

The relationship between mindfulness, emotion regulation,
habitual thinking and eating behaviours.

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Glossary

ANOVA:	Analysis of Variance
BMI	Body mass index calculated by dividing weight by height
DERS:	Difficulties in Emotion Regulation Scale
DoH:	Department of Health
DSM-V:	The Diagnostic and Statistical Manual of Mental Disorders fifth version
FFMQ:	Five Facets of Mindfulness Questionnaire
HINT:	Habit Index of Negative Thinking
HNST:	Habitual Negative Self-Thinking
MAI:	The mindful attention induction developed for cue-exposure
MBAs:	Mindfulness-Based Approaches
MBCT:	Mindfulness-Based Cognitive Therapy
MBIs:	Mindfulness-Based Interventions
MBSR:	Mindfulness-Based Stress Reduction programme
MEQ:	Mindful Eating Questionnaire
MTs	Mindfulness techniques often applied mindfulness practices
RME:	Reward Motivated Eating
RWF:	Relationship with Food
SBT	Standard Behavioural Treatments for weight management
SPSS	IBM statistical analysis package version 21
Study 1	Online survey reported in chapter three
Study 2	Thematic analysis and development of MAI reported in chapter four
Study 3	Cue-exposure study using MAI reported in chapter five
Study 4	MEP intervention reported in chapter six
TFEQ:	Three-Factor eating questionnaire version R18V2 unless stated otherwise
VAS	Visual analogue scale
WEMWBS:	Warwick-Edinburgh Mental Well-Being Scale
WHO:	World Health Organisation

Thesis abstract

Evidence regarding the effectiveness of mindfulness-based interventions (MBIs) for health-related eating behaviours is emerging. However, the underlying mechanisms are unclear. This thesis presents findings from a series of studies examining the role of two potential mechanisms; extending research into the role of emotion regulation and is the first known research to examine the role of mental habit. A mixed method approach was used to increase understanding about relations between mindfulness (dispositional, experimentally manipulated, and cultivated through practice) and reward motivated eating (RME; uncontrolled and emotional). Chapters one and two provide a review of current literature. Chapter three presents findings from an initial online study in which mediation analyses support the proposition that difficulties in emotion regulation and habitual negative self-thinking are underlying mechanisms in relations between dispositional mindfulness and RME. In addition, participants who engaged in mindfulness meditation reported greater dispositional mindfulness, fewer difficulties in emotion regulation, less habitual negative self-thinking, and uncontrolled or emotional eating. The second study examined mindful induction scripts, a necessary and novel step in clarifying and increasing transparency in the attribution of effects evidenced in experimental settings. The analysis and resultant components informed the development of a Mindful Attention Induction (MAI) used in study three to examine the influence of an MAI on hedonic reactivity to the properties of food. Subjective hunger decreased and fullness increased for the mindfulness group compared to the control group indicating that mindful attention to properties of food can reduce hedonic reactivity, however, the effects were short lived. Importantly, food intake was significantly greater for the control group compared to the mindful group despite, by that point, no subjective differences in craving or appetitive measures. The findings illustrate how a mindful

approach cultivated through mindful mediation may influence behavioural change without reliance on translation of intentions into actions. The final study piloted the Mindful Eating Programme, a synthesis of the findings and methods of studies 1-3. Qualitative analyses provides a picture of the process of change, which was often attributed to increased awareness of antecedents to undesired eating tendencies, noticing in the present moment and use of mindfulness practices as a tool to realise change.

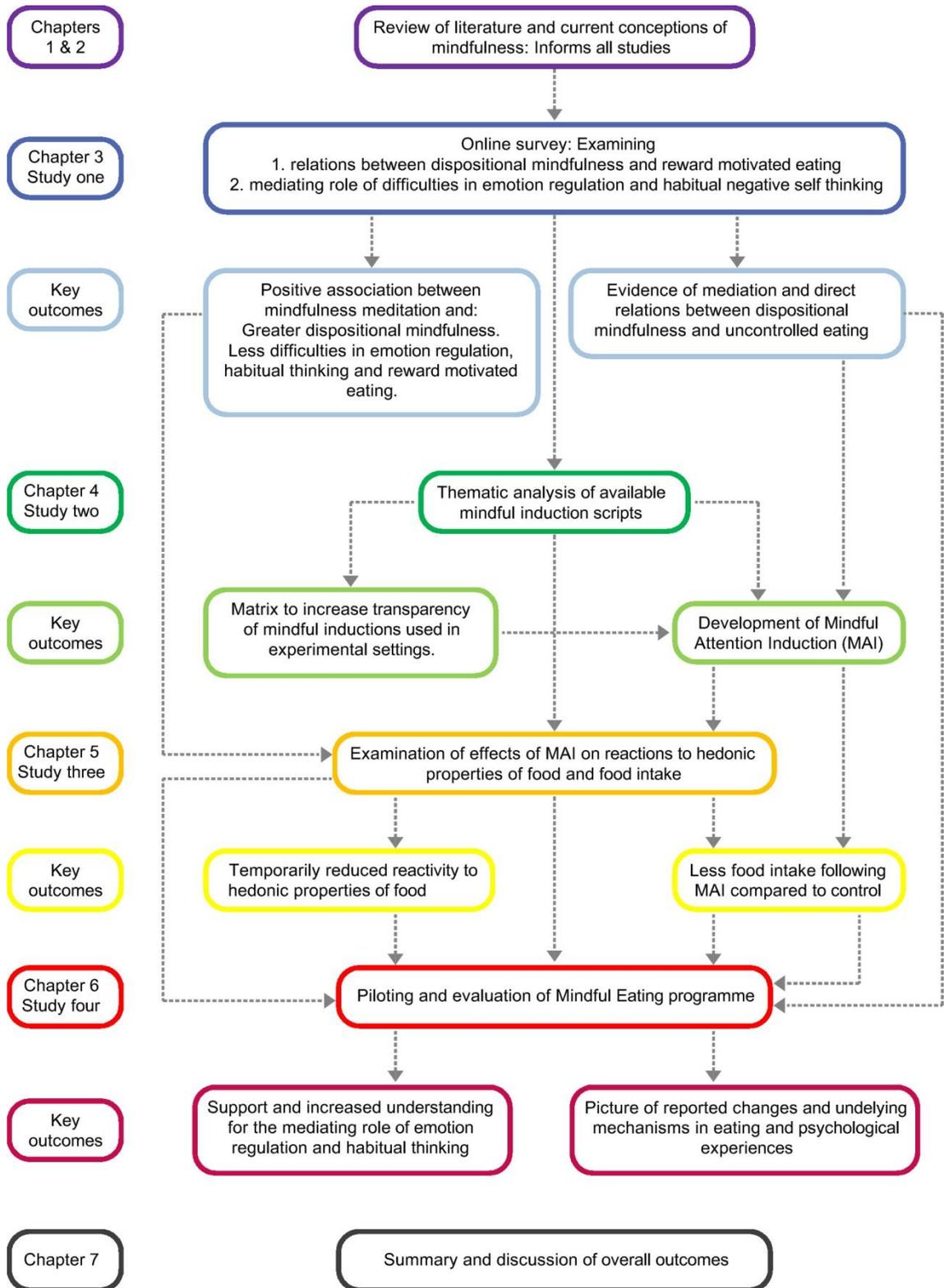


Figure 1. Graphical representation of studies and key outcomes.

