience myself as separate from my changing

thoughts and feelings. The meaning of item refers to the mindful state of mind which is difficult to understand if a translator has not adequate of mindfulness practice. Furthermore, the English words in some items can be understood accurately only if the translator knows and understand English deeply as a native English speaker (mother tongue), for instance, item 1 in the HADS -   I feel tense or 'wound up'. In order to decrease this shortcoming related to cross-cultural psychological factors, the items were adjusted and translated based on the etic approach. Regarding the etic approach, the items were translated with the universal, not cultural-specific, concept that can apply across all circumstances or conditions (Haskel et al., 1992) because the present study investigated and measured mindfulness and emotional states as universal or common concepts among human. After this step, five native Thai students tested the translation in order to validate the trans-culture nature of the test, with the scales subsequently being adjusted in response to the received feedback. The reliability and validity of the scales were then investigated from the data collected from Thai students.

4.4.4 Procedure:

US: After gaining ethical approval from the Ethical Board of the School of Psychology, the University of Leicester, a research advertisement and project was launched in the online crowdsourcing service of MTurk to recruit participants. The questionnaire (as consisted of a set of standardised scales), alongside the consent form (as indicated the rights of the participants), was then distributed. Respondents were asked to complete the survey comprehensively, with missing data not meeting the requirements of the survey program. After completing the questionnaire, the respondents were given a monetary incentive of 10 cents per person via the MTurk system.

Thailand: The questionnaire was distributed to 1,800 Thai undergraduate students as part of the data collection process. It was expected that it would take approximately 30 minutes for a respondent to complete the questionnaire.

4.4.5 Data Analysis

All data collected for the present research was analysed via SPSS Version 24. Scales Reliability was examined by two programmes. The reliability of the trait mindfulness scales – the MAAS and the Trait TMS – was computed by Cronbach's coefficient alpha, whereas the nine subscales of the CERQ reliability were calculated by

using the Pearson Correlation coefficient as this is appropriate for one subscale with two items (Cramer, Atwood & Stoner, 2006; Sainfort & Booske, 2000). In terms of the sample size, the G Power programme (Faul et al., 2007)* was utilised to identify a sufficient sample size with a medium effect at the power of .80 for regression analysis to be undertaken. The minimum sample was found to number 127. Thus, the sample size of the two surveys (155 US residents and 1,800 Thai residents) is adequate. In order to examine the correlation between trait mindfulness and emotion regulation strategies as independent variables, and emotional states (anxiety and depression) as dependent variables, a Pearson Product Moment Correlation was initially utilised.

Furthermore, One way-MANOVA was performed to investigate the differences of emotional states (anxiety and depression) between a group with meditation experiences, and one without mediation experiences. This was produced as both theory and previous studies suggest that meditation relates positively with mindfulness (e.g., Josefsson et al., 2011). Mediation experience thus could be a potential confounding variable that influences the association between mindfulness and emotional states (anxiety and depression). As such, three-step multiple regression analysis was further conducted in order to identify whether mindfulness has an incremental value over the models of mindfulness and cognitive emotion regulation strategies in predicting anxiety and depression. In addition, a hierarchical multiple regress has been used to control the effects of the confounding factors – the demographic variables including gender (transform from a category variable to a dummy variable by coding; 0 = female, 1 = male), age, and meditation experiences (0 = no meditation experience, 1 = have meditation experiences) in Step 1 and the effects of emotion regulation strategies (in Step 2) on the emotional states of anxiety and depression. Finally, in Step 3, I investigated if trait mindfulness can increase the predicting values of the existing model after controlling for age, gender, meditation experience, and cognitive emotion regulation strategies.

Regarding hypothesis 2, in terms of mediation analysis, the significant correlations between mindfulness, cognitive emotion regulation, and emotional states (anxiety and depression) which were indicated in the results of correlation analysis were analysed by the method of bootstrapping, the PROCESS Macros programme in SPSS (Preacher & Hayes, 2008). To examine the mediation effect, mindfulness variables (mindful attention awareness, curiosity and decentering) were added as independent

variables, dependent variables were anxiety and depression, and mediators were the strategy of cognitive emotion regulation. Gender, age, and meditation experience were controlled as covariates. Via this programme, the standard errors of 5,000 bootstrapped samples were examined. The results will indicate the direct effect of mindfulness towards anxiety and depression after controlling cognitive emotion regulation, and the indirect effect of mindfulness on anxiety and depression through cognitive emotion regulation strategy (mediators). If zero does not exist in the range of 95 % confidence intervals between the lower limit and the upper limit, the indirect effect for the mediator is significant. In the other words, that mediator has a significant effect on the relationship between independent and dependent variable (Preacher & Hayes, 2008).

4.5 Results:

4.5.1 Reliability Analysis

The reliability of the trait mindfulness scales (MAAS, Trait TMS) and HADS was calculated as the Cronbach alpha coefficient reliability. Additionally, descriptive data (i.e., mean, standard deviation, minimal and maximal scores) was produced, as is illustrated in Table 2 (below). The coefficient of Conbrach's Alpha in all scales is acceptable (.60-.92). However, notably, there might be some shortcomings of the scales. Firstly, the Alphas for the Thai sample is lower, especially with the Decentering (.60) and Depression facets (.63). As described in a previous section, a possible explanation for this could relate to the accuracy of the test's translation (Tavakol & Dennick, 2011). Although the standardised process was performed to validate all English scales into Thai scales (as described in the previous section), the ability of the Thai translators (non-native English speakers) to understand and interpret the concepts could play a role here. Secondly, the means between the two samples among the scales are different – for example, Decentering, Anxiety and Depression. The differences could be a result of several reasons, including the accuracy and interpretation of the tests, demographic factors such as religious factor between Buddhists (a majority of the Thai respondents) and non-Buddhist (a majority of the US resident respondents), as well as the surrounding culture/way of life (Matsumoto & Hwang, 2012) between American (Western) and Thai (Eastern) people.

Table 2.

Descriptive Data and Cronbach Alpha Coefficient Reliability for Trait Mindfulness Scales; MAAS, Trait TMS and HADS

	Scales	M	SD	Min	Max	α
MAAS	US	41.45	13.67	16	76	.92
	Thai	65.23	10.96	23	90	.87
Trait	Curiosity Facet: US	18.73	5.61	6	30	.90
TMS	Curiosity Facet: Thai	15.28	4.09	0	24	.78
	Decentering Facet: US	24.03	4.75	10	35	.71
	Decentering Facet: Thai	15.43	3.78	2	28	.60
HADS	Anxiety Facet: US	13.78	5.11	1	21	.90
	Anxiety Facet: Thai	8.37	3.50	0	20	.78
	Depression Facet: US.	16.04	4.15	4	21	.84
	Depression Facet: Thai	5.14	3.06	0	19	.63

Note. M = Mean; SD = Standard Deviation; Min = Minimal Scores; Max=Maximal Scores; α = Coefficient Alpha; MAAS= Mindful Attention Awareness Scale; Trait TMS; Trait Toronto Mindfulness Scale; HADS = Hospital Anxiety and Depression Scale

To measure the reliability of the CERQ-short subscales, the Pearson's product moment correlation coefficient was generated – with this revealing that the correlation between two items in all subscales are large in the US group and small-to-large in the Thai group, with this being illustrated in Table 3.

Table 3.

Pearson's Product Moment Correlation Coefficient between Two Items of CERQ-Short Subscales

Subscale of CERQ-Short		Pearson Correlation Coefficient	Significance	Correlation Strength
Self-Blame	US	.62**	p<.001	Large
	Thai	.20**	p<.001	Small
Other-Blame	US	.70**	p<.001	Large
	Thai	.45**	p<.001	Large
Rumination	US	.42**	p<.001	Large
	Thai	.37**	p<.001	Large
Catastrophising	US	.77**	p<.001	Large
	Thai	.57**	p<.001	Large
Positive Refocusing	US	.53**	p<.001	Large
	Thai	.23**	p<.001	Small
Positive Reappraisal	US	.50**	p<.001	Large
	Thai	.45**	p<.001	Large
Refocus on Planning	US	.55**	p<.001	Large
	Thai	.37**	p<.001	Large
Putting into Perspective	US	.49**	p<.001	Large
	Thai	.28**	p<.001	Medium
Acceptance	US	.71**	p<.001	Large
	Thai	.53**	p<.001	Large

** *p* <.01 (2-Tailed)

Correlation Strength Indexes by McGrath & Meyer (2006)

Notably, the correlation coefficient of the subscales of self-blame, positive refocusing and putting into perspective among Thai participants was lower than in the US group. A possible explanation is that this might be impacted upon by the accuracy of the scales' translation, as depends on the understanding and interpretations of the translators (Tavakol & Dennick, 2011) as described in the previous section.

4.5.2 Correlation Analysis

Table 4 (US sample) and Table 5 (Thai sample) present the correlations found among subjective mindfulness (mindful attention awareness by MAAS and curiosity and decentering by Trait TMS), cognitive emotion regulation strategies and emotional state (anxiety and depression). According to Table 4, the trait mindfulness scores; mindful attention awareness and decentering (except the curiosity facet of Trait TMS) have a significant and negative correlation with anxiety and depression in the US sample. In a similar way, the cognitive emotion regulation strategies (with the exception of putting into perspective and acceptance) have a significant association with anxiety and depression. The strategies of self-blame, other-blame, rumination and catastrophising have a positive association, while positive refocusing, positive reappraisal and refocus on planning have a negative association with emotional state. In regard to the strength of the correlation with anxiety, catastrophising has the strongest ย

positive correlation, then mindful attention awareness (negative), rumination (positive), self-Blame (positive), decentering Trait TMS (negative) and positive refocusing (negative), positive reappraisal (negative) and refocusing on planning (negative) and other-blame, respectively. In terms of the association with depression, catastrophising has the greatest positive correlation, then mindful attention awareness (negative), refocusing on planning (negative), positive reappraisal (negative) and self-blame (positive), rumination (positive), positive refocusing (negative), other-blame (positive) and decentering Trait TMS (negative), respectively. As expected, trait mindfulness and emotion regulation strategies are correlated with anxiety and depression, however the strength and direction of this correlation varies.

Table 4.

Correlation between Trait Mindfulness, Cognitive Emotion Regulation Strategy and Emotional State (Anxiety and Depression) among US Residents.

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Mindful attention awareness	41.45	13.67														
2.Curiosity	18.73	5.61	.08													
3.Decentering	24.03	4.75	.21**	.56**												
4.Self-Blame	6.32	2.02	-.20*	.15	.11											
5.Other-Blame	7.61	1.86	-.20*	.32	.01	-.05										
6.Rumination	5.75	1.96	-.11	.41**	.07	.33**	.18*									
7.Catastrophising	7.23	2.21	-.45**	.03	-.10	.33**	.45**	.48**								
8.Putting into Perspective	5.70	1.86	.08	.17*	.28**	.10	.08	.10	-.17*							
9.Positive Refocusing	7.06	1.80	.14	.07	.18*	-.03	.13	-.02	-.15	.32**						
10.Positive Reappraisal	5.30	2.02	.17*	.27**	.39**	-.01	-.04	.11	-.31	.50**	.56**					
11.Acceptance	4.55	2.03	.26**	.22**	.28**	.10	-.03	.19*	-.16*	.26**	.19*	.36**				
12.Refocusing on Planning	4.98	1.93	.22**	.16	.28**	-.06	-.01	.04	-.29**	.39**	.32**	.60**	.28**			
13.Anxiety	13.78	5.11	-.52**	-.06	-.25**	.29**	.22**	.40**	.60**	-.05	-.25**	-.23**	-.14	-.23**		
14.Depression	16.04	4.15	-.45**	-.11	-.21**	.35**	.23**	.30**	.60**	-.10	-.28**	-.35**	-.06	-.37**	.71**	

*p < .05. **p <.01

Note. M-Mean; SD-Standard Deviation; 1- Mindful attention awareness; 2-Curiosity Facet-Trait TMS; 3-Decentering Facet-Trait TMS; 4-Self-Blame; 5-Other-Blame; 6-Rumination; 7-Catastrophsing; 8-Putting into Perspective; 9-Positive Refocusing; 10-Positive Reappraisal; 11-Acceptance; 12-Refocus on Planning; 13-Anxiety; 14-Depression

Table 5

Correlation between Trait Mindfulness, Cognitive Emotion Regulation Strategy and Emotional State (Anxiety and Depression) (Thai Survey)

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Mindful attention awareness	65.23	10.96														
2. Curiosity Trait TMS	15.28	4.09	-.06*													
3. Decentering Trait TMS	15.43	3.78	-.10*	.62**												
4.Self-Blame	6.86	1.51	-.15**	.18**	.16**											
5.Other-Blame	4.54	1.57	-.26**	.05*	.06*	.13**										
6.Rumination	7.20	1.56	-.16**	.25**	.22**	.40**	.10**									
7.Catastrophising	5.40	1.97	-.35**	.11**	.12**	.34**	.43**	.38**								
8.Putting into Perspective	6.88	1.65	-.01	.19**	.18**	.26**	.08**	.25**	.20**							
9.Positive Refocusing	6.15	1.58	-.19**	.19**	.17**	.17**	.24**	.24**	.21**	.26**						
10.Positive Reappraisal	7.73	1.52	.18**	.23**	.25**	.29**	-.12**	.31**	-.03	.37**	.20**					
11.Acceptance	7.75	1.58	.14**	.22**	.22**	.38**	-.10**	.40**	.20	.35**	.17**	.50**				
12.Refocus on Planning	7.09	1.49	-.00	.25**	.20**	.33**	.08**	.31**	.14**	.40**	.28**	.45**	.33**			
13.Anxiety	8.37	3.50	-.46**	.04	.05	.15**	.22**	.21**	.42**	-.03	.09**	-.19**	-.09**	-.08**		
14.Depression	5.14	3.06	-.34**	-.07**	-.03	.04	.20**	.00	.23**	-.10**	-.07**	-.28**	-.21**	-.15**	.52**	

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

Note. M-Mean; SD-Standard Deviation; 1- Mindful attention awareness; 2-Curiosity Facet-Trait TMS; 3-Decentering Facet-Trait TMS; 4-Self-Blame; 5-Other-Blame; 6-Rumination; 7-Catastrophsing; 8-Putting into Perspective; 9-Positive Refocusing; 10-Positive Reappraisal; 11-Acceptance; 12-Refocus on Planning; 13-Anxiety; 14-Depression

Table 5 demonstrates the correlation found among subjective mindfulness (mindful attention awareness by MAAS and curiosity and decentering by Trait TMS), cognitive emotion regulation strategies and emotional state (anxiety and depression) within the Thai sample. As illustrated in Table 5, the trait mindfulness scores (mindful attention awareness) have a significant and negative correlation with the emotional states of anxiety and depression. However, in terms of Trait TMS, only the curiosity facet is significantly positively correlated with depression. In regard to the cognitive emotion regulation strategies, self-blame, other-blame, rumination and catastrophising – with the exception of putting into perspective – have a positive and significant correlation with anxiety. In contrast, positive reappraisal, refocus on planning and acceptance have a negative and significant correlation with anxiety. Positive refocusing has a positive and significant association with anxiety. In terms of depression, only other-blame and catastrophising have a significant and positive correlation, while positive refocusing, positive reappraisal, putting into perspective, acceptance and refocus on planning have negative and significant relationships with depression. In regard to the strength of correlation with anxiety, mindful attention awareness has the greatest correlation, followed by catastrophising, other-blame, rumination, positive reappraisal, self-blame, acceptance and positive refocus and refocus on planning, respectively. In terms of correlation strength with depression, mindful attention awareness shows the greatest correlation, followed by positive reappraisal, catastrophising, acceptance, other blame, refocusing on planning, putting into perspective, curiosity and positive refocusing, respectively.

4.5.3 MANOVA Analysis

Table 6

Results of MANOVA of Mediation Experiences and Emotional States (Anxiety and Depression) in the US Residents

	Value	F	Hypothesis df	Error df	sig	P
Pillai's trace	.001	.09	2	152	.91	.001
Wilk's lambda	.999	.09	2	152	.91	.001
Hotelling's trace	.001	.09	2	152	.91	.001

	No meditation experience (n=116)		Have meditation experience (n=39)				
	M	SD	M	SD	t	df	p
Anxiety	13.81	.48	13.69	.82	.12	.948	.901
Depression	16	.39	16.15	.67	-.15	.770	.842

According to Table 6, there was no statistically significant difference in emotional states (anxiety and depression) based on meditation experience, $F (2, 152) = .09$, $p = ns;$ Wilk's $\Lambda = 0.999$, partial $\eta_2 = .001$.

Table 7

Results of MANOVA of Mediation Experiences and Emotional States (Anxiety and Depression) in Thai Study

	Value	F	Hypothesis df	Error df	sig	P
Pillai's trace	.004	3.51	2	1671	.03	.004
Wilk's lambda	.996	3.51	2	1671	.03	.004
Hotelling's trace	.004	3.51	2	1671	.03	.004

	No meditation experience (n=462)		Have meditation experience (n=1212)				
	M	SD	M	SD	t	df	p
Anxiety	8.13	.16	8.43	.10	-.30	.191	.117
Depression	4.81	.14	5.25	.09	-.44	.167	.008

Regarding Table 7, there was a statistically significant difference in emotional states (anxiety and depression) based on meditation experience, $F_{(2, 1671)} = 3.51$, $p <$ .05; Wilk's $\Lambda = 0.996$, partial $\eta_2 = .004$.

4.5.4 Regression Analysis

In regard to the results of the correlation analysis, mindfulness and cognitive emotion regulation have a significant association with the emotional state of anxiety and depression. As such, three-step multiple regression analysis was further conducted in order to identify whether mindfulness has an incremental value over the models of mindfulness and cognitive emotion regulation strategies in predicting emotional states (anxiety and depression). After controlling for age and gender (Step 1), I explored whether all cognitive emotion regulation strategies could predict anxiety and depression (i.e., the dependent variables) in Step 2. Finally, in Step 3, I investigated if trait mindfulness could increase the predicting values of the existing model as shown in Table 8 (US sample) and Table 9 (Thai sample).

Table 8

Hierarchical Multiple Regression Analysis with Emotional States (Anxiety, Depression)
as Dependent Variables and Mindfulness, Cognitive Emotion Regulation Strategies as
Predictor Variables among US Residents.

	Anxiety				Depression			
	B	β	T	Sig	B	β	T	Sig
Step 1								
1.Gender	-1.99	-.20	-2.5	.02	-.58	-.07	-.86	.39
2. Age	.06	.09	1.16	.25	.06	.11	1.36	.18
3. Meditaion experience	-.09	-.01	-.10	.92	.11	.01	.14	.89
Step 2								
1. Gender	-.67	-.07	-.97	.33	.23	.03	.43	.67
2. Age	-.03	-.05	-.66	.51	-.04	-.08	-1.17	.24
3. Meditation experience	-.02	-.00	-.02	.98	.25	.03	.42	.68
4. Self-Blame	.23	.09	1.26	.21	.38	.18	2.56	.01
5. Other-Blame	.06	.02	.26	.80	.15	.07	.89	.38
6. Rumination	.38	.15	1.82	.07	.11	.05	.64	.53
7. Catastrophising	1.04	.45	4.65	.00	.77	.41	4.35	.00
8. Positive Refocusing	-.56	-.20	-2.50	.01	-.34	-.15	-1.89	.06
9. Positive Reappraisal	.10	.04	.40	.69	-.16	-.08	-.81	.42
10. Refocus on Planning	-.22	-.08	-1.00	.32	-.47	-.22	-2.66	.01
11. Putting into Perspective	.29	.11	1.41	.16	.20	.09	1.21	.23
12. Acceptance	-.23	-.09	-1.28	.20	.15	.07	1.02	.31
Step 3								
1. Gender	-.40	-.04	-.63	.53	.41	.05	.78	.44
2. Age	-.03	-.05	-.82	.41	-.04	-.08	-1.24	.22
3. Meditation experience	-.41	-.04	-.57	.57	-.02	-.002	-.03	.98
4. Self-Blame	.20	.08	1.16	.25	.35	.17	2.44	.02
5. Other-Blame	.03	.01	.13	.89	.13	.06	.81	.42
6. Rumination	.54	.21	2.53	.01	.28	.13	1.56	.12
7. Catastrophising	.76	.33	3.51	.00	.57	.31	3.19	.00
8. Positive Refocusing	-.48	-.17	-2.29	.02	-.28	-.12	-1.65	.10
9. Positive Reappraisal	.14	.06	.58	.56	-.16	-.08	-.80	.42
10. Refocus on Planning	-.14	-.05	-.67	.50	-.42	-.20	-2.51	.01
11. Putting into Perspective	.29	.11	1.52	.13	.19	.08	1.19	.24
12. Acceptance	-.04	-.02	-.23	.82	.25	.12	1.82	.07
13. mindful attention awareness (MAAS)	-.11	-.28	-4.03	.00	-.07	-.22	-3.16	.00
14. Curiosity TMS	-.07	-.08	-1.02	.31	-.10	-.13	-1.64	.10
15. Decentering TMS	-.150	-.14	-1.77	.08	-.03	-.04	-.47	.64

Table 8 demonstrates the results of the US sample. Hierarchical multiple regression analysis was performed with the MAAS score, Trait TMS with curiosity, decentering facet and nine cognitive emotion regulation strategies with the emotional states of anxiety and depression as dependent variables. As illustrated in Table 8, in Step 1, gender, age, and meditation experience held no significant statistical value in predicting anxiety [F $(3,151) = 2.52$, $r = .22$, $r^2 = .05$, adj $r^2 = .03$, $\Delta R^2 = .05$, $p = ns$], and depression [F $(3,151) = 0.90$, $r = .13$, $r^2 = .02$, adj $r^2 = .00$, $\Delta R^2 = .02$, $p = ns$]. As shown in Table 6, gender could explain the variance of anxiety among the US residents sample. In Step 2, nine strategies of cognitive emotion regulation demonstrate a significant change in R^2 in predicting emotional states (anxiety, F $[12,142]$ change = 10.88, $r = .66$, $r^2 = .44$, adj $r^2 = .39$, $\Delta R^2 = .39$, $p < .001$; depression, F $[12,142]$ change = 13.00, $r = .68$, $r^2 = .46$, adj $r^2 = .42$, $\Delta R^2 = .44$, $p < .001$). This reveals that the two cognitive emotion regulation strategies of catastrophising, and positive refocusing account for unique variance in anxiety after controlling for the effect of gender, age and meditation experience. Whereas catastrophising, refocus on planning and self-blame strategies account for unique variance in depression. In Step 3, after controlling for gender, age and cognitive emotion regulation strategies, and cognitive emotion strategies, mindfulness has a significant effect upon increasing the predicting of the value for the model [anxiety, F $(15,139)$ change = 9.90, $r = .73$, $r^2 = .54$, adj $r^2 = .49$, $\Delta R^2 = .10$, $p < .001$; depression, F $(15,139)$ change = 5.72, $r = .72$, $r^2 = .52$, adj $r^2 = .47$, $\Delta R^2 = .06$, $p < .001$]. In terms of mindfulness, the finding also highlights that only MAAS accounted for the variance in emotional state.

Table 9 illustrates the results of the Thai sample in the same way as the data of the US sample. As presented in Table 9 in Step 1 age, gender, and meditation experience is not identified as possessing a significant statistical value in predicting anxiety (F $[3,1548] = .56$, $r = .03$, $r^2 = .00$, adj $r^2 = -.00$, $\Delta R^2 = .00$, $p = ns$), yet there is a significant change in R^2 in predicting depression (F $[3,1548] = 11.63$, $r = .15$, $r^2 = .02$, adj $r^2 = .02$, $\Delta R^2 = .02$, $p < .001$). As shown in Table 9, gender, age, and meditation experience could explain the variance of depression among the Thai sample. After strategies of cognitive emotion regulation were added in Step 2, significant change in R^2 in predicting emotional states are revealed (anxiety, F $[12,1539]$ change = 55.2, $r = .50$, $r^2 = .25$, adj $r^2 = .24$, $\Delta R^2 = .24$, $p < .001$; depression, F $[12,1539]$ change = 29.15, $r = .41$, $r^2 = .16$, adj $r^2 = .16$, $\Delta R^2 = .14$, $p < .001$). Gender, catastrophising, rumination,

refocus on planning, positive reappraisal, acceptance and self-blame is found to have a significant effect upon increasing the predicting of anxiety, while age and all cognitive emotion strategies – excluding rumination and putting into perspective – accounted for a unique variance in depression. In Step 3, after inserting mindfulness, R^2 has a significant change for emotional states (anxiety, $F [15,1536]$ change = 62.14, $r = .57$, $r^2 = .33$, adj $r^2 = .32$, $\Delta R^2 = .08$, $p < .001$; depression, $F [15,1536]$ change = 32.25, $r = .46$, $r^2 = .22$, adj $r^2 = .21$, $\Delta R^2 = .05$, $p < .001$). In the same way as with the US group, in terms of mindfulness, mindful attention awareness is found to have the greatest power in predicting anxiety and depression, while the two facets of mindfulness by Trait TMS cannot predict anxiety and depression significantly.

Table 9.

Hierarchical Multiple Regression Analysis with Emotional States (Anxiety, Depression) as Dependent Variables and Mindfulness, Cognitive Emotion Regulation Strategies as Predictor Variables among the Thai Sample.

	Anxiety				Depression			
	B	β	T	Sig	B	β	T	Sig
Step 1								
1.Gender	-.11	-.02	-.57	.57	.55	.09	3.47	.00
2. Age	.04	.02	.75	.45	.15	.09	3.55	.00
3. Meditation experiences	.18	.02	.90	.37	.37	.06	2.16	.03
Step 2								
1. Gender	-.51	-.07	-3.03	.00	.24	.04	1.61	.11
2. Age	.04	.02	.87	.39	.11	.07	2.73	.01
3. Meditation experiences	.25	.03	1.43	.15	.46	.07	2.89	.00
4. Self-Blame	.21	.09	3.36	.00	.22	.11	3.97	.00
5. Other-Blame	.07	.03	1.14	.25	.19	.10	3.79	.00
6. Rumination	.37	.16	6.01	.00	.08	.04	1.43	.15
7. Catastrophising	.59	.33	11.67	.00	.22	.15	4.94	.00
8. Positive Refocusing	.08	.04	1.56	.12	-.12	-.06	-2.34	.02
9. Positive Reappraisal	-.36	-.15	-5.43	.00	-.39	-.20	-6.63	.00
10. Refocus on Planning	-.26	-.11	-3.99	.00	-.15	-.07	-2.57	.01
11. Putting into Perspective	-.09	-.04	-1.69	.09	-.02	-.01	-.37	.71
12. Acceptance	-.18	-.08	-2.80	.01	-.21	-.10	-3.56	.00
Step 3								
1. Gender	-.58	-.08	-3.65	.00	.19	.03	1.27	.20
2. Age	-.02	-.01	-.43	.67	.07	.04	1.73	.08
3. Meditation experiences	.16	.02	.97	.33	.40	.06	2.59	.01
4. Self-Blame	.13	.06	2.26	.02	.17	.09	3.15	.00
5. Other-Blame	.02	.01	.38	.70	.16	.09	3.29	.00
6. Rumination	.28	.12	4.61	.00	.02	.01	.41	.69
7. Catastrophising	.47	.26	9.62	.00	.14	.09	3.20	.00
8. Positive Refocusing	-.03	-.01	-.58	.56	-.18	-.10	-3.79	.00
9. Positive Reappraisal	-.23	-.10	-3.56	.00	-.31	-.15	-5.25	.00
10. Refocus on Planning	-.24	-.10	-3.93	.00	-.13	-.06	-2.29	.02
11. Putting into Perspective	-.09	-.04	-1.65	.10	-.02	-.01	-.31	.76
12. Acceptance	-.10	-.04	-1.57	.12	-.15	-.08	-2.65	.01
13. mindful attention awareness (MAAS)	-.10	-.32	-13.55	.00	-.07	-.25	-9.65	.00
14. Curiosity TMS	.01	.01	.39	.70	-.03	-.04	-1.32	.19
15. Decentering TMS	.00	.00	.06	.95	.02	.03	.85	.40

4.5.5 Mediation Analysis

In regard to the results of the correlation analysis, mindfulness and cognitive emotion regulation have a significant association with emotional state (anxiety and depression). As such, multiple mediation analysis was further conducted in order to identify whether cognitive emotion regulation (mediators: MV) mediates the significant associations that exist between mindfulness (independent variables: IV) and anxiety and depression (dependent variables: DV). In the present study, the mediation analyses were conducted only on the significant associations between an independent variable (facet of mindfulness) and a dependent variable (anxiety and depression) (Baron & Kenny, 1986). In regard to the results of the correlation analysis in Table 4 and 5, show that mindful attention awareness has a significant and negative correlation with emotional states (anxiety and depression) in the US and Thailand. It also shows a significant negative association between decentering and emotional states (anxiety and depression) in the US as well as a significant and negative association between curiosity and depression in Thailand.

In the US survey, Table 10 illustrates the results of the multiple mediation analyses undertaken as to the effect of cognitive emotion regulation strategy on mindful attention awareness predicting anxiety. The total effect of mindful attention awareness (IV) and cognitive emotion regulation strategies (MV) on anxiety (DV) were significant (-.1894, $SE = .0263$). The direct effect of mindful attention awareness on anxiety were significant (-.1184, $SE = .0261$). In regard to mediators, mindful attention awareness has direct effects on self-blame (-.0264, $SE = .0120$), but self-blame has no significant effects on anxiety (.1561, $SE = .1739$). Mindful attention awareness has no significant direct effects on other-blame (-.0248, $SE = .0111$), and other-blame has no significant effects on anxiety (.-.0222, SE = .1993). Mindful attention awareness has no significant direct effects on rumination (-.0090, SE = .0115), yet rumination has significant effects on anxiety (.4930, SE = .1983). Mindful attention awareness has significant direct effects on catastrophising (-.0658, $SE = .0118$), and catastrophising has significant effects on anxiety (.7338, $SE = .2124$). Mindful attention awareness has no significant direct effects on putting into perspective (-.0078, $SE = .0113$), and putting into perspective has no significant direct effects on anxiety (.2488, $SE = .1943$). Mindful attention awareness has no significant direct effects on positive refocusing (.0199, $SE = .0109$), but positive refocusing has significant effects on anxiety (-.4342, $SE = .2124$).

Mindful attention awareness has no significant direct effects on positive reappraisal (.0240, $SE = .0122$), and positive reappraisal has no significant effects on anxiety (-.0168, $SE = .2391$). Mindful attention awareness has significant direct effects on acceptance (.0397, $SE = .0117$), acceptance has no significant effects on anxiety (-.0632, $SE = .1719$). Mindful attention awareness has significant effects on refocusing on planning (.0248, $SE = .0112$), but refocusing on planning has no significant effects on anxiety (-.1629, $SE = .2079$). The 95% confidence interval of indirect effects of the model indicates that the associations between mindful attention awareness and anxiety were significantly mediated by catastrophising (-.0483, 95% CI [-.0876, -.0156]) and not by self-blame (-.0041, 95% CI [-.0165,.0062]), other blame (-.0006, 95% CI [-.0143,.0120]), rumination (-.0045, 95% CI [-.0198, .0060]), putting into perspective (.0019, 95% CI [-.0058, .0119]), positive refocusing, (-.0087, 95% CI [-.0232, .0020]), positive reappraisal (-.0004, 95% CI [-.0153, .0120]), acceptance (-.0025, 95% CI [-.0195, .0128]) and refocusing on planning (-.0040, 95%CI [-.0186, .0053]). All mediation results were displayed in Figure 3

Table 10

Summary of Multiple Mediation Analyses of Cognitive Emotion Regulation Strategy on Mindful Attention Awareness Predicting Anxiety (Model 4 of PROCESS macro) in the US Residents Study

Independent variable	Mediating variable	Dependent variable	Effect of independent variable on mediating variable (a)	Effect of mediating variable on dependent variable (b)	Indirect effect of independent variable by mediating variable	
					(a x b)	95% CI
Mindful attention awareness	1. Self-Blame	Anxiety	-.0264* (*SE* = .0120)	.1561 (*SE* = .1739)	-.0041	[-.0165,.0062]
	2. Other-Blame		-.0248 (*SE* = .0111)	-.0222 (*SE* = .1993)	-.0006	[-.0143,.0120]
	3. Rumination		-.0090 (*SE* = .0115)	.4930* (*SE* =.1983)	-.0045	[-.0198, .0060]
	4. Catastrophising		-.0658** (*SE* = .0118)	.7338* (*SE* = .2196)	-.0483*	[-.0876, -.0156]
	5. Putting into Perspective		-.0078 (*SE* = .0113)	.2488 (*SE* = .1943)	.0019	[-.0058, .0119]
	6. Positive Refocusing		.0199 (*SE* = .0109)	-.4342* (*SE* = .2124)	-.0087	[-.0232, .0020]
	7. Positive Reappraisal		.0240 (*SE* = .0122)	-.0168 (*SE* = .2391)	-.0004	[-.0153, .0120]
	8. Acceptance		.0397** (*SE* = .0117)	-.0632 (*SE* = .1719)	-.0025	[-.0195, .0128]
	9. Refocusing on Planning		.0248* (*SE* = .0112)	-.1629 (*SE* = .2079)	-.0040	[-.0186, .0053]

Total Effect (c) = Total Effect = -.1894** (*SE* = .0263)
Direct Effect (c′) = -.1184** *SE* = .0261 [-.1699, -.0668]

(a)   (a x b)   (b)

Self-Blame

-.0264*   -.0041 [-.0165, .0062]   -.1561

Other-Blame

-.0248   -.0006 [-.0143, .0120]   -.0222

Rumination

-.0090   -.0045 [-.0198, 0060]   .4930*

Catastrophising

-.0658**   -.0483 [-.0876, -.0156]   .7338*

Mindful attention awareness   -.1184** [-.1699, -.0668] (c′)   Anxiety

.0078   .2488

Putting into Perspective

.0019 [-.0058, 0119]

.0199   -.4342*

Positive refocusing

-.0087 [-.0232, .0020]

.0240   -.0168

Positive Reappraisal

-.0004 [-.0153, 0120]

.0397**   .0632

Acceptance

-.0025 [-.0195, .0128]

.0248*   -.1629

Refocusing on Planning

-.0040 [-.0186, .0053]

Figure 3. Mediation Model for the Relationship between Mindful Attention Awareness and Anxiety Mediated by Cognitive Emotion Regulation Strategy in the US Residents Study

Table 11 shows the result of the multiple mediation analyses undertaken as to the effect of cognitive emotion regulation strategy on decentering predicting anxiety in the US residents' samples. According to Table 11, the total effect of decentering (IV) and cognitive emotion regulation strategies (MV) on anxiety (DV) were significant (-.2707, $SE = .0857$). The direct effect of decentering on anxiety were significant (-.2524, $SE = .0748$). Regarding mediators, decentering has no direct effects on self-blame (.0401, $SE = .0352$), self-blame has no significant effects on anxiety (.2794, $SE = .1794$). Decentering has no significant direct effects on other-blame (-.0020, $SE = .0326$), and other-blame has no significant effects on anxiety (.0571, $SE = .2051$). Decentering has no significant direct effects on rumination (.0268, $SE = .0333$), rumination has no significant effects on anxiety (.3435, $SE = .2030$). Decentering has no significant direct effects on catastrophising (-.0395, $SE = .0373$), catastrophising has significant effects on anxiety (1.0656, $SE = .2155$). Decentering has significant direct effects on putting into perspective (.1083, $SE = .0315$), and putting into perspective has no significant direct effects on anxiety (.3458, $SE = .2005$). Decentering has significant direct effects on positive refocusing (.0746, $SE = .0314$), positive refocusing has significant effects on anxiety (-.5885, $SE = .2170$). Decentering has significant direct effects on positive reappraisal (.1699, $SE = .0329$), positive reappraisal has no significant effects on anxiety (.2809, $SE = .2505$). Decentering has significant direct effects on acceptance (.1045, $SE = .0341$), acceptance has no significant effects on anxiety (-.1605, $SE = .1741$). Decentering has significant effects on refocusing on planning (.1184, $SE = .0136$), but refocusing on planning has no significant effects on anxiety (-.1761, $SE = .2142$). The 95% confidence interval of indirect effects of the model indicates that the associations between decentering and anxiety were significant mediated by positive refocusing (-.0439, 95% CI [-.0938, -.0008]), and not by self-blame (.0112, 95% CI [-.0113, .0483]), other blame (-.0001, 95% CI [-.0238, .0168]), rumination (.0092, 95% CI [-.0173, .0424]), catastrophising (-.0421, 95% CI [-.1426, .0451]) putting into perspective (.0375, 95% CI [-.0026, .0938]), positive reappraisal (.0477, 95% CI [-.0477, .1301]), acceptance (-.0168, 95% CI [-.0624, .0212]) and refocusing on planning (-.0209, 95%CI [-.0768, .0311]). All mediation results were displayed in Figure 4.