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Chapter One:

General Introduction and thesis overview

1.1. Overview

Many health problems reflect behavioural choices of an individual and are therefore, at least in part, controllable if not avoidable (Terry & Leary, 2011). Evidence suggests that up to 63% of global mortality can be linked to social and behavioural control (World Health Organization, 2013) however people often do not behave in ways that would promote health or extend their lifespan. It is well known that healthy eating and physical exercise reduces the risk of obesity and related health problems, but many people do not behave in ways that would reduce their risk of experiencing these problems. The lack of engagement in simple actions that would promote health and reduce the risk of health-related problems is often attributed to failures in self-regulation (Terry & Leary, 2011). That is not to say people do not draw on a remarkable self-regulatory capacity to overcome impulses and temptations that drive humans to, for example, overeat or drink too much alcohol (Tice & Bratslavsky, 2000). This ability to abstain from gratifying immediate needs and desires is adaptive (Metcalf & Mischel, 1999) and enables people to engage in longer term goal-directed behaviours enabling the attainment of desirable outcomes (Hagger, Wood, Stiff, & Chatzisarantis, 2010). Attempts to regulate or lose weight rely on successful self-regulation (de Ridder & de Wit, 2007): the setting of goals, cognitive preparation, monitoring and evaluation of goal-directed behaviour (Conner & Norman, 2005). A range of practical and knowledge based factors may influence an individual's tendency to engage in health-related behaviours. However, even when these factors are addressed people may have difficulty engaging in or maintaining such behaviours for the requisite time period to effect positive health outcomes. For instance, despite best intentions long-term goals such as

weight regulation or loss are sacrificed often for short-term emotional gratification (Metcalfe & Mischel, 1999; Tice & Bratslavsky, 2000). Given the substantial health, economic and individual costs associated with overweight and obesity it is critical for cost effective, empirically supported preventative and treatment interventions to be developed, understood, evaluated and disseminated.

Emergent research suggests that mindfulness-based approaches and interventions may address underlying processes that influence health behaviours including eating tendencies. The current thesis examines the relationships and effect of mindfulness (dispositional, experimentally induced and cultivated through an intervention), emotion regulation and habitual thinking on eating tendencies associated with obesity and overweight. Difficulties in emotion regulation and habitual negative self-thinking are examined as underlying mechanisms and outcomes.

This chapter describes the potential of Mindfulness-Based Interventions (MBIs) to effect positive psychological and behavioural outcomes including improvements in behavioural self-regulation (Robins, Keng, Ekblad, & Brantley, 2012). Thereafter issues surrounding descriptions and definitions of mindfulness within western psychology and models of mindfulness are described. The Liverpool Mindfulness Model (LMM; Malinowski, 2013b) is introduced as a pragmatic map to guide research into the mechanisms of influence between mindfulness practices and behavioural outcomes. This chapter concludes with an outline of the main hypotheses and an overview of studies addressing them.

1.1.1. An overview of Mindfulness-Based Interventions

The past three decades have witnessed a rise in popular and academic interest in the benefits of mindfulness (Jha, 2013; Keng, Smoski, & Robins, 2011; Malinowski, 2013b). Empirical evidence indicates that MBIs improve psychological and physical health in clinical and non-clinical populations (Chiesa & Serratti, 2009; Chiesa & Serretti, 2010; Grossman, Niemann, Schmidt, & Walach, 2004; Keng et al., 2011). This is particularly evident from randomised controlled trials designed to treat recurrent depression (Kuyken et al., 2008; Teasdale et al., 2000), stress and anxiety (Anderson, Lau, Segal, & Bishop, 2007; Nyklíček & Kuijpers, 2008), and chronic pain (Chiesa & Serretti, 2011; Rosenzweig et al., 2010). Several interventions have been developed based on mindfulness-related principles and practices, including the eight week Mindfulness-Based Stress Reduction and (MBSR; Kabat-Zinn, 1982), Mindfulness-Based Cognitive Therapy programmes (MBCT; Segal, Williams, & Teasdale, 2002), Dialectical Behaviour Therapy (DBT; Linehan, 1993), and Acceptance and Commitment Therapy (ACT; S. C. Hayes, Strosahl, & Wilson, 1999). These interventions aim to cultivate a state of awareness and non-judgemental acceptance through, to varying degrees, mindfulness meditation practices. The approaches differ according to the theoretical stance or focus. For example, MBCT increases awareness of cognitive processes and their impact on mood (Lau & McMann, 2005); Mindfulness-Based Eating Awareness Therapy (MB-EAT) specifically addresses eating awareness (Kristeller & Wolever, 2011); Acceptance and Commitment Therapy (ACT) increases psychological flexibility by separating actual, and interpreted, functions of behaviour (Prevedini, Presti, Rabitti, Miselli, & Moderato, 2011); whereas Dialectical Behaviour Therapy (DBT) increases awareness to reduce extreme behavioural reactions (Lau & McMann, 2005). Within this thesis both the meditation orientated interventions (i.e.

MBSR and MBCT) and the less meditation oriented interventions are included in the family of MBIs reviewed. However, the focus of the research conducted for this thesis is on the effects of mindfulness meditation based practices.

MBIs have recently been developed to address behavioural outcomes particularly within the field of health-related behaviours including eating behaviours, alcohol consumption and physical activity (e.g. Ostafin, Bauer, & Myxter, 2012; Salmoirago-Blotcher, Hunsinger, Morgan, Fischer, & Carmody, 2013). MBIs specifically addressing eating behaviours are reviewed in detail in introducing the Mindful Eating Programme in chapter six (6.2.3). According to Brown and Ryan's (2003) theoretical perspective mindfulness practices promote behavioural self-regulation through increased attention and sensitivity to psychological, physical and environmental cues. For example, previous research indicates that individuals higher in dispositional mindfulness, specifically reporting heightened awareness and attention to inner and external experiences, are more likely to translate their intentions into behaviours than less mindful individuals (Chatzisarantis & Hagger, 2007).