Table 11

Summary of Multiple Mediation Analyses of Cognitive Emotion Regulation strategy on Decentering predicting Anxiety

(Model 4 of PROCESS macro) in the US Residents Study

Independent variable	Mediating variable	Dependent variable	Effect of independent variable on mediating variable (a)	Effect of mediating variable on dependent variable (b)	Indirect effect of independent variable by mediating variable	
					(a x b)	95% CI
Decentering	Self-Blame	Anxiety	.0401 (*SE* = .0352)	.2794 (*SE* = .1794)	.0112	[-.0113, .0483]
	Other-Blame		-.0020 (*SE* = .0326)	.0571 (*SE* = .2051)	-.0001	[-.0238, .0168]
	Rumination		.0268 (*SE* = .0333)	.3435 (*SE* = .2030)	.0092	[-.0173, .0424]
	Catastrophising		-.0395 (*SE* =.0373)	1.0656** (*SE* = .2155)	-.0421	[-.1426, .0451]
	Putting into Perspective		.1083** (*SE* =.0315)	.3458 (*SE* = .2005)	.0375	[-.0026, .0938]
	Positive Refocusing		.0746* (*SE* = .0314)	-.5885** (*SE* = .2170)	-.0439	[-.0938, -.0008]
	Positive Reappraisal		.1699** (*SE* = .0329)	.2809 (*SE* = .2505)	.0477	[-.0477, .1301]
	Acceptance		.1045** (*SE* =.0341)	-.1605 (*SE* =.1741)	-.0168	[-.0624, .0212]
	Refocusing on Planning		.1184** (*SE* = .0136)	-.1761 (*SE* = .2142)	-.0209	[-.0768, .0311]

Total Effect (c) = -.2707* (*SE* = .0857)

Direct Effect (c′) = -.2524** (*SE* = .0748) [-.4003, -.1045]

(a)   (a x b)   (b)

Self-Blame
.0401
.0112 [-.0113, .0483]
.2794

Other-Blame
-.0020
-.0001 [-.0238, .0168]
.0571

Rumination
.0333
0092 [-.0173, .0424]
.3435

Catastrophising
-.0395
-.0421 [-.1426, -.0451]
1.0656**

Decentering
-.2524** [-.4003, -.1045] (c′)
Anxiety

.1083**
Putting into Perspective
.0375 [-.0026, 0938
.3458

.0746*
Positive refocusing
-.0439 [-.0938, -.0008]
-.5885**

.1699**
Positive Reappraisal
.0477 [-.0477, 1301]
.2809

.1045**
Acceptance
-.0168 [-.0624, .0212]
-.1605

.1184**
Refocusing on Planning
-.0209 [-.0768, .0311]
-.1761

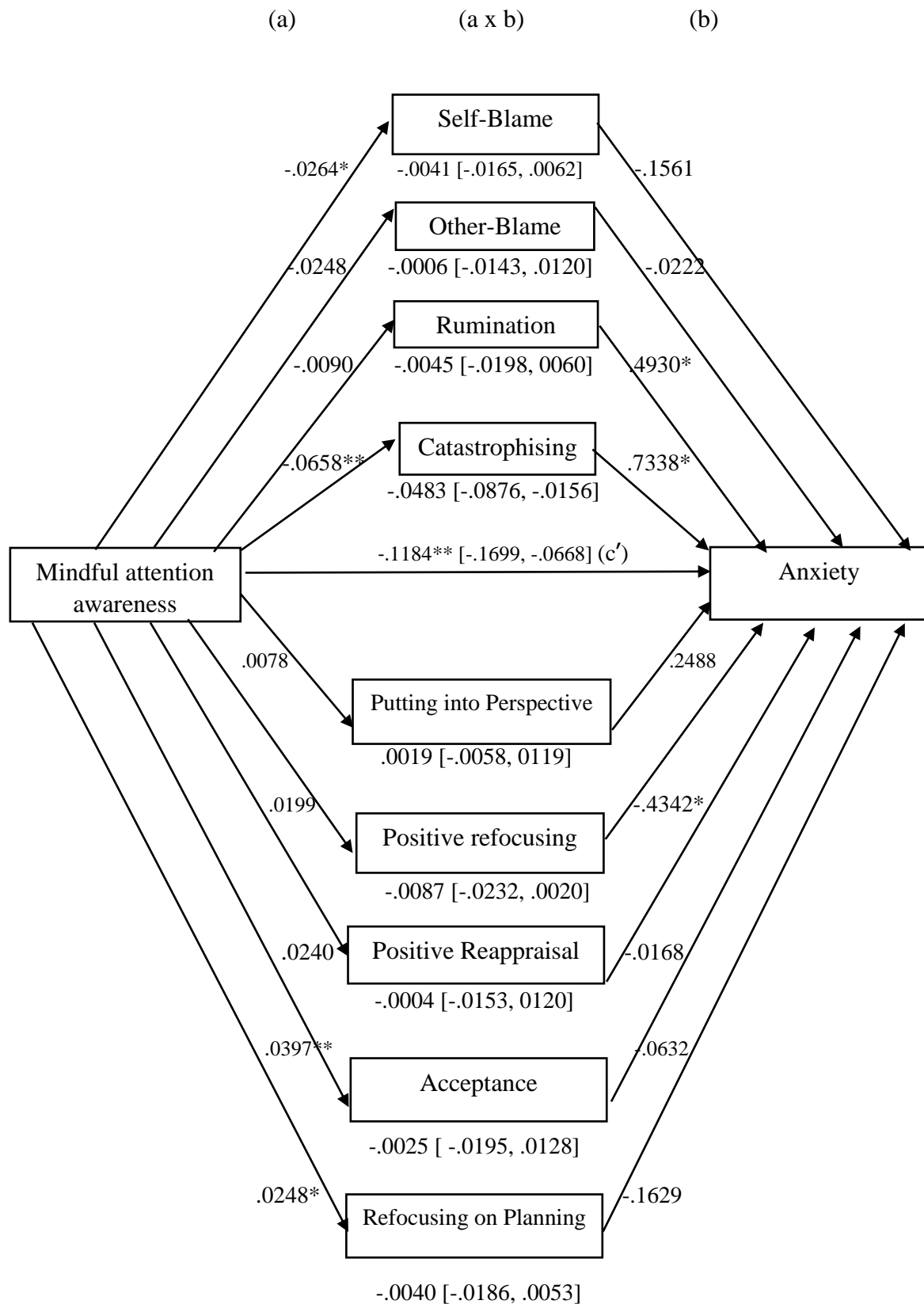*Figure 4.* Mediation Model for the Relationship between Decentering and Anxiety
Mediated by Cognitive Emotion Regulation Strategy in the US Residents Study

Table 12 demonstrates the result of multiple mediation analyses of cognitive emotion regulation strategy on mindful attention awareness predicting depression in the US residents. The total effect of mindful attention awareness (IV) and cognitive emotion regulation strategies (MV) on depression (DV) were significant (-.1356, *SE* = .0026). The direct effect of mindful attention awareness on depression were significant (-.0735, *SE* = .0213). Regarding mediators, mindful attention awareness has direct effects on self-blame (-.0264, *SE* = .0120), self-blame has significant effects on depression (.3270, *SE* = .1420). Mindful attention awareness has no significant direct effects on other-blame (-.0248, *SE* = .0111), and other-blame has no significant effects on depression (.1297, *SE* = .1613). Mindful attention awareness has no significant direct effects on rumination (-.0090, *SE* = .0115), but rumination has significant effects on depression (.1746, *SE* = .1620). Mindful attention awareness has significant direct effects on catastrophising (-.0658, *SE* = .0118), and catastrophising has significant effects on depression (.5827, *SE* = .1793). Mindful attention awareness has no significant direct effects on putting into perspective (-.0078, *SE* = .0113), and putting into perspective has no significant direct effects on depression (.1719, *SE* = .1587). Mindful attention awareness has no significant direct effects on positive refocusing (.0199, *SE* = .0109), and positive refocusing has no significant effects on depression (-.2591, *SE* = .1735). Mindful attention awareness has no significant direct effects on positive reappraisal (.0240, *SE* = .0122), and positive reappraisal has no significant effects on depression (-.2359, *SE* = .1617). Mindful attention awareness has significant direct effects on acceptance (.0397, *SE* = .0117), acceptance has no significant effects on depression (-.2486, *SE* = .1404). Mindful attention awareness has significant effects on refocusing on planning (.0248, *SE* = .0112), refocusing on planning has significant effects on depression (-.4322, *SE* = .1699). The 95% confidence interval of indirect effects of the model indicates that the associations between mindful attention awareness and depression were significant mediated by catastrophising (-.0383, 95% CI [-.0691, -.0123]), and refocusing on planning (-.0107, 95% CI [-.0289, -.0001]), but not by self-blame (-.0086, 95% CI [-.0235, .0002]), other blame (-.0032, 95% CI [-.0141, .0053]), rumination (-.0016, 95% CI [-.0098, .0032]), putting into perspective (.0013, 95% CI [-.0044, .0087]), positive refocusing, (-.0052, 95% CI [-.0157, .0021]), positive reappraisal (-.0057, 95% CI [-.0281, .0050]), and acceptance (.0099, 95% CI [-.0019, .0253]). All mediation results were displayed in Figure 5.

Table 12

Summary of Multiple Mediation Analyses of Cognitive Emotion Regulation Strategy on Mindful Attention Awareness predicting Depression (Model 4 of PROCESS macro) in the US Residents study

Independent variable	Mediating variable	Dependent variable	Effect of independent variable on mediating variable (a)	Effect of mediating variable on dependent variable (b)	Indirect effect of independent variable by mediating variable	
					(a x b)	95% CI
Mindful attention awareness	1.Self-Blame	Depression	-.0264* (*SE* = .0120)	.3270* (*SE* = .1420)	-.0086	[-.0235, .0002]
	2. Other-Blame		-.0248 (*SE* = .0111)	.1297 (*SE* = .1613)	-.0032	[-.0141, .0053]
	3. Rumination		-.0090 (*SE* = .0115)	.1746 (*SE* =.1620)	-.0016	[-.0098, .0032]
	4. Catastrophising		-.0658** (*SE* = .0118)	.5827** (*SE* = .1793)	-.0383**	[-.0691, -.0123]
	5.Putting into Perspective		.0078 (*SE* =.0113)	.1719 (*SE* = .1587)	.0013	[-.0044, .0087]
	6. Positive Refocusing		.0199 (*SE* = .0109)	-.2591 (*SE* = .1735)	-.0052	[-.0157, .0021]
	7. Positive Reappraisal		.0240 (*SE* = .0122)	-.2359 (*SE* = .1617)	-.0057	[-.0281, .0050]
	8. Acceptance		.0397** (*SE* = .0117)	.2486 (*SE* = .1404)	.0099	[-.0019, .0253]
	9. Refocusing on Planning		.0248* (*SE* = .0112)	-.4322* (*SE* = .1699)	-.0107	[-.0289, -.0001]

Total Effect (c) = -.1356*** (*SE* = .0026), [-.1803, -.0909]

Direct Effect (c′) = -.0735* (*SE* = .0213) [-.1156, -.0314]

(a)   (a x b)   (b)

Self-Blame

-.0264*   -.0086 [-.0235, .0002]   .3270*

Other-Blame

.0248   .0032 [-.0141, .0053]   .1297

Rumination

.0090   -.0016 [-.0098, .0032]   .1620

Catastrophising

-.0658**   -.0383 [-.0691, -.0123]   .5827**

Mindful attention awareness   -.0735** [-.1156, -.0314] (c′)   Depression

.0078   .1719

Putting into Perspective

.0013 [-.0044, .0087]

.0199   -.2591

Positive refocusing

-.0052 [-.0157, .0021]

.0240   -.2359

Positive Reappraisal

-.0057 [-.0281, 0050]

.0397**   .2486

Acceptance

.0099 [-.0019, .0253]

.0248*   -.4322*

Refocusing on Planning

-.0107 [-.0289, -.0001]

Figure 5. Mediation Model for the Relationship between Mindful Attention Awareness and Depression Mediated by Cognitive Emotion Regulation Strategy in the US Residents Study

Table 13 shows the result of mediation analyses of cognitive emotion regulation strategy on decentering predicting depression in the US residents. According to Table 13, total effect of decentering (IV) and cognitive emotion regulation strategies (MV) on depression (DV) were significant (-.1893, $SE = .0713$). The direct effect of decentering on depression were significant (-.1285, $SE = .0608$). Regarding mediators, decentering has no direct effects on self-blame (.0401, $SE = .0352$), self-blame has significant effects on depression (.3984, $SE = .1454$). Decentering has no significant direct effects on other-blame (-.0020, $SE = .0326$), and other-blame has no significant effects on depression (.1511, $SE = .1668$). Decentering has no significant direct effects on rumination (.0268, $SE = .0333$), rumination has no significant effects on depression (.0861, $SE = .1651$). Decentering has no significant direct effects on catastrophising (-.0395, $SE = .0373$), yet catastrophising has significant effects on depression (.7856, $SE = .1752$). Decentering has significant direct effects on putting into perspective (.1083, $SE = .0315$), but putting into perspective has no significant direct effects on depression (.2262, $SE = .1631$). Decentering has significant direct effects on positive refocusing (.0746, $SE = .0314$), and positive refocusing has significant effects on depression (-.3518, $SE = .1765$). Decentering has significant direct effects on positive reappraisal (.1699, $SE = .0329$), positive reappraisal has no significant effects on depression (-.0712, $SE = .2038$). Decentering has significant direct effects on acceptance (.1045, $SE = .0341$), acceptance has no significant effects on depression (.1804, $SE = .1416$). Decentering has significant effects on refocusing on planning (.1184, $SE = .0136$), and refocusing on planning has significant effects on depression (-.4454, $SE = .1742$). The 95% confidence interval of indirect effects of the model indicates that the associations between decentering and depression were significant mediated by refocusing on planning (-.0527, 95%CI [-.1181, -.0079]), and not by self-blame (.0160, 95% CI [-.0134, .0548]), other blame (-.0003, 95% CI [-.0223, .0141]), rumination (.0023, 95% CI [-.0119, .0221]), catastrophising (-.0310, 95% CI [-.1122, .0325]]), putting into perspective (.0245, 95% CI [-.0090, .0714]]), positive refocusing (-.0262, 95% CI [-.0680, .0059]), positive reappraisal (-.0121, 95% CI [-.0973, .0591]), and acceptance (.0188, 95% CI [-.0126, .0565]). All mediation results were displayed in Figure 6.

Table 13

Summary of Multiple Mediation Analyses of Cognitive Emotion Regulation Strategy on Decentering Predicting Depression

(Model 4 of PROCESS macro) in the US Residents Study

Independent variable	Mediating variable	Dependent variable	Effect of independent variable on mediating variable (a)	Effect of mediating variable on dependent variable (b)	Indirect effect of independent variable by mediating variable	
					(a x b)	95% CI
Decentering	Self-Blame	Depression	.0401 (*SE* = .0352)	.3984** (*SE* = .1454)	.0160	[-.0134, .0548]
	Other-Blame		-.0020 (*SE* = .0326)	.1511 (*SE* = .1668)	-.0003	[-.0223, .0141]
	Rumination		.0268 (*SE* = .0333)	.0861 (*SE* = .1651)	.0023	[-.0119, .0221]
	Catastrophising		-.0395 (*SE* = .0373)	.7856*** (*SE* = .1752)	-.0310	[-.1122, .0325]
	Putting into Perspective		.1083** (*SE* = .0315)	.2262 (*SE* = .1631)	.0245	[-.0090, .0714]
	Positive Refocusing		.0746* (*SE* = .0314)	-.3518* (*SE* = .1765)	-.0262	[-.0680, .0059]
	Positive Reappraisal		.1699** (*SE* = .0329)	-.0712 (*SE* = .2038)	-.0121	[-.0973, .0591]
	Acceptance		.1045** (*SE* = .0341)	.1804 (*SE* = .1416)	.0188	[-.0126, .0565]
	Refocusing on Planning		.1184** (*SE* = .0316)	-.4454* (*SE* = .1742)	-.0527*	[-.1181, -.0079]

Total Effect (c) = -.1893** (*SE* = .0713)

Direct Effect (c′) = -.1285* (*SE* = .0608) [-.2488, -.0083]

(a)   (a x b)   (b)

Self-Blame

.0401   -.0160 [-.0134, .0548]   -.3984**

Other-Blame

-.0020   -.0003 [-.0223, .0141]   .1511

Rumination

.0268   .0023 [-.0119, .0221]   .0861

Catastrophising

-.0395   -.0310 [-.1122, .0325]   .7856**

Decentering   -.1285* [-.2488, -.0083] (c′)   Depression

.1083**   .2262

Putting into Perspective

.0245 [-.0090, .0714]

.0746**   Positive refocusing   -.3518*

-.0262 [-.0680, .0059]

.1699**   -.0712

Positive Reappraisal

-.0121 [-.0973, 0591]

.1045**   .1804

Acceptance

.0188 [-.0126, .0565]

.1184**   -.4454*

Refocusing on Planning

-.0527 [-.1181, -.0079]

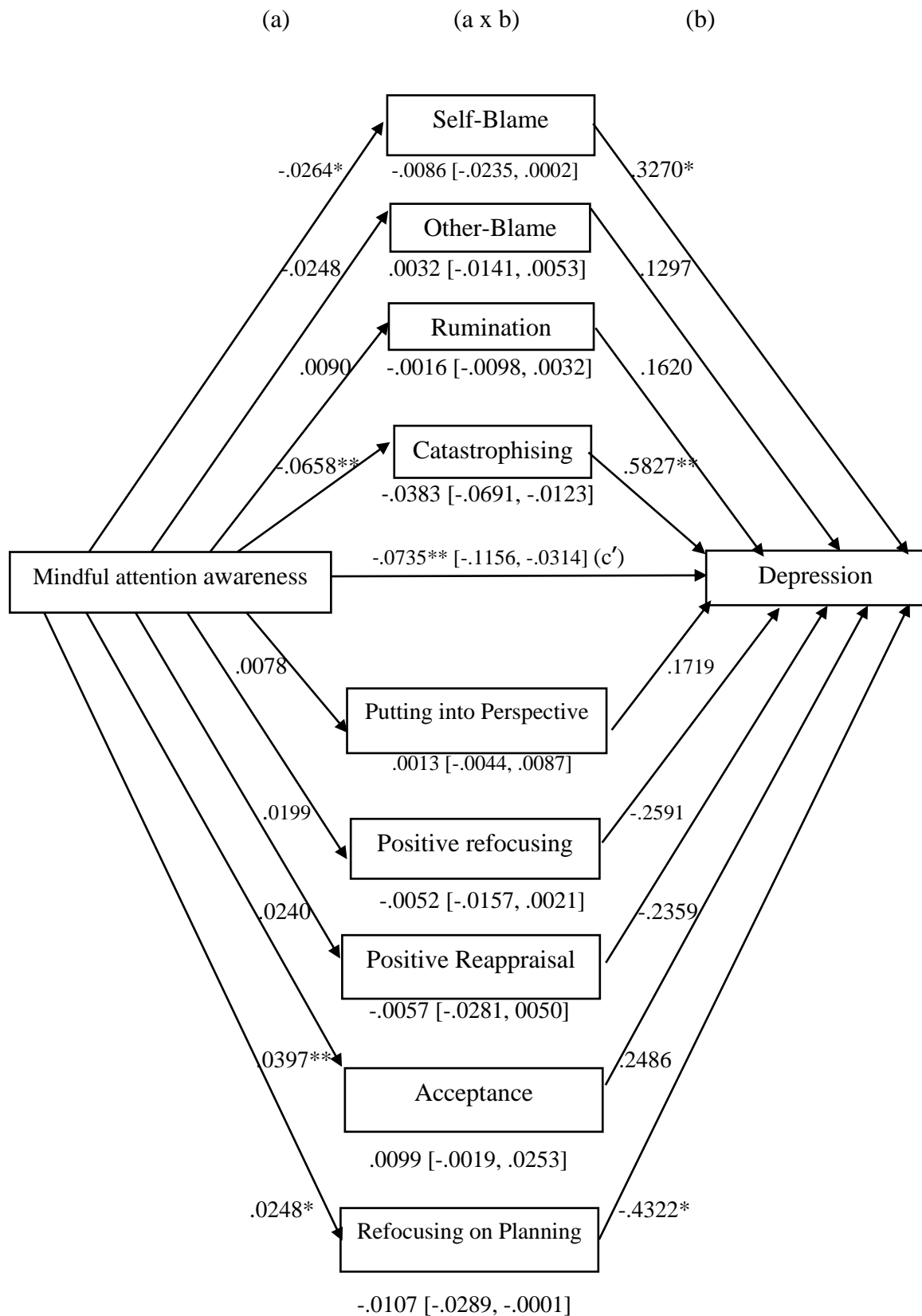*Figure 6*. Mediation Model for the Relationship between Decentering and Depression Mediated by Cognitive Emotion Regulation Strategy in the US Residents Study

Turning to the survey in Thailand, Table 14 illustrates the results of multiple mediation analyses of cognitive emotion regulation strategy on mindful attention awareness predicting anxiety. The total effect of mindful attention awareness (IV) and cognitive emotion regulation strategies (MV) on anxiety (DV) were significant (-.1485, SE = .0072). The direct effect of mindful attention awareness on anxiety were significant (-.1031, SE = .0076). Regarding mediators, mindful attention awareness has direct effects on self-blame (-.0213, SE = .0035), and self-blame has significant effects on anxiety (.1210, SE = .0584). Mindful attention awareness has significant direct effects on other-blame (-.0357, SE = .0035), other-blame has no significant effects on anxiety (.0220, SE = .0529). Mindful attention awareness has significant direct effects on rumination (-.0276, SE = .0035), and rumination has significant effects on anxiety (.2708, SE = .0588). Mindful attention awareness has significant direct effects on catastrophising (-.0627, SE = .0043), and catastrophising has significant effects on anxiety (.4653, SE = .0477). Mindful attention awareness has no significant direct effects on putting into perspective (-.0078, SE = .0113), and putting into perspective has no significant direct effects on anxiety (-.0027, SE = .0038). Mindful attention awareness has significant direct effects on positive refocusing (-.0288, SE = .0036), but positive refocusing has no significant effects on anxiety (-.0173, SE = .0512). Mindful attention awareness has significant direct effects on positive reappraisal (.0230, SE = .0035), and positive reappraisal has significant effects on anxiety (-.2067, SE = .0581). Mindful attention awareness has significant direct effects on acceptance (.0143, SE = .0035), acceptance has no significant effects on anxiety (-.0948, SE = .0602). Mindful attention awareness has no significant effects on refocusing on planning (-.0005, SE = .0034), refocusing on planning has significant effects on anxiety (-.2360, SE = .0603). The 95% confidence interval of indirect effects of the model indicates that the associations between mindful attention awareness and anxiety were significant mediated by rumination (-.0075, 95% CI [-.0116, -.0039]), catastrophising (-.0292, 95% CI [-.0373, -.0217]), and positive reappraisal (-.0048, 95% CI [-.0085, -.0016]), but not by self-blame (-.0026, 95% CI [-.0055, .0000]), other blame (-.0008, 95% CI [-.0050, .0032]), putting into perspective (.0003, 95% CI [-.0005, .0013]), positive refocusing, (.0005, 95% CI [-.0025, .0035]), acceptance (-.0014, 95% CI [-.0036, .0004]) and refocusing on planning (.0001, 95%CI [-.0017, .0019]). All mediation results were displayed in Figure 7.

Table 14

Summary of Multiple Mediation Analyses of Cognitive Emotion Regulation Strategy on Mindful Attention Awareness Predicting Anxiety (Model 4 of PROCESS macro) in Thai Study

Independent variable	Mediating variable	Dependent variable	Effect of independent variable on mediating variable (a)	Effect of mediating variable on dependent variable (b)	Indirect effect of independent variable by mediating variable	
					(a x b)	95% CI
Mindful attention awareness	Self-Blame	Anxiety	-.0213** (*SE* = .0035)	.1210* (*SE* = .0584)	-.0026	[-.0055, .0000]
	Other-Blame		-.0357** (*SE* = .0035)	.0220 (*SE* = .0529)	-.0008	[-.0050, .0032]
	Rumination		-.0276** (*SE* = .0035)	.2708** (*SE* = .0588)	-.0075	[-.0116, -.0039]
	Catastrophising		-.0627** (*SE* = .0043)	.4653** (*SE* = .0477)	-.0292	[-.0373, -.0217]
	Putting into Perspective		-.0027 (*SE* = .0038)	-.0948 (*SE* = .0513)	.0003	[-.0005, .0013]
	Positive Refocusing		-.0288** (*SE* = .0036)	-.0173 (*SE* = .0512)	.0005	[-.0025, .0035]
	Positive Reappraisal		.0230** (SE = .0035)	-.2067** (SE = .0581)	-.0048	[-.0085, -.0016]
	Acceptance		.0143** (*SE* = .0035)	-.0948 (*SE* = .0602)	-.0014	[-.0036, .0004]
	Refocusing on Planning		-.0005 (*SE* = .0034)	-.2360** (*SE* = .0603)	.0001	[-.0017, .0019]

Total Effect = -.1485** (*SE* = .0072)

Direct Effect (c′) = -.1031** (*SE* = .0076), [-.1179, -.0883]

(a)   (a x b)   (b)

Self-Blame
-.0026 [-.0055, .0000]

-.0213**   .1210*

Other-Blame
-.0008 [-.0050, .0032]

-.0357**   .0220

Rumination
-.0075 [-.0116, -.0039]

-.0276**   .2708**

Catastrophising
-.0292 [-.0373, -.0217]

-.0627**   .4653**

Mindful attention awareness   -.1031 ** [-.1179, -.0883] (c′)   Anxiety

-.0027   -.0948

Putting into Perspective
.0003 [-.0005, .0013]

-.0288**   -.0173

Positive Refocusing
.0005 [-.0025, 0035]

.0230**   .2067**

Positive Reappraisal
-.0048 [-.0085, -.0016]

0143**   -.1184

Acceptance
-.0017 [-.0040, 0001]

.0005   -.2360**

Refocsuing on Planning
.0001 [-.0017, .0019]

Figure 7. Mediation Model for the Relationship between Mindful Attention Awareness and Anxiety Mediated by Cognitive Emotion Regulation Strategy in Thai Study

Table 15 shows the result of mediation analyses of cognitive emotion regulation strategy on decentering predicting anxiety in Thai samples. According to Table 15, total effect of decentering (IV) and cognitive emotion regulation strategies (MV) on anxiety (DV) were significant (.0468, $SE = .0231$). The direct effect of decentering on anxiety were not significant (.0371, $SE = .0215$). Regarding mediators, decentering has direct effects on self-blame (.0663, $SE = .0098$), and self-blame has significant effects on anxiety (.1993, $SE = .0605$). Decentering has significant direct effects on other-blame (.0261, $SE = .0103$), other-blame has no significant effects on anxiety (.0576, $SE = .0552$). Decentering has significant direct effects on rumination (.0906, $SE = .0098$), and rumination has significant effects on anxiety (.3452, $SE = .0614$). Decentering has significant direct effects on catastrophising (.0649, $SE = .0128$), catastrophising has significant effects on anxiety (.5870, $SE = .0490$). Decentering has significant direct effects on putting into perspective (.0829, $SE = .0106$), and putting into perspective has no significant direct effects on anxiety (-.1079, $SE = .0537$). Decentering has significant direct effects on positive refocusing (.0750, $SE = .0101$), but positive refocusing has no significant effects on anxiety (.0828, $SE = .0533$). Decentering has significant direct effects on positive reappraisal (.0957, $SE = .0096$), positive reappraisal has significant effects on anxiety (-.3631, $SE = .0647$). Decentering has significant direct effects on acceptance (.0883, $SE = .0098$), acceptance has significant effects on anxiety (-.1979, $SE = .0624$). Decentering has significant effects on refocusing on planning (.0780, $SE = .0994$), refocusing on planning has significant effects on anxiety (-.2440, $SE = .0631$). The 95% confidence interval of indirect effects of the model indicates that the associations between decentering and anxiety were significant mediated by self-blame (.0128, 95% CI [.0045, .0228]), rumination (.0313, 95% CI [.0192, .0444]), catastrophising (.0381, 95% CI [.0214, .0555]), acceptance (-.0175, 95% CI [-.0305, -.0064]), and refocusing on planning (-.0190, 95%CI [-.0312, -.0084]), but not by other blame (.0015, 95% CI [-.0017, .0059]), putting into perspective (-.0089, 95% CI [-.0188, .0004]), positive refocusing (.0062, 95% CI [-.0014, .0148]) and positive reappraisal (-.0347, 95% CI [-.0501, -.0203]), All mediation results were displayed in Figure 8.

Table 15

Summary of Multiple Mediation Analyses of Cognitive Emotion Regulation Strategy on Decentering Predicting Anxiety

(Model 4 of PROCESS macro) in the Thai Study

Independent variable	Mediating variable	Dependent variable	Effect of independent variable on mediating variable (a)	Effect of mediating variable on dependent variable (b)	Indirect effect of independent variable by mediating variable	
					(a x b)	95% CI
Decentering	1. Self-Blame	Anxiety	.0663** (*SE* = .0098)	.1933** (*SE* = .0605)	.0128	[.0045, .0228]
	2. Other-Blame		.0261* (*SE* = .0103)	.0576 (*SE* = .0552)	.0015	[-.0017, .0059]
	3. Rumination		.0906** (*SE* = .0098)	.3452** (*SE* = .0614)	.0313	[.0192, .0444]
	4. Catastrophising		.0649** (*SE* = .0128)	.5870** (*SE* = .0490)	.0381	[.0214, .0555]
	5. Putting into Perspective		.0829** (*SE* = .0106)	-.1079* (*SE* = .0537)	-.0089	[-.0188, .0004]
	6. Positive Refocusing		.0750** (*SE* = .0101)	.0828 (*SE* = .0533)	.0062	[-.0014, .0148]
	7. Positive Reappraisal		.0957** (*SE* = .0096)	-.3631** (*SE* = .0647)	-.0347	[-.0501, -.0203]
	8. Acceptance		.0883** (*SE* = .0098)	-.1979** (*SE* = .0624)	-.0175	[-.0305, -.0064]
	9. Refocusing on Planning		.0780** (*SE* = .0994)	-.2440** (*SE* = .0631)	-.0190	[-.0312, -.0084]

Total Effect (c) = .0468*, (*SE* = .0231) [.0014, .0922]

Direct Effect (c′) = .0371, (*SE* = .0215), [-.0050, .0791]

(b)   (a x b)   (b)

Self-Blame
.0128 [.0045, .0228]
.0663**
.1933**

Other-Blame
.0015 [-.0017, .0059]
.0261*
.0576

Rumination
.0313 [-.0192, 0444]
-.0906**
.3452**

Catastrophising
.0381 [.0214, .0555]
.0649**
.5870**

Decentering → Anxiety
.0371 [-.0050, .0791] (c′)

Putting into Perspective
-.0089 [-.0188, 0004]
.0829**
.1079*

Positive refocusing
-.0062 [-.0014, .0148]
.0750**
.0828

Positive Reappraisal
-.0347 [-.0501, 0203]
.0957**
-.3631**

Acceptance
-.0175 [-.0305, -.00064]
.0883**
-.1979**

Refocusing on Planning
-.0190 [-.0312, 0084]
.0780**
.2440**

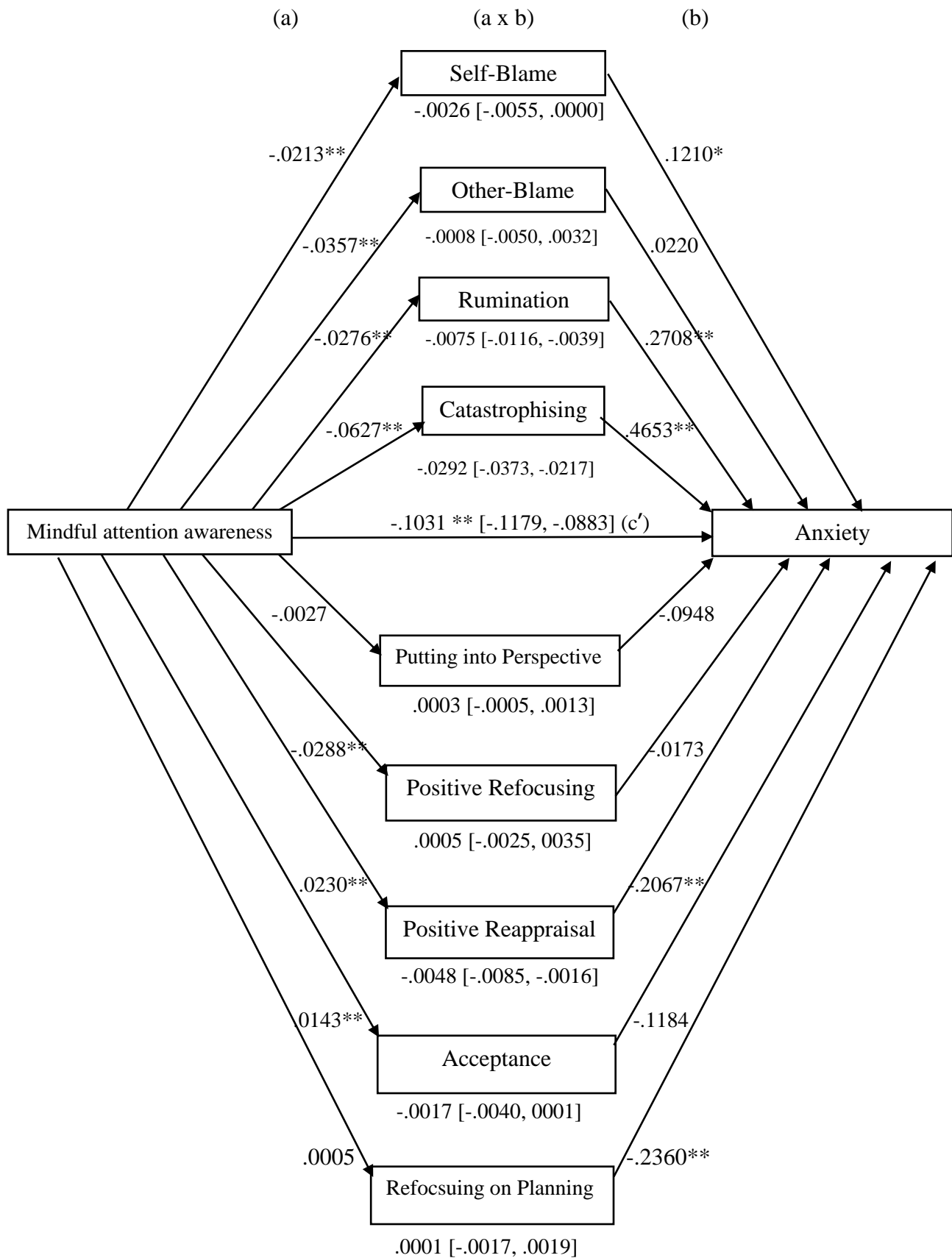*Figure 8.* Mediation model for the relationship between Decentering and Anxiety mediated by cognitive emotion regulation strategy in Thai Study

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Table 16 demonstrates the results of multiple mediation analyses of cognitive emotion regulation strategy on mindful attention awareness predicting depression in Thai samples. The total effect of mindful attention awareness (IV) and cognitive emotion regulation strategies (MV) on depression (DV) were significant (-.0922, *SE* = .0066). The direct effect of mindful attention awareness on depression were significant (-.0724, *SE* = .0071). Regarding mediators, mindful attention awareness has direct effects on self-blame (-.0224, *SE* = .0035), and self-blame has significant effects on depression (.1622, *SE* = .0544). Mindful attention awareness has significant directs effect on other-blame (-.0354, *SE* = .0036), other-blame has significant effects on depression (.1730, *SE* = .0495). Mindful attention awareness has significant direct effects on rumination (-.0283, *SE* = .0035), but rumination has no significant effects on depression (.0117, *SE* = .0546). Mindful attention awareness has significant direct effects on catastrophising (-.0631, *SE* = .0043), and catastrophising has significant effects on depression (.1447, *SE* = .0445). Mindful attention awareness has no significant direct effects on putting into perspective (-.0039, *SE* = .0038), and putting into perspective has no significant direct effects on depression (-.0011, *SE* = .0479). Mindful attention awareness has significant direct effects on positive refocusing (-.0286, *SE* = .0036), and positive refocusing has significant effects on depression (-.2005, *SE* = .0467). Mindful attention awareness has significant direct effects on positive reappraisal (.0221, *SE* = .0035), and positive reappraisal has significant effects on depression (-.2850, *SE* = .0578). Mindful attention awareness has significant direct effects on acceptance (.0137, *SE* = .0035), acceptance has significant effects on depression (-.1541, *SE* = .0561). Mindful attention awareness has no significant effects on refocusing on planning (-.0009, *SE* = .0034), but refocusing on planning has significant effects on depression (.1322, *SE* = .0561). The 95% confidence interval of indirect effects of the model indicates that the associations between mindful attention awareness and depression were significant mediated by other blame (-.0061, 95% CI [-.0103, -.0022]), catastrophising (-.0292, 95% CI [-.0148, -.0037]), positive refocusing, (.0057, 95% CI [.0029, .0091]), positive reappraisal (-.0063, 95% CI [-.0100, -.0033]), and acceptance (-.0021, 95% CI [-.0043, -.0015]), but not by self-blame (-.0036, 95% CI [-.0065, -.0011]), rumination (-.0003, 95% CI [-.0034, .0028]), putting into perspective (.0000, 95% CI [-.0005, .0006]), and refocusing on planning (.0001, 95%CI [-.0009, .0012]). All mediation results were displayed in Figure 9.

Table 16

Summary of Mediation Analyses of Cognitive Emotion Regulation Strategy on Mindful Attention Awareness Predicting Depression (Model 4 of PROCESS macro) in Thai Study

Independent variable	Mediating variable	Dependent variable	Effect of independent variable on mediating variable (a)	Effect of mediating variable on dependent variable (b)	Indirect effect of independent variable by mediating variable	
					(a x b)	95% CI
Mindful attention awareness	Self-Blame	Depression	-.0224** (*SE* = .0035)	.1622** (*SE* = .0544)	-.0036	[-.0065, -.0011]
	Other-Blame		-.0354** (*SE* = .0036)	.1730** (*SE* = .0495)	-.0061	[-.0103, -.0022]
	Rumination		-.0283** (*SE* = .0035)	.0117 (*SE* = .0546)	-.0003	[-.0034, .0028]
	Catastrophising		-.0631** (*SE* = .0043)	.1447** (*SE* = .0445)	-.0091	[-.0148, -.0037]
	Putting into Perspective		-.0039 (*SE* = .0038)	-.0111 (*SE* = .0479)	.0000	[-.0005, .0006]
	Positive Refocusing		-.0286** (*SE* = .0036)	-.2005** (*SE* = .0467)	.0057	[.0029, .0091]
	Positive Reappraisal		.0221** (*SE* = .0035)	-.2850** (*SE* = .0578)	-.0063	[-.0100, -.0033]
	Acceptance		.0137** (*SE* = .0035)	-.1541* (*SE* = .0561)	-.0021	[-.0043, -.0015]
	Refocusing on Planning		-.0009 (*SE* = .0034)	.1322* (*SE* = .0561)	.0001	[-.0009, .0012]

Total Effect (c) = -.0922** (*SE* = .0066)

Direct Effect (c′) = -.0724** (*SE* = .0071) [-.0863, -.0586]

(a)   (a x b)   (b)

Self-Blame
-.0024**   .0036 [-.0065, -.0011   .1622**

Other-Blame
-.0354**   -.0061 [-.0103, -.0020]   .1730**

Rumination
-.0283**   -.0003 [-.0034, .0028]   .0117

Catastrophising
-.0631**   -.0091 [-.0148, -.0037]   .1447**

Mindful attention awareness   -.0724** [-.0863, -.0586] (c′)   **Depression**

Putting into Perspective
-.0039   .0000 [-.0005, .0006]   -.0111

Positive Refocusing
-.0286**   .0057 [.0029, 0091]   -.2005**

Positive Reappraisal
.0221**   -.0063 [-.0100, -.0033]   -.2850**

Acceptance
.0137**   -.0021 [-.0043, -.0015]   -.1541*

Refocusing on Planning
-.0009   .0001 [-.0009, .0012]   .1322*

Figure 9. Mediation Model for the Relationship between Mindful Attention Awareness and Depression Mediated by Cognitive Emotion Regulation Strategy in Thai Study

Table 17 shows the results of multiple mediation analyses of cognitive emotion regulation strategy on curiosity predicting depression in Thai study. The total effect of curiosity (IV) and cognitive emotion regulation strategies (MV) on depression (DV) were significant (.0474, $SE = .0184$). The direct effect of curiosity on depression were not significant (.0115, $SE = .0183$). Regarding mediators, curiosity has significant direct effects on self-blame (.0710, $SE = .0089$), self-blame has significant direct effects on depression (.2146, $SE = .0182$). Curiosity has significant direct effects on other-blame (.0206, $SE = .0995$), and other-blame has no significant effects on depression (.1990, $SE = .0505$). Curiosity has significant direct effects on rumination (.0992, $SE = .0090$), rumination has no significant effects on depression (.0839, $SE = .0560$). Curiosity has significant direct effects on catastrophising (.0582, $SE = .0118$), and catastrophising has significant effects on depression (.2456, $SE = .0447$). Curiosity has significant direct effects on putting into perspective (.0799, $SE = .0097$), putting into perspective has no significant direct effects on depression (-.0279, $SE = .0493$). Curiosity has significant direct effects on positive refocusing (.0805, $SE = .0093$), positive refocusing has significant effects on depression (-.1137, $SE = .0587$). Curiosity has significant direct effects on positive reappraisal (.0886, $SE = .0088$), positive reappraisal has significant effects on depression (-.3870, $SE = .0587$). Curiosity has significant direct effects on acceptance (.0838, $SE = .0090$), and acceptance has significant effects on depression (-.2105, $SE = .0538$). Curiosity has significant effects on refocusing on planning (.0922, $SE = .0086$), refocusing on planning has significant effects on depression (-.1595, $SE = .0572$). The 95% confidence interval of indirect effects of the model indicates that the associations between curiosity and depression were significant mediated by self-blame (.0154, 95% CI [.0068, .0248]), other blame (.0041, 95% CI [.0003, .0093]), catastrophising (.0143, 95% CI [.0073, .0232]), positive refocusing, (-.0091, 95% CI [-.0174, -.0017]), positive reappraisal (-.0343, 95% CI [-.0487, -.0217]), acceptance (-.0177, 95% CI [-.0286, -.0079]) and refocusing on planning (-.0147, 95%CI [-.0253, -.0043]), but not by rumination (.0083, 95% CI [-.0026, .0196]), and putting into perspective (-.0022, 95% CI [-.0099, .0052]), All mediation results were displayed in Figure 10.

Table 17

Summary of Multiple Mediation Analyses of Cognitive Emotion Regulation Strategy on Curiosity Predicting Depression

(Model 4 of PROCESS macro) in Thai Study

Independent variable	Mediating variable	Dependent variable	Effect of independent variable on mediating variable (a)	Effect of mediating variable on dependent variable (b)	Indirect effect of independent variable by mediating variable	
					(a x b)	95% CI
Curiosity	Self-Blame	Depression	.0710** (*SE* = .0089)	.2164** (*SE* = .0183)	.0154	[.0068, .0248]
	Other-Blame		.0206* (*SE* = .0095)	.1990** (*SE* = .0505)	.0041	[.0003, .0093]
	Rumination		.0992** (*SE* = .0090)	.0839 (*SE* = .0560)	.0083	[-.0026, .0196]
	Catastrophising		.0582** (*SE* = .0118)	.2456** (*SE* = .0447)	.0143	[.0073, .0232]
	Putting into Perspective		.0799** (*SE* = .0097)	-.0279 (*SE* = .0493)	-.0022	[-.0099, .0052]
	Positive Refocusing		.0805** (*SE* = .0093)	-.1137* (*SE* = .0490)	-.0091	[-.0174, -.0017]
	Positive Reappraisal		.0886** (*SE* = .0088)	-.3870** (*SE* = .0587)	-.0343	[-.0487, -.0217]
	Acceptance		.0838** (*SE* = .0090)	-.2105** (*SE* = .0538)	-.0177	[-.0286, -.0079]
	Refocusing on Planning		.0922** (*SE* = .0086)	-.1595* (*SE* = .0572)	-.0147	[-.0253, -.0043]

Total Effect (c) = -.0474** (*SE* = .0184) [-.0835, -.0114]
Direct Effect (c′) = -.0115 (*SE* = .0183) [-.0474, .0243]

(a)　　　　　　　　　　　　(a x b)　　　　　　　　　　　(b)

Self-Blame

.0710**　　　.0154 [.0068, .0248]　　　.2164**

Other-Blame

.0206*　　　.0041 [.0003 .0093]　　　.1990**

Rumination

.0992**　　　.0083 [-.0026, .0196]　　　.0839

Catastrophising

.0582**　　　.0143 [.0073, .0232]　　　.2456**

Curiosity　　　　-.0115 [-.0474, .0243] (c′)　　　　Depression

.0799**　　　　　　　　　　　　-.0279

Putting into Perspective

-.0022 [-.0099, .0052]

.0805**　　　　　　　　　　　-.1137*

Positive Refocusing

-.0091 [-.0174, -.0017]

.0886**　　　　　　　　　-.3870**

Positive Reappraisal

-.0343 [-.0487, -.0217]

.0838**　　　　　　　　-.2105*

Acceptance

-.0177 [-.0286, -.0079]

.0922**　　Refocusing on Planning　　-.1595**
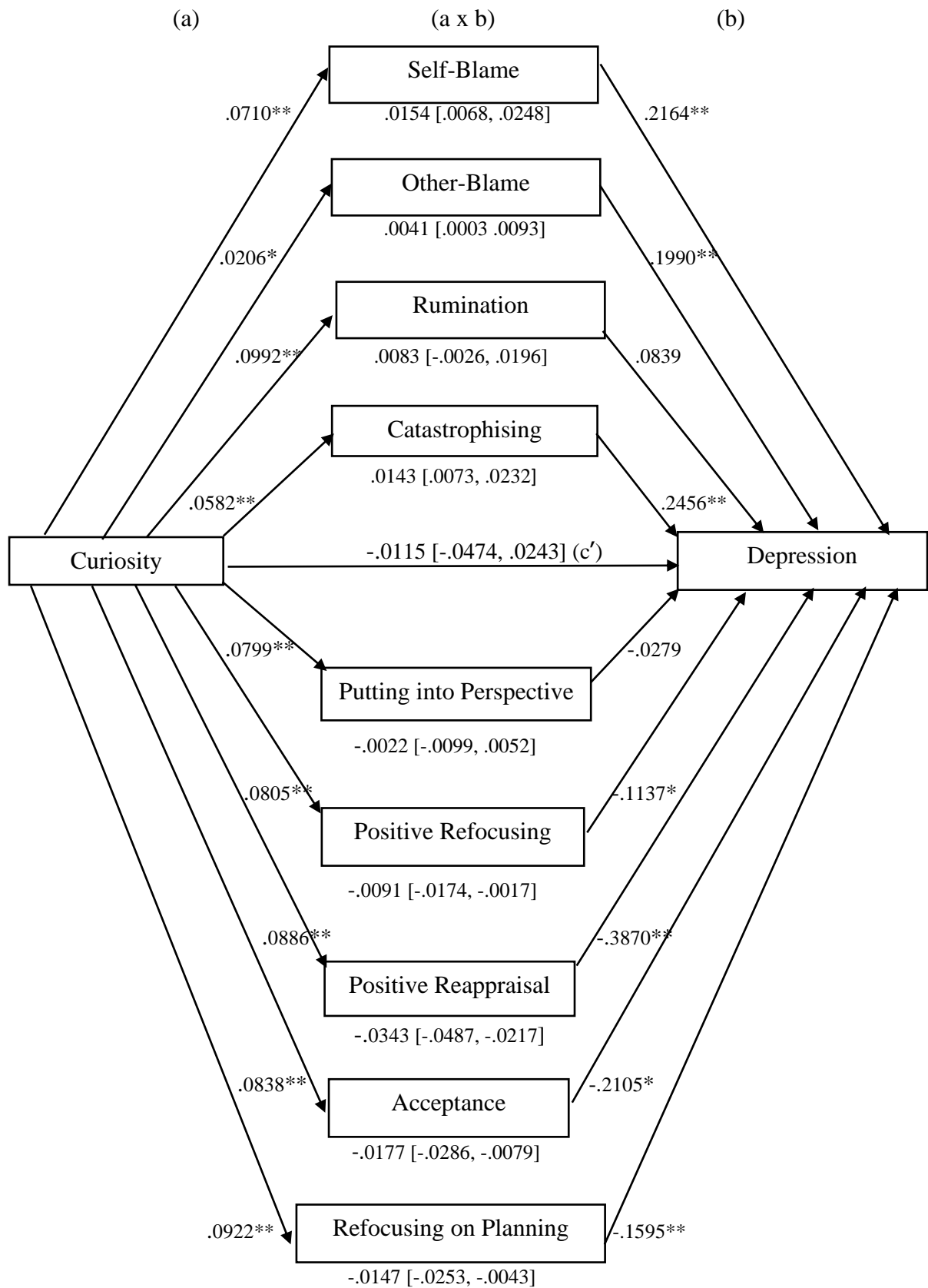
-.0147 [-.0253, -.0043]

Figure 10. Mediation Model for the Relationship between Curiosity and Depression
Mediated by Cognitive Emotion Regulation Strategy in Thai Study

4.6 Discussion:

The main purpose of the present study is to investigate whether trait Mindfulness; mindful attention awareness), curiosity and decentering and nine cognitive emotion regulation strategies (self-blame, other-blame, rumination, catastrophising, positive refocusing, positive reappraisal, refocus on planning, acceptance and putting into perspective) is associated with emotional states in terms of anxiety and depression in the US and Thailand. As well, it is to investigate whether the association between mindfulness and emotional states (anxiety and depression) is mediated by cognitive emotion regulation. Together, these studies mainly indicate that trait mindfulness and strategies of cognitive emotion regulation were associated with emotional states (anxiety and depression) – as hypothesised. This finding is in line with previous literature as to this area (e.g., Giluk, 2009; Mesmer-Magnus et al., 2017; Webb, Miles & Sheeran, 2012) although, notably, partially different results are found. In addition, as expected, the results indicate that the influence on predicting emotional states (anxiety and depression) by trait mindfulness and by cognitive emotion regulation strategies are different, as has been found in previous investigations (e.g., Chamber et al., 2015; Keng et al., 2013).

In terms of trait mindfulness, the key findings show that the MAAS score has a significant and negative correlation with emotional states including anxiety and depression among both the US and Thai samples. Notably, this is the strongest predictor of anxiety and depression. This relationship can be explained in terms of mindfulness aspects pertaining to the process of emotion of present attentive self-awareness and non-elaborating. In regard to the mindfulness concept, a mindful person could be attentionally aware of their sensations, feelings and thoughts at the present moment, namely in being present. Consequently, they may be less occupied by negative thoughts being held as to the past or worry as to the future, subsequently then being able to decrease any negative emotional states. In terms of non-elaborating, a mindful individual tends not to judge (appraise) the present stimuli being experienced. Consequently, emotional responses or emotional states (especially those negative emotional states such as anxiety and depression) could be reduced. In other words, mindfulness might weaken emotional states by diminishing the cognitive reappraisal being undertaken, as is a significant step in the emotion process. Surprisingly however, when it comes to the association between the facets of mindfulness (curiosity and

decentering) measured by Trait TMS and emotional states, diverse results are established. The curiosity facet only has a significant and negative correlation with depression in the Thai sample, whereas the decentering facet is negatively and significantly correlated with anxiety and depression in the US sample but not in the Thai sample. In addition, the differences between these two measures is highlighted in terms of predicting power. While the MAAS score is the greatest predictor, curiosity and decentering cannot predict anxiety and depression. The different findings from that of mindfulness by MAAS might reflect the problematic issues that arise within mindfulness investigations – crucial areas that arise due to the different concepts of mindfulness found among the subjective scales. Indeed, these aspects have been discussed, in detail, in previous literature (e.g. Andrei, Vesely & Siegling, 2016; Baer, 2016; Chiesa, 2013; Hart, Ivtzan & Hart, 2013; Park, Reilly-Spong & Gross, 2013; Purser & Milillo, 2015; Rau & Williams, 2016; Sauer et al., 2013).

In turning now to the main finding as to the association between the strategy of cognitive emotion regulation, four unadjusted strategies (catastrophising, rumination, self-blame, and other-blame) and five adjusted strategies and emotional states (positive reappraisal, positive refocusing, refocusing on plan, putting into perspective, and acceptance), as hypothesised the significant correlations between these two variables, are revealed. The results further show that different emotion regulation strategies have unique correlational strength with anxiety and depression. Theoretically, this finding could be clarified by the emotion regulation model as proposed by Gross and Thompson (2009), whereby it is described in the introduction that the strategy of emotion regulation could impact upon emotional responses. Furthermore, meaningful results are established via hierarchical multiple regression to clarify the relationships.

In regard to the unadjusted cognitive emotion regulation strategies, catastrophising is the most distinctive cognitive emotion regulation strategy in regard to this aspect having a positive relationship with anxiety and depression in both the US and Thai samples. A possible explanation here is that catastrophic-thinking focuses on the unpleasantness of the experience (Garnefski, Kraaij & Spinhoven, 2002) and consequently may cause individuals to be anxious and depressive. In a similar way, rumination – repetitive thinking over distressing symptoms, especially feelings and thoughts being induced by bad experiences (Garnefski, Kraaij & Spinhoven, 2002; Nolan, Roberts & Gotlib, 1998) – demonstrates a potential power to predict anxiety.

It could be said that individuals who undertake rumination consistently overthink the future in negative ways due to previous negative experiences and are thus likely to be anxious and have unpleasant feelings in the future. However, unexpectedly, although rumination is significantly correlated with depression among the US sample it is not a significant predictor. Clarification as to the current finding should be explored in future investigations. Also, the self-blame strategy identifies the variation of power in predicting anxiety and depression in the present findings. While self-blame can predict depression among the samples in both countries, it predicts anxiety only in the Thai sample. One likely reason for this relationship is that persons who blame themselves for stressful circumstances could induce guilty feelings and disgust as to themselves and thereby decrease their own self-worth. Consequently, such persons may become depressive (Duncan & Cacciatore, 2015; Zahn et al., 2015) and face anxiety (Duncan & Cacciatore, 2015). The Other-Blame strategy – the blaming of other people for one's own experiences (Garnefski, Kraaij & Spinhoven, 2002) – is found to have a significant and positive correlation with anxiety and depression, however, it can predict only depression in the Thai sample. A possible contributor to this association is that persons employing the other-blame strategy in order to deal with their respective situations may feel powerless (Antoine et al., 2018), with this consequently having the potential to elicit anxiety and depression.

In regard to the adjusted cognitive emotion regulation strategies, positive reappraisal, a thought whereby positive meaning is given towards experiences in life in order to develop oneself (Garnefski, Kraaij & Spinhoven, 2002), is shown to have negative associations with anxiety and depression, yet it is found to be able to predict anxiety and depression in the Thai sample but not in the US sample. This relationship could be explained in terms of the process of adaptive coping, whereby positive reappraisal can help persons to reduce their stress by appraising stressful events in positive ways (Garland, Gaylord & Park, 2009) and hence negative emotional states could be reduced. In the same vein, positive refocusing is associated with emotional states, however, in terms of being a predictor, various results have been produced. It has been noted as being able to predict anxiety in the US sample and to predict depression in the Thai sample. The differences in these results could derive from the cultural factors discussed in a previous section, whereby individual differences (such as their respective culture) could impact upon how a person regulates their emotion and

emotional response (John & Gross, 2007). This is a feasible reason for the identified negative relationship as, with emotional states, instead of thinking about real matters individuals can keep focusing on positive matters (Garnefski, Kraaij & Spinhoven, 2002) and thus may encounter a decrease in anxiety or depression evoked by actual events. In regard to the strategy of refocusing on planning, an ability is found to predict anxiety and depression within the Thai sample, but only depression can be predicted in the US survey. The relationship between this strategy and emotional states can be explained as individuals, when facing difficulties, tending to use this strategy to think about how they will deal with any arisen difficulties (Garnefski, Kraaij & Spinhoven, 2002). A result of this is that anxiety and depression induced by negative thoughts may not be evoked. The present findings identify how the strategy of acceptance is able to predict depression only in the Thai sample. When individuals use this strategy, they will accept experiences without avoiding them (Garnefski, Kraaij & Spinhoven, 2002) and thus negative experiences may not irritate them or induce distress. Finally, the strategy of putting into perspective is the only cognitive emotion regulation strategy that failed to predict anxiety and depression, although it is positively correlated with depression within the Thai sample. It may therefore be said that individuals who regulate emotion by comparing the given circumstances with other events in order to minimise the seriousness of the situation (Garnefski, Kraaij & Spinhoven, 2002) may invoke insufficient influence upon their emotional states.

In regard to the comparison between trait mindfulness and the strategy of cognitive emotion regulation in terms of the degree of predicting emotional states, as hypothesised the results reveal differences among these variables. While the remaining cognitive emotion regulation strategies account for the unique variance as to anxiety and depression – as discussed previously – mindfulness and the catastrophising strategy demonstrate the strongest potential to predict anxiety and depression. In the current findings, mindfulness has the greatest association and is negatively correlated with anxiety and depression, whereas catastrophising is positively correlated with those negative anxiety and depression. One can assume that mindfulness and catastrophising might be highly involved with mental health relating to anxiety and depression. Thus, mindfulness could be crucial and beneficial for human well-being as the higher the level of trait mindfulness people possesses, the lower levels of anxiousness and depression they will encounter. Also, conceptually, mindfulness might be involved with

catastrophising as mindfulness could decrease overthinking (a common instigator of catastrophising). Reducing the use of the catastrophising strategy may thus be able to diminish the facing of anxiety and depression. The meaningful associations among mindfulness, cognitive emotion regulation, anxiety and depress were revealed in the present study, hence, crucially, further investigation, mediation analysis, should explore the casual effects among mindfulness, cognitive emotion regulation and emotional states in order to gain more understanding about the mechanism of mindfulness on emotional states (anxiety and depression) through cognitive emotion regulation strategy.

The following is a discussion about the finding on the mediation analysis in the present study. The main result reveals that the associations between mindfulness (mindful attention awareness, curiosity, decentering) and emotional states (anxiety and depression) are mediated by cognitive emotion regulation strategy as was hypothesised. Although the main finding indicates that cognitive emotion regulation mediates the association between mindfulness and emotion states (anxiety and depression), the results are diverse upon the facet of mindfulness (mindful attention awareness, curiosity, and decentering) and type of emotional states (anxiety and depression), and the group of sample (the US resident and Thai). The detail is discussed as follow.

In respect to anxiety, the negative association with mindful attention awareness is mediated by catastrophising both in the US resident (Table 10) and Thai samples (Table 14). As was discussed in the previous section, one possible theoretical explanation is that mindful attention awareness could allow individuals to be aware and pay attention to the present moment, but not focus on the past experiences, thus individuals could diminish to use catastrophising strategy focusing on the past experiences inducing anxiety (Garnefski, Kraaij & Spinhoven, 2002). Furthermore, in Thai study, rumination is also a significant mediator. This finding supports previous study of Desrosiers and colleagues (2013). In similar way with catastrophising, it could be said that a person with mindful attention awareness at the present moment tend not think repetitively over distressing feeling and thoughts (rumination) elicited by bad experiences. Additionally, positive reappraisal mediates the association as well in Thai group. It could be possibly explained that a mindful person who pays attention at the presence without negatively thinking about the past experience might shift their thought to focus easily on the positive meaning of experiences in life to develop oneself

(Garnefski, Kraaij & Spinhoven, 2002), consequently, the anxiety could be decreased. With regard to the negative association between decentering, another facet of mindfulness, and anxiety, positive refocusing mediated this association in the US resident (Table 11). This finding collaborates with the previous work of O'Toole and colleagues (2018). It could be possibly explained by that individuals with decentering tend not to judge or elaborate their own experiences with self-reference (Davis, Lau, & Cairns, 2009) especially negative self-reference which can evoke negative elaboration inducing anxiety (Memnin & Fresco, 2013; Otoole et al/, 2018). Hence decentering could allow individuals not focus on negative sides and shift to refocus on positive sides of the experience that could reduce anxiety.

In terms of depression, the association with mindfulness are mediated by cognitive emotion regulation as well. First is the association between mindful attention awareness and depression. It was mediated by catastrophising both in the US residents (Table 12) and Thai group (Table 16). In the same way of the association with anxiety, mindful attention awareness let individuals to be attentionally aware of the present experiences including feeling and thought, thus it can reduce catastrophising, a thought focusing on the unpleasantness of the experience (Garnefski, Kraaij & Spinhoven, 2002). As a result, reduced catastrophising could decrease depression. Moreover, refocusing on planning, a thought of action to handle the negative situation (Garnefski, Kraaij & Spinhoven, 2002), is also a significant mediator on the negative association between mindful attention awareness and depression in the US and Thai group (Table 12 and 16). The possible explanation is that mindful persons pay attention to the present moment so they could disengage their negative thought or elaboration on the event to the present actual event. Their thought might not be interfered by the negative elaboration so they could shift their thought to concentrate or focus on the plan to handle the unpleasant event. As mindful attention awareness could enhance concentration on planning by disengaging from negative thought over the negative experiences, it could diminish depression elicited by such experiences. In Thai group, significant mediators of this association are other-blame, positive refocusing, positive reappraisal, and acceptance (Table 16). Regarding other-blame, thoughts to blame another person or environment for one own experience (Garnefski, Kraaij & Spinhoven, 2002), the possible explanation is similar to catastrophising and rumination that mindful persons could diminish or disengage their negative thought or negatively judge by being

aware attentionally on the actual present internal experiences, thus they tend to be not judge or think negatively on other person, and this could decrease depression. In terms of positive reappraisal, the thinking to create positive meaning on the event (Garnefski, Kraaij & Spinhoven, 2002), the possible explanation is similar to refocusing on planning that mindful attention awareness could allow individuals to be aware of the present moment attentionally so they could disengage and shift from the thought over the past or the future, especially on negative thought, then they may possibly create positive meaning on the event they face. As a result, the depression induced by negative thought could be reduced. In terms of acceptance, the thoughts to accept one own experience as it happened (Garnefski, Kraaij & Spinhoven, 2002), it could be said that mindful attention awareness could allow individuals not to elaborate or judge the experience they face as they are attentionally aware of the actual experience at the present moment as a result individuals could accept what they face as it is. Thus, individual with acceptance could possibly reduce negative judging stimulated depression. Unexpectedly, positive refocusing is mediated the positive association between mindful attention awareness and depression in respondents. Regarding the present result, it indicated that mindful attention awareness was a significant and negative predictor of positive refocusing. While positive refocusing has negative association with depression. Thus, it could be explained that individual with mindful attention awareness might pay attention at the actual present experience therefore they tend not to focus on positive sides of that experience. As a consequence, the more mindful attentional aware of the actual present event, the less refocus positive side of the event. Depression is a mood disorder induced by sadness (World Health Organization, 2017). Hence, individuals might be more depressive if they could not realize the positive side of their experiences to uplift their sadness.

Second is the association between curiosity and depression. Regarding the finding in Thai respondents, the positive association is mediated by self-blame, other blame, catastrophising, while the negative association is mediated by positive refocusing, positive reappraisal, acceptance, and refocusing on planning (Table 17). The possible explanation is that curiosity facet is a willingness to learn one own experience with openness (Davis, Lau, & Cairns, 2009), thus curios people might more open to both unadjusted and adjusted cognitive emotion thoughts. Those are self-blame, other blame, catastrophising thus depression evoked by these unadjusted cognitive emotion

strategies could increase. Curios people could also more open to learn and apply adjusted cognitive emotion regulation strategies, positive reappraisal and acceptance, thus depression could be inhibited by these strategies as well. It could be said that cognitive emotion regulation completely meditates the association between curiosity and depression as it has significant total effect, but not significant direct effect according Table 17.

Third is the association between decentering and depression in the US group. This association is mediated by refocusing on planning (Table 12). This could be explained in a similar way of how refocusing on planning is mediated the negative association between mindful attention awareness and depression. That is individuals with decentering tend not to judge or elaborate their experiences with self-reference stimulating negative thought and feeling. Thus, they could shift their attention to think of action to handle the negative situation. Consequently, depression induced by negative thought, and reduced by focusing on planning could be decreased.

Collectively, these studies outline a critical role for mindfulness on anxiety and depression in two ways; direct effect and indirect effects through cognitive emotion regulation strategies. Mindful attention awareness and decentering revealed negative association with anxiety and depression because mindful individuals are likely to be aware of their actual present experiences without elaborating that might induce anxiety and depression. With these aspects of mindfulness, individual could decrease using unadjusted cognitive emotion regulation strategies including catastrophising, rumination, self-blame, and other blame. In addition, mindful person could also use more adjusted cognitive emotion regulations; positive refocusing, positive reappraisal, acceptance, and planning because they may be capable to disengage from negative thought, then shift their thought to positive thought as they may not be interfered by negative thought. As a consequence, anxiety and depression could be reduced. This present study supports evidence from several clinical studies especially regarding mindfulness-based stress reduction programme (Kabat-Zinn, 1990) and mindfulness based cognitive therapy for depression programme (Segal, Teasdale & Williams, 2002) that reveal meaningful benefit of stressful or depressive persons. (e.g., Chiesa et al., 2017; Dobkin, 2008; Edenfield & Saeed, 2012; Grossman et al., 2004; Klatt, Buckworth & Malarkey, 2009; Khoury et al., 2015; Melloni et al., 2013). However, it is worth noting that curiosity, another facet of mindfulness indicates different results from

that of mindful attention awareness and decentering in terms of the effect on anxiety and depression. That is curiosity, a willingness to learn one own experience with openness, could be an accelerator of the effect of cognitive emotion regulation on emotional states (anxiety and depression). It could increase depression if individuals use unadjusted thoughts but decrease depression if using adjusted thoughts to regulated emotion. In other words, curiosity itself has no direct effect on emotional state.