It is proposed that a mindful approach to experience may enhance an individual's capacity to fulfil their intentions by strengthening self-regulation abilities, that is, the ability to stay focused on the fulfilment of plans and to control the influence of counter intentional cues that can distract people from acting on their intentions (Chatzisarantis & Hagger, 2007). The findings of the current research programme and how they elucidate processes that might bridge or address the intention-behaviour gap are discussed in chapters six and chapter seven in the general discussion.

In parallel to research examining the effectiveness of MBIs, researchers have investigated psychological and neurophysiological mechanisms or processes that may

underpin evidenced beneficial effects (Malinowski, 2013b). The current thesis examines the role of two potential mechanisms, emotion regulation and mental habit by which mindfulness practices may influence eating as a health-related behaviour. Eating behaviour, specifically reward motivated eating, is used throughout the thesis as an outcome to examine the role of each potential mechanism.

1.1.2. Defining and describing mindfulness

The following section outlines considerations and difficulties experienced by those engaging in mindfulness research. The review illustrates the complexities involved and current issues with the term and application of mindfulness and although by no means exhaustive demonstrates the reasoning behind the approach adopted in this thesis. Within western psychology the predominant view of mindfulness is of an “awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, p. 145). Mindfulness is widely understood as a state of mind that differs from everyday wakefulness, which has been characterised as having a quality of automaticity or unawareness of the present moment in which individuals operate on “automatic pilot” (Kabat-Zinn, 1990). The word mindfulness derives from the Pāli word *sati* which has been translated as both ‘remembrance’ or memory, and lucid awareness of what is occurring in the phenomenological field (Bodhi, 2011). Mindfulness is central to Buddhist models of human well-being (Coffey & Hartman, 2008) and mindful practice is described as a pathway to relieve human suffering (Bodhi, 2011). Despite mounting evidence of beneficial effects of MBIs and the surge in published research, caution is required when interpreting these findings and attributing beneficial effects to

mindfulness per se (Grossman & Van Dam, 2011). Debate remains over what is actually meant by the word *mindfulness*. Part of the confusion is attributable to the different uses and meanings ascribed within research and in common parlance (Grossman, 2010).

Within research the word mindfulness has been used to describe a universal human capacity (Kabat-Zinn, 2003), a stable trait or disposition (Brown & Ryan, 2003), a state of mind that can be induced (in some examples within eight minutes, Erisman & Roemer, 2010), and as the culmination of mindfulness meditation practice (Lykins & Baer, 2009).

Mindfulness can also be conceptualised on multiple levels as illustrated in the descriptions of MBIs. For example as a psychological process (Chiesa, Serretti, & Jakobsen, 2013), a measurable outcome (Brown & Ryan, 2003), or a cognitive style (Davidson, 2000; S. C. Hayes & Wilson, 2003; Kostanski & Hased, 2008). A subtle yet important source of confusion is captured in the observation that the term *sati* actually means ‘to be mindful’ which contrasts with the use of the word mindfulness within western psychology as a noun which inherently implies a stable trait or construct rather than a process or a way of being (Grossman & Van Dam, 2011). Indeed, recent developments in understanding mindfulness have questioned how comparable modern definitions of the term are to original descriptions of mindfulness (Grossman & Van Dam, 2011). Modern conceptions of mindfulness have described it as a construct (e.g. Baer, Smith, & Allen, 2004; Brown & Ryan, 2003) whereas classical literature and increasing numbers of mindfulness practitioners and clinical researchers suggest that mindfulness may more accurately be described as a non-conceptual phenomenological attentional process (Grabovac, Lau, & Willett, 2011). This thesis approaches mindfulness as a process with underlying mechanisms which will be explored in chapter two in descriptions of mechanisms and in introducing models of mindfulness (1.1.3).

Further debate exists as to the extent to which trait or dispositional mindfulness relates to state mindfulness or indeed mindfulness cultivated through mindful practices (Thompson & Waltz, 2007). For example, two studies examined correlations between measures of trait (Five Facet Mindfulness Questionnaire (FFMQ); Baer, Smith, et al., 2006) and state mindfulness (Toronto Mindfulness Scale (TMS); Lau et al., 2006). The first of Thompson and Waltz's (2007) studies found no significant correlations, the second found that only one of the FFMQs five subscales (observing) and TMS were significantly correlated for meditation naïve individuals but there were no significant correlations when the measures were completed by experienced meditators. However, caution is needed when taking such findings as evidence that state and trait mindfulness are exclusive constructs as each of the scales measure different definitions of mindfulness, most notably the state measure of mindfulness (Toronto Mindfulness Scale; Lau et al., 2006) does not include items that measure the role of attention. Alternatively the findings may highlight a non-linear relationship between state and trait mindfulness (Thompson & Waltz, 2007). Cross-sectional surveys examining the associations between trait mindfulness in populations without meditation experience and outcomes of interest are based on the premise that all humans have the capacity to be mindful and that there is individual difference in the extent to which people can be described as mindful (Brown & Ryan, 2003; Kabat-Zinn, 2003). Commonality between state and trait mindfulness is argued to rest in the premise that state mindfulness leads to increased trait mindfulness (Chiesa, 2012). Each level at which mindfulness can be conceptualised and each methodological approach used, from cross-sectional surveys to longitudinal studies, are proposed to be important in gaining greater understanding of mindfulness (J. M. Williams, 2010).

In sum, to date there is no consensus on how mindfulness should be defined or indeed what components the term describes. However, the majority of psychological research adopts or encompasses Kabat-Zinn's (2003) definition incorporating a receptive attention to whatever arises in the present moment with an open, curious non-judgmental attitude (e.g Baer, 2003; Bishop et al., 2004; Brown, Ryan, & Cresswell, 2007; Grossman et al., 2004; Keng et al., 2011; Shapiro, Carlson, Astin, & Freedman, 2006). Therefore this thesis adopts the predominant view of mindfulness provided by Kabat-Zinn (2003) whilst acknowledging the widespread confusion that stems from using mindfulness as an umbrella term without further clarification (Davidson, 2010). As the evidence base grows it becomes particularly important to be clear as to exactly what is being measured and how it relates to mindfulness (Davidson, 2010; Grossman & Van Dam, 2011; J. M. Williams, 2010). Therefore throughout the thesis it will be made explicit what is being described by the term mindfulness (e.g. state, dispositional, practice or attitude). The term mindfulness practice is used throughout the thesis to describe meditative practices and exercises designed to cultivate state and increase dispositional mindfulness.

1.1.3. Models of mindfulness

There are several dominant models of mindfulness reflecting different conceptions of mindfulness and stances. Despite differences in the number of components and terminology, current conceptual models of mindfulness practices and associated benefits each describe a process. That is, positive outcomes of mindfulness practices are associated with changes in *how* phenomena are experienced rather than changes in the *content* of these experiences per se (Bishop et al., 2004; Chiesa &

Malinowski, 2011; Shapiro et al., 2006). This section provides an overview of models describing overlap and differences concluding with the reasoning behind the use of the Liverpool Mindfulness Model (Malinowski, 2013b) as a guide to this and future research into the role of mindfulness in health behaviour change.

Bishop et al. (2004) provide a two component model in an attempt to operationalize Kabat-Zinn's (2003) definition: active self-regulation of attention and an orientation to experience characterised by curiosity, openness and acceptance. The first component describes mindfulness as an emergent state or cognitive skill that occurs when individuals turn their attention to present moment experience. The second component describes an active process of relating openly with acceptance to whatever phenomenon arise in the field of experience (Bishop et al., 2004). It is important to note that within this context the concept of acceptance refers to full experiential openness to the reality of the present (Roemer & Orsillo, 2002) rather than passive resignation or over or under engagement (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008). In contrast Brown and Ryan (2003) propose a single component model of mindfulness: a receptive attention and awareness of the present moment. In an attempt to acknowledge Buddhist origins of mindfulness and western psychological theory Wallace and Shapiro (2006) propose a four component model in which the development and balance of components is required for profound well-being. The components are as follows: motivation (motivation/intention), attention, cognition, and affect. Adopting a psychometric approach to modelling mindfulness, Baer et al. (2006) combined five mindfulness scales. Subsequent factor analysis of responses revealed a five-facet structure of mindfulness which they labelled: non-reactivity to inner experience, observing internal and external phenomena, acting with awareness, describing and non-judging of experience.

The models described thus far describe the process of mindfulness practice or the cultivation of mindfulness. In contrast Shapiro et al. (2006) provide a three component model to express how mindfulness effects positive change: attention training, intention and the adoption of a mindful attitude which includes an acceptance of what is occurring in the field of experience. These three axioms of mindfulness are proposed to lead to a meta-mechanism: re-perceiving (Shapiro et al., 2006) which will be described in more detail in chapter two (2.2.). An alternative definition and model of mindfulness is provided by Langer (1989) in which mindfulness is an active elaborative process involving the construction of meaning and new categories predominately in response the external environment (Bishop et al., 2004). This conceptualisation overlaps with the previously described views only in the inclusion of attentional engagement (Bishop et al., 2004). Langer's (1989) mindfulness definition is based within social psychology and has a cognitive emphasis resulting in interventions and target outcomes that are very different from how mindfulness is addressed in this thesis. For example the emphasis in this thesis is on how mindfulness influences how thoughts are experienced rather than changing the content of thoughts.

Interest in understanding mindfulness as a process and the mechanisms involved has led to the proposal of a multi-tiered framework to guide research: The Liverpool Mindfulness Model (LMM; Malinowski, 2013b, see fig 1.1). Consistent with conceptions of mindfulness outlined above the LMM emphasises the core role of attentional skills (Hölzel et al., 2011; Lutz, Slagter, Dunne, & Davidson, 2008; Malinowski, 2013b). The framework describes an attitude to the focus of awareness be it a specific object or open awareness: non-judging awareness. In doing so the LMM encompasses Kabat-Zinn's (2003) view of mindfulness, but also importantly maps the

relations through to three forms of outcomes: physical, behavioural and mental well-being thereby extending the focus of previous models.