Considering all of the above-provided evidence, it can be seen that a number of substantial issues arise in exploring the relationship between mindfulness, emotion regulation strategies and emotional states (anxiety and depression). The first issue relates to the mindfulness measures and the different results found among mindful attention awareness, curiosity, and decentering. As discussed, the findings seem to disclose and emphasise the existing problematic issue of mindfulness whereby diverse concepts are found across the subjective mindfulness scales. Thus, future investigation should give concern to this shortcoming and should aim to find effective solutions through which to validate the results of undertaken research – for example, by measuring mindfulness objectively, applying diverse mindfulness measures or evaluating mindfulness by measuring antithetical variables of mindfulness (namely mind wandering, as presumably relates to the use of emotion regulation). A further issue relates to the cultural factors that arise. Although the present study is not cross-cultural in nature, it is worth noting that different results are found between the US and Thai samples in terms of the variance of correlation among the different cognitive emotion regulation strategies with anxiety and depression. By extension, it can be claimed that culture influences such results as it may impact upon how individuals regulate their emotion (John & Gross, 2007). Notably, this echoes prior findings (e.g., Butler, Lee & Gross, 2007; Hu et al., 2014; Soto et al., 2011). Thus, to investigate related topics, cultural variables and cultural factors should be concerned with. The final issue worth considering is the difference between the sample sizes – whereby the US survey had 155 respondents and the Thai survey had 1,800 respondents. In regard to the statistical analysis, the greater the sample size, the greater the accuracy of the results (such as in relation to decreasing the uncertainty of the results and in increasing the power to detect differences among the variables) (Cohen, 1992). Thus, the different results in the US sample and the Thai sample may not be directly comparable. The surveys are aimed only at reflecting the preliminary results relating to the association

between mindfulness, cognitive emotion regulation and emotional states in different cultural backgrounds. Thus, future investigation among diverse cultures with comparable sample sizes are needed when producing cross-cultural studies.

Taken together, these studies support the notion that mindfulness and emotion regulation strategies are associated with emotional states (anxiety and depression), however some limitations to this conclusion should be considered. The first limitation is that the scales of mindfulness in this study are subjective and are employed in relation to different concepts and thus the findings vary. It is necessary to clarify these results with future investigation, as can be achieved by using potential measures as mentioned in a prior section. The other limitation is that the Thai sample comprises only university students and thus the findings could be less generalisable to different populations.

4.7 Conclusion

Overall, these studies illustrate how mindfulness and cognitive emotion regulation strategies relate to the emotional states of anxiety and depression. Although the findings provide variance as to the associations between these variables, it is mainly indicated that mindful attention awareness and catastrophising have the strongest associations with the emotional states of anxiety and depression. The more mindful a person is, the less emotional states (anxiety and depression) they have. The more catastrophic thoughts that they regulate, the more emotional states (anxiety and depression) are induced. The association between mindfulness and anxiety, and depression was also mediated by cognitive emotion regulation strategies as mindfulness (mindful attention awareness and decentering) might allow persons to use less unadjusted cognitive emotion regulation strategies by disengaging from negative thought and to use more adjusted strategies by shifting to focus on positivity of their experiences. The finding contributes and expand the understanding on the mechanism of facet of mindfulness on anxiety and depression through cognitive emotion regulation. An implication of this is that mindfulness may be beneficial to a person's mental health. Yet, it is necessary to give further investigation as to these results to ensure robustness, with this being achievable via the application of different measures of mindfulness and by undertaking a cross-cultural study with comparable sample sizes.

Chapter Five

Relationships That Exist between Mindfulness and Emotional Reactivity via the Use of Affective Pictures

5.1 Abstract

To deepen the understanding held as to the relationship between mindfulness and emotion, it is necessary to explore the various related dimensions of mindfulness and emotions. Emotional reactivity is a crucial dimension as its influence within this relationship has been demonstrated in previous studies. Additionally, this can be investigated via the emotional process in a laboratory, as is the other substantial method of exploring human emotion. So far however, the relationship between mindfulness and emotional reactivity has been understudied, particularly when using affective pictures in a laboratory setting. Moreover, the previously published results as to this area are not consistent. The primary aim of this study is thus to explore the relationship between mindfulness (as assessed via the Mindful Attention Awareness Scale, Trait Toronto Mindfulness Scale and breath counting accuracy) and emotional reactivity (as accessed via Skin Conductance Response and self-ratings). 44 non-clinical undergraduate students of the University of Leicester took part in an analogue laboratory, whereby the database of The Nencki Affective Picture System (NAPS) was used to elicit emotional reactivity. The findings have identified that mindfulness – mindful attention awareness of MAAS, the decentering facet of Trait TMS and Mind Wandering are significant predictors of emotional reactivity. These findings can contribute to a better understanding being held as to the relationship between the two variables. In addition, the limitations of the study are also noted.

5.2 Introduction

Operationally, the concept of mindfulness emphasises two aspects or facets; self-awareness with attention being given to present internal experiences, and attitude-related facet as arises as non-elaborating, decentering, acceptance (Bishop et al., 2004). To date, the exploration of mindfulness, as involves emotion, has increased significantly due to emotion playing a crucial role in human behaviour and the mental health of individuals (Gu et al., 2015). The investigations as to the relationship between mindfulness and emotion has been undertaken through many dimensions because

emotion has multiple facets – as highlights that various definitions of emotion have been given by researchers. Sander (2013) has identified four general criteria that frequently arise within the definitions given as to emotion; (1) that emotion has multiple dimensions including physiological, cognitive and expressive facets, (2) that the emotional process has two phases – emotion elicitation and emotional response, (3) that emotion always involves objects or matters and (4) that the duration of emotion is short in comparison with other phenomena of emotion. Recently, renewed interest has been given to the emotional reactivity involved in the relationship between mindfulness and emotional states relating to mental health (Gu et al., 2015).

5.2.1 Overview of Emotional Reactivity

A significant method of investigating emotion-related issues is the focusing on emotional reactivity as is involved in the emotion processes undertaken by individuals. As mentioned in the general introduction, the emotion process has been detailed in a number of major theories or models of emotion – including the James-Lang Theory (Strongman, 1996), a contemporary model proposed by Scherer (2000), through physiological-based theories such as the motivation organisation of emotion by Lange (1995) and the Category Theory of Emotion by Ekman (1992) and, finally, via cognitive-based theories such as the Social Cognition Theory (Sander, 2013). Although emotional processes have been differently explained by several models, in general it is held that emotion is elicited by affective stimuli, as are potentially internal sources (i.e., biological factors) and external sources (i.e., individual experiences) (Scherer, 2000). Here, emotional reactivity is then expressed in various forms – such as via a physiological response. Aside from these theoretical explanations, Rachman (1980) has proposed an operational process of emotion that emerges out of emotional disturbance, with this being followed by a decreasing of emotional disturbance and then the restoring of normal emotion or behaviour.

In regard to the study of emotional reactivity, Skin Conductance R esponse (SCR) is widely applied to assess emotional reactivity (Bach et al., 2009; Braithwaite et al., 2013; Kreibig, 2010), primarily as it is related to the sympathetic emotional process (Bach et al., 2009; Kreibig, 2010). SCR is one form of physiological emotional reactivity in terms of electrodermal activity (EDA) or Galvanic Skin Response (GSR). SCR reflects electrical changes in the eccrine sweat glands of skin (notably in the

hands) and is induced by the sympathetic autonomic nervous system (ANS) (Figner & Murphy, 2011; Kreibig, 2010; Mendes, 2008). SCR refers to "the phasic change in [the] electrical conductivity of skin" (Braithwaite et al., 2013) and can therefore be measured by passing a slight current from two electrodes through a person's skin. From this, resistance to the current can be assessed (Mendes, 2008). In general, SCR is calculated in terms of the amplitude of change in the unit of microSiemen (μS) (Figner & Murphy, 2011).

Investigations as to emotional reactivity are based on the emotional process, whereby researchers are required to elicit emotion via the presentation of affective stimuli in order to induce emotional reactivity. Internationally, affective pictures are widely utilised in emotion and attention laboratory studies (Bradley & Lang, 2007b). From affective pictures system (APS) research, variations of emotional intensity, in it being indicated via the amplitude of skin conductance, has been shown to be influenced by the respective types of image viewed – be it pleasant, unpleasant or neutral (Alpers, Adolph & Pauli, 2011; Pastor et al., 2008). The use of affective pictures to evoke emotion has thus been widely utilised (e.g., Garrett & Maddock, 2006; Güntekin & Başar, 2014). This technique, originally created by Lang, Bradley & Cuthbert in 1997 (Lang, Bradley, & Cuthbert, 1998), is now mainly referred to as the International Affective Pictures System (IAPS). To date, additional resources as to affective pictures have been developed - for example, the Nencki Affective Picture System (NAPS) – in order to improve the quality of stimuli produced (Marchewka et al., 2014). Using such affective pictures is vital for investigating emotional reactivity, with previous studies having documented that such stimuli could provoke emotional responses activated by the Central Nervous System (CNS) and the Autonomic Nervous System (ANS). Notably, this plausibly establishes that emotional engagement relates to emotional theory. Additionally, the context of affective pictures is manageable within a laboratory setting and thus this strengthens our understanding as to the emotion-related mechanism in regard to both clinical and nonclinical issues (Bradley & Lange, 2007b).

5.2.2 Link between Mindfulness and Emotional Reactivity.

Mindfulness could pertain to emotional reactivity, not only in terms of physiological reactivity but also in regard to cognitive response. Theoretically, a plausible explanation as to this association could be considered to relate to

physiological-based and cognitive-based theories. Firstly, in respect of physiological-based theories of emotion, emotional bodily reactivity is the result of the Central Nervous System and the Autonomic Nervous System – namely the sympathetic nervous system - being evoked by affective stimuli (Banks et al., 2012). Theoretically, affective stimuli could activate the brain or nervous system, from which individuals may undertake to flight (avoid) or fight in response. This is found to arise in relation to both aversive and unpleasant stimuli (Friedman, 2007) and to appetitive or pleasant stimuli (Lang, Davis & Öhman, 2000). Consequently, physiological reactivity can be expressed in several forms – such as Skin Conductance Response (Lang, Davis & Öhman, 2000). However, physiological reactivity might be altered mainly via expectation and attention being given to bodily states (Hoehn-Saric & McLeod, 2000) and thus mindfulness may impact upon the physiological reactivity as mindful persons tend to be non-judgmental or accepting (less expectant) towards emotional stimuli. Moreover, such persons are able to be aware of and pay attention towards present sensations and feeling while disengaging from habitual emotional reactivity towards affective stimuli (Ho et al., 2015). It could be said that mindfulness may improve physiological flexibility and adaptability towards emotional tasks – i.e., in relation to autonomic flexibility (Friedman, 2007; Park & Thayer, 2014; Thayer & Lane, 2000). Secondly, together with cognitive-based theories, aspects of mindfulness - including self-awareness as to the present moment and the possession of an open, non-judgemental or accepting attitude – could reduce emotional reactivity by increasing the psychological flexibility of individuals (e.g., Cristea et al., 2012; Gu et al., 2015; Lindsay & Creswell, 2017; Park & Thayer, 2014). Psychological flexibility, as manifests as the capability to receive or be open to present experiences with acceptance (Gu et al., 2015), is involved with adaptive emotion regulation (Hayes & Feldman, 2004; Park & Thayer, 2014). Mindful persons with psychological flexibility could therefore adapt or disengage their cognitive response to regulate their emotion while facing emotional stimuli, doing so without avoidance or suppression. As a consequence, individuals could plausibly balance their emotional response to arisen stimuli (Erisman & Roermer, 2010; Garland, 2011; Ho et al., 2015; Lindsay et al., 2018).

5.2.3 Previous Studies and Limitations

A number of studies have investigated the relationship between mindfulness, especially in terms of mindfulness-based intervention and emotion-related variables

such as stress. Consistently, the results of such research have revealed the relationship that arises between these two variables (Gu, 2015). Studies as to mindfulness and emotional reactivity, as use affective pictures in a laboratory setting, represent the other method of studying emotion in regard to the process of emotion (Feldman et al., 2014), however this approach has rarely been employed.

One study in this area is Ortner, Kilner & Zelazo (2007), as explored the effects of trait mindfulness by measuring both the Toronto Mindfulness Scale (TMS) and the Mindful Attention Awareness Scale (MAAS). In addition, mindfulness was also measured in regard to emotional interference and cognitive tasks (attentional control). In the first study, affective pictures were presented to evoke emotions among mindfulness mediation (MM) practitioners. The results demonstrated that those participants with higher levels of MM experience had less interference from affective pictures. Furthermore, it was found that these individuals had a higher level of psychological wellbeing. In the second study, the participants who had attended a mindfulness meditation course reported a smaller skin conductance response and encountered a decrease in emotional interference. Here, wellbeing among the research participants increased. Both studies indicated that mindfulness meditation decreases emotional interference. Interestingly however, the TMS score was found to have a negative relationship with emotional interference whereas MAAS was found to be unrelated to emotional interference. In line with a study by Arch and Craske (2006), the group focusing on breath demonstrated a greater response to neutral pictures yet a lower response to negative pictures and had less worry and global volatility than the unfocused-on-breath group. Moreover, in the same vein, Lawrence (2014) examined the impact of state mindfulness (as gained from brief training) on emotional response (SCR and a self-reported picture rating scale) via the viewing of affective pictures (IAPS), finding that individuals with higher levels of meditation experience have lower SCR and encounter less arousal in response to affective pictures.

In contrast, a number of investigations have reported no association between mindfulness and emotional reactivity. For example, Vernig and Orsillo (2009) investigated the effects of brief mindfulness instruction upon psychophysiological emotions as manifested in response to affective pictorial stimuli. This study further included a participant group of individuals with alcohol dependence in a lab analogue. Here, no difference between the alcohol-dependent group and non-dependent group was

found. Additionally, Watford and Stafford (2011) reported that participants who had received brief mindfulness training could be better aware of their emotions but could not regulate their emotion effectively. Moreover, Cosme and Weins (2015), in studying the relationship between self-reported trait mindfulness (the Mindfulness Attention Awareness Scale: MAAS and the Five Facet Mindfulness Questionnaire: FFMQ), skin conductance response and self-reported responses to affective pictures failed to demonstrate any relationship between individuals with different levels of trait mindfulness and emotional response upon the viewing of affective pictures. Similarly, Cho et al., (2017) have examined the association between trait mindful attention and immediate emotional reactivity induced by affective pictures and emotional recovery in a laboratory, demonstrating here that mindfulness is not correlated with emotional reactivity evoked by unpleasant pictures, but this might improve emotional recovery.

In regard to such prior research, mindfulness has been studied in terms of trait or state mindfulness and has been assessed through different self-reported scales as to the emotional reactivity induced by affective pictures. Although emotional reactivity has been measured via psycho-physiological changes, such as skin conductance response, the results gained across the various studies have been inconsistent. Such inconsistency is possibly a consequence of the various aspects that one can assume pertains to the diversity of the subjective measurements of mindfulness employed in terms of the mindfulness concept (Andrei, Vesely & Siegling, 2016; Baer, 2016; Chiesa, 2013; Hart, Ivtzan & Hart, 2013; Park, Reilly-Spong & Gross, 2013; Purser & Milillo, 2015; Rau & Williams, 2016; Sauer et al., 2013). One suggestion as to improving the robustness of such studies is the application of diverse measures in assessing mindfulness, whereby it is noted that subjective scales should be used alongside objective or behavioural scales when evaluating mindfulness, especially in terms of physiological or biological measures (Chiesa, 2013; Grossman & Van Dam, 2011; Park, Reilly-Spong & Gross, 2013, Sauer et al., 2013). Thus, in the present study, I have applied not only traditional subjective self-reported scales of mindfulness, but also a breath-counting programme to measure behavioural or objective mindfulness via breath counting accuracy. As it has been evidenced that the accuracy of breath counting can reflect the mindfulness facet – i.e., self-awareness possessed as to the present moment (Levinson et al., 2014) – this could be an effective measure in a mindfulness study and could possibly improve the accuracy of the studies undertaken as to this topic.

5.2.4 Research Aims of the Current Study

Previous research has suggested that the relationship between mindfulness and emotional reactivity has been inconsistent. Thus, the research aims of this present study have pertained to re-exploring the associations found between mindfulness and emotional reactivity, achieved via the application of subjective and objective scales – mindfulness through a self-reported scale and breath counting accuracy, emotional reactivity through a self-reported scale and skin conductance response).

5.3 Method:

5.3.1 Participants

This study used 44 non-clinical or healthy participants (screened to remove individuals with a history of a head injury or psychological disorders) with normal vision (or vision that was corrected to normal vision by glasses or contact lenses). All of the participants were recruited via the Psychology Experimental Participation Requirement (EPR) system as operated by the Department of Psychology, University of Leicester. This ensured that all of the participants were undergraduate or graduate students, selected regardless of their individual differences. All of the participants gave informed consent and gained 5 credits for taking part in the study. Should a participant have fallen asleep during the study session, their data would have been excluded from the data set. In terms of gender, 9 of the participants were male (20.50 %) while 35 (79.50%) were female. Considering that the gender imbalance of the data might impact on the result of the study. The age range of the sample was between 18 and 49 years old ($M = 20.05$; $SD=.70$). In regard to the religious beliefs of the participants, 17 participants had no religion (38.60%), 16 were Christian (36.40%), 1 was Jewish (2.3%), 4 were Muslim (9.10%), 4 were Sikh (9.10%) and 2 (4.50%) stated that they held other religious beliefs. However, 6 participants recorded missing data due to Internet instability during the recording of the SCR data.

Ethical Approval

Ethical approval for this study was granted by the University Ethics Sub-Committee of Psychology, University of Leicester (Reference Number: 3354-cp341).

5.3.2 Design

The study utilised an analogue laboratory design to investigate the relationship between levels of mindfulness, as measured by two subjective mindfulness scales and a breath-counting accuracy computer programme, and emotional reactivity (induced by affective pictures) and measured by skin conductance response (SCR) and a picture rating scale.

Stimulus Materials

A slideshow of affective pictures, displayed via Microsoft Office's PowerPoint programme, has been made for this study. The database of The Nencki Affective Picture System: NAPS (Marchewka et al., 2014) was utilised for this purpose. The NAPS is a newly developed standardised affective picture system that consists of 1,356 pictures divided into five categories; people, faces, animal, objects and landscapes. The category of "people" is divided into photos of live and dead people, with this consisting of either some parts of a human body or the whole body. The "faces" category consists of images of a complete face or parts of a face. The "animal" category consists of pictures of dying or living animals. Pictures in the category of "objects" consist of a variety of items including foods and vehicles. The last category, "landscape", contains diverse images of nature or human-created scenes without humans or animals within the frame. All of the pictures are to be evaluated with a self-rating scale – this being the valence scale. The scale denotes a rating from "very negative" (1) to "very positive" (9), a motivational direction from "to avoid" (1) to "approach" (9) and the intensity of emotion evoked by the picture in question from "relaxed" (1) to "arousal" (9). 30 pictures have been selected from the database for use in this study; 10 neutral pictures (for example, a hen, a mine), 10 positive pictures (such as a smiling couple) and 10 negative pictures (for instance, an old toilet). The 10 neutral photographs of the NAPS are number 016, 061, 097,105, 129, 150, 152, 216, 239, 305. The 10 pleasant pictures are number 026, 088, 172, 178, 186, 190, 242, 252, 254, 272. The 10 unpleasant pictures number are 007, 009, 019, 022, 058, 121, 125, 146, 285, 287 (See Appendix B). Ethically, care has been given to avoided sensitive pictures – for example, images that are erotic, involve the abuse of people or animals or are highly intense arousal pictures. (See Figure 11)

Figure 11. An example of a slide of affective picture**.**

 A pilot study for this research was conducted with 16 participants. Here, piloted materials (a slideshow of the affective pictures) were utilised in order to assess the participants' understanding of the task's instructions and the emotional responses demonstrated towards each picture. In regard to understanding the instructions given, all participants were able to clearly comprehend what they were being asked to do. In terms of the emotion response, all 30 selected affective pictures were measured in three dimensions; valence (negative to positive), and intensity (relaxed to arousal). Measurements were gained via a self-rating. This was undertaken in order to ensure whether it is appropriate or not to elicit emotions

5.3.3 Measures

1. Self- reported measures: This project has applied four subjective scales through which it measures the related psychological variables. The measures are as follows:

*1.1. The Mindful Attention Awareness Scale (*MAAS*) (*Brown & Ryan, 2003**).** This scale, as consists of 15 items, evaluates mindfulness in daily life**.** The main character of the mindfulness measured through this scale focuses on the one dimension of dispositional mindfulness, specifically in terms of open and receptive awareness as to the present moment. An example of an item is: "I tend to walk quickly to get where I'm going without paying attention to what I experience along the way". A respondent rated

his or her frequency of experiences via a 6-point Likert scale - between 1 (almost always) and 6 (almost never). The result is calculated by reversing all of the scores and then producing a summation. An individual with a higher score is thus held to demonstrate a higher level of mindfulness.

*1.2 The Trait Version of the Toronto Mindfulness Scale (*Trait TMS*) (*Davis, Lau, & Cairns, 2009**).** This measure consists of 13 items and is developed from the original Toronto Mindfulness Scale as was applied to measure state mindfulness (Lau et al., 2006*).* This scale emphasises two components; curiosity; willingness to learn one own experiences with openness *(*for example, *"*I am curious about what I might learn about myself by taking notice of how I react to certain thoughts, feelings or sensations*")* and decentering; not appraise internal experiences with self-reference *(*for example, *"*I experience my thoughts more as events in my mind than as a necessarily accurate reflection of the way things *'*really*'* are.*").* Each statement is rated via a 5-point Likert scale from 0 *(*not at all*)* to 4 *(*very much*).*

1.3 Mind Wandering *(*Levinson et al., 2014*).* One item utilised in-between the counting breaths to measure mind-wandering is*: "*just now where was your attention?*"* Here, answers are given via 2 6-point Likert scales from 1 *(*completely on-task*)* to 6 *(*completely of task*).*

1.4 Picture Intensity Rating Scale. This scale is replicated from the study of Marchewka et al. *(*2014*).* This bipolar semantic scale, given in a paper-pencil form, is designed to measure the dimension of emotion experience. The first dimension is related to valence*: "*You are judging this picture as.*".* The respondents rate an answer from 1 *(*very negative*)* to 9 *(*very positive*)*, 5 is neutral. The next statement is designed to assess the degree of arousal*: "*Having confronted this image, you are feeling...*".* Here, the response is rated between 1 *(*relaxed*)* and 9 *(*aroused*)*, 5 is neutral. The last item seeks to identify the respondent*'*s motivational direction towards each picture*: "*My reaction to this image is...*"* The answer given is between 1 *(*to avoid*)* and 9 *(*to approach*)*, 5 = neutral.

2. Objective Measures

2.1 A breath counting programme. Levels of mindfulness is measured via breath count accuracy, achieved by recording this on a computer programme, *(*See Appendix A*)*, thus replicating the methodology of Levinson et al. (2014**).** Through this

programme, a participant counts their breath from 1 to 9 repeatedly. After breathing in and out, a participant will count their breaths and will then press a specific key on a keyboard (between and including the 1st to 8th breaths, they are required to press the down arrow key. On the 9th breath, they are required to press the right arrow key. If they miscount, they are to press the up-arrow key). The programme then records the key presses and subsequently calculates the accuracy of the breath counting. The breath counting accuracy is calculated from 100% – (the number of incorrect ongoing 9-counts + the number of incorrect count probe responses + the number of self-caught miscounts) divided by (the number of ongoing 9-counts + the number of count probe responses + the number of self-caught miscounts). The respiratory rate of the respondent is to be confirmed by a Venier respiration monitor belt with Logger Pro 3.

2.2 Physiological Measures. In the present study, emotional reactivity was measured in terms of electrodermal activity (EDA) in specific regard to skin conductance reactivity (SCR). SCR highlights phasic changes on a person's skin in regard to its electrical conductivity (Braithwaite et al., 2013). Any changes in SCR is related to activity of the sweat gland, that produced by the sympathetic nervous system. By using the NeuroLog galvanic skin response logger sensor, the amplitude of SCR in a unit of microSiemen (µS) could be measured (See Figure 12). As such, the responses of the respondents are able to be recorded during their viewing of the 30 affective pictures. The pictures' SCR amplitude is then able to be calculated in terms of average analysis (Greenwald, Cook & Lang, 1989) by subtracting the mean SCR during a baseline period (as identified in the 3 seconds prior to the picture being displayed) from mean of SCR found during the 6-second picture presentation.
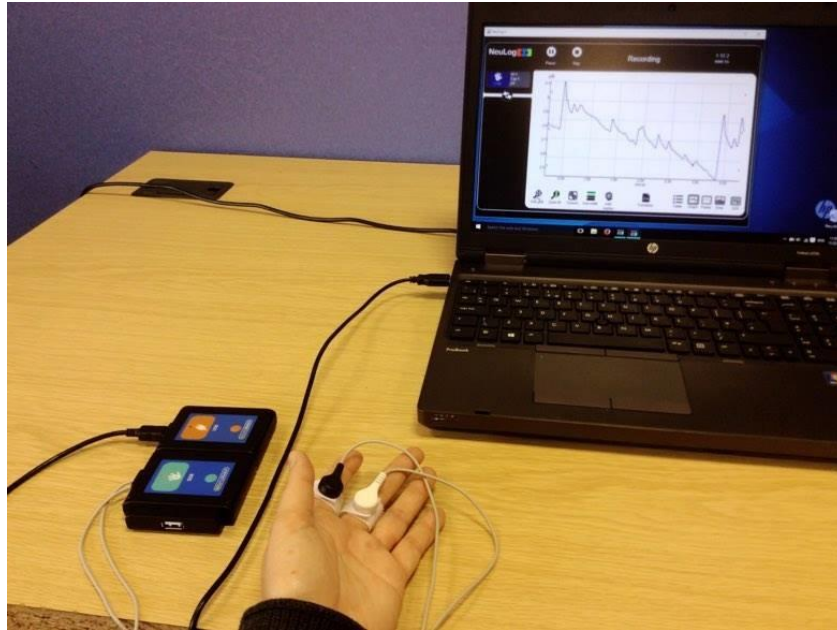
Figure 12. Skin conductance response measured by using the NeuroLog galvanic skin response logger sensor

5.3.4 Procedure

On arrival at a laboratory with low stimuli, participants were informed of their rights and are given a consent form to complete. The research procedures were then clearly explained to them. Following this, the participants were instructed as to how to complete a packet of standardised self-reported Psychological variables scales – two scales of mindfulness (MAAS, Trait-TMS).

The mindfulness level of the respondents was then measured via a 25-minute computer-tested breath counting programme. During this time, and after a 6-minute resting baseline, participants counted their 1-9 breaths repeatedly for 18 minutes. Throughout this exercise, they were asked to press specific keyboard keys with each breath. The data was recorded via a computer, with the worn respiratory belt concurrently checking the participants' respiratory rate in order to analyse breath count accuracy. Between the breath counting task, participants were also asked to evaluate their mind-wandering as well.

Upon completion of the breath counting session, the participants were then instructed as to the second session and were told that, in this part of the research, their emotional reactivity would be evaluated by them viewing 30 affective pictures. These pictures consisted of 10 pleasant, 10 neutral and 10 unpleasant images and were

presented on a 19-inch computer monitor via the Microsoft Office PowerPoint programme. This was undertaken in order to induce passive viewers' emotion. At the beginning, a 2-minute resting period was used to record a skin conductance level (SCL) baseline. Following that, each picture was randomly displayed (see Appendix B) for 6 seconds, this being a long-enough period to effect SCR (Norris, Larsen & Cacioppo, 2007). Following this, a page displayed the number of the following pictures is presented for 25 seconds (Figure 13). As such, in this study the inter-stimulus interval (ISI) was 25 seconds, this being due to this period potentially allowing the emotional reactivity instigated by the previous picture to diminish (Garrett & Maddock, 2006). All slides were displayed automatically. During the viewing of these pictures, the emotional reactivity of the participants was measured in terms of skin conductance response. Here, the NeuroLog galvanic skin response logger sensor (NUL-217) was utilised to assess SCR or natural galvanic skin response (GSR), achieved by attaching two electrodes to two fingers on the participant's non-dominant hand. Before attaching electrodes, the participants were asked to clean their fingers with alcohol in order to clean away any fluid (such as skin cream) that might affect the SCR measurements. Moreover, the participants also had to rub their hands and fingers together in order to warm them. Should this not be completed, the equipment would not properly detect the signals. Great care was taken to attach the electrode to the fingers tightly and respondents were asked not to move this hand in order to prevent incorrect SCR measurements being collected. Each session took approximately 20 minutes. Finally, they were asked to view a slide again to rate all pictures. Overall, the laboratory procedure took approximately 90 minutes.
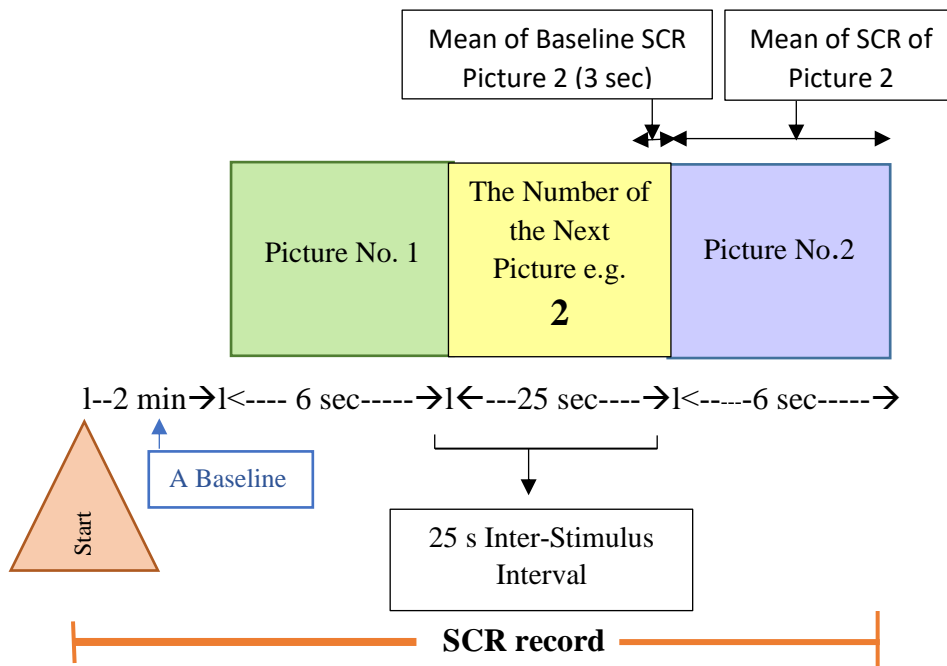
Figure 13. The Slide of Affective Pictures Presentation Timings

5.3.5 Data Analysis

In this study, investigation was given as to whether mindfulness is correlated with emotional reactivity. The mindfulness level was measured by self-reported scales (MAAS, Trait TMS and mind wandering) and breath counting accuracy. The Cronbach Alpha Reliability Coefficient of the MAAS scale was measured at .81 ($n = 44$) and the facet of curiosity and decentering of Trait TMS was measured at .88, and .73 ($n = 44$), respectively. Emotional reactivity was evaluated by the SCR average analysis (i.e., the mean of the SCR measured during the viewing of affective pictures minus the SCR of the 3-second period prior to the affective picture being presented) and the intensity score of the picture rating scales. The correlations that arise between mindfulness and emotional reactivity have been analysed via Pearson correlations. Furthermore, hierarchical multiple regressions were performed in order to control for any confounding variables (i.e., gender and age) in the correlation between mindfulness and emotional reactivity. However, prior to analysing the collected data, the effectiveness of the affective pictures was examined in order to identify whether they could elicit an appropriate amount of SCR during the viewing process, with this being undertaken in an attempt to ascertain the validity of the research results.

5.4 Results

5.4.1 Preliminary Analysis

A paired-samples *t*-test was conducted in order to investigate if all 30 affective pictures used in the experiment were capable of eliciting emotional reactivity in terms of SCR. The results highlighted that the SCR of three pictures – a hen and an old man standing in a football field (neutral pictures) and a patient with a respirator (an unpleasant picture) – produced results which differed significantly from the SCR baselines (t (37) = 2.19, $p <.05$, t (37) = 2.22, $p < .05$ and t (37) = 2.03, $p <.05$, respectively). As a result, the correlations between mindfulness and SCR were analysed as the sum of the changed SCR invoked by these three affective pictures.

5.4.2 Correlations of Variables; Mindfulness, Mindlessness and Emotional Reactivity

Correlations between mindfulness (the scores of the Breath Counting Accuracy, the MAAS, the Trait TMS including mindlessness in terms of mind wandering (TUT), the emotional reactivity, the SCR and the scores of the picture intensity rating) were investigated via the Pearson correlation statistic. The results of this analysis are illustrated in Table 18. As expected, for the thirty-seven participants, the scores of the trait mindfulness aspects (MAAS) were significantly and negatively correlated with the SCR and with the picture intensity rating. Moreover, there was a positive and significant correlation between mindlessness (the scores as to task-unrelated thought) and the picture intensity rating. Although the breath counting accuracy was not significant correlated with Total SCR Change, it nonetheless revealed a negative correlation with the SCR change elicited by the neutral pictures. In addition, the decentering score of Trait TMS was negatively associated with the SCR change induced by the negative pictures.

Table 18

The Pearson Correlation Matrix among Mindfulness, Mindlessness (Task-Unrelated Thought) and Emotional Reactivity

	M	*SD*	1	2	3	4	5	6	7
1. MAAS	58.44	10.26							
2. Curiosity Trait TMS	14.86	5.08	-.11						
3. Decentering Trait TMS	12.53	5.04	-.02	.38*					
4. Breath Counting Accuracy	.71	.16	-.03	.30	-.23				
5. TUT	29.56	10.47	-.19	-.03	-.23	-.16			
6. Total SCR	.02	.09	-.42**	-.05	-.32	-.23	.11		
7. Picture Intensity Rating	132.19	33.78	-.35*	.10	-.10	.29	.40*	.29	

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

Note. MAAS = Mindful Attention Awareness Scale; Curiosity Trait TMS = Curiosity Facet of Toronto Mindfulness Scale (Trait Version); Decentering Facet of Toronto Mindfulness Scale (Trait Version); TUT = Task-Unrelated Thought; Total SCR = Sum of Skin Conductance Reactivity Change induced by Affective Pictures; Picture Intensity Rating = Rating Score of Picture Intensity.