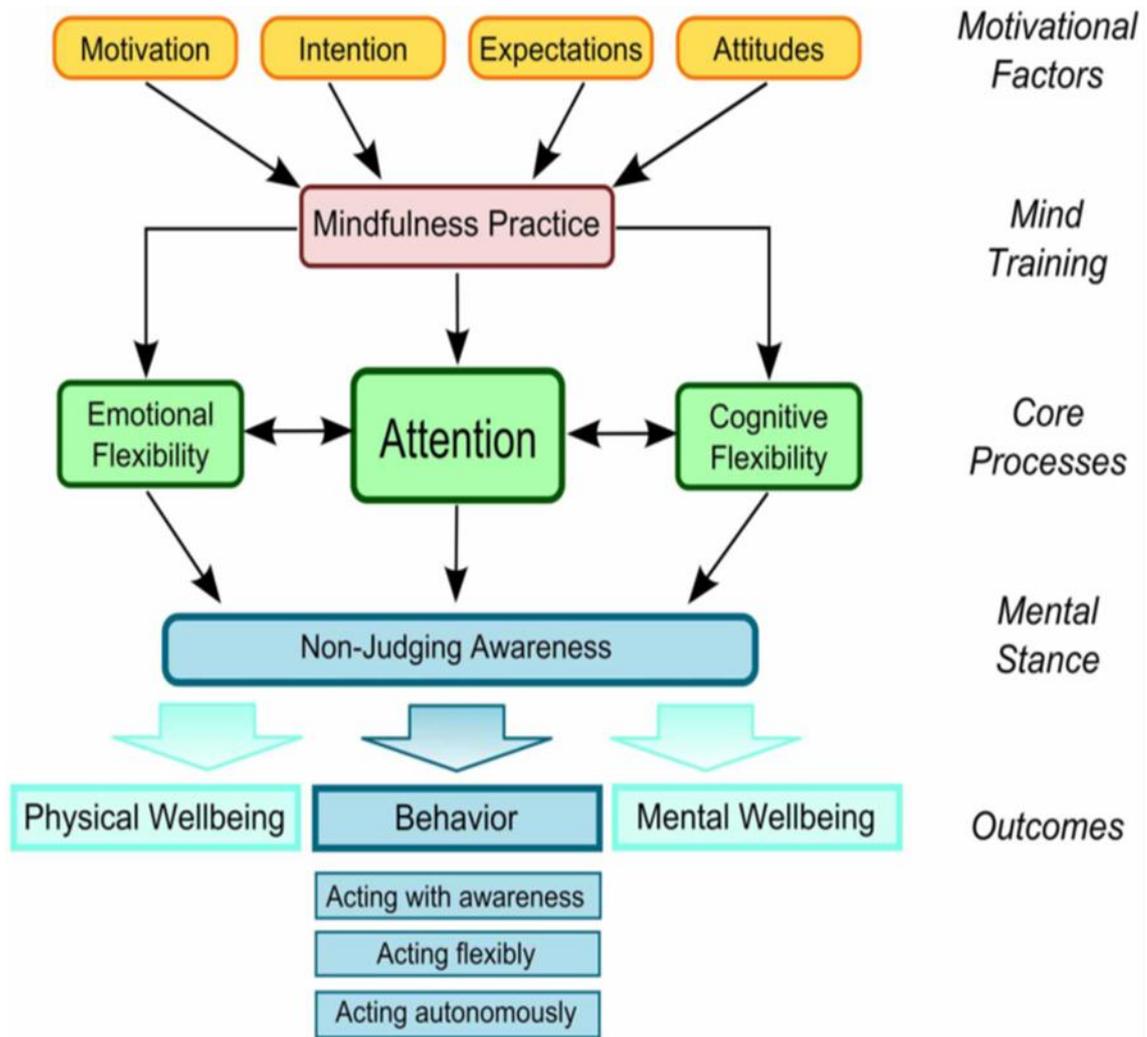


Figure 1.1. Liverpool Mindfulness Model (Malinowski, 2013b)

The framework delineates five tiers from motivational factors (tier one: motivation, intention, expectation and attitudes) to outcomes (tier five: physical and mental well-being and behavioural outcomes). The model focuses on the development of core processes (tier three: attention, emotional and cognitive flexibility) through

mind training (tier two: mindful practice). Tier four describes an orientation to experience or mental stance of non-judging awareness that facilitates positive outcomes.

The three core processes outlined in the LMM address to greater or lesser extents theoretically and empirically proposed mechanisms underlying the effects of mindfulness practice on positive outcomes reviewed in chapter two. It is important to note that the framework presented in the LMM acknowledges that each of these processes may be interrelated and may facilitate each other (Hölzel et al., 2011; Malinowski, 2013b). In addressing the complexity of mindfulness and relations between processes the LMM is argued to represent a pragmatic guide or map for research examining mechanisms of mindfulness in this thesis. The LMM is well placed to address and explore processes involved in models of behaviour change as it models motivational and volitional phases of behaviour change.

1.1.4. Measuring mindfulness

As might be expected in a field that lacks consensus on an operational definition there are multiple measures of mindfulness-based on different definitions and the number of components addressed. The last decade has seen the development and validation of at least nine such measures: the *Freiburg Mindfulness Inventory* (FMI; Buchheld, Grossman, & Walach, 2001), the *Mindful Attention Awareness Scale* (MAAS; Brown & Ryan, 2003), the *Cognitive and Affective Mindfulness Scale-Revised* (CAMS-R; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007), the *Southampton Mindfulness Questionnaire* (SMQ; Chadwick et al., 2008), the *Kentucky Inventory of Mindfulness Scale* (KIMS; Baer et al., 2004), the *Five-Facets of Mindfulness Questionnaire* (FFMQ; Baer, Smith, et al., 2006), the *Toronto Mindfulness Scale* (TMS; Lau et al., 2006), the *Philadelphia Mindfulness Scale* (PHLMS; Cardaciotto et al., 2008) and, the *Comprehensive Inventory of Mindfulness Experiences beta* (CHIME-B;

Bergomi, Tschacher, & Kupper, 2013). Interestingly, all these measures with the exception of the TMS were originally designed to assess mindfulness as a trait-like quality that is manifest as a general tendency to be mindful in daily life. Variations in measures highlights the lack of an external 'gold standard' referent to validate or discern which is the best measure of mindfulness (Grossman & Van Dam, 2011). The validation of MBIs within psychological research and application by measuring changes in mindfulness has been described as necessary (Baer, 2011) but perhaps not yet possible due to the early state of research (Grossman & Van Dam, 2011). Grossman and Van Dam (2011) suggest that the measures to date are best described as capturing features related to mindfulness rather than as measures of mindfulness itself. Grossman and Van Dam (2011) caution against confusing the characteristics measured in mindfulness scales with definitions and quantification of mindfulness itself, and highlights psychometric inconsistencies based on differing interpretations of scale items between meditators and non-meditators. Limitations of self-report measures become particularly pertinent when considering that the accuracy of mindfulness measures rely on individuals being aware of their inner states. That is, the ability to accurately measure 'mindfulness' is reliant on participants' 'mindfulness'. Mindfulness has been described as an inherent human capacity that occurs naturally, can differ between individuals and is not culturally bound (e.g. Brown & Ryan, 2004; Kabat-Zinn, 2003). As such, mindfulness is experienced to lesser or greater extent by all humans (Bergomi, Tschacher, & Kupper, 2012). In accordance with Bergomi et al., (2013) the view adopted in thesis is that rejecting the use of self-report measures of mindfulness does not acknowledge the value of measuring psychological concepts associated with mindfulness. Moreover, in agreement with Grossman et al., (2011) the thesis acknowledges the limitations of self-report measures and rather than asserting that a

measure captures mindfulness it adopts the more sensitive approach of describing what the scales measure as an aspect of mindfulness.

To date ¹ the most pragmatic and inclusive approach to measuring the posited components of mindfulness has been provided by Baer and colleagues (2006) in the form of the FFMQ (Hölzel et al., 2011). Indeed, for assessment in general populations the FFMQ has been suggested to provide the most comprehensive coverage of aspects of current conceptions of mindfulness (Bergomi et al., 2012). However, it is important to acknowledge the limitations of using self-report methods to measure mindfulness. Such limitations include what is described as response-shift. Response-shift describes a psychometric phenomenon in which internal standards with which experiences are compared shift by virtue of practicing or experiencing something (Howard, Dailey, & Gulanick, 1979). This phenomenon and associated semantic shift may be particularly pertinent when measures of mindfulness are used to compare meditation naïve individuals with experienced meditators. This may perhaps explain the perplexing conclusions drawn from the two studies that suggested that binge drinking students rated themselves on the FMI (Buchheld et al., 2001) as more mindful than experienced meditators (Grossman & Van Dam, 2011) and when measuring changes in mindfulness as a result of an MBIs. This may reflect different semantic interpretations of the scale items that may hamper the validity of the measure across different populations. A second need for caution when considering the reliability of mindfulness measures can be attributed to social desirability. Based on the recognisability of desirable skills or behaviours within scale items participants may respond with the ‘right answer’ particularly when having invested time and effort into the development of ‘mindfulness’ (Chiesa, 2012). Furthermore, the lack of consensus between scales on what is being measured leads to difficulty in comparing research findings or may lead to

misleading conclusions based on measured state and trait mindfulness. With these limitations understood the FFMQ is used throughout the thesis as it encompasses previously widely used measures notably the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) but also allows the examination of facets and has been shown to be appropriate for the general population.

1.2. Research questions and outline of the thesis

The thesis presents a series of studies that examine the role of two potential mechanisms, emotion regulation and mental habit, in the relationship between mindfulness practices and a specific health-related behaviour: reward motivated eating (see figure 1, pg. 15). The central question that will be addressed is how does mindfulness influence the tendency to engage in reward motivated eating. By examining the potential mediating role of difficulties in emotion regulation and habitual negative self-thinking the current research aims to increase understanding of the mechanisms of influence between mindfulness and eating behaviours. If these proposed relations and mechanisms of influence are confirmed the findings will inform the development of more effective health prevention and promotion interventions. Chapter two (2.2.-2.3) provides a review of evidence regarding underlying mechanisms in the relations between mindfulness and beneficial outcomes focusing on health-related behaviours influenced by self-regulation. Reward motivated eating behaviour is introduced as a vehicle for examining the role of emotion regulation and mental habits as mechanisms in the relations between mindfulness and health-related behaviour. Finally, previous mindful approaches to eating behaviours are reviewed.

Chapter three is the first empirical chapter reporting the findings from Study 1, an online survey (N=622) designed to address three key research questions. Firstly,

what is the nature of the relations between dispositional mindfulness, eating measures, emotion-regulation, and habitual negative self-thinking? Secondly, what evidence is there that the relationship between dispositional mindfulness and eating measures are mediated by emotion regulation and/or habitual negative self-thinking? Finally, how do current meditators and individuals who have never meditated differ on measures of dispositional mindfulness, emotion regulation, negative self-thinking and eating behaviours?

Having examined relations between dispositional mindfulness and eating behaviours, and differences between meditators and non-meditators, the focus of the thesis turns to examining the effects of an induced state of mindfulness or manipulation of mindfulness in a lab based analogue of uncontrolled eating. It was necessary to develop an experimental paradigm to examine how a mindful meditation manipulation technique may affect participant's appetitive ratings and subsequent eating behaviours following either a mindful or standard cue exposure task. Chapter four describes the systematic analysis of available mindful induction techniques (Study 2). Commonalities and differences between emergent components and subcomponents from the mindfulness inductions are discussed. In this chapter I discuss how these induction or manipulation techniques relate to current models of mindfulness by examining which components are addressed by such methods. The findings of the analysis informed the development of a mindfulness attention induction (MAI) for use in a randomised controlled (N=40) cue exposure experiment (Study 3) in which all participants were exposed to the properties of snack type foods. Prior to attending the experimental session participants completed measures of dispositional mindfulness, emotion regulation, mental habit and eating behaviours. Chapter five outlines the rationale, methods and findings of this study.

Chapter six describes the final empirical phase, the findings from studies 1-3 and review of current mindfulness-based approaches to eating are brought together to inform the development, piloting and evaluation of the Mindful Eating Programme (MEP; N=22). The MEP provides a framework for teaching mindful meditation practices to increase dispositional mindfulness, reduce difficulties in emotion regulation and the habitual quality of negative self-thinking and examine the influence of these changes in eating behaviours. Mixed methods approaches are used for example to examine the use of mindful attention practice shown in study 3 to influence subjective experience of hunger and actual intake. Qualitative analyses are used to examine if emotion regulation and habitual thinking are described as influencing eating and if mindful practices influence these and reward motivated eating behaviour.

Chapter seven provides an overview of the findings of each study in this thesis. The results of this research programme are discussed in light of previous research and how they add or differ from current conceptions of mindfulness and increase understanding of emotion regulation and habitual thinking as underlying mechanisms of influence. Discussion also addresses the extent to which the aims of the thesis have been met. The composition of the Liverpool Mindfulness Model is reviewed in the context of the research and revisions suggested. In addition how the thesis's contribution to understanding of mindful approaches to behaviour change is discussed with reference to addressing the intention-behaviour gap. Strengths and limitations of the research programme are discussed with recommendations for future directions in this area of research.

Notes: 1. It should be noted that the current research was conducted prior to the publication by Bergomi, Tschacher, and Kupper (2013).

Chapter two:

Mindfulness-based approaches to behavioural and psychological change: Theory, research, underlying mechanisms and applications.

2.1. Chapter overview

Several psychological processes have been proposed as potential mechanisms in the relations between mindfulness practices and positive outcomes. These include: attentional skills; stress reduction; behavioural self-regulation; mindful awareness, exposure and associated distress tolerance; emotion regulation; decoupling of the ‘self’ from experiences, events, and mental processes; and reductions in habitual negative self-thinking. Evidence for each proposed mechanism and relations with psychological and behavioural outcomes is briefly reviewed in the context of health-related behaviours. Following this, the relation of difficulties in emotion regulation and habitual negative self-thinking with eating behaviour will be considered. The role of difficulties in emotion regulation and habitual negative self-thinking as underlying mechanisms and outcomes are explored in a survey (Study 1, chapter three), an experimental examination of the effect of mindful attention on hedonic reactivity (Study 3, chapter five), and in relation to the experience of a Mindful Eating Programme (Study 4, chapter six). Eating behaviour, specifically reward motivated eating, is introduced as a vehicle for examining the role of emotion regulation and habitual thinking as mechanisms underlying the beneficial effects of mindfulness practices. To my knowledge, this thesis constitutes the first research programme to explicitly examine the influence of mindfulness on habitual thinking as an underlying mechanism of the relations between mindfulness and a behavioural outcome. The inclusion of mental habit reflects the assertion that mindfulness meditative practices alter individuals relations to thought

processes promoting greater cognitive flexibility (e.g. Bieling et al., 2012; Moore & Malinowski, 2009) which may in turn influence self-regulatory processes (e.g. Glomb, Duffy, Bono, & Yang, 2011).