5.4.3 Multiple Regression Analysis

Table 19

Hierarchical Multiple Regression between Mindlessness/Mind Wandering (Task-Unrelated Thoughts) and Emotional Reactivity

	Total SCR				**Picture Intensity Rating**			
	B	**β**	**T**	**Sig**	**B**	**β**	**T**	**Sig**
Step 1								
1.Gender	.03	-.01	-.08	.94	-16.63	-.21	-1.32	.20
2. Age	-.00	-.04	-.25	.81	-1.81	-.27	-1.72	.09
Step 2								
1. Gender	.45	-.01	-.09	.93	-17.42	-.22	-1.45	.16
2. Age	.00	.19	1.03	.31	-.19	-.03	-.16	.87
3. MAAS	.00	-.52	-3.33	.00	-.71	-.22	-1.41	.17
4. Curiosity-Trait TMS	.00	.00	.00	1.00	1.53	.24	1.59	.12
5. Decentering-Trait TMS	7.59	-.50	-2.98	.01	-.23	-.03	-.20	.84
6. Breath Counting Accuracy	-.01	-.31	-1.89	.07	55.97	.28	1.73	.09
7. Task-Unrelated Thought	-.16	-.09	-.57	.58	1.27	.40	2.58	.02

In addition, a two-step multiple regression analysis was conducted to identify the unique variance of the aspects of mindfulness (i.e., the independent variables) to predict emotional reactivity (i.e., the dependent variables) after controlling for gender and age (Table 19). To do so, Step 1 saw age and gender first being entered. Mindfulness (as included mindful attention awareness, curiosity, decentering, breath counting accuracy and mind wandering/task-unrelated thought were added in Step 2. As illustrated in Table 9, in Step 1, age and gender is found to have no significant statistical value in predicting Total SCR [$F_{(2,34)} = .03$, $r = .04$, $r^2 = .00$, adj $r^2 = -.06$, $\Delta R^2 = .00$, $p = ns$] and picture intensity rating [$F_{(2,36)} = 2.33$, $r = .34$, $r^2 = .11$, adj $r^2 = .24$, $\Delta R^2 = .11$, $p = ns$]. In Step 2, mindfulness is found to establish a significant change in R^2 in predicting emotional reactivity (Total SCR, [$F_{(7,29)}$ change $= 4.33$, $r = .65$, $r^2 = .43$, adj $r^2 = .29$, $\Delta R^2 = .43$, $p < .01$]; Picture Intensity Rating, [$F_{(7,31)}$ change $= 2.70$, $r = .62$, $r^2 = .38$, adj $r^2 = .24$, $\Delta R^2 = .27$, $p < .05$]. This thus reveals that mindfulness

accounts for the unique variance in emotional reactivity (i.e., total SCR Change) and picture intensity rating after controlling for the effect of gender and age. and MAAS score and the facet of decentering-Trait TMS are significant predictors of total SCR, while task-unrelated thought has a significant effect upon increasing the predicting of the picture intensity rating.

5.5 Discussion

This study set out to determine whether mindfulness is associated with emotional reactivity. The main findings document significant correlations between mindfulness and emotional reactivity including in relation to physiological reactivity (SCR) and picture intensity rating, although the correlation varies among the scales of mindfulness (MAAS, curiosity and decentering facets of Trait TMS, breath counting accuracy and task-unrelated thought).

In regard to the Pearson's correlation analysis undertaken, and in terms of trait mindfulness, mindful attention awareness has an unsurprising significant and negative correlation with SCR and picture intensity rating. Moreover, the hierarchical regression analysis demonstrates that the MAAS score is a significant predictor of SCR. This also accords with earlier investigations (e.g., Feldman et al., 2016; Keng, Smoski & Robins, 2011). Furthermore, although curiosity, decentering, and breath counting accuracy was not significant correlated with emotional reactivity, the hierarchical multiple analysis reveals, interestingly, that the facet of mindfulness involved with the possession of a non-judging attitude (decentering) differs significantly from the facet of awareness (curiosity) in terms of predicting SCR. As highlighted in the results, decentering in Trait TMS accounts for a unique variance of SCR whereas the curiosity facet, as emphasises self-regulation in regard to being aware of present experiences, does not impact upon SCR. The accuracy of breath counting, as with curiosity, fails to predict emotional reactivity. While the breath counting programme is designed to measure the self-awareness held as to breathing in terms of present moment awareness, Levinson et al. (2014) argue that this does not assess another vital component of mindfulness, the possession of a non-judging attitude or acceptance. In accordance with the present results, previous studies have found that the acceptance component plays a crucial role in regard to emotional reactivity (e.g., Feldman et al., 2016; Lindsay & Creswell, 2017; Lindsay et al., 2018; Teper & Inzlicht, 2014; Uusberg et al., 2016). As mentioned in a

previous section, this result may be explained via the physiological-based and cognitive-based theories of emotion. Trait mindfulness, as measured by MAAS and Trait TMS, is composed of aspects of attentive self-awareness as to present experiences and the possession of a non-judging attitude (decentering), with this potentially involving cognitive-related factors (attention and cognitive reappraisal). These two aspects of mindfulness might impact upon emotional reactivity as physiological reactivity might be altered mainly by expectations and attention being given to bodily states (Hoehn-Saric & McLeod, 2000). Mindful persons tend to pay attention and be aware of present experiences, thus potentially being able to disengage from their emotional stimuli (Ortner, Kilner & Zelazo, 2007; Taylor et al., 2011) and habitual emotional reactivity in an effective manner (Ho et al., 2015). As a consequence, SCR, as a form of physiological reactivity, may be changed. Aside from attentive awareness, the decentering facet could involve emotional reactivity under the cognitive-based theory. Due to mindful persons tending not to appraise affective stimuli, and instead are likely to accept and not avoid it, their emotion reactivity as aroused by their thoughts may be decreased. Mindfulness may thus improve psychological and physiological flexibility and adaptability towards emotional tasks (Friedman, 2007; Park & Thayer, 2014; Thayer & Lane, 2000).

What is curious about this result is that, in terms of the association between the facet of mindfulness and SCR provoked by the pictures with different valence (neutral and unpleasant), the correlation analysis shows that the decentering facet is significantly and negatively associated with the SCR elicited by the unpleasant picture, while breath counting accuracy (the present awareness facet) is found to have a significant and negative correlation with the SCR induced by the neutral pictures. It is difficult to explain this result, but it might pertain to the valence of the affective pictures as elicits different emotional reactivity. The negative or unpleasant pictures might have a strong content which invokes aversive valence and intense emotional reactivity, while neutral pictures do not have strong content and thus fail to invoke aversive or appetitive valence and thereby arouse less reactivity (Ortner, 2015). It could be said that, in the present findings, when emotional reactivity was evoked by neutral pictures, the emotions of individuals may not have been too intense or aversive towards becoming disengaged or regulated by attentive mindful awareness. Here, the present awareness of individuals can function properly to reduce emotional reactivity (Ortner, Kliner & Zelazo, 2007; Taylor et al., 2011). However, whereupon intense emotion is induced by

aversive negative pictures, acceptance may play a key role in diminishing emotional reactivity (Feldman et al., 2016; Lindsay & Creswell, 2017; Lindsay et al., 2018). This finding plausibly supports the main conclusions that in addition to awareness, acceptance is essential for balancing emotional reactivity, with this finding corresponding with previous studies (e.g., Cho et al., 2017; Lindsay et al., 2018; Watford & Stafford, 2011).

Mind wandering (Task-unrelated thought; TUT) could refer to mindfulness in the inverse aspect, namely mindlessness, as the results clearly indicate a significant positive correlation between mind wandering and emotional reactivity in terms of the self-rating given to the intensity of the affective pictures. Furthermore, via multiple regression analysis, it is shown that TUT is a crucial predictor of the picture intensity rating. This accords with previous studies, as have shown a positive association between mind wandering and emotional reaction (e.g., Carriere, Cheyne & Smilek, 2008). Theoretically, mindlessness is the opposite mental state to mindfulness (Brown & Ryan, 2003; Van Dam, Earleywine & Borders, 2010; Höfling et al., 2011). A mindless person is not aware of their present thoughts, feelings or sensations due to their mind being distracted by inner or outer stimuli – such as ruminative thoughts and the mind losing attention and wandering from the present experience towards typically being preoccupied by the past or the future. Mind wandering, or task-unrelated thoughts is thus a significant criterion of mindlessness (e.g., Schad, Nuthmann & Engbert, 2012; Forster & Lavie, 2014). A possible explanation for the positive association between mind wandering (TUT) and picture intensity might pertain to TUT being involved with cognitive emotion regulation in terms of overthinking or elaborating towards affective stimuli that influences one's emotional state (Gross & John, 2003; Garnefski & Kraaij, 2007) or attention (Pessoa, Oliveira & Pereira, 2013) and emotional reactivity (Gu et al., 2015) through the emotional process. This also accords with our earlier surveys.

Together, these studies provide important insights into the literature as to the relationship between mindfulness and emotional reactivity. The findings conceivably expand and deepen our understanding as to the potential aspects of mindfulness involving emotional reactivity. The results emphasise how mindfulness is correlated with emotional reactivity and, moreover, both self-awareness as to the present moment and the attitude-related facet (i.e., decentering) are essential aspects in the relationship that arises with emotional reactivity. This is especially true for negative emotional reactivity. In addition, mind wandering or task-unrelated thought, as may involve

elaborating on or judging emotional targets, could be an influential cognitive variable for emotional reactivity. These findings have important implications for developing human mental health, namely as it helps us to better understand the crucial aspects of mindfulness as are associated with emotional balance. This is because these areas may improve the psychological flexibility or resilience of individuals.

Despite these implications, the present investigation has encountered some imitations in regard to the gaining of consistent results. The first limitation relates to affective stimuli. Although the 30 affective standardised pictures used in this study had already been piloted via self-rating and were selected prior to being presented in the experiment, only three pictures produced a significant effect upon SCR. This may have arisen due to several factors – for example, expectation and attention to bodily states (Hoehn-Saric & McLeod, 2000) can affect labelling (Ortner, 2015). Another limitation relates to the homogeneous nature of the participants, a result of the sample being recruited via the EPR System of the Department of Psychology, University of Leicester. As the participants were students of this department, they thus possessed similar demographic traits (such as age). In regard to the limitations of this study, and as emotion is a complicated variable to investigate, research in this area must apply numerous methods when seeking to produce robust empirical evidence. For example, the use of different affective stimuli could potentially evoke clearer emotional responses. Moreover, participants could be recruited from heterogeneous resources (such as in a community) in order to increase the variety of the given study's sample. It is also necessary to explore those factors that influence the relationship between mindfulness and emotion (for example, executive functions, emotion regulation and different dimensions of emotional reactivity such as valence).

5.6 Conclusion

Overall, these studies provide reasonable evidence of an association between mindfulness and emotional reactivity. Mindful attention awareness was significant negative correlated and is a significant predictor of emotional reactivity, while the decentering facet accounts for the variance of SCR. Furthermore, it has been found that mind wandering was significant positive correlated and has significant power to predict emotion reactivity in terms of the picture intensity rating. Interestingly, although breath counting accuracy is uncorrelated with emotion reactivity in general, it nonetheless shows a significant negative correlation with the SCR induced by neutral pictures. In

addition, the decentering facet is significantly negative associated with the SCR induced by the negative picture. Regarding the result, it could be said that the association between mindfulness and emotional reactivity are various upon the facet of mindfulness and valence of emotional reactivity. For the attitude-related facet of mindfulness, decentering, acceptance plausibly plays a crucial role in emotion reactivity. This is specifically true for negative emotion as this could involve psychological flexibility improved by mindfulness. This study could, therefore, be of value to attempts being made to improve the mental health of individuals, despite the research possessing some limitations and future studies being required in this area, especially in terms of measurement of mindfulness.

Chapter Six

Relationships That Exist between Mindfulness and Emotional Reactivity via the Use of Affective Visual and Audio Clips

6.1 Abstract

In regard to the limitations of the effectiveness of affective pictures in the previous study, and as emotion is a complicated variable to investigate, research in this area must apply numerous methods when seeking to produce robust empirical evidence. For example, the use of different affective stimuli – such as dynamic affective video and sound clips – could potentially evoke clear emotional responses. Therefore, Lab 2 was developed in order to explore the relationships that arise between mindfulness and emotional reactivity, with this possessing the same main objective as that of Lab 1. A procedure was designed to replicate Lab 1 yet differing in Lab Two as this comprised 15 affective video clips derived from YouTube and 15 affective sound clips derived from The International Affective Digitized Sounds (Bradley & Lang, 2007a). The results from the 48 participants ($n = 48$) indicate that, in a similar vein to the results of Lab 1, mindful attention awareness (MAAS) correlates significantly with the scores as to the emotion intensity rating of the video and sound clips. The decentering facet of Trait TMS indicates a significant association with SCR, yet breath counting accuracy and mind wandering (task-unrelated thought) does not show any significant association with emotional reactivity. These findings may invoke intriguing questions as to the nature of mindfulness and the extent of the relationships held with emotional reactivity. The limitations of the research and potential areas of future study are also discussed.

6.2 Introduction

6.2.1 Emotion and Process of Emotion

Emotion is a complex and illusive phenomenon as was defined in several documents (Brown & Cavanagh, 2016; Kleinginna and Kleinginna, 1981). For example, in regard to the component process model, Scherer (2005, p. 697) has stated that emotion is "…an episode of interrelated, synchronized changes in the states of all or most of the five organismic subsystems in response to the evaluation of an external or internal stimulus event as relevant to major concerns of the organism…". In relation to the component process model, emotion involves the organismic subsystems

(information processing and cognitive process) and emotion components (Scherer, 2005). The components of emotion comprise subjective internal experiences (feeling), a biological process and consequence (e.g., physiological response), cognition (e.g., cognitive reappraisal), motivation (action tendencies) and expressive behaviours (e.g., facial expression) (Sander, 2013; Scherer, 2005). When individuals are exposed to affective stimuli (such as unpleasant circumstances), emotional reactivity may be elicited with the emotion components via an emotional process. Theoretically, the process of emotion involves two main factors; internal factors (such as personal cognitive appraisal) and external factors (such as affective stimulus or situations) (Ekman, 1992; Frijda, 2008; Scherer, 2000). In terms of the physiology-based theory of emotion, physical affective stimuli may be able to elicit emotion through sensory receptors such as eyes and ears (Brown & Cavanagh, 2016; Koelsch, 2014; Larsen et al., 2008). The affective stimulus which elicits emotion through different sensory organs (e.g., eyes and ears) could also invoke diverse impacts upon emotional experience as the different sensory organs might produce different sensory information that may be synchronised to emotion perception and this might thus affect emotional reactivity (Koelsch, 2014). Hence, emotion could be investigated by applying the physiology-related emotion process.

6.2.2 Emotion Investigation

For decades, researchers working within the field of emotion sciences have applied the emotion process, via the physiology-related theory, to investigate emotion in laboratory settings (Rottenberg, Ray & Gross, 2007; Schaefer et al., 2010). As a consequence, effective techniques of emotion elicitation have been developed through the use of various affective stimuli in order to improve the quality of such research (Coan & Allen, 2007; Hewig et al., 2005; Polivy, 1981; Schaefer et al., 2010). With respect to visual stimuli, aside from affective pictures, visual dynamic clips exist as a form of substantial stimulus. Traditionally, film clips are the primary affective clips to have been used, with clips from social media and media-hosting sites (such as YouTube) having been employed in recent years (Chen, Chang & Yeh, 2017; Knautz & Stock, 201; Rumpa et al., 2015; Wang et al., 2015). Numerous studies have highlighted the effectiveness of this approach in eliciting emotion responses in a diverse range of dimensions – including via subjective reports and physiological reactivity (e.g., Kaviani et al., 1999; Lazarus et al., 1962; Rottenberg, Ray & Gross, 2007; Westermann et al.,

1996). Thus, visual clips have been used widely as an affective stimulus of emotion in laboratories for a number of decades (Schaefer et al., 2010; Uhrig et al., 2016). A range of studies can be pointed to in this regard – see, for example, the research of Berna, Ott & Nandrino (2014), Cabral et al., (2017), Dhaka & Kashyap (2017), Ekman & Friesen (1974), Fayolle, Droit-Volet & Gil, (2014) and Green & Addis (2012). The advantages of using such visual clips have been addressed in prior literature (e.g., Aguado et al., 2018; Hewig et al., 2005; Lazarus et al., 1962; Rottenberg, Ray & Gross, 2007; Schaefer et al., 2010), whereby it has been concluded that this approach is a practical method of investigating emotion in a laboratory setting. In addition, visual clips can gain a high degree of attention from viewers (Rottenberg, Ray & Gross, 2007). Furthermore, visual dynamic clips are close to real life and natural experiences, with such studies thereby having the potential to provide a high degree of ecological validity (Aguado et al., 2018; Gross and Levinson, 1995; Kreibig et al., 2007). In addition, when compared with affective pictures, visual clips demonstrate more powerful emotion elicitation – both in regard to intensity and valence (Horvat, Kukolja & Ivanec, 2015).

Asides from visual clips, audio clips have also been used as affective stimulus in emotion studies conducted within laboratory settings, a result of sound potentially being able to affect the brain and its emotion process (Frühholz, Trost & Grandjean, 2014; Frühholz, Trost & Kotz, 2016; Kaviani, Kumari & Wilson, 2010; Koelsch, 2014; Krumhansl, 1997; Panksepp & Bernatzky, 2002; Sander, Brechmann & Scheich, 2003; Yang et al., 2018). A crucial qualification of sound pertaining to emotional elicitation relates to the fact that sound can trigger affective memory among listeners, thus inducing informative imagery for such individuals – as can plausibly affect their emotional perception (Bach et al., 2007; Gomez & Danuser, 2004; Koelsch, 2014; Tesoriero & Rickard, 2012). In previous research, various sounds have been shown to have a substantial effect upon emotions. For example, van den Bosch and colleagues (2017) investigated the effect of diverse soundscapes – including beach, forest, urban and silent soundscapes – on the core affect or mood of 13 individuals with intellectual disabilities, finding that sounds impact the intensity (relaxed) and valence (pleasant) of subjective emotions or core affects. In addition, sounds (noise and music) can influence physiological reactivity – witnessed, for example, in relation to heart rate, respiratory, skin conductance and electroencephalograms (e.g., Bradley & Lang, 2000; Crespo-

Llado, Vanderwert & Geangu, 2018; Dillman Carpentier & Potter, 2007; Gomez & Danuser, 2004; Greco et al., 2017; Khalfa et al., 2002). Thus, audio is a substantial affective stimulus in an emotion laboratory (Stevenson & James, 2008). Bradley and Lang (2007a) developed a standardised affective audio set, namely the International Affective Digitized Sounds (IADS) system, based on dimensions of emotion (including intensity and valence) in order to improve upon the quality of undertaken emotion experiments. In addition, IADS can effectively provoke diverse categories of emotion – such as happiness, disgust and anger (Stevenson & James, 2008; Yang et al., 2018). This effective resource has been applied in various experiments and studies as to emotion (Greco et al., 2017). For example, Nardelli and colleagues (2015) employed IADS to elicit emotional reactivity (heart rate) through the autonomic nervous system among 27 non-clinical participants. As expected, they found that emotional reactivity in terms of heart rate variability varies on the dimension of affective sounds.

6.2.3 Mindfulness and Emotional Reactivity Induced Via Visual and Audio Stimuli

A mindful person is an individual who is aware of internal experiences at the present moment without appraising one's own present inner experiences.
An individual's internal experiences could involve emotional reactivity being provoked by physical sensation arousal via affective visuals and sounds (Baumgartner, Esslen & Jäncke, 2005). This is the same outcome as with the use of affective pictures as although different sensory arousal might invoke differing emotional reactivity, all emotional reactivity derives from the same process of emotion (Larsen et al., 2008). Theoretically, mindfulness has important aspects that might be associated with emotional reactivity. Firstly, attentive self-awareness being given as to the present internal experience of an individual leads that person to be a mindful person, whereby that person could then shift or disengage effectively from past emotional experiences (Ho et al., 2015). Moreover, such people are possibly aware of the present sensational experiences that can alter their physiological reactivity towards emotion (Hoehn-Saric & McLeod, 2000). Secondly, by possessing a non-elaborating attitude towards an emotional stimulus, individuals can accept (or not appraise or be expecting as to) the present affective experience faced. Thus, mindful persons may be able to regulate emotion and thus could improve their psychological and physiological flexibility and

adaptability, from which their emotional reactivity may be diminished (Friedman, 2007; Hayes & Feldman, 2004; Park & Thayer, 2014; Thayer & Lane, 2000). In accordance with the theory proposed, previous studies have demonstrated a meaningful relationship as to emotional reactivity, although most such investigations have focused on state or cultivated mindfulness and emotional reactivity.

For example, Lalot and colleagues (2014) established that when comparing persons with mindfulness meditation experience and those without such experience, the former demonstrated lower emotional reactivity in terms of self-rating and facial expressions of emotion as evoked by positive films. In accordance with an investigation undertaken by Beblo et al., (2018), as explored whether breathing meditation influenced emotional valence and arousal as assessed via self-report, it was found that breathing meditation invoked delayed effects of negative emotional reactivity when induced by affective films. In a similar vein, Michal et al., (2013) reported that individuals with a Depersonalisation Disorder (DPD) demonstrated a reduced degree of SCR being evoked by affective sound clips during the practicing of mindful breathing. However, Erisman & Roermer (2010), in investigating 523 healthy participants watching emotional film clips, recorded emotional reactivity and affection and found that mindfulness reveals more positive affect when induced by positive films but that less of a negative affect is induced by mixed clips. Additionally, it was discovered that no significant SCR change occurred. Likewise, Sze et al., (2010) documented a lack of association between mindfulness (Vipassana; awareness training) and emotional reactivity (self-reported and heart rate) as provoked by affective films.

In turning now to emotional process-related issues, Greenberg and Meiran (2013) explored meditators and naivety with mindfulness meditation as elicited mood via the watching of sad and happy mood clips. The results here emphasise the positive correlation between mindfulness and emotional engagement, being in contact with emotions yet facilitating mindful participants to recover from experiences of emotion. Similarly, mindful attention awareness, trait mindfulness reveals a positive correlation with emotional valence scores, however a high degree of mindful attention awareness demonstrates a negative association with an individual's heart rate during the viewing of violent clips (Brzozowski et al., 2018). Further to this, Alex Brake and colleagues (2016) have identified how mindfulness-based exposure strategies effectively enrich emotional exposure towards levels of distress via visual and descriptive stimulus. Thus,

it could be concluded that mindfulness might be positively associated with emotional arousal, emotional recovery or emotional balance.

As described above, few studies have examined the association between mindfulness and emotional reactivity via the effective method of employing affective clips. The existing findings also lack clarity as to this association. Moreover, in order to validate and expand upon the results as to whether mindfulness is substantially associated with the emotional reactivity elicited via diverse affective stimuli, I have re-explored the relationship between mindfulness and emotional reactivity via emotional visual and sound clips in terms of subjective and objective assessments.

Objectives:

The aim of the study has been to explore the associations between mindfulness (subjective and behavioural measures) and emotional reactivity (self-rating and skin conductance response: SCR) via the use of affective visual and audio clips.

6.3 Method:

6.3.1 Participants

The 65 participants were non-clinical undergraduate students with normal vision or vision corrected by glasses or contact lenses in the Department of Psychology, University of Leicester. All participants were recruited regardless of their individual differences by the Psychological Experimental Participation Requirement (EPR) system. All participants gave informed consent and received 5 credits for taking part in the study. 15 of the participants were male (23.10 %) while 50 (76.90%) were female. The range of age of the sample was between 18 and 40 years old ($M = 19.80$; $SD = 2.95$). In terms of religion, 25 participants had no religion (38.50%), 30 were Christian (46.20%), 1 was Hindu (1.5%), 6 were Muslim (9.20%), 2 were Sikh (3.10%) and 1 (1.50%) participant had other religious belief. However, 9 (13.85%) participants recorded missing data because of Internet instability during the recording of the SCR data and counting their breath. Additionally, in case of being asleep during the study session, their data would have not been included into the data set.

Ethical Approval

Ethical approval for this study was granted by the University Ethics Sub-Committee of Psychology, University of Leicester.

6.3.2 Design

In this current study, the analogue laboratory design was applied in order to explore the relationship between levels of mindfulness, as measured by traditional subjective scales including a behavioural mindfulness measure: a breath-counting accuracy, and emotional reactivity (evoked by affective video clips and sound clips) measured by the self-rating scale, and skin conductance response (SCR).

Stimulus Materials

In this study, a slideshow of affective clips, displayed via Microsoft Office's PowerPoint programme, has been made. However, the affective stimuli have been changed from affective pictures in the first experiment to affective clips (15 video clips, and 15 sound clips) in order to improve effectiveness of its quality in terms of its intensity. All of clips have been divided into three categories in terms of valence; positive (pleasant), negative (unpleasant), and neutral clips based on scores of self-rating in a pilot study. In a pilot study, all of the clips were evaluated with a self-rating scale – this being the valence scale. The category of "positive clips" consists of five clips, negative category had five clips, and neutral clips had five clips as well (See Appendix C).

Regarding affective video clips, 15 video clips have been selected from 30 clips in YOUTUBE. Eight participants in a pilot study were asked to use the valence scale to indicate the greatest amount of each emotion e.g., happiness, joy, fear, disgusting while experienced the clips. The scale denotes a rating from "Not at all/None" (0) to "Extremely/A great deal" (8). Ethically, care has been given to avoided sensitive clips – for example, erotic, involve the abuse of people or animals or are highly intense arousal clips. Five clips with the highest rating of each category were chosen to be affective video clips as stimuli in the current experiment.

In regard with affective sound clips, 15 sound clips have been chosen from The International Affective Digitized Sounds (2nd Edition; IADS-2) (Bradley & Lang,

2007a) composted of five pleasant, five unpleasant, and five neutral clips (See Appendix D).

6.3.3 Measures

In this current study, I have applied both subjective and objective measures to assess mindfulness, and emotional reactivity in order that validity of results could be improved.

1. Self-reported measures: This project has applied four subjective scales through which it measures the related psychological variables. The measures are as follows:

1.1. The Mindful Attention Awareness Scale (MAAS) (Brown & Ryan, 2003). This scale has 15 items in order to evaluate overall mindfulness in everyday life, specifically in terms of open and receptive awareness as to the present moment. An example of an item is "I forget a person's name almost as soon as I've been told it for the first time" A respondent rated his or her frequency of experiences via a 6-point Likert scale - between 1 (almost always) and 6 (almost never). The result is calculated by reversing all of the scores and then producing a summation. An individual with a higher score is thus held to demonstrate a higher level of mindfulness.

1.2 The Trait Version of the Toronto Mindfulness Scale (Trait TMS) (Davis, Lau & Cairns, 2009). This measure consists of 13 items based on the original Toronto Mindfulness Scale (Lau et al., 2006). This scale has two components; curiosity (for example, "I am curious about each of my thoughts and feelings as they occur.") and decentering (for example, "I am more invested in just watching my experiences as they arise, than in figuring out what they could mean"). Each item is rated via a 5-point Likert scale from 0 (not at all) to 4 (very much).

1.3 Mind Wandering (Levinson et al., 2014). Mind wandering could be referred to mindlessness, a distracted mind which is the opposite state of mindfulness. During counting breath, participants were asked to assess mind wandering: "just now where was your attention?". This question would be appeared in a computer monitor eventually. Their answers were given via 2 6-point Likert scales from 1 (completely on-task) to 6 (completely of task).

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1.4 Clips Rating Scale. This scale is applied to assess emotional reactivity. It is adjusted from the study of Marchewka et al. (2014) in a form of bipolar semantic self-reported scale. The first component of the test evaluates valence: "You are judging this clip as…". The respondents rate an answer from 1 (very negative) to 9 (very positive), 5 is neutral. The following item is to assess the degree of arousal: "Having confronted this clip, you are feeling...". Here, the response is rated between 1 (relaxed) and 9 (aroused), 5 is neutral. The last item asked the respondent to evaluate motivational direction towards each clip: "My reaction to this clip is..." The answer given is between 1 (to avoid) and 9 (to approach), 5 = neutral.

2. Objective Measures

2.1 A breath counting programme. In this study has utilised a breath counting accuracy as an index of level of mindfulness in terms of behavioural measure. The accuracy of breath counting could be recorded via a computer programme replicated the methodology of Levinson et al. (2014). Through this programme, participants were requested to count their breath from 1 to 9 repeatedly, participants have counted breaths and then pressed a specific key on a keyboard (between the 1st to 8th breaths, pressed the down arrow key after breathing in and out, but pressed the right arrow key on the 9th breath. If they miscounted, pressed the up-arrow key). The breath counting accuracy was calculated from 100% – (the number of incorrect ongoing 9-counts + the number of incorrect count probe responses + the number of self-caught miscounts) divided by (the number of ongoing 9-counts + the number of count probe responses + the number of self-caught miscounts). The Venier respiration monitor belt with Logger Pro 3 was used as an instrument to confirm the respiratory rate of the respondent.

2.2 Physiological measures. In the present study, emotional reactivity was measured in terms of skin conductance reactivity (SCR) which is one form of electrodermal activity (EDA) (Braithwaite et al., 2013). SCR could be changed due to stimulating of emotion. Evoked emotion could affect activity of sweat gland by the sympathetic nervous system, then elicit changing of SCR. I have used the NeuroLog galvanic skin response logger sensor to record the amplitude of SCR in a unit of microSiemen (μS) during watching or listening the affective clips. To calculate SCR change, average analysis formula was applied. Regarding affective video clips, SCR change has been calculated by subtracting the mean of SCR (as identified in the 40

seconds prior to the video clips being displayed**)** from the average SCR level found during the video clips presentation**.** In regard to affective sound clips, SCR change was calculated by subtracting the mean of SCR **(**as identified in the three seconds prior to the sound clips being played**)** from the average SCR level found during playing the sound clips**.**

6.3.4 Procedure

When a participant has arrived a laboratory, a researcher has provided information about the right of participants and gave them a consent form to complete including explained research procedure clearly. After this, the researcher has instructed a participant how to complete two self-reported scales of mindfulness; MAAS, Trait TMS via BOS online survey.

After completing self-reports of mindfulness, participant have begun counting their breath via a 25-minute computer-tested breath counting programme to measure mindfulness in terms of accuracy of breath counting. The beginning was a 6-minute resting baseline, after this period, participants were requested to count their 1-9 breaths repeatedly for 18 minutes. Throughout this task, they were asked to press specific keyboard keys with every breath. The computer has recorded their performances. While counting their breath, they have worn respiratory belt to check respiratory rate in order to confirm their breath counting rate. Participants were also asked to evaluate their mind-wandering during period of breath counting.

After the breath counting session, the participants were then taken the second session. In this part, firstly their emotional reactivity would be evaluated by them viewing 15 affective video clips. These video clips consisted of five pleasant, five neutral and five unpleasant clips showed on a 19-inch computer monitor via the Microsoft Office PowerPoint programme. This was undertaken in order to induce passive viewers' emotion. The beginning was a 2-minute resting period. Following this, each video clip was randomly displayed (duration of clips was between 13-38 seconds). Then, a page of self-rating of emotional reactivity was shown for 20 second. Next, a page displayed the number of the following clip was shown for 40 seconds (Figure 14). In this present study, the inter-stimulus interval (ISI) between affective video clips was 60 seconds because this period potentially could decrease the emotional reactivity elicited by the previous video clips to diminish (Uy et al., 2013). All slides were displayed automatically.
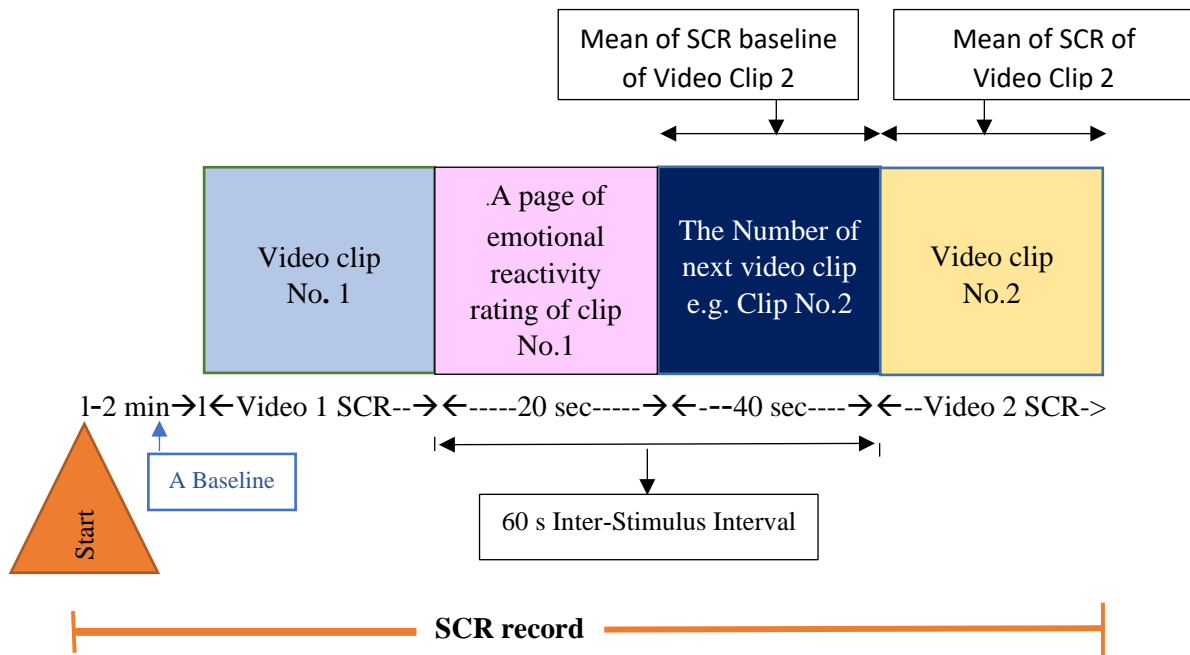
Figure 14. The Slide of Affective Video Clips Presentation Timings.