2.2. Mechanisms of mindfulness

It is important to note that based on current literature proposed mediating mechanisms are not likely to operate exclusively and may be, interdependent, iterative or share varying degrees of heterogeneity and overlap (Coffey, Hartman, & Fredrickson, 2010; Malinowski, 2013b; Teper, Segal, & Inzlicht, 2013). Furthermore, there is a vast array of terms used to describe proposed mechanisms, often reflecting author's research perspective resulting in distinct terminology describing overlapping constructs or processes. For example, mindfulness practices typically involve noticing, observing, and in some instances labelling of phenomena, without evaluating or assigning meaning to them. This creates the opportunity for individuals to perceive a distance between themselves and their thoughts, emotions, and experiences shifting their perspective. This process has most commonly been described as “decentring” (Feldman, Greeson, & Senville, 2010) or ‘re-perceiving’ (Shapiro et al., 2006). In introducing proposed mechanisms in this chapter the terms are both used following the authors original intention. However, latterly where the same process is described for clarity the term decentred or decentring have been used rather than re-perceiving to reduce confusion with or implications of active cognitive reappraisal as taught within Cognitive Behavioural Therapeutic interventions.

Mechanisms may also be seen as outcomes in and of themselves (Shapiro et al., 2006). For example, as an outcome, attention abilities cultivated through mindfulness

practices, combined with a quality of non-evaluative judgement, has led to measurable significant shifts in perspective (D. M. Fresco et al., 2007) or re-perceiving of psychological phenomenon (Shapiro et al., 2006). Re-perceiving is also described as an overarching mechanism that leads to greater equanimity, objectivity, clarity and fosters direct mechanisms: self-regulation, values clarification, cognitive, emotional and behavioural flexibility and exposure (Shapiro et al., 2006). A randomised control study of these direct mechanisms in the context of a MBSR programme provides initial support for Shapiro et al.'s (2006) proposed relationship between re-perceiving, the proposed direct mechanisms and psychological and physiological outcomes (Carmody, Baer, Lykins, & Olendzki, 2009). However, according to Carmody et al. (2009) the high inter-correlation between mindfulness and re-perceiving itself suggests that these are overlapping constructs that both increase through participation in MBSR programmes.

2.3. Processes underlying the effects of mindfulness practices and MBIs

2.3.1. Attentional skills

Mindfulness practices involve sustaining and switching attention back to the present moment (Bishop et al., 2004). In doing so they are proposed to improve the ability to control attention which may facilitate further psychological benefits (Keng et al., 2011). For example, intervention-related improvements in the ability to sustain attention have been associated with reductions in depressive symptoms for novice meditators (Chambers, Lo, & Allen, 2008). Attentional skills are a core component of psychological flexibility argued to be fundamental for psychological and physical health (Kashdan & Rottenberg, 2010). For example, research examining the effects of mindfully attending to smoking cues (noticing, accepting non-judgementally) has

shown, in comparison to normal attention, reduced self-reported craving and reduced neural activity in craving related regions of the subgenual anterior cingulate cortex (sgACC; Westbrook et al., 2013). Further examination indicated reduced interaction between the sgACC and other craving related brain regions (Westbrook et al., 2013). The evidence was taken to indicate that mindful attention to smoking cues may decouple neuro-circuitry involved in craving and reduces reactivity to experience thereby increasing psychological flexibility. This is different from increasing regulation of responses to experiences that would have been associated with recruitment of lateral prefrontal cortex.

Mindfulness is proposed to enhance attention to, and experience of, primary transient emotional experiences, and thoughts that signal a need for control, such as quickened heart rate in anger (Teper et al., 2013). The present-moment awareness cultivated by mindfulness practices is involved at the level of attentional deployment, prompting the practitioner to attend to all primary sensations in the field of experience with refined attunement (e.g. sensitivity, non-elaboration and acceptance; Teper et al., 2013). Early awareness and acceptance of these sensations is advantageous, allowing individuals to efficiently recruit regulatory resources or not. That is, mindful acceptance, in turn, promotes a non-judgmental attitude toward sensations, reducing the likelihood of suppression, rumination, or the habitual construction of stories around the sensations. Indeed, the effect of mindfulness on the experience of transient, preconscious affect may be quite different, as mindfulness heightens visceral sensations and thus amplifies the experience of these quick affects whilst reducing the automaticity or need to change it (Williams, 2010). This may allow people to flexibly attend to the somatic features of emotional experience, thereby attenuating the need for reappraisal or regulation of

responses (Brefczynski-Lewis, Lutz, Schaefer, Levinson, & Davidson, 2007; Farb, Anderson, Irving, & Segal, 2013).

2.3.2. Stress reduction

Several randomised controlled trials of MBSR programmes have shown intervention-related decreases in perceived stress (e.g. Bränström, Kvillemo, Brandberg, & Moskowitz, 2010; Nyklíček & Kuijpers, 2008; Oman, Shapiro, Thoresen, Plante, & Flinders, 2008). Perceived stress has been shown to mediate relations between dispositional mindfulness and several health-related behaviours including self-reported sleep quality, binge eating, activity restriction (attributed to poor physical or mental health), perceived overall health and physical activity (Roberts & Danoff-Burg, 2010). Higher perceived stress for both men and women has been associated with higher fat diets, less frequent exercise, increased cigarette smoking, recent increases in smoking tobacco, less self-efficacy to quit smoking, and less self-efficacy to not smoke when stressed (Ng & Jeffery, 2003). A prospective study over three years indicates that eating in response to stress and aversive emotions was associated with poor awareness of physiological states and an inability to differentiate between hunger and emotional arousal (e.g. Leon, Fulkerson, Perry, & Early-Zald, 1995). An exploratory study examined the effects of a mindful eating and stress reduction intervention on overweight and obese women's abdominal fat (Daubenmier et al., 2011). Findings indicate intervention-related increases in dispositional mindfulness, responsiveness to bodily sensations, reduced anxiety and eating in response to external cues, and a reduced tendency to eating in response to emotions. Furthermore, participants who showed greatest increases in dispositional mindfulness, responsiveness to bodily sensations and

reductions in chronic stress had the greatest reductions in abdominal fat (Daubenmier et al., 2011). It was speculated that reductions in abdominal fat resulted from mindfulness reducing reliance on 'comfort foods' to manage stress or other aversive emotions (Daubenmier et al., 2011). However, the intervention was not effective in reducing abdominal adiposity or improving fat distribution across all participants, improvements were observed among those who increased in mindfulness and decreased in chronic stress and emotional eating. The study also suffered from high attrition rates (n = 40 at start and n= 17 at follow up) highlighting the need for caution in interpreting findings or evaluating the efficacy of the intervention.

2.3.3. Behavioural self-regulation

The terms psychological and behavioural are used to describe covert and overt outcomes respectively whilst acknowledging that this distinction (although providing a useful heuristic) may not be ontologically valid. For example, psychological and behavioural processes share considerable overlap including having automatic and habitual qualities (Verplanken, 2010). Accurate perceptions of internal cues and appropriate responses to them are necessary for successful self-regulation (Caldwell, Baime, & Wolever, 2012). Brown and Ryan (2003) suggest that greater mindfulness (dispositional or trained) may lead to, or be associated with, behavioural change due to increased self-regulatory capabilities resulting from on-going mindful awareness of bodily processes, thoughts, emotions and environmental cues. Therefore, a mindful approach to experiences (non-judging or reacting) may engender greater awareness from which to respond rather than react, increasing the likelihood of behaving consistently with longer term goals, doing so may lead to a greater sense of behavioural

control and self-efficacy (Gilbert & Waltz, 2010). Indeed, higher dispositional mindfulness has been associated with greater confidence in ability to regulate emotions without smoking (Vidrine et al., 2009) and greater self-efficacy concerning ability to change health-related behaviours (Gilbert & Waltz, 2010). Participation in an MBSR programme has been shown to improve self-reported behavioural regulation in a non-clinical sample (Robins et al., 2012).

Brown et al. (2007a; Brown, Ryan, & Creswell, 2007b) draw an important distinction between the monitoring and controlling aspects of self-regulation, such that monitoring processes (i.e. accurately attending to one's thoughts, feelings, sensations, and bodily state) better resemble the nature of mindfulness than the controlling processes (i.e. altering one's behaviour to conform with ego-driven and often socially prescribed motives). Rather than requiring greater efforts at self-control drawing on already limited resources (Muraven, Tice, & Baumeister, 1998) adopting a mindful approach involves meeting experiences with an accepting decentred stance that may both increase sensitivity to antecedents and desensitise previously conditioned behaviours (Breslin, Zack, & McMain, 2002).

2.3.4. Mindful awareness, exposure and associated distress tolerance

When somatic and mental events go unrecognised they may trigger automatic reward motivated behaviours like eating (Caldwell et al., 2012). The ability to switch and sustain attention taught in mindfulness practices promotes awareness of and exposure to distressing thoughts, emotions, sensations and external cues that may otherwise go unnoticed (Brown, Ryan, & Creswell, 2007a; Caldwell et al., 2012). In this way sensitivity to and awareness of internal cues is enhanced which may attenuate guidance of behaviours by external cues and thus reduce, for example, eating in

response to external cues (Alberts, Thewissen, & Raes, 2012). Furthermore, mindfulness practices provide an insight that many types of distress that usually provoke an automatic reaction can be tolerated, thereby increasing distress tolerance and reducing automaticity (Caldwell et al., 2012). Exposure to internal and external phenomena as they arise is suggested to lead to desensitisation, a reduction in emotional reactivity, quicker recovery, and a greater tolerance for, and acceptance of aversive states thereby facilitating more effective emotion regulation (Borkovec, 2002). For example, voluntary exposure to aversive phenomena and experiences may lead to decreases in emotional and cognitive disturbance and more adaptive behavioural responses (e.g. Felder, Zvolensky, Eifert, & Spira, 2003; Levitt, Brown, Orsillo, & Barlow, 2004).

2.3.5. Emotion regulation

Considerable research has focused on the relationship between mindfulness practices, dispositional mindfulness, emotion regulation and associated psychological and behavioural health outcomes (Arch & Craske, 2006; Brown & Ryan, 2003; Chambers, Gullone, & Allen, 2009; Chiesa et al., 2013; Erisman & Roemer, 2010; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Hölzel et al., 2011; Koole, 2009; J. M. Williams, 2010). Emotion regulation describes a form of equally loosely-defined types of self-regulation (Gross & Thompson, 2007) and is often used as an umbrella term for a broad range of strategies for altering emotional experiences and responses (Gross & Thompson, 2007; Hölzel et al., 2011; Koole, 2009). Adaptive emotion regulation is argued to play an integral role in mental health and adaptive functioning (Gross & Thompson, 2007; Kring & Sloan, 2009). However, due to the multiple levels on which emotion regulation can be conceptualised, as with mindfulness, there is no consensus regarding the precise definition and operationalisation of the term (Chambers et al.,

2009). In reviewing the relations between emotions and emotion regulation Chambers et al. (2009) provides evidence that a range of strategies or processes at both phases (generation and regulation of emotions) are required for adaptive emotion regulation and that these strategies or processes are not exclusive. The term emotion regulation, as used throughout this thesis, describes both the perceptual generative (bottom up) processes such as appraisal and the response regulation (top down) processes including experiential avoidance and actively reinterpreting emotional stimuli. Although much research has compared the relative efficacy and benefits of adopting different emotion regulation strategies (e.g. suppression v's expression or reappraisal) based on reading of current literature it is suggested that the most adaptive approach or form of emotion regulation is flexibility (Kashdan & Rottenberg, 2010). Psychological flexibility refers to dynamic processes incorporating transactions between people and their environmental contexts. Flexibility may be reflected in: (1) adaption to fluctuating situational demands, (2) reconfiguration of mental resources, (3) shifts in perspective, and (4) balancing competing desires, needs, and life domains (Kashdan & Rottenberg, 2010).

Mindfulness is proposed to support adaptive flexible emotion regulation in various ways (Chambers et al., 2009). For instance, by regulating attention to the on-going sensory, cognitive and affective fields of awareness (e.g. Cahn & Polich, 2006), and improving individuals capacity to disengage from aversive emotional stimuli thereby enabling greater emotional flexibility (Lutz et al., 2008). In addition mindful practices are proposed to strengthen flexible response tendencies (e.g. Moore & Malinowski, 2009), increasing non-judgemental awareness thereby facilitating healthy engagement with thoughts and emotions (A. M. Hayes & Feldman, 2004), reducing emotional reactivity (e.g. Arch & Craske, 2006), and enhancing emotion differentiation

(e.g. C. L. Hill & Updegraff, 2012). The ability to perceive thoughts and emotions as transient rather than taking them as reality allows disengagement from overt and covert habitual reactions (J. M. Williams, 2008).

Finally, mindful emotion regulation fundamentally differs from emotion regulation strategies such as reappraisal or suppression in the way in which emotions and thoughts are perceived (Chambers et al., 2009). Reappraisal and suppression strategies, for example, are based on the premise that thoughts and emotions have some form of inherent existence and therefore aversive thoughts and emotions must be acted upon