After watching the slide of video clips, the slide of affective sound clips was presented in a similar way. However, the duration of sound clips had the same length as affective pictures in the previous study; six seconds, and ISI was five seconds (Figure 15). During experiencing of these affective clips, SCR was recorded as the emotional reactivity of the participants by the NeuroLog galvanic skin response logger sensor (NUL-217). Participants have been attached two electrodes to two clean and warm fingers on the non-dominant hands tightly in order that the equipment would properly detect the signals. In addition, the participants were required not to move this hand and fingers during this recording period to prevent the effect of moving on SCR measurements. Overall, the laboratory procedure has taken within 90 minutes.
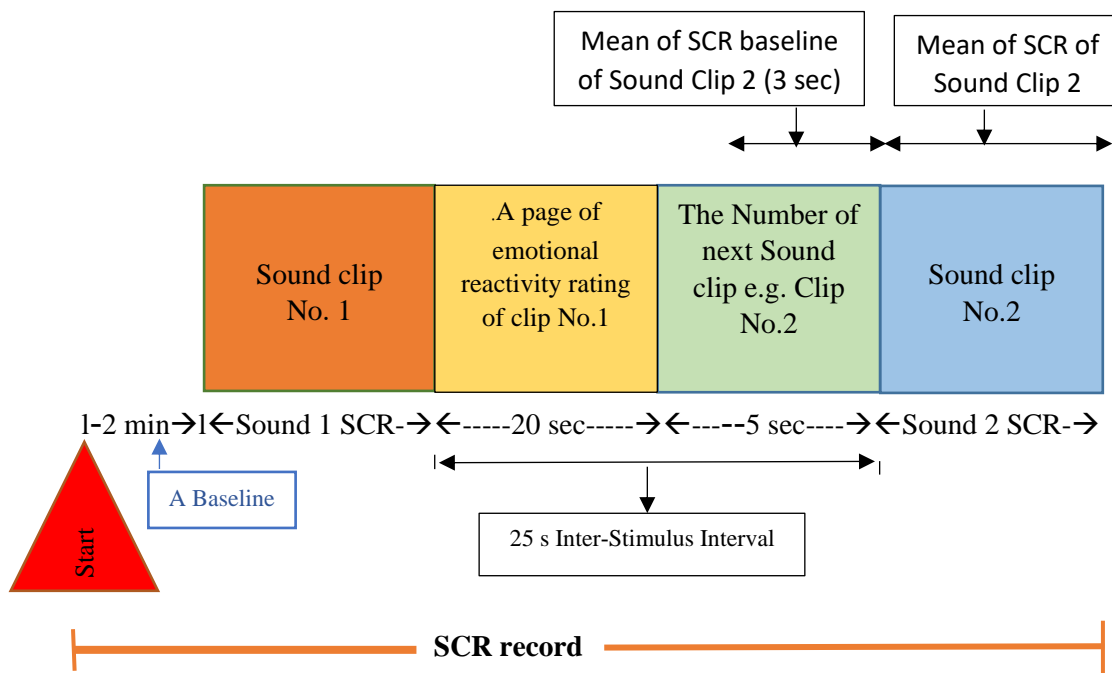
Figure 15. The Slide of Affective Sound Clips Presentation Timings.

6.3.5 Data Analysis

In this present study, I have investigated whether mindfulness, as assessed by traditional self-reported scales (MAAS, Trait TMS and mind wandering) and an objective or behavioural measure (i.e., breath counting accuracy) is associated with emotional reactivity (SCR and self-rating scores) evoked by affective video and sound clips. In terms of SCR analysis, SCR change was here calculated based on the average analysis method, as is the most common method of calculating SCR change (Braithwaite et al., 2013). The formula is as follows.

SCR change = The Mean of SCR during exposure to an affective clip minus the Mean of SCR baseline prior to the onset of an affective clip

Whereby the average SCR measured during the watching of or listening to an affective clip was subtracted by the average SCR measured for the 40-second period of a video clip (Figure 14) and a 3-second period for a sound clip prior to the playing of affective clips (Figure 15). The duration of the baseline between the affective video clip and the affective sound clips are different because affective clips can affect emotion for longer than affective sounds. In this study, the baseline periods are based on the study

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of Rottenberg, Ray & Gross (2007) and Uy et al (2013) and the study of Ortner, Kilner, & Zelado (2007) respectively.

The Cronbach Alpha Reliability Coefficient of the MAAS scale was measured at .84, while the curiosity and decentering facets of Trait TMS was measured at .87 and .63, respectively. Pearson correlations were applied to analyse the correlations between mindfulness and emotional reactivity. Moreover, multiple regressions were conducted to control for any confounding variables (i.e., gender and age) in the correlation between mindfulness and emotional reactivity. Prior to analysing the correlation, examination was given as to whether each affective clip could evoke significant SCR change by using a paired-sample *t*-test analysis to establish the validity of the research results.

6.4 Results

6.4.1 Preliminary Analysis

All affective video and sound clips were analysed by a paired-sample *t*-test to investigate the capability of eliciting emotional reactivity in terms of SCR. The results have indicated that the SCR of the two video clips (a crying baby, and a laughing baby with a dog) differed significantly from the SCR baselines ($t(56) = 2.91$, $p <.01$, $t(56) = 3.38$, $p < .01$ respectively, and one affective sound clip (raining) $t(56) = 2.74$, $p <.01$. Hence, I have used only the sum of the changed SCR of these two affective video clips in case of analysing of emotional reactivity elicited by affective video clips. On the same way, only a sound clip of raining was analysed in terms of emotional reactivity induced by affective sound clips.

6.4.2 Correlations of Variables; Mindfulness, Mind Wandering and Emotional Reactivity

The Pearson correlation statistic was conducted to investigate the correlations that arise between mindfulness – with this including the scores of the MAAS, curiosity, and decentering subscales of Trait TMS, breath counting accuracy (including mindlessness in terms of mind wandering or task-unrelated thought (TUT)) – and emotional reactivity (as includes SCR induced by effective affective clips according to

the preliminary analysis mentioned above and all clip intensity rating scores).The results of this are illustrated in Table 20. As expected in terms of the subjective mindfulness scores, it is indicated that the scores of the MAAS has significant and negative correlations with the intensity rating of video clips and a sound clip (r (56) = -.31, $p < .05$, r (56) = -.26, $p < .05$), respectively. In terms of the valence of emotion, the results reveal a significant negative correlation between the scores of the MAAS and the intensity rating of positive video clips [r (56) = .33, $p < .05$]. In addition, decentering (Trait TMS) was found to be significantly and positively correlated with SCR change in response to positive video clips [r (56) = .32, $p < .05$], but has a negative and significant association with SCR change in response to (neutral) sound clips [r (56) = -.30, $p < .05$]. However, breath counting accuracy, curiosity and mind wandering has been found to have no significant association with emotional reactivity.

Table 20

Pearson Correlation Matrix among Breath Counting Accuracy, Subjective Mindfulness, Mind Wandering (Task-Unrelated Thought) and Emotional Reactivity (N = 56)

	M	*SD*	1	2	3	4	5	6	7	8	9
1. MAAS	56.95	10.49									
2. Curiosity-Trait TMS	20.65	5.37	-0.99								
3. Decentering Trait TMS	19.24	4.25	-0.16	0.38*							
4. Breath Counting Accuracy	0.58	0.21	-0.10	0.27*	0.33*						
5. Task-Unrelated Thought (TUT)	32.31	10.50	-0.26*	0.09	-0.05	-0.30*					
6. SCR (Video Clips)	0.30	0.56	0.11	0.23	0.32*	0.10	-0.03				
7. Video Clip Intensity Rating	70.57	15.07	-0.31*	0.12	0.05	-0.13	0.05	0.06			
8. SCR (Sound Clips)	0.03	0.13	0.01	-0.06	-0.30*	0.04	-0.07	-0.16	0.23		
9. Sound Clip Intensity Rating	74.73	18.31	-0.26*	0.07	0.10	-0.06	-0.07	-0.03	0.56**	0.21	

$* p < 0.05, ** p < 0.01$

Note. *M* – Mean; *SD* – Standard Deviation; 1. MAAS = Mindful Attention Awareness Scale; 2. Curiosity Facet of Trait TMS = Toronto Mindfulness Scale (Trait Version); 3. Decentering Facet of Trait TMS; 4. Breath Counting Accuracy; 5. TUT = Task-Unrelated Thought; 6. SCR (Video Clips) = Sum of Average Analysis of Skin Conductance Reactivity Induced By Affective Video Clips; 7.Video Clip Intensity Rating = Rating Score of Video Clip Intensity; 8. SCR (Sound Clips) = Sum of Average Analysis of Skin Conductance Reactivity Induced By Affective Sound Clips; 9. Sound Clip Intensity Rating

6.4.4 Multiple Regression Analysis

Table 21

Hierarchical Multiple Regression between Mindlessness/Mind Wandering (Task-Unrelated Thoughts) and Emotional Reactivity

	Total SCR (Video)				Intensity rating (Video)			
	B	**β**	**T**	**Sig**	**B**	**β**	**T**	**Sig**
Step 1								
1.Gender	0.13	0.10	0.65	0.52	4.71	0.14	0.95	0.34
2. Age	0.03	0.16	1.00	0.32	0.09	0.02	0.12	0.90
Step 2								
1. Gender	0.14	0.11	0.66	0.51	4.95	0.14	0.97	0.34
2. Age	0.02	0.10	0.63	0.53	0.37	0.08	0.56	0.58
3. MAAS	0.01	0.18	1.16	0.25	-0.57	-0.42	-3.03	.004
4. Curiosity-Trait TMS	-.002	-0.02	-0.12	0.91	0.21	0.08	0.51	0.61
5. Decentering-Trait TMS	0.03	0.29	1.79	0.08	-0.08	-0.02	-0.16	0.88
6. Breath Counting Accuracy	0.15	0.06	0.38	0.71	-16.19	-0.23	-1.60	0.12
7. Task Unrelated Thought	0.01	0.10	0.63	0.53	-0.10	-0.07	-0.49	0.63
	Total SCR (Sound)				Intensity rating (Sound)			
	B	**β**	**T**	**Sig**	**B**	**β**	**T**	**Sig**
Step 1								
1.Gender	-0.02	-0.07	-0.46	0.65	1.68	0.04	0.26	0.80
2. Age	0.01	0.24	1.59	0.12	0.22	0.04	0.24	0.81
Step 2								
1. Gender	-0.02	-0.08	-0.46	0.65	2.29	0.05	0.33	0.74
2. Age	0.01	0.30	1.92	0.06	0.19	0.03	0.21	0.84
3. MAAS	0.00	-0.03	-0.18	0.86	-0.62	-0.35	-2.45	0.02
4. Curiosity-Trait TMS	.001	0.03	0.20	0.84	0.25	0.07	0.47	0.64
5. Decentering-Trait TMS	-0.01	-0.37	-2.40	0.02	0.15	0.03	0.23	0.82
6. Breath Counting Accuracy	0.04	0.07	0.42	0.67	-15.73	-0.18	-1.17	0.25
7. Task Unrelated Thought	0.00	0.03	0.18	0.86	-0.37	-0.20	-1.31	0.20

In addition, a two-step multiple regression analysis was conducted to identify the unique variance of the aspects of mindfulness (i.e., the independent variables) to predict emotional reactivity (i.e., the dependent variables) after controlling for gender and age (Table 21). To examine this, age and gender were entered in Step 1, following which mindfulness (including mindful attention awareness, curiosity, decentering, breath counting accuracy) and mind wandering (task-unrelated thought) was introduced in Step 2. As illustrated in Table 4, in Step 1, age and gender has no significant statistical value in predicting Total SCR (Video, $F_{[2,49]} = 1.22$, $r = .22$, $r^2 = .05$, adj $r^2 = .01$, $\Delta R^2 = .05$, $p = ns$; Sound, $F_{[2,49]} = 1.29$, $r = .22$, $r^2 = .05$, adj $r^2 = .01$, $\Delta R^2 = .05$, $p = ns$), and clip intensity rating [$F_{[2,49]} = 1.22$, $r = .22$, $r^2 = .05$, adj $r^2 = .01$, $\Delta R^2 = .05$, $p = ns$), and clip intensity rating (Video, $F_{[2,55]} = .59$, $r = .15$, $r^2 = .02$, adj $r^2 = -.01$, $\Delta R^2 = .02$, $p = ns$; sound, $F_{[2,56]} = .10$, $r = .06$, $r^2 = .03$, adj $r^2 = -.03$, $\Delta R^2 = .004$, $p = ns$). In Step 2, mindfulness failed to establish a significant change in R^2 in predicting Total SCR, (Video, [$F_{(7,44)}$ change = .98, $r = .38$, $r^2 = .14$, adj $r^2 = .01$, $\Delta R^2 = .10$, $p = .ns$;   sound, [$F_{(7,44)}$ change = 1.27, $r = .41$, $r^2 = .17$, adj $r^2 = .04$, $\Delta R^2 = .12$, $p = ns$), and clip intensity rating, [Video, $F_{(7,50)}$ change = 2.32, $r = .45$, $r^2 = .09$, adj $r^2 = .09$, $\Delta R^2 = .18$, $p = ns$; sound, $F_{(7,51)}$ change = 1.47, $r = .36$, $r^2 = .13$, adj $r^2 = .01$, $\Delta R^2 = .13$, $p = ns$]. This reveals that mindfulness does not account for the unique variance in emotional reactivity (i.e., Total SCR Change) and clip intensity ratings. However, mindful attention awareness is a great predictor of clip intensity rating while the facet of decentering-Trait TMS has a significant effect upon increasing the predicting of Total SCR Change in response to (neutral) sound clips.

6.5 Discussion

This present study has aimed to explore the association between mindfulness and emotional reactivity as induced via affective video and sound clips. The principal findings of this research partially confirm that there is a significant correlation between mindfulness (as assessed by subjective scales) and emotional reactivity. Through Pearson correlation analysis, mindful attention awareness has been found to have a significant and negative association with the intensity rating of emotion as invoked via visual and audio clips.   In addition, the decentering facet of Trait TMS is found to significantly and positively correlate with SCR as elicited via video clips (specifically a positive clip), yet this is negatively associated with SCR as induced via a sound clip (a

neutral clip). However, mind wandering (task-unrelated thought) and breath counting accuracy failed to show a significant correlation with emotional reactivity.

Overall, mindful attention awareness was found to have a negative correlation with emotional reactivity when assessed via self-reported scales. Moreover, with reference to hierarchical multiple regression, mindful attention awareness accounts for a unique variance as to the intensity rating of video and sound clips. The finding echoes those of previous studies (e.g., Beblo et al., 2018; Brzozowski et al., 2018; Lalot et al., 2014), including in relation to the results of the first laboratory study. It could thus be concluded that although emotional reactivity is elicited by different affective stimuli (i.e., static pictures, dynamic video and sound clips), mindful attention awareness is likely to be negatively associated with emotional reactivity when focusing on conscious perception – namely via self-ratings. Thus, in the same way as discussed in a previous chapter, a possible explanation for this finding could pertain to the cognitive-based theory of emotion and the emotional regulation process (Gross & Thompson, 2009). In relation to mindful attention awareness, mindfulness emphasises uni-faceted mindfulness (i.e., receptive self-awareness) with attention being given to the present experience (Brown & Ryan, 2003). Hence, a person being mindful could seemingly easily disengage one's own attention from the past emotional stimuli they have faced (Ortner, Kilner & Zelazo, 2007; Taylor et al., 2011), and thus give less evaluation to their past experience. Also, such persons tend to be receptive to their own emotional experience without giving judgement to this. As a result, the appraisal directed towards such emotional stimuli, as may impact upon the rating of emotional reactivity, could possibly decrease. In other words, mindfulness seems to improve the psychological flexibility and adaptability of individuals (Friedman, 2007; Park & Thayer, 2014; Thayer & Lane, 2000), as may thus reduce   the subjective rating given to emotional reactivity.

However, in regard to the facets of mindfulness, decentering (non-elaborating attitude) indicates distinguished correlations and could be a powerful predictor of SCR (the different form of emotional reactivity based on neurophysiological response). This relationship might be explained via the cognitive-based theory of emotion as the cognitive expectations held towards affective stimuli could alter the arisen emotional physiological response (Hoehn-Saric & McLeod, 2000). In regard to previous investigations, it has been found that decentering likely enhances adaptive emotion

regulation (Teper, Segal & Inzlicht, 2013), as might involve the expectations held as to emotional stimuli. As a consequence, this could influence SCR. In other words, decentering allows a person not to judge or evaluate situations or the emotional stimuli they are experiencing, especially if this is aversive stimuli, and thereby accept it. This could therefore increase an individual's psychological and physiological flexibility (Friedman, 2007; Park & Thayer, 2014; Thayer & Lane, 2000).

Yet, interestingly, the direction of correlation is different upon the valence of emotion. In regard to the present finding, the decentering facet reveals a negative association with the SCR induced by a neutral sound clip, yet a positive association with the SCR induced by a positive clip. A possible theoretical explanation for this finding could involve the valence of emotion. As highlighted in the results, decentering is positively correlated with the SCR induced by a positive clip. This could be explained via the decentering facet being involved with acceptance (Davis, Lau & Cairns, 2009). Therefore, individuals who possess decentering may allow themselves to approach and accept full experiences from pleasant stimuli with an appetitive motivation. In regard to the investigation of Britton and colleagues (2006), positive emotional arouse invoked during the watching of films could increase SCR as positive films could activate adrenalin and impact upon a person's peripheral nervous system (Esmaeili and colleagues; 2011). Additionally, as positive stimuli might be an appetitive stimulus, it could release more dopamine as a neurotransmitter, with this having a crucial influence upon the affective and cognitive process as well as on hormones (Mirenowicz & Schultz, 1996; Kim, Matthews & Moghaddam, 2010). Thus, the present findings demonstrate that SCR elicited via a positive video has a positive association with decentering. In contrast, decentering demonstrates a negative correlation with SCR elicited via a neutral sound clip (rain). It is difficult to explain this result, but one can assume that although a neutral sound is not negative in regard to its valence, it possibly evokes different imagery and information from memory due to the various characteristics of the neutral sound, (Gomez & Danuser, 2004). As a result, this could have an influence upon the emotional perception of the sound (Tajadura-Jiménez et al., 2010) and this might impact upon the physiological response given (Bach et al., 2008; Koelsch, 2014). In being decentered, a mindful person is likely to not judge the sound based on its character, as might evoke emotion. Consequently, SCR being

induced via an emotional perception could diminish if decentering is practiced with psychological and physiological flexibility and adaptability (as mentioned previously).

Turning now to the mindfulness-related facet which focused on self-awareness with attention being given to the present, neither curiosity, breath counting accuracy or mind wandering have been recorded as having a significant association with emotional reactivity – including intensity rating and SCR. This result is in-line with previous investigations (e.g., Sze et al., 2010). Presumably, when compared with the non-elaborating related facet, attentive awareness as to self-experiences might be less involved with emotional reactivity as attentive self-awareness as to the present inner experience allows mindful individuals to face emotional stimuli with curiosity. As a result, the emotional reactivity faced whilst being exposed to stimulus is plausibly not adjusted (Brzozowski et al., 2018). On the contrary, after having their emotional reactivity induced, a mindful person tends not to evaluate or appraise stimulus and merely accepts this, thus potentially being able to recover from the emotional imbalance elicited by the affective stimuli (Carlin & Ahren, 2014; Greenberg & Meiran, 2013).

It is also worth mentioning the diverse associations between mindfulness and emotional reactivity here. In regard to the direction of the association with positive stimuli, mindful attention awareness is correlated negatively with the intensity rating of positive video clips while, in contrast, the decentering facet is positively correlated with the SCR induced via a positive clip. One can assume that mindfulness with receptive attentive self-awareness could increase psychological flexibility (as mentioned previously) and thus mindful persons are likely to pay attention to the present self-experience, not to the past. Moreover, such persons tend not to assess the value of all sorts of affective stimuli, including positive stimuli. As a result, the intensity rating based on their emotional perception may decrease. This result is supported by previous investigations (e.g., Erisman & Roermer, 2010; Lalot et al., 2014). However, although decentering, via a non-elaborating attitude, allows an individual to not reappraise positive stimuli, this might not inhibit the physiological effect of positive or appetitive stimuli. This therefore demonstrates a positive correlation with emotional physiological reactivity as discussed earlier.

Taken together, the present results emphasise the meaningful association that arises between mindfulness and emotional reactivity in a comparable way as with

previous laboratory studies. Overall, it has been demonstrated that trait mindfulness has a significant and negative correlation with emotional reactivity as elicited via various sensory organs (including eyes and ears). In general, although mindfulness (i.e., attentive self-awareness with a non-elaborating related attitude) has been found to have a significant and negative association with emotional reactivity, the possession of non-elaborating attitude might be a dominant physiological response, specifically in relation to SCR, as may refer to robust emotional reactivity. The results could highlight the potential role of mindfulness in improving emotional balance by developing physiological and psychological flexibility and being adaptive (Friedman, 2007; Friese, Messner & Schaffer, 2012; Park & Thayer, 2014; Thayer & Lane, 2000), namely in regard to adaptive emotion regulation (Erisman & Roermer, 2010). It could be said that trait mindfulness reveals its ability to invoke substantial benefits for human mental health, primarily by enriching an individual's emotional balance, diminishing their negative emotional reactivity while strengthening their positive emotional reactivity in both cognitive and physiological conditions.

Although the present investigation seems to have revealed valuable results, these finding may be somewhat limited by the number of effective emotional clips used in relation to eliciting physiological responses (two video clips and one sound clip). The limit of the number of affective clips inducing SCR may affect the result of correlation between mindfulness and emotional reactivity. As shown in Table 20, the correlations between mindfulness and different form of emotional reactivity was various, furthermore, the emotional reactivity in the form of SCR was not significantly correlated with the emotional reactivity in the form of clip rating both video and sound clips. One of the possible explanations is that the number of clips using for calculating self-rating score are different (15 video clips and 15 sound clips) and SCR (2 video clips, 1 sound clip). In the future, such shortcomings may be decreased by testing affective clips with both subjective ratings and physiological measures prior to their employment in a laboratory study. Moreover, the participants in this present study were gained from the EPR System and thus may lack heterogeneity. Further work should be undertaken as to investigating a diverse range of participants – such as those from different cultural groups – in order to increase the research's generalisability. Also, investigating different dimensions of emotion – i.e., valence, intensity and types of

emotion (e.g., basic emotion) – is required in order to improve the robustness of the exploration of this topic.

6.6 Conclusion

This laboratory study has set out to investigate the association between mindfulness and emotional reactivity as elicited via affective video and sound clips. The findings presented here have confirmed a significant correlation and are in accordance with recent studies. Yet, the study has gone some way towards expanding our understanding of the association between mindfulness and emotional reactivity regarding the facets of mindfulness and the form of emotional reactivity. It can be concluded that mindfulness has a significant and negative correlation with emotional reactivity in terms of subjective evaluation and the physiological form, although this is evoked through different sensory receptors such as eyes and ears. Both self-awareness being possessed at the present inner experience and decentering, a non-elaborating attitude (as arises as a facet of mindfulness) has a major impact upon emotional reactivity. In addition, mindfulness demonstrates its ability to provide crucial advantages for mental health by reducing negative emotional reactivity and by increasing positive emotional reactivity. Future investigation may explore mindfulness and emotional reactivity in terms of the dimensions of emotion (intensity and valence in different groups) and the forms of emotional reactivity (self-report and physiological response) in order to expand our held understanding as to the influence or mechanism of mindfulness on various emotional dimensions, areas that might be utilised to induce positive effects upon human mental health.

Chapter Seven

Relationships That Exist between Mindfulness and Emotional Reactivity via the Use of Intense Affective Clips: Thai Study

7.1 Abstract

In Lab 3, I continued to investigate the relationship between mindfulness and emotional reactivity by replicating the previous laboratory study. To expand upon the investigation given as to this topic, the affective stimuli were developed to include affective intense video clips due to the held intensity being a substantial dimension of emotional reactivity. 15 piloted affective video clips (as derived from YouTube) were applied while the participants of this latter study were Thai in order to expand upon the heterogeneity of the sample used, thus addressing the notion of possessed culture impacting upon mindfulness. Data was collected from a sample ($n = 47$) of undergraduate students from Chiang Mai University, Thailand. Unexpectedly, the main results fail to illustrate a significant correlation between mindfulness and SCR while mind wandering is not found to be correlated with the emotional reactivity scores. Possible explanations for this outcome are thus given discussion. The limitations of the research and potential areas of future study are also discussed.

7.2 Introduction

7.2.1 Mindfulness and Negative Emotion

Several previous studies alongside this present PhD project, has documented how mindfulness has a meaningful relationship with emotional states and emotional reactivity. For example, Beblo and colleagues (2018) have examined whether mindfulness mediation affects the positive and negative emotion process. The results demonstrated the effect of mindfulness (breathing meditation) in delaying unpleasant emotional reactivity. Similarly, Weinstein, Brown and Ryan (2009) explored the effect of mindfulness on the coping strategies, appraisal of stress situations and stress consequences among university students. The findings show that mindfulness decreases the negative appraisal given towards stress situations and stress avoidance while it increases stress acceptance. This could lead to advantages being gained from mindfulness in relation to human well-being. In regard to the mental wellbeing view, mindfulness with attentive self-awareness and without elaboration being given towards

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present internal experiences is held to play a critical role in mental health (Alsubaie et al., 2017; Eberth & Sedlmeier, 2012; Giluk, 2009; Gu et al., 2015; Keng, Smoski & Robins, 2011). This is because, theoretically, such an aspect could help individuals to effectively and adaptively regulate emotion (Teper, Segal & Inzlicht, 2013; Uusberg et al., 2016), achieved by improving psychological and physiological flexibility and adaptability (Friedman, 2007; Hayes & Feldman, 2004; Park & Thayer, 2014; Thayer & Lane, 2000; Weinstein, Brown, & Ryan, 2009). As a result of these advantages, emotional balance is enhanced.

As evidence suggests that mindfulness is a crucial aspect of emotion and mental health, several attempts have been made to explore the associations between mindfulness and emotional reactivity. For instance, a meta-analysis conducted by Gu et al. (2015) was based on 20 studies showing the robustness of the mindfulness effect on emotional reactivity (distress induced by negative thought). However, to date, little attention has been paid to emotional reactivity elicited via intense stimuli (Koriat et al., 1972) – an approach which may produce different impacts on individuals in terms of the regulation of their emotion and its consequences (Gross, 1998). It is important to explore whether mindfulness is correlated with emotional reactivity in the case of emotion being elicited by intense affective stimuli due to there being a likelihood that individuals will face stressful or high-arousal situations (stimuli) in their lives (Kabat-Zinn, 1990). Moreover, the findings of such an investigation may expand the robust understanding held as to mindfulness in regard to its effective impact on quality of life among clinical and nonclinical people (Beblo et al., 2018).

7.2.2 Mindfulness and Emotional Reactivity induced by Intense Affective Stimuli

Previous investigations as to this topic, when applying intense affective stimuli, have mostly used intense emotional clips within emotion analogue laboratory settings (Gross, 1998). The reason for doing so derives from the effectiveness of such clips in eliciting emotional reactivity (Lazarus et al., 1962; Schaefer et al., 2010; Westermann et al., 1996) and the high degree of ecological validity produced in such emotion laboratory studies (Koriat et al., 1972; Gross & Levenson, 1995; Schaefer et al., 2010). Despite its usefulness, the findings among the few investigations undertaken as to whether mindfulness has a relationship with emotional reactivity (as induced via intense

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emotional stimuli) are diverse. Here, it has been found that this depends upon the type of mindfulness, forms of emotional reactivity and assessing period explored.

Carlin and colleague (2014), in investigating undergraduate students briefly trained in mindfulness in order to examine the association between mindfulness and fear avoidance while watching films, found that their results suggest that the mindful students demonstrated less fear avoidance than the control group. In other words, mindfulness could enhance resilience to fear. In a similar way, Crosswell et al., (2017), in exploring the relationship between mindfulness by training emotional recovery after stressful negative emotion is provoked by an unpleasant recall task, found that mindfulness has a positive association with both emotional arousal and emotional rebalance. Diaz et al. (2014), in contrast, investigated whether trait mindfulness (FFMQ) and cultivated mindfulness has an effect upon emotional response evoked by acute stressors. The findings of this research highlight that trait mindfulness has no correlation with emotional balance after emotion is induced directly, yet it has a significant positive correlation with less disturbing thinking one day after exposure to a stressor. On the contrary, cultivated mindfulness is found to have a positive correlation with emotional balance just after induced emotion, yet this is not associated with disturbed-thinking a day later. Brzozowski et al., (2018), in moving in a different direction, examined the effect of trait mindfulness (mindful attention awareness) on the heart response elicited by violent clips and gained findings that emphasised the positive relationship between mindful attention awareness and the valence rating of emotion alongside the negative association with heart rate reactivity.

Aside from the few studies produced and their various findings, the other limitation of the investigation given to the relationship between mindfulness and emotional reactivity via the use of intense affective stimuli is the utilisation of heterogeneous research populations, particularly in regard to cultural aspects (Cabral et al., 2017). Existing studies have mainly been undertaken with Western populations, as described above, and there have been very few attempts to examine non-Western samples. One notable exception here is the research of Sze and colleagues (2010). As a consequence, the results available to date could suffer from shortcomings pertaining to a lack of consideration being given to individual differences – for example, those involved in a sample's cultural aspects. The first shortcoming here relates to mindfulness. Culture may be indirectly involved with mindfulness, for instance, via

religion. Typically, Buddhists are likely to be more familiar with mindfulness than non-Buddhists as mindfulness is rooted in Buddhism and Buddhist practice. As a result, Buddhists may understand mindfulness in terms of its associated knowledges and experiences (Christopher, Woodrich & Tiernan, 2014), with this having the potential to impact the data derived via self-assessment scales (Grossman, 2008; Chiesa, 2013). It could thus be beneficial to explore populations which are familiar with mindfulness in an effort to strengthen the robustness of any results (Baer (2015). The second problematic issue here pertains to the emotion process, particularly the step of emotion regulation, whereby individuals with different cultures may regulate their emotions differently (John & Gross, 2007) – seen, for example, in the findings of Butler, Lee & Gross (2007), Hu et al. (2014) and Soto et al. (2011). Also, the perceptions given as to stimuli (affective clips) may vary due to cultural differences, with this having the potential to influence emotional reactivity (Gabert-Quillen et al., 2015; Schaefer, 2010).

Hence, the present study seeks, as its main purpose, to explore the association between mindfulness and emotional reactivity elicited via intense affective clips among Thai people, a result of Thai people presumably being familiar with mindfulness – both its knowledge and experience aspects – due to Thailand being a Buddhist country. This research population is being utilised in order to decrease the shortcomings which relate to cultural issues and to increase the heterogeneousness of the results. However, this investigation is notably not a cross-cultural study and instead is purposive for a preliminary study relating to future investigation involving culture.

7.2.3 Research Aims of the Current Study

The aim of this study has been to explore the associations that exist between mindfulness (subjective and behavioural measures) and emotional reactivity (self-rating and skin conductance response: SCR) by using intense affective video clips among Thai participants.

7.3 Method:

7.3.1 Participants

In this experiment, the participants were 47 undergraduate and graduate students in universities in Chiang Mai, Thailand. An advertisement was launched in the Department of Psychology, Chiang Mai University to find potential participants, with

the criterion for participation being that the individual possessed a non-clinical condition and good vision. In addition, a financial incentive (of 100 Thai Baht or £2) would be offered to each participant in the experiment. Of the 47 participants, 9 (19.10%) were male and 38 (80.90%) were female. The age range of the sample spanned from 18 to 62 years old ($M = 21.43$; $SD = 6.94$). In terms of religion, all were Buddhist (100%) and no missing data was encountered in this study.

Ethical Approval

Ethical approval for this study was granted by the University Ethics Sub-Committee of Psychology, University of Leicester.

7.3.2 Design

As with the first and second experiments, I applied an analogue laboratory design to the third experiment in order to investigate the relationship that exists between levels of mindfulness, as measured by a behavioural mindfulness measure (breath-counting accuracy, traditional and subjective scales) and emotional reactivity (as evoked by intense affective video clips), with this being measured by skin conductance response (SCR) and the self-rating scale.

Stimulus Materials

Although I used the same design as the first and second experiment, the affective stimuli was changed due to the consequences of the previous experiment in terms of the stimuli's capabilities in inducing emotion. In this study, the affective stimuli were changed from non-intense emotional video clips (as used in the second experiment) to more intense affective video clips. Furthermore, affective sound clips were excluded from the list of materials used in order to improve the effectiveness of its quality in terms of intensity. 15 clips remained divided into three categories, as with the previous studies, in terms of valence; positive (pleasant), negative (unpleasant) and neutral (See Appendix E). The duration of each clip was 10 seconds, with each clip being randomly and automatically presented via the Microsoft Office PowerPoint program.

To select appropriate effective video clips in regard to their intensity, I had tested the affective video clips in a pilot study. Here, four participants watched 18 affective clips selected from YouTube and had their SCR recorded while watching

these clips. This SCR data was then analysed to identify the 15 most effective clips for use within the experiment.

Due to the intense nature of the stimuli, ethical considerations arose. Consequently, the participants were informed, via a consent form at the beginning of the experiment, that the videos they were to watch contained emotional content that included real violence and upsetting material derived from YouTube clips.

7.3.2 Measures

In this study, I applied objective measures to assess mindfulness and emotional reactivity in order to improve the validity of the results. However, subjective measures were also applied to refine the results of the experiment in a traditional measure.

1. Subjective Measures: This project has applied four self-reported scales through which it measures the related mindfulness variables and emotional reactivity. The measures are as follows:

1.1. The Mindful Attention Awareness Scale (MAAS) (Brown & Ryan, 2003). This scale has 15 items in order to evaluate overall mindfulness in the "day-to-day experience" of human life, specifically in terms of individuals being open and aware of inner experiences as to the present moment. An example of an item here is "I forget a person's name almost as soon as I've been told it for the first time, It seems I am "running on automatic," without much awareness of what I'm doing"". A participant was asked to rate their frequency of experience via a 6-point Likert scale – between 1 (almost always) and 6 (almost never). The result was calculated by reversing all of the scores and then producing a summation. An individual with a higher score is thus referred to as possessing a higher level of mindfulness.

1.2 The Trait Version of the Toronto Mindfulness Scale (Trait TMS) ((Davis, Lau & Cairns, 2009). 13 items of this measure have been adapted from the original scale of the Toronto Mindfulness Scale (Lau et al., 2006). This scale has two facets of mindfulness; curiosity (e.g., "I am curious about what I might learn about myself by just taking notice of what my attention gets drawn to") and decentering (for instance, "I am receptive to observing unpleasant thoughts and feelings without interfering with them"). Each item was evaluated via a 5-point Likert scale from 0 (not at all) to 4 (very much).

1.3 Mind wandering (Levinson et al., 2014). Mind wandering could be referred to as mindlessness, a distracted mind that is the opposite state of mindfulness. During the breath counting, each participant was asked to assess mind wandering: "Just now, where was your attention?" This question appeared on a computer monitor at a given point, with answers being given via 2 6-point Likert scales from 1 (completely on-task) to 6 (completely off-task).

1.4 Video clip emotional reactivity rating scale. This scale is applied to assess emotional reactivity. It is replicated from the study of Marchewka et al. (2014) and represents a bipolar semantic self-reported scale. The first component of this scale explores valence: "You are judging this clip as…". Each respondent was asked to rate an answer from 1 (very negative) to 9 (very positive), with being 5 neutral. The next item was to report the degree of arousal: "Having confronted this clip, you are feeling...". Here, the response was evaluated between 1 (relaxed) and 9 (aroused), with 5 being neutral. The final item asked the respondent to assess their motivational direction towards each clip: "My reaction to this clip is..." The answer given was from 1 (to avoid) to 9 (to approach), with 5 being neutral.

2. Objective Measures

2.1 A breath counting programme. This study utilised breath counting accuracy as an index level of mindfulness in terms of it being a behavioural measure. The breath counting accuracy could be recorded via a computer program that is replicated from the methodology of Levinson et al. (2014). Through this program, each participant was required to repeatedly count their breath from 1 to 9 while pressing specific keys on a keyboard (between the 1st and 8th breaths they were required to press the down arrow key after breathing in and out but, on the 9th breath, they were required to press the right arrow key. If they miscounted, they were to press the up-arrow key). The breath counting accuracy was calculated from 100% – (the number of incorrect ongoing 9-counts + the number of incorrect count probe responses + the number of self-caught miscounts) divided by (the number of ongoing 9-counts + the number of count probe responses + the number of self-caught miscounts). A Venier respiration monitor belt with Logger Pro 3 was used as an instrument to confirm the respiratory rate of each respondent.

2.2 Physiological measures. In this study, emotional reactivity was measured in terms of skin conductance reactivity (SCR), as is a form of electrodermal activity (EDA) (Braithwaite et al., 2013). Here, SCR could be changed due to the stimulating of motion. Evoked emotion could affect the activity of the sweat glands via the sympathetic nervous system, thus eliciting changing SCR. I used the NeuroLog galvanic skin response logger sensor to record the amplitude of SCR in microSiemen units (µS) while the participant was watching or listening to the affective clips. To calculate SCR change, an average analysis formula was applied. In regard to the affective video clips, SCR change was calculated by subtracting the mean SCR (as identified in the 40 seconds prior to the video clips being displayed) from the average SCR level found during the video clips presentation.

7.3.3 Procedure

Upon a participant coming to the laboratory, a researcher conveyed details of the experiment, including the rights of the participant. A consent form was also provided, as also conveyed a clear explanation as to the process. The researcher then explained how to complete the two self-rating measures of mindfulness, MAAS and Trait TMS, as undertaken via a BOS online survey.

Following this, each participant begun a session of breath counting using a 25-minute computer-tested breath counting program. This program is a behavioural measure of mindfulness. The accuracy of the breath counting was calculated from the data recorded on this program, thereby allowing an identification of the level of mindfulness being experienced by that participant. Following an initial 6-minute resting baseline recording, each participant needed to count their breaths, in cycles of 1-9, repeatedly for 18 minutes. Throughout this breath-counting period, the participant was further required to press a specific keyboard of the computer that corresponded to each breath. The computer recorded their performance. During the breath counting, a respiratory belt was tightened around the waist of the participant to objectively record their respiratory rate. Each participant was also requested to assess their mind-wandering during the breath-counting period.

Following the breath-counting session, the participant then engaged with the final session. In this session, their emotional reactivity would firstly be measured by them passively watching 15 intense affective video clips. These video clips consisted of

five pleasant, five neutral and five unpleasant clips presented on a 19-inch computer monitor via the Microsoft Office PowerPoint program. Each participant encountered a 2-minute resting period at the beginning to reduce any emotional state before taking part in the experiment. Each video clip was then randomly and automatically shown for a duration of 10 seconds. Next, a self-rating page as to emotional reactivity was presented for 20 seconds. Furthermore, the monitor would display a page showing the number of the following clip for 40 seconds (Figure 16). In this investigation, the inter-stimulus interval (ISI) between the affective video clips was 60 seconds, with this period having the potential to reduce the emotional reactivity induced by the previous video clip to a normal SCR baseline (Uy et al., 2013).
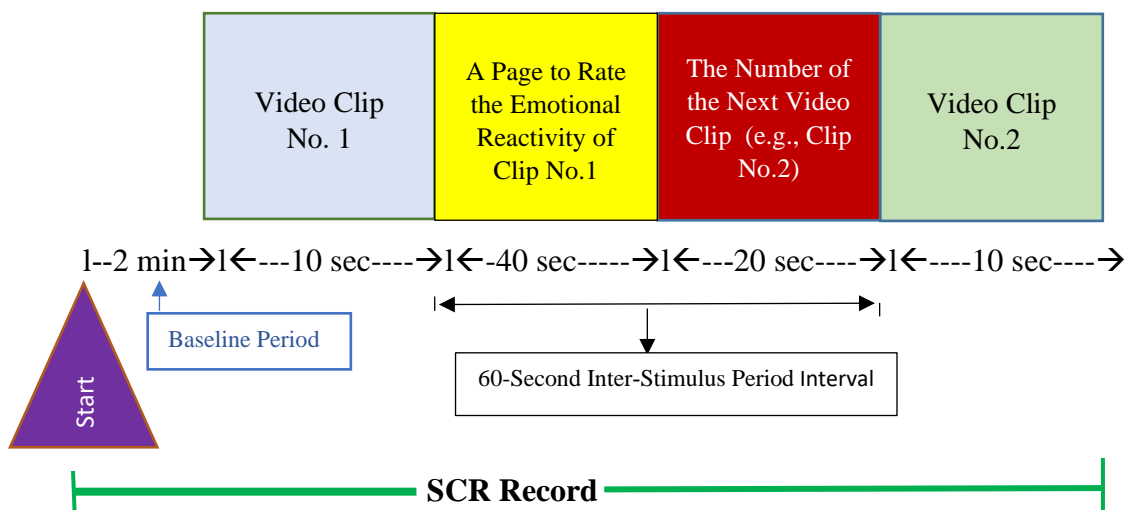
Figure 16. Slide of the Intense Affective Video Clips Presentation Timings

While watching these intense affective clips, the NeuroLog galvanic skin response logger sensor (NUL-217) recorded the SCR as the emotional reactivity of the participant. Two clean and warm fingers on the non-dominant hand of each participant were attached tightly to this sensor so that the equipment would correctly detect the signals. Additionally, the participants were required to not move the attached hand and fingers during this SCR recording period to prevent disruption of the SCR recording. The laboratory procedure took approximately 90 minutes.

7.3.5 Data Analysis

This experiment has been designed to explore whether the scores of the MAAS and that of the Trait TMS, as subjective mindfulness scales, are correlated with emotional reactivity. This is measured via a self-rated scale and the physiological response (SCR) among 47 Thai Buddhist students in Thailand. In addition, breath counting accuracy has been used as an index level of the held mindfulness and mind wandering (Task-unrelated thought), undertaken in order to refine the results of the investigation. The Cronbach Alpha Reliability Coefficients of the MAAS, curiosity and decentering-facet of the Trait TMS scale were assessed at .80, .87 and .76, respectively. The correlations identified between mindfulness and emotional reactivity were further analysed via the Pearson correlations. In addition, gender and age were controlled for as confounding variables through hierarchical multiple regressions. In order to ascertain the validity of the results, I conducted a paired-sample t-test analysis to examine the effectiveness of the intense visual clips (in terms of them eliciting emotional reactivity) prior to analysing the correlations.

7.4 Results

7.4.1 Preliminary Analysis

All of the intense affective clips were analysed by a paired-sample t-test to investigate their capabilities in eliciting emotional reactivity in terms of SCR. In regard to the results, all clips demonstrated a capacity to stimulate emotion, with the mean SCR increasing significantly while watching the clips from the SCR baseline recording. These increases were found as follows; a train $t(47) = 2.07$, $p < .05$, a crying baby with a mother's song $t(47) = 5.96$, $p < .01$, a cleaning machine $t(47) = 4.28$, $p < .001$, a dreaming dog $t(47) = 3.37$, $p < .01$, rain drops, $t(47) = 4.13$, $p < .001$, a big snake $t(47) = 3.50$, $p < .01$, a laughing baby with a dad $t(47) = 4.77$, $p < .001$, a motorcycle accident $t(47) = 5.22$, $p < .001$, the sky $t(47) = 5.24$, $p < .001$, a girl at a swimming pool $t(47) = 6.95$, $p < .001$, a crocodile $t(47) = 5.60$, $p < .001$, a group of laughing babies $t(47) = 4.86$, $p < .001$, an orange snake $t(47) = 5.29$, $p < .001$, a plate of sugar $t(47) = 5.90$, $p < .001$, and a baby and a dog $t(47) = 5.20$, $p < .001$.

7.4.2 Correlations of Variables; Mindfulness, Mindlessness and Emotional Reactivity

Table 22.

Pearson Correlation Matrix among Mindfulness, Mind Wandering (Task-Unrelated Thought) and Emotional Reactivity Induced via Intense Clips

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. MAAS	65.22	9.33													
2. Curiosity Trait TMS	15.81	4.88	0.20												
3. Decentering Trait TMS	16.23	4.37	0.14	0.49**											
4. Breath Counting Accuracy	0.76	0.15	0.12	0.08	-0.04										
5. Task-Unrelated Thought	24.60	8.81	-0.22	-0.16	0.01	-0.51**									
6. Total SCR	10.31	12.60	-0.12	0.16	0.09	0.12	-0.07								
7. SCR (positive clips)	4.01	5.00	-.11	.17	.09	.12	-.05	.99**							
8. SCR (neutral clips)	2.87	3.55	-.16	.13	.07	.11	-.07	.99**	.97**						
9. SCR (negative clips)	3.43	4.18	-.10	.16	.10	.11	-.09	.99**	.97**	.96**					
10. Clips Intensity Rating	73.36	9.90	-0.06	-0.02	-0.11	-0.06	0.08	0.16	.16	.17	.15				
11. Positive clips intensity rating	16.38	6.35	-.06	-.11	.00	-.13	.13	.14	.14	.17	.10	.73**			
12. Neutral clips intensity rating	36.13	4.07	-.09	.22	-.04	-.23	.14	.15	.14	.17	.14	.77**	.34*		
13. Negative clips intensity rating	20.85	5.24	.07	-.17	-.21	.37*	-.19	-.02	-.01	-.07	.03	.30*	-.22	.06	

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

Note. *M* – Mean; *SD* – Standard Deviation; 1. MAAS = Mindful Attention and Awareness Scale; 2. Curiosity Facet of Trait TMS = Toronto Mindfulness Scale (Trait Version); 3. Decentering Facet of Trait TMS; 4. Breath Counting Accuracy; 5. TUT = Task-Unrelated Thought; 6. SCR (Intense Video Clips) = Sum of Average Analysis of Skin Conductance Reactivity Induced Via Intense Affective Video Clips; 7. Intense Video Clip Intensity Rating = Intensity Rating Score of Intense Video Clips

As illustrated in Table 22, a Pearson correlation was performed in order to examine the correlation between mindfulness – including the scores of the MAAS, Trait TMS (curiosity and decentering) and breath counting accuracy – and mindfulness-related aspect (mind wandering; task-unrelated thought) and emotional reactivity (subjective rating and SCR). Contrary to expectations, this study did not find a statistically significant association between mindfulness and emotional reactivity. However, in terms of the correlation as to the valence of emotion, breath counting accuracy reveals a significant and positive association with the intensity rating of negative clips [r (47) = .37, $p < .05$].

7.4.3 Multiple Regression Analysis

Table 23

 Hierarchical Multiple Regression between Mindlessness/Mind Wandering (Task-Unrelated Thoughts) and Emotional Reactivity Induced via Intense Clips

	Total SCR				Clip Intensity Rating			
	B	**β**	**T**	**Sig**	**B**	**β**	**T**	**Sig**
Step 1								
1.Gender	13.17	0.42	2.98	.005	70.69	0.13	0.86	0.40
2. Age	0.06	0.03	0.24	.81	3.13	0.08	0.54	0.60
Step 2								
1. Gender	14.62	0.46	3.26	.002	74.31	0.13	0.78	0.44
2. Age	-0.13	-0.07	-0.46	0.65	3.01	0.17	0.93	0.36
3. MAAS	-0.25	-0.19	-1.28	0.21	0.23	-0.05	-0.31	0.76
4. Curiosity-Trait TMS	0.61	0.24	1.44	0.16	-0.05	0.11	0.59	0.56
5. Decentering-Trait TMS	0.27	0.09	0.55	0.59	0.22	-0.20	-1.04	0.31
6. Breath Counting Accuracy	8.83	0.10	0.64	0.52	-0.44	-0.03	-0.17	0.87
7. Task-Unrelated Thought	-0.08	-0.06	-0.35	0.73	-2.02	0.09	0.49	0.63

Table 23 illustrates the results of the conducted two-step hierarchical multiple regression. The two-step multiple regression analysis was conducted to identify the unique variance of the aspects of mindfulness (i.e., the independent variables) to predict

emotional reactivity (i.e., the dependent variables) after controlling for gender and age. To investigate this, gender and age were inserted in Step 1 to control their effects, with mindful attention awareness, curiosity, decentering, breath counting accuracy and TUT then being added in Step 2. As expected, mindfulness is found to not be a significant predictor of emotional reactivity. The results demonstrate that, in Step 1, gender and age has a significant statistical value in predicting total SCR (F [2,43] = 4.44, $r = 0.41$, $r^2 = 0.17$, adj $r^2 = 0.13$, $\Delta R^2 = 0.17$, $p < .05$, yet has no unique predicting with the clip intensity rating [F [2,43] = 0.48, $r = 0.15$, $r^2 = .02$, adj $r^2 = .02$, $\Delta R^2 = .02$, $p = ns$). In Step 2, mindfulness and mind-wandering failed to demonstrate a significant change in R^2 in predicting Total SCR, [F (7,38) change = 1.07, $r = 0.52$, $r^2 = 0.27$, adj $r^2 = 0.14$, $\Delta R^2 = .10$, $p = ns$] or the clip intensity rating, [F (7,38) change = 0.30, $r = 0.24$, $r^2 = 0.06$, adj $r^2 = 0.16$, $\Delta R^2 = 0.04$, $p = ns$].

7.5 Discussion

The purpose of this study was to examine the association between mindfulness and emotional reactivity as elicited via intense clips. It was unexpected that a significant correlation between the two variables would not be found. These current findings are somewhat surprising given the fact that they do not support the previous research conducted in this area (e.g., Brzozowski et al., 2018; Carlin et al., 2014). Several factors could explain these results.

Firstly, mindfulness might be involved with emotional reactivity in relation to two opposite directions of the mindfulness facets. The facet of present self-awareness is likely to be positively involved in emotional arousal when one is exposed to emotional stimulus. However, after emotion is induced, a non-elaborating facet (such as decentering) could be positively involved in emotional recovery via emotional detachment (Beblo et al., 2018; Crosswell et al., 2017; Greenberg & Meiran, 2014). However, in the case of emotional reactivity being evoked via intense stimuli, it might take time for mindfulness to facilitate individuals in rebalancing their emotional reactivity – with this having been demonstrated in a number of previous investigations (e.g., Beblo et al., 2018; Diaz et al., 2014). It may thus be said that the period in which emotional reactivity was assessed after the presentation of intense affective clips in this study might have been too early to reveal the impact of mindfulness on emotional

recovery. In other words, a longer time may be needed for a high level of emotional reactivity arousal to encounter an emotional balance reset via mindfulness.

Secondly, with respect to the cognitive-based theory of emotion, emotional reactivity may be altered by the priming of prior intense emotional stimulus (Kensinger & Schacter, 2008) or the antecedent conditions (Lazarus et al., 1962). The priming, as implicit recent memory from previous intense stimulus, can plausibly impact upon an individual's emotion regulation in regard to the adaption of their emotional response as induced by stressful elicitors (Gross, John & Richards, 1999) as a defensive affective process (Lazarus et al., 1962). In a laboratory study, prior negative or threatening intense clips may impact upon cognition – such as in relation to the held expectation as to the next form of stimulus. Hence, participants may control their emotional expression prior to watching the subsequent intense clips. If this is held to be true, emotional reactivity, both in regard to the self-rated scores and the SCR, may be altered (Hoehn-Saric & McLeod, 2000; Philippot, Schaefer & Herbette, 2003; Salas, Radovic & Turnbull, 2012).

Thirdly, another possible explanation for this finding is that emotional reactivity as aroused via intense stimuli might be too arousing to be diminished by the physiological emotional effect (i.e., via the peripheral nervous system), with this being in line with a study by Gross (1998). In this study, Gross found that participants watching an intense film (the amputation – a disgusting film) demonstrated a higher level of physiological reactivity than participants watching a less intense film as the latter group could reappraise the detail or information of the film properly. Through this ability, physiological reactivity is likely to be reduced (Gross, 1998).

Finally, as emotion reactivity in this current study involves threatening or stressful stimulus, the findings as to emotional reactivity may respond to the personality of the participants (Koriat et al., 1972; Lazarus et al., 1962). This idea could correspond to the research of Lazarus et al., (1962), whereby detailed examination as to this study's participants and their viewing of psychologically-stressful films demonstrated a discrepancy between the subjective emotional rating and physiological reactivity measured, a result of the participants potentially rating their emotional reactivity based on their personality (for example, in regard to the self-confidence or honesty held).

It is worth noting that although the main finding here failed to demonstrate an association between mindfulness and emotional reactivity, in respect of the valence of emotion the breath counting accuracy emphasises a significant positive correlation with SCR elicited via negative intense clips [r (47) = 0.36, $p < .05$]. In a similar way, curiosity is a significant predictor of the emotional intensity rating of neutral clips (β = 0.40, $p <.05$). breath counting accuracy and curiosity is the aspect of mindfulness which focuses on present awareness with attention, with this identifying a positive association with emotional reactivity. This accords with my earlier investigations as well as with previous works (e.g., Brake et al., 2016; Crosswell et al., 2017; Greenberg & Meiran, 2013). As discussed in my previous studies, this relationship may be explained via the fact that mindful people are likely to be aware of all inner experiences – including feelings, sensations and emotions – emerging at the present moment with natural attention. As a result, such individuals could be exposed to and engage with such fully-emotional experiences. Hence, the more aware the individual is, the more emotionally aroused they can become.

The current findings presumably hold some meaningful issues as to the association between mindfulness and emotional reactivity elicited via intense stimuli, particularly in terms of the facet of mindfulness. Although the main results demonstrate no statistically substantial relationship, mindfulness focusing on self-awareness of the present experience (curiosity and breath counting accuracy) demonstrates a significant relationship with emotional reactivity. In contrast, decentering, the non-elaborating attitude facet was found to not be associated with emotional reactivity as induced via intense clips. This could lead to the assumption that in the case of emotional reactivity being induced via high arousal stimulus or situations, mindfulness with self-awareness or curiosity may increase emotional intensity. However, it is possible that it takes a certain amount of time for emotional balance to be reset following emotional disturbance via decentering (e.g., Beblo et al., 2018; Crosswell et al., 2017; Greenberg & Meiran, 2014). Hence, future research as to the current topic is therefore recommended to evaluate emotional reactivity not only in relation to the process following an individual's direct exposure to intense or stressful stimuli, but also in regard to a prolonged period following this exposure. Through this, any gained findings would be more adequately validated. Moreover, individual differences (such as personality or gender) may be influential factors here and thus investigation should be

given as to this relationship, a result of emotional reactivity evoked via intense situations potentially being involved with coping abilities. Such investigations could expand our held understandings and verify the benefits of mindfulness in relation to the area of mental health.

Despite these promising results, it is possible that these findings are limited. These limitations pertain to a number of concerns. Firstly, in terms of the methodology used, the inter-stimulus interval (ISI) employed between the intense clips (1 minute) might not have been long enough to allow participants to rebalance their emotion. Notably, there is no standardised ISI documented in previous studies. The ISI used in the current study was replicated from the research of Rottenberg, Ray and Gross (2007), a result of this study having been referred to widely in regard to emotion laboratory research using affective films. The ISI used in the present study may not have been adequate to ensure that emotional reactivity was not impacted upon by the emotional reactivity evoked from prior intense clips. Secondly, the intense clips used in the present study were grouped only by valence (i.e., positive, neutral and negative), however each valence might comprise different discrete emotions (i.e., the negative valence might include anger, disgust or sadness). As previous studies have addressed how different discrete emotions might elicit distinguished emotional reactivity, the intense clips employed in this study may equally have impacted upon the various emotional reactivity measurements as well as the overall results of the investigation. Finally, the research participants in the study were volunteers from Chiang Mai University and were not randomised. Thus, the results gained may not be generalisable to a broader range of the ordinary population. Further work should therefore be undertaken to investigate various and differing samples.

7.6 Conclusion

In this investigation, the aim was to assess the relationship between mindfulness and emotional reactivity via the use of intense clips. The most obvious finding to have emerged from this study is that no significant association has been found between mindfulness and emotional reactivity. However, in terms of the facet of mindfulness, and that of emotional valence, the facet relating to self-awareness with attention (breath counting accuracy and curiosity) demonstrates a positive relationship with emotional

reactivity. Thus, the study has confirmed the previous findings in the present study which found that the association between mindfulness and emotional reactivity vary upon the facet of mindfulness and emotional reactivity. However, regarding the main finding, a non-significant association between mindful attention awareness or decentering, and emotional reactivity induced by intense affective video clips might raise the question about the effect of mindfulness on emotion, and the influencing factors on the association between mindfulness and emotional reactivity. An implication of this may be that, with regard to intense emotional reactivity, mindfulness may not produce an immediate impact and instead time may be needed to facilitate an individual's emotional balance. Hence, in future research, it is important that exploration is given to the relationship between mindfulness and emotional reactivity elicited via stressful stimuli over a prolonged period. Additionally, concern should also be given to the factors which are potentially involved with this relationship – such as individual differences. Different discrete emotions should thus be considered to be significant factors that require exploration in regard to this topic, with this allowing the robustness of such investigations to be strengthened.

Chapter Eight

General Discussion

8.1 Overview

The relationship between mindfulness and emotion has been widely investigated for a number of decades, whereby the benefits of mindfulness involving emotion have been documented in several studies. However, the findings gained as to this topic are diverse and inconsistent. Hence, this thesis aims to examine the association between mindfulness and emotional reactivity to expand upon the results demonstrated in the past. This thesis comprises five studies. Two surveys have been conducted to explore mindfulness and emotional states (anxiety and depression) in general, while three analogue emotion laboratory studies were performed by utilising various affective stimuli – affective pictures, visual clips and audio clips, including intense video clips – to deepen the knowledge and understandings held as to these relationships. The importance and originality of this study pertains to the fact that mindfulness and emotional reactivity were assessed via not only subjective scales but also objective measures, undertaken in order to enhance the quality of the investigation. This is the first time that mindfulness has been assessed via an objective approach to explore the association between these two variables. Additionally, mind wandering, as involves the opposite aspect of mindfulness, was recorded. Another crucial variable explored in the present research is cognitive emotion regulation, namely as this could relate to emotional reactivity and mindfulness according to previous findings. Although this is not a cross-cultural study, the samples in this thesis were collected from Western nations (the US and the UK) and an Eastern country (Thailand) to increase the heterogeneous nature of the research population and to diminish the culture-related limitations of the study identified in previous investigations. As the cultural factor could impact mindfulness experience as well as emotional response and regulation, different results gained among participants from three countries provide a starting point to consider these aspects not in country along but within a number of countries. Therefore, the current study points to possible cross-cultural differences that future work can explore. This can be best done by using matched samples; in terms of size and key demographic variables such as religious believes. The present findings emphasise the relationship between mindfulness and emotional reactivity. Moreover, the results reveal

several considerable aspects pertaining to these relationships – including in relation to the dimensions of mindfulness and emotional reactivity. In general, mindful attention awareness and decentering have a significant and negative association with negative emotional reactivity yet are positively associated with positive emotional reactivity. Valuable primary information relating to culture has also been introduced. This chapter will discuss the main results, including the substantial issues that have arisen which relate to the purpose of the thesis. In addition, the encountered implications, required future research and limitations that have emerged from the present thesis will be addressed.

8.2 Summary of Results & Discussion

8.2.1 The Survey Project (Chapter 4): The first and second study comprise two surveys developed as a preliminary exploration as to the association between trait mindfulness and emotional states (anxiety and depression), with this being undertaken prior to further specific investigation being given to the relationship between mindfulness and emotional reactivity. Despite mindfulness presumably being an effective strategy of emotion regulation, namely via mindful emotion regulation, to date few studies have compared mindfulness and basic emotion regulation. As a consequence, nine cognitive emotion regulation strategies have been included in the surveys administered here in order to compare mindfulness in terms of its association with emotional states (anxiety and depression). As expected, the findings demonstrate that trait mindfulness (including mindful attention awareness, curiosity and decentering) and strategies of cognitive emotion regulation (self-blame, other-blame, rumination, catastrophising, putting into perspective, positive refocusing, positive reappraisal, acceptance and refocusing on planning) hold a significant correlation with emotional states (anxiety and depression) among the US and Thai samples. Mindful attention awareness has negative and significant correlation with anxiety and depression. Decentering is negatively correlated with anxiety and depression among the US residents, but not in the Thai group. While curiosity is positive correlated with depression only in the Thai group. Regarding cognitive emotion regulation strategy, the findings show that cognitive emotion regulation has various associations with anxiety and depression. The adjusted cognitive emotion regulations including positive refocusing, positive reappraisal, and refocussing on planning is positive correlated with anxiety and depression. In contrast, unadjusted cognitive emotion regulation strategy;

self-blame, other blame, and catastrophising has significant and positive with anxiety and depression. With putting into perspective and acceptance being the only aspects which failed to demonstrate an association with emotional states (anxiety and depression) among the US group. However, putting into perspective is associated with depression while rumination is significantly and positively correlated with anxiety among the Thai respondents. In terms of predicting power, the degree of predicting capability varies and depends upon the types of emotional states (anxiety and depression) and respondent groups (US and Thai) explored. In regard to mindfulness, mindful attention awareness has the strongest negative predicting power with anxiety and depression among the Thai respondents and the second strongest predicting power among the US group. In relation to the strategy of cognitive emotion regulation, catastrophising is the strongest positive predictor of anxiety and depression among the US sample, yet among the Thai respondents it has the second strongest positive predictor with emotional anxiety.

8.2.2 Analogue Laboratory Projects

Three analogue laboratory studies have been further conducted in this thesis in order to investigate the relationship between mindfulness and emotional reactivity. Diverse affective stimuli (including static affective pictures, dynamic affective video clips, affective sound clips and intense affective video clips) were utilised so as to expand and deepen the gained results of the investigations. The laboratory design was applied here due to its effectiveness within emotion studies. Subjective and objective measures have also been applied to assess mindfulness (via MAAS, Trait TMS, task-unrelated thought and breath counting accuracy) and emotional reactivity (via emotion intensity rating and SCR.). In relation to the research's main purpose, the findings of the three studies demonstrate the negative relationship and positive between mindfulness facets and emotional reactivity. These results were also analysed in terms of various emotional reactivity dimensions (i.e., valence of emotional reactivity) despite this not being the initial main aim of the investigation.

Laboratory 1 (Chapter 5) was undertaken in order to explore the relationship between mindfulness and emotional reactivity as induced by affective pictures among undergraduate students at the University of Leicester. The main results show that the scores of the MAAS is significantly and negatively correlated with emotional reactivity.

In addition, in regard to the hierarchical multiple regression analysis produced, the scores of the MAAS and the decentering facet of Trait TMS accounts for a unique variance of SCR while mind wandering is a significant predictor of emotion intensity rating. Another interesting result, as gained via deepened analysis as to the valence of emotion, is that decentering demonstrates a negative association with SCR induced via a negative picture. In a similar way, breath counting accuracy has a significant negative correlation with SCR induced via neutral pictures.

Laboratory 2 (Chapter 6) was further conducted to investigate the relationship between mindfulness and emotion reactivity. Here, affective video clips and affective sound clips were utilised to elicit emotion due to their effectiveness in inducing emotional reactivity. This was undertaken in order to expand the investigation as to the relationship between mindfulness and emotional reactivity as induced through a different sensory organ (ears) – a result of different physical stimuli being able to invoke diverse impacts upon emotional experiences (Koelsh, 2014). The results of the study indicate that mindful attention awareness is significantly and negatively correlated with video clip and sound clip emotion intensity ratings and, furthermore, is a strong predictor of the clip intensity rating of emotion. In addition, decentering shows a significant and positive association with SCR change induced via video clips and a negative association with SCR change via sound clips. In contrast, breath counting accuracy, curiosity and mind wandering have been found to have no significant association with emotional reactivity. This expansion of results as to the valence of emotion indicates that mindful attention awareness is negatively correlated with the intensity rating of positive video clips and the intensity rating of negative sound clips. Decentering, on the contrary, is positively correlated with SCR change elicited via positive video clips but negatively associated with SCR change elicited via the neutral sound clip. This also has a significant effect upon increasing the predicting of Total SCR Change in response to (neutral) sound clips.

Laboratory 3 (Chapter 7), the final laboratory study to be performed, examined the relationship between mindfulness and emotional reactivity as evoked by intense affective clips among Thai undergraduate students in Chiang Mai University, Thailand. Intense affective video clips were employed to expand upon the prior investigations as to the intensity of emotion, a crucial dimension of emotion relating to mental health. Here, a Thai sample was employed to diminish culture (religion)-related shortcomings

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to explore mindfulness. Buddhism is deeply rooted in Thai culture. The majority of Thai people are also Buddhists. Therefore, they possibly understand mindfulness more accurately through their religious and cultural experiences. The findings were unexpected as no statistically significant associations were found between mindfulness and emotional reactivity. Yet, in terms of the correlation as to the valence of emotion, breath counting accuracy was found to have a significant and positive association with the intensity rating of negative clips. As well, curiosity is a significant predictor of intensity rating induced by neutral clips. This could refer to the association between mindfulness and emotional reactivity could be impacted by the facet of mindfulness and dimension of emotion including valence and intensity. This will be discussed in the following section.

Overall, the results of this thesis support the idea that mindfulness has a significant association with emotional states and emotional reactivity. Another significant finding to emerge from this study is that, together, these results provide important insights into the relationship between mindfulness and emotional reactivity with respect to substantial aspects (including the dimension of mindfulness, and the dimension of emotional reactivity summarised in Figure 9). The meaningful associations found between mind wandering (a crucial contrasting aspect to mindfulness) and emotional reactivity is also important. These two issues are discussed in the next section.

8.3 General Discussion

8.3.1 Relationship between Mindfulness and Emotional Reactivity

The initial findings of this research are suggestive of a robust link between mindfulness and emotional reactivity. Here, mindful attention awareness reveals a significant negative correlation with emotional states and emotional reactivity, particularly via the measuring of self-ratings except in the last investigation. In addition, in regard to the facet of mindfulness, decentering shows vigorous negative associations with emotional reactivity in terms of SCR and emotional states, while the facets of self-awareness (curiosity and breath counting accuracy) are partially correlated with emotional reactivity in this thesis. As illustrated in Figure 17, the findings as combined

provide the variations of the relationship between mindfulness and emotional reactivity involving the following aspects;

1) *Constructs of Mindfulness*:
   - Uni-facets (mindful attention awareness by MAAS),
   - Multi-facets with two facets;
     o Relating to present self-awareness (curiosity by Trait TMS and breath counting accuracy),
     o Relating to non-elaborating attitudes (decentering by Trait TMS).

2) *Dimension of Emotional Reactivity*: Valences (negative, neutral and positive) and intensity.

3) *Form of Emotional Reactivity*: Cognitive response (intensity rating of emotion) and physiological reactivity (SCR).

Thus, the results will be discussed as to the substantial aspects mentioned above.

The uni-faceted mindfulness (mindful attention awareness) indicates a meaningful negative association with anxiety and depression (US and Thai survey) and emotional reactivity (SCR) – affective pictures, intensity rating of affective pictures, affective video clips and affective sound clips. Conceptually, mindful attention awareness is emphasised within mindfulness as "the presence or absence of attention to and awareness of what is occurring in the present" (Brown & Ryan, 2003). It could thus be seen that the dominant aspect here is related to attention and awareness being given to the present moment, as leads to mindful individuals being open and receptive to internal experiences evoked by emotional stimuli. Hence, the negative association between mindfulness regarding mindful attention awareness and emotional reactivity could be explained in line with the cognitive-based and physiological-based theories of emotion. With respect to the cognitive-based theory of emotion, mindful persons tend to pay attention and be aware of present experiences, thus potentially being able to disengage from their emotional stimuli (Ortner, Kilner & Zelazo, 2007; Taylor et al., 2011) as well as past emotional experiences. From this, such individuals may give less appraisal or overthinking towards emotional stimulus. This may thus effectively reduce emotional states and emotional reactivity, especially in terms of subjective ratings (Ho et al., 2015). In addition, in terms of the physiological-based theories of emotion, SCR, as a form of physiological reactivity, may be altered due to changing thoughts being

given towards emotional inner experiences or paying attention and being aware of present bodily experiences (Hoehn-Saric & McLeod, 2000). Mindful attention awareness could thus be seen to pertain to emotional reactivity in terms of cognitive subjective rating and SCR, yet the association with subjective rating is distinguished.

With regard to the dimension of emotional reactivity (valence and intensity), mindful attention awareness indicates clearly a negative association with emotional reactivity as induced via negative, neutral and positive affective stimuli – seen in Lab 1 and Lab 2. The possible explanation for this is as discussed above. However, for its association with emotional reactivity as induced by intense stimuli (video clips) – seen in Lab 3 – the mindful attention awareness and emotional reactivity indicated no significant correlation. It could thus be assumed that emotional reactivity as aroused via intense stimuli might be too arousing to be diminished by self-awareness with attention to the present moment in regard to disengaging from intense emotional stimuli. Mindful attention awareness could thus solely be related to emotional reactivity induced by less strong stimuli – as demonstrated in Lab 1 and Lab 2.

The multi-facets of mindfulness include the facet of present self-awareness (curiosity and breath counting accuracy) and the facet of non-elaborating (decentering), as demonstrate the diverse relationships witnessed with emotional reactivity. In regard to the facet of present self-awareness, curiosity has a positive association with intensity rating (neutral clips in Lab 3). Breath counting accuracy is positively correlated with intensity rating (negative intense video clips in Lab 3), but this was negatively correlated with SCR as induced by affective pictures in Lab 1. Notably, the facet of present self-awareness tends to be positively correlated with emotional reactivity. These results are in accordance with the findings of other studies). For example, the work of Alex Brake and colleagues (2016) showed that when participants using mindfulness were faced with emotional visual stimuli, their overall distress level increased (although later this decreased). The authors also mentioned that the effectiveness of mindfulness might depend on the period of mindfulness encountered. Crosswell et al. (2017) have further reported that, among a group of women who attained mindfulness training, increasing sadness and anger was found when compared to a control group, yet the level of emotion declined afterwards. Greenberg and Merian (2014), in investigating non-meditators and mindfulness meditators who induced emotion by generating emotional memories, found that meditators increased their engagement with emotion

but could recover quickly from such emotional experiences. A possible explanation for this might be that curiosity and breath counting accuracy is involved with the aspect of mindfulness which focuses on present awareness with attention and thus might allow mindful individuals to be more receptive and to be drawn to intense dynamic stimuli (video clips – as has the power to draw attention from viewers). From this, the intensity rating of emotion (via cognitive appraisal) might thus increase here. However, in the case of the negative association with SCR as induced by neutral static pictures in Lab 1, it could be assumed – in the same vein as with mindful attention awareness – that when emotional reactivity is evoked by neutral pictures, the emotions of individuals may not have been too intense or aversive towards becoming disengaged or regulated by attentive mindful awareness (breath counting). Here, the present awareness of individuals can function properly to reduce emotional reactivity (Ortner, Kliner & Zelazo, 2007; Taylor et al., 2011). Therefore, the different direction of the association between the present self-awareness facet and emotional reactivity may be involved with the dimension of emotional reactivity in terms of the intensity of emotion.

Another facet of mindfulness is non-elaborating, decentering, and is, in reference to the dimension of emotion (the valence of emotion), generally negatively associated with SCR as induced by neutral and negative stimuli except in Lab 3. These results support earlier findings in this area (e.g., Eifert & Heffner, 2003; Lindsay et al., 2018; Naragon-Gainey & DeMarree, 2017). One can assume that the decentering facet could involve emotional reactivity under the cognitive-based theory. As mindful persons tend not to appraise affective stimuli, and instead are likely to accept and not avoid this, their emotion reactivity as aroused by negative or stressful thoughts may be decreased. Decentering likely enhances adaptive emotion regulation (Teper, Segal & Inzlicht, 2013), as might involve thoughts held as to emotional stimuli. This could thus influence SCR. However, surprisingly, decentering indicated a positive association with SCR induced via positive clips. Decentering might therefore allow individuals to be more accepting or approaching as to the effect of emotional positive stimuli (Davis, Lau & Cairns, 2009), thereby potentially releasing more dopamine (as a neurotransmitter), influencing the affective and cognitive process and hormones (Mirenowicz & Schultz, 1996; Kim, Matthews & Moghaddam, 2010) and increasing SCR.

In regard to another dimension of emotion, the intensity of emotional reactivity, in contrast to the finding of Lab 1 and 2, decentering failed to show a significant

association with SCR as induced by intense stimuli in Lab 3. It seems possible that this result arises as, after emotion is evoked, decentering could be positively involved in emotional recovery via emotional detachment (Beblo et al., 2018; Crosswell et al., 2017; Greenberg & Meiran, 2014). However, in the case of emotional reactivity being evoked via intense stimuli, it may take time for mindfulness to facilitate individuals in rebalancing their emotional reactivity (see, for example: Beblo et al., 2018; Diaz et al., 2014). However, it is possible that the period given to assessing emotional reactivity in Lab 3 may be too early to have captured the emotional rebalance produced from decentering. Thus, the meaningful correlation between decentering and emotional reactivity (SCR) was highlighted only in Lab 1 and 2, but not in Lab 3. Another explanation could relate with some limitations of mindfulness. Regarding previous studies, mindfulness failed to show the effectiveness to improve emotional states such as depression (e.g., Johnson et al., 2016; 2017). The authors noted that the failure might involve with the confounding variables such as personal factors including age of participants. As mindfulness is widely applied in non-clinical and clinical sectors, the limitation of mindfulness must be explored in various dimensions in order to maximise the effectiveness of mindfulness

Interestingly, it is remarkable that with respect to the form of emotional reactivity, decentering has a distinguished association with SCR – as was discussed earlier – yet it failed to demonstrate a significant correlation with the intensity rating of emotion. Notably, previous studies have reported the differences between cognitive emotional response and physiological response in regard to the process of emotion (Plutchik, 2001; Uhrig et al., 2016). With respect to the differences in the present finding, one possible explanation is that decentering is related to acceptance. Here, individuals with decentering tend not to evaluate or judge affective stimulus with their self-reference and so face and accept the emotional stimuli that they are exposed to. As a result, they might rate the stimuli encountered without judging it. Hence, decentering is not associated with intensity rating. However, after accepting the emotional experience, the stressful feeling could decrease while the SCR (i.e., the physiological response of emotion) could diminish – as discussed above.

The relationship between mindfulness and emotional reactivity varies depending upon the facet of mindfulness and the dimension of emotional reactivity (including valence and intensity of emotional reactivity) explored. In the case of emotional reactivity induced via non-intense or non-stressful dynamic stimulus, mindful attention

awareness shows a vital negative association with the subjective intensity rating of emotion in all valences of emotion (including positive, neutral and negative). In terms of breath counting accuracy (present self-awareness facet) is negatively associated with SCR induced via neutral stimulus. Similarly, decentering, a non-elaborating facet, is likely to be negatively correlated with SCR induced via negative and neutral stimulus, however it is positively associated with SCR induced via positive stimulus. On the contrary, in terms of emotional reactivity induced by intense or stressful stimulus, no significant association between mindfulness and emotional reactivity is found. This might be due to several factors – for example, the period provided in which to assess emotional reactivity might have been too short to evaluate the emotional rebalance encouraged by mindfulness (especially decentering). Still, an interesting finding is that curiosity and breath counting accuracy, a present self-awareness facet, has a significant and positive correlation with intensity rating (neutral and negative). This may demonstrate discrepancy between two facets of mindfulness in terms of their association with emotional reactivity as induced via stressful or intense situations – with this being in accordance with previous studies (e.g., Beblo et al., 2018; Crosswell et al., 2017; Greenberg & Meiran, 2014).

In summary, the main findings of the present thesis can illustrate the general association between dimensions of mindfulness (present self-awareness measured by curiosity, breath counting accuracy; non-elaborating measured by decentering; mindful attention awareness measured by MAAS; mindlessness measured by mind wandering) and the facet of emotional reactivity (valence and intensity measured by affective stimuli self-rating, SCR and HADS) – shown in Figure 17.
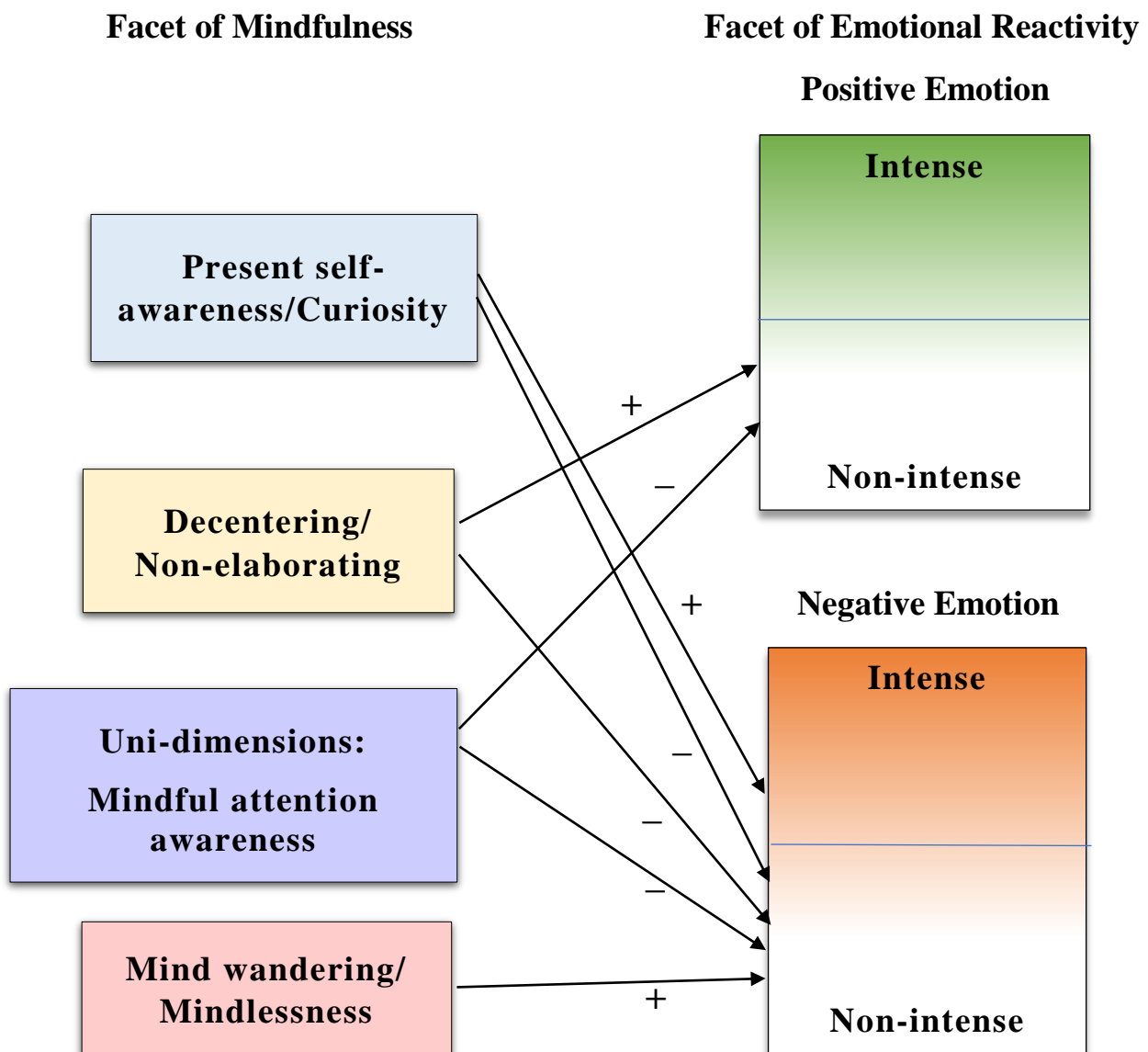
Facet of Mindfulness

Facet of Emotional Reactivity

Positive Emotion

Intense
Non-intense

Negative Emotion

Intense
Non-intense

Present self-awareness/Curiosity

Decentering/Non-elaborating

Uni-dimensions:

Mindful attention awareness

Mind wandering/Mindlessness

+

−

+

−

−

−

+

Figure 17. Summary of Main Findings: Association Between Mindfulness Facets and the Emotional Reactivity Dimension

In regard to Figure 17, mindfulness (particularly the facet of self-awareness as to present inner experiences) can plausibly be held to decrease negative emotional reactivity as it has a negative association with negative emotional reactivity. However, the facing of stressful or intense emotional experiences might increase emotional experiences via present self-awareness as they have positive association. However, the non-elaborating facet (decentering) could then subsequently facilitate emotional rebalance. Notably, the time needed to regain emotional equilibrium in cases of

stressful or intense emotional experiences is greater. Additionally, this non-elaborating is correlated positively with positive emotional reactivity and thus it could enrich the pleasant emotion as well. Mindful attention awareness has been revealed to distinguish a negative relationship with emotional reactivity, while mind wandering (the mindless aspect) has been shown to have a positive relationship with negative emotion. From this finding, mindfulness can be argued to be beneficial for human mental health – both in ordinary daily life and when facing stressful emotional life experiences. In being self-aware of situations within the present moment, a lesser degree of mind wandering could help people to shift their thinking or to disengage from emotional experiences, thereby allowing negative emotions (including anxiety and depression) to be diminished. Moreover, through non-elaborating or not overthinking emotional situations, especially hectic experiences, mindful people may be helped to rebalance their emotion gradually and to thereby improve upon their positive emotions.

8.3.2   Mindfulness: Potential Effective Emotion Regulation

The present findings as to both surveys and laboratory studies reveal the potential of mindfulness as a significant factor within enhancing mental health, namely in its role in developing adaptive psychological and physiological flexibility and thus rebalancing emotion disturbance when an individual faces emotional stimuli or situations. One can assume that mindfulness thereby pertains to emotion regulation.

In relation to the two surveys undertaken with the US and Thai sample, mindfulness and nine strategies of cognitive emotion regulation were explored as to their association with the negative emotional states of anxiety and depression, and whether the association between mindfulness and negative emotional states (anxiety and depression) is mediated by cognitive emotion regulation. Several previous studies have highlighted the crucial role of emotion regulation within human mental health, with Gross (1998) having proposed two main emotion regulation strategies (suppression and cognitive reappraisal) based on the process of emotion. Several investigations have further revealed that two processes of emotion regulation have different emotional consequences (e.g., Aldao, 2013; Gross, 1998, 2002) as they focus on distinct aspects based on the process of emotion. Cognitive Reappraisal focuses on emotional antecedent, whereas Suppression focuses on emotional response. Nonetheless, both

emotion regulation strategies involve the manipulation of emotion. Several studies have investigated the effects of cognitive reappraisal and suppression on emotion-related results (Gross, 2007), with a number of findings suggesting that cognitive reappraisal is more advantageous for well-being than suppression (e.g., Gross, 1998). However, recently, some reports have demonstrated diverse findings, nothing that appropriate emotion regulation strategies depend upon the situation (e.g., Aldao, 2013; McRae et al., 2011; Troy, Shallcross & Mauss, 2013).

Mindfulness-based emotion regulation, namely mindful emotion regulation, has recently been proposed as a substantial aspect of emotion regulation (Chamber, Gullone & Allen, 2009) due to its robust association with emotional variables. Mindful emotion regulation emphasises the aspect of mindfulness in regulating the emotion induced via being aware of present inner emotional experiences without manipulating one's own thought (cognition) and emotional consequence. Regarding the opposite concept to traditional emotion regulation (antecedent or response focusing of the emotion process), mindfulness was explored as to its association with emotional reactivity by comparing this with cognitive reappraisal and expressive suppression. Previous findings have produced diverse results (e.g., Brockman et al., 2017; Chamber et al., 2015; Keng et al., 2013; Quaglia, Goodman & Brown, 2014). However, the present study supports the idea that mindfulness-based emotion regulation could enhance human mental health. The findings indicate a negative association between negative emotional states (anxiety and depression) in both the US and the Thai survey. Mindful attention awareness is the greatest predictor of anxiety and depression among the Thai respondents, and the second most powerful predictor among the US respondents. It is obvious that mindful attention awareness is negatively correlated with negative emotional states. Moreover, mind wandering (Task-Unrelated Thought), as is the opposite aspect of mindfulness, demonstrates a positive and significant association with emotional reactivity (intensity rating of emotion). Additionally, the results of the hierarchical multiple regression performed indicated that mind wandering accounted for the unique variance of the intensity rating of emotion in Lab 1. It could be assumed that the greater the degree of mind wandering, the greater the intensity rating of emotion. A possible explanation as to the positive relationship that arises between mind wandering and emotional intensity rating is that when an individual's mind begins wandering from the present moment, that person tends to be occupied by matters pertaining to their past experiences or to the

future. As a consequence, mind wandering could raise several negative thoughts – such as catastrophising, rumination and worry. Thus, negative emotional states or reactivity could be elicited by such negative cognitive thinking. This is in line with the results of the surveys, whereby it was shown that catastrophising has the strongest power in predicting anxiety and depression among the US sample and the second strongest power in predicting these aspects among the Thai sample. As well, the mediation analysis indicated that negative association between mindfulness (mindful attention awareness and decentering) and anxiety and depression was mediated by unadjusted cognitive emotion regulation (catastrophising, rumination, self-blame, and other blame).

Hence, the present study provides strong empirical confirmation that mindfulness has a crucial relationship with emotional reactivity, as presents self-awareness with attention and without elaborating upon one's own experiences, could possibly encourage people to regulate emotion properly. Furthermore, mindfulness might inhibit minds from wandering away from present experiences and towards the past or future-related matters – this being an activity which could invoke intrusive cognition and negative emotion (such as anxiety and depression). It could thus be said that mindfulness enriches human mental health by promoting positive emotion while decreasing negative emotion in terms of cognitive and physiological responses, with this having been demonstrated strongly in this thesis.

8.4 Implications of Findings

In regard to the present findings, mindfulness has been found to have a significant association with emotional reactivity. The robustness of the results potentially has important implications for developing human mental health, namely as it reveals insights as to the crucial aspects of mindfulness and its association with emotion. This arises among a number of specific circumstances, with these detailed below:

1) As mindfulness is significant negative associated with negative emotion, in ordinary daily life, mindfulness, particularly the self-awareness facet given as to present inner experiences, could plausibly decrease emotional reactivity – especially that evoked by negative thoughts. Being self-aware of situations at the present moment could help people to shift thinking or to disengage from

negative emotional experiences (including past experiences) whereupon negative emotional reactivity could then be diminished.

2) As the negative association between mindfulness and anxiety and depression is mediated by unadjusted cognitive emotion regulation such as rumination, catastrophising, in a similar vein as Situation 1 (above), being aware of present experiences could inhibit the mind from wandering from the present state to the past or future, an activity which may initiate rumination or worry that provokes negative emotion (such as anxiety and depression).

3) As a significant positive association with positive emotion is mediated by adjusted emotion regulation such as positive refocusing, positive reappraisal, refocusing, acceptance, and refocusing on planning, a non-elaborating attitude could enrich positive physiological emotional reactivity as it allows mindful individuals to open up to all positive experiences in daily life.

4) As the facet of present self-awareness such as curiosity has significant positive association with emotional reactivity, but decentering facet has negative association with negative emotion. Thus, it could be understood the mechanism of mindfulness on emotional reactivity that when facing stressful or intense emotional experiences, the mindful individuals may initially be more emotionally aroused due to their strong awareness of present emotional experiences. the non-elaborating facet could subsequently facilitate emotional rebalance by improving psychological and physiological flexibility.

5) Although the finding in the present study demonstrated that mindfulness was not correlated with intense emotional reactivity, some of previous studies noted that the effectiveness of mindfulness could involve with the duration of mindfulness. Hence mindfulness in terms of non-elaborating could rebalance the emotion elicited by intense situations however it may require a longer duration for this to be completed than in cases of less intense emotional reactivity. This could suggest that mindfulness is likely to enhance mental health in the long-term.

It could thus be said that mindfulness is essential for mental health in both daily life and in times of life being hectic. Being aware of present experiences while non-elaborating towards one's own inner experiences could enhance metal health by diminishing negative emotional states or reactivity while also enriching pleasant feelings. Moreover, when facing frantic situations, mindful people tend to recover their

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emotional balance effectively when non-elaborating or overthinking in stressful situations.

8.5 Suggestions for Future Work

Despite these promising results, more research as to this topic needs to be undertaken before the association between mindfulness and emotional reactivity is fully understood. A number of potential future studies within which the robustness of the investigation as to this area could be improved are detailed below.

8.5.1 Mindfulness Issues:

The first issue here pertains to the aspect of mindfulness. It is recommended that further research be undertaken in relation to the following aspects of mindfulness. In previous studies (Andrei, Vesely & Siegling, 2016; Baer, 2016; Chiesa, 2013; Hart, Ivtzan & Hart, 2013; Park, Reilly-Spong & Gross, 2013; Purser & Milillo, 2015; Rau & Williams, 2016; Sauer et al., 2013) as well as the main findings of the present research, the association between mindfulness and emotional states or emotional reactivity has been found to vary among the aspects of mindfulness – for example, between uni-dimension (mindful attention awareness: MAAS) and multi-dimension (curiosity and decentering: Trait TMS) mindfulness. Another aspect of mindfulness which should be explored is the difference between trait, state or cultivate mindfulness developed via experiences in relation to their association with emotion as a number of previous studies have produced divergent results between trait and state mindfulness in diverse topics, including in relation to the relationships held with emotion (e.g., Kiken et al., 2015; Tsafou et al., 2017). However, few investigations have been conducted in this area and thus it could be beneficial if various aspects of mindfulness are investigated. This way, a deeper understanding and clarity will develop as to which aspects of mindfulness have an outstanding effect upon emotion. Such findings could then be employed to enhance wellbeing or mental health.

Another issue of mindfulness that could be focused upon in future studies relates to mindfulness measures. In the future, it will be important to explore the potential use or the utility of breath counting accuracy as a behavioural (objective) measure of mindfulness because in the present study, breath counting accuracy reveals both the advantages and disadvantages. Regarding the present findings, generally, breath counting accuracy showed less significant results of the associations with emotional

reactivity than the other subjective scale of mindfulness. This might reflect a weakness of the breath counting measure that assess mindfulness of breathing in terms of the present awareness facet excluding the facet of non-elaborating (Levinson et al., 2014). As a consequence, the breath counting does not represent one of the crucial aspects of mindfulness particularly cognitive related aspect, thus it might affect the results of the investigation of mindfulness with variables involving with cognition. However, despite this limitation, breath counting can be a potential tool as it presents the other crucial aspect of mindfulness, self-present awareness, moreover, it is an objective method which has no important shortcomings of subjective method such as self-bias of the participant. Hence, the future works are needed to explore the appropriate ways to apply the breath counting programme as a tool to investigating mindfulness

Additionally, the mind wandering probes used in this programme could be the potential scale through which to measure mindfulness in the opposite approach. As previous research has identified difficulties in relation to producing a consistent definition of mindfulness, the application of various mindfulness measures has been suggested in order to decrease this shortcoming (Chiesa, 2013; Grossman & Van Dam, 2011; Park, Reilly-Spong & Gross, 2013, Sauer et al., 2013). Thus, a number of scales of mindfulness – including subjective self-rating, a behavioural measure (breath counting accuracy) and mind wandering (as the opposite aspect of mindfulness) – were utilised. Subsequent results could show ways of improving the effectiveness of mindfulness measurements, especially within the breath counting programme. The mind wandering probe (task-unrelated thought) employed in this programme could be an effective measure as it has less shortcomings in relation to the employment of subjective bias. However, so far, this programme has rarely been applied in measuring mindfulness. This study should thus be repeated using the breath counting programme to explore its potential use as an objective measure of mindfulness.

8.5.2 Emotional Reactivity Issues:

Future research could focus on the aspect of emotional reactivity. Firstly, further studies are required to better understand the complex association that arises between mindfulness and the dimension of emotional reactivity. In regard to the present findings, different aspects of emotional reactivity (especially the dimension of emotional reactivity such as valence and intensity) are clearly involved with the

relationship held with mindfulness. Moreover, in general, previous investigation as to these associations have only focused on negative emotion in terms of the valence of emotional reactivity and on emotional reactivity induced by non-intense stimulus. Consequently, further research should examine more closely the links between mindfulness and the dimension of emotional reactivity. Second, different types of basic emotion (such as fear and anger, joy and sadness) should be investigated in terms of their association with mindfulness (Plutchik, 2001) as these are more specific than emotional valence. Basic emotions are complex as they are consequences of cognition (Plutchik, 2001) and thus the emotional reactivity pertaining to such basic emotions is unique. The exploration as to mindfulness and basic emotions might provide a better understanding as to the relationship between mindfulness and basic emotions.

Asides from the dimension of emotional reactivity, a further issue here pertains to the measure of emotional response. As seen in the present findings, the relationship between mindfulness and emotional reactivity measured via experiential (subjective self-rating) and physiological (SCR) measures differ. In previous research, the experiential and physiological measure of emotion has been found to be relevant but not substitutable (Mauss & Robinson, 2009). Such differences may relate to the divergent concept of emotion as applied to the assessment of emotion responses (Uhrig et al., 2016). The exploration of mindfulness in terms of its relationship with emotional reactivity in various forms may therefore provide essential information as to the mechanism of mindfulness on emotional reactivity through the process of emotion.

8.6 Limitations

The present study was subject to several of potential methodological weaknesses. The first weakness relates to the research samples employed. Although the samples were collected from three different countries, the project used convenience sampling from universities (except for the US survey). As the participants were motivated by the incentive to take part in the research, further caution should be held as to the generalisability of the gained findings.

The second shortcoming pertains to the carryover effect, as arises due to the within-subjects design being used in the present analogue laboratory study. A carryover effect affecting the findings of this study responds to two areas. The first area pertains

to the fatigue effect, whereby a participant becomes bored or fatigued after taking part in the prolonged laboratory study (as comprises an average duration of 90 minutes). Consequently, the attention given towards undertaking their tasks might decrease. The second area, the context effect, arises when a participant is exposed to prior affective stimulus. Here, their perception as to the next stimulus might be altered due to the individual comparing this with the former stimulus (Tourangeau & Rasinski, 1988).

Thirdly, some limitations pertained to the affective stimuli utilised in the present laboratory study. The potential affective stimuli selected in the present investigation might need to be examined as to its effectiveness in terms of eliciting emotional reactivity, not only from the subjective rating but also SCR. As shown in the preliminary analysis gained in Lab 1 and 2, only a few affective pictures and affective clips could evoke an SCR change from the SCR baseline. While all affective stimuli were tested in regard to their ability to elicit emotional reactivity as assessed via subjective rating, only a few could induce SCR change. As is consistent with the available literature in this area, the present findings identified differences between the forms of emotional reactivity induced via the same affective stimuli (Uhrig et al., 2016). The Interval Stimuli Interval (ISI) of the affective clips in Lab 2 and 3 (1 minute between each video clip and 5 second between each sound clip) has no standard in reference to previous investigations. This is because the affective clips used in the present studies were selected from YouTube, with this being a new source of affective clips (Chen, Chang & Yeh, 2017; Knautz & Stock, 2010; Rumpa et al., 2015; Wang et al., 2015). Previously, only films or emotional scenes were applied. Thus, the ISI of the affective clips were only for affective films and may thus be different from the real scene clips of YouTube. Although the ISI used with the affective clips was replicated from the study of Rottenberg, Ray & Gross (2007), the ISI in Lab 2 and 3 is assumed to have been a suitable and sufficient interval between the affective clips in regard to allowing the emotional reactivity (SCR) induced by the previous clip to be reset to the level of the baseline period prior to the next affective clips being presented.

8.7 Conclusion

The present study has sought to investigate whether mindfulness is associated with emotional reactivity. Two survey and three analogue laboratory studies were performed in order to achieve this aim. Affective pictures, video and sound clips (including intense video clips) were utilised in the laboratory studies while subjective

and objective measures were utilised to assess mindfulness and emotional reactivity. In general, the results demonstrate a significant correlation between mindfulness and emotional reactivity, yet variations of this relationship were found among the dimensions of mindfulness and emotional reactivity. For mindfulness, mindful attention awareness indicated an outstanding negative association with subjective emotional reactivity (intensity rating of emotion) and emotional states (anxiety and depression). The decentering facet of mindfulness was found to significantly correlate with SCR, a physiological responding of emotion. This promotes positive emotional reactivity but diminishes negative emotional reactivity. Furthermore, intense emotional reactivity may be prolonged to reveal the association between mindfulness and emotional reactivity while, in relation to emotion regulation, mindfulness (namely mindful emotion regulation) could effectively reduce negative emotional states via awareness being held as to inner present experiences with attention and non-elaborating towards emotional inner experiences. Moreover, aspects of mindfulness could inhibit mind wandering, the contrasting aspect of mindfulness, as may initiate cognitive reappraisal whereby cognitive emotion regulation strategies influence negative emotion according to the findings of the two surveys. The present study extends our knowledge as to the association between mindfulness and emotional reactivity. These results have implications for mental health settings, yet the research has some shortcomings within its research methodology – including in relation to its samples, affective stimuli and research design. Hence, future research should be cautious yet answer the questions invoked from the findings of the present studies.

APPENDIX

Appendix A: The example of pages of breath counting programme

Introduction

This programme is a measure of breath counting. The programme has three parts. A short survey. Then a practice session of breath counting. Then a breath counting evaluation. Together this program with take 25 minutes.

Program developed by

Peijsel, Chatwiboon
Davis, Jodil
Maltby, John
Maratos, Elizabeth

This programme is based on a description of a breath counting programme in reference.

Previous   Next

Awareness Online: Practice

Following your breathing at it's own natural rhythm, as it moves in and out. Now start with each breath press the ↓ key.

So each time you breath in and out again, press the ↓ key.

Continue this as you count up to 9. When you get to 9, press the → key (instead of the ↓ key). Then return to 1 on the next breath and pressing the ↓ key, going from 1 to 9 again and again.

Please begin key-pressing as you count your breaths if you have not already done so. Your count will be highlighted below.

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ → ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ →

Count your breath...

(A breath counting period is 18 minutes)

Appendix B: The Slide of Selected Affective Pictures from NAPS ((Marchewka et al., 2014).

Slide No.	Content	Category	Original Slide No.	Valence
1	An empty bottle	Objects	152	Neutral
2	A smiling Indian woman	Faces	252	Positive
3	Fishes in a pool	Animals	129	Neutral
4	A butcher chopping meat	People	058	Negative
5	A bright yellow window	Landscapes	088	Positive
6	A hen in a garden	Animals	105	Neutral
7	A man cleaning an open wound on a leg	People	019	Negative
8	A deserted mine	Landscapes	061	Neutral
9	Playing dolphins	Animals	186	Positive
10	Waste in a building	Landscapes	007	Negative
11	A red metal lock	Objects	239	Neutral
12	An old toilet with a red stain	Objects	121	Negative
13	Wooden sculptures in a garden	Objects	272	Positive
14	A sitting woman	Faces	305	Neutral
15	A severe patient with a respirator	Faces	146	Negative
16	Divers in an ocean	People	190	Positive
17	A burning house	Landscapes	022	Negative
18	A smiling couple	Faces	242	Positive
19	Colourful hand-painted plates	Objects	254	Positive
20	An injured football player	Faces	287	Negative
21	A construction worker	People	097	Neutral
22	A windy sunny beach	landscapes	178	Positive
23	A crashed motorcycle in a canal	Objects	285	Negative
24	An elderly man	People	150	Neutral
25	An unflushed toilet	Objects	125	Negative
26	A man with glasses	Faces	216	Neutral

Slide No.	Content	Category	Original Slide No.	Valence
27	A policeman and a car accident on a bridge	People	009	Negative
28	A man feeding seals	People	026	Positive
29	Blocks of flats	Landscapes	016	Neutral
30	A peacock spreading its tail-feathers	Animals	172	Positive

* Valence rating from 1 (very negative) to 9 (very positive), 5 = neutral

** Arousal rating from 1 (relaxed) to 9 (aroused), 5 = neutral

Appendix C: The Slide of Selected Affective Video Clips.

Slide No.	Content	Valence
1	A construction worker is pouring cement.	Neutral
2	A dog is trying to save a dead dog.	Negative
3	A mouse is playing with a food bowl.	Positive
4	Traffic on the road	Neutral
5	A father is playing with his baby.	Positive
6	A shark is attacking a recording camera	Negative
7	A little boy wakes up and does the Gangnam style dance.	Positive
8	People are walking in town.	Neutral
9	A man is picking his nose in a train.	Negative
10	A dolphin is playing with a child.	Positive
11	Men are fighting with each other.	Negative
12	A man is working with a machine in a river.	Neutral
13	A baby is weeping.	Negative
14	A big turtle is walking on a beach.	Neutral
15	A child is playing and laughing with a dog.	Positive

* Valence rating from 1 (very negative) to 9 (very positive), 5 = neutral

** Arousal rating from 1 (relaxed) to 9 (aroused), 5 = neutral

Appendix D: The Slide of Selected Affective Sound Clips from IDAS-2 (Bradley et al., 2007).

Slide No.	Content	Original No.	Valence
1	Helicopter	410	Neutral
2	Applause	351	Positive
3	Court-sport	370	Neutral
4	Vomit	255	Negative
5	Soda Fizz	725	Neutral
6	Music (Bach)	811	Positive
7	Rain	698	Neutral
8	Female scream	277	Negative
9	Babies crying	260	Negative
10	Music (Beethoven)	810	Positive
11	Typewriter	322	Neutral
12	Laughing	226	Positive
13	Car-Horns	420	Negative
14	Seagull	150	Positive
15	Jack-Hammer	380	Negative

* Valence rating from 1 (very negative) to 9 (very positive), 5 = neutral

** Arousal rating from 1 (relaxed) to 9 (aroused), 5 = neutral

Appendix E: The Slide of Selected Intense Affective Video Clips

Slide No.	Content	Valence
1	A train is moving.	Neutral
2	A baby is crying while his mother is singing.	Negative
3	A machine is cleaning water.	Neutral
4	A dog is running in his sleep.	Positive
5	Rain drops on a window.	Neutral
6	A big snake is attacking a camera.	Negative
7	A baby is playing with his dad.	Positive
8	A motorcycle is crashing into a truck.	Negative
9	Blue sky	Neutral
10	A fat girl is playing at a swimming pool.	Positive
11	A crocodile bites a showman.	Negative
12	Babies are laughing with their mother.	Positive
13	An orange snake is attacking a rat.	Negative
14	A presentation of a plate of sugar	Neutral
15	A child is playing with bubbles and a dog.	Positive

* Valence rating from 1 (very negative) to 9 (very positive), 5 = neutral

** Arousal rating from 1 (relaxed) to 9 (aroused), 5 = neutral

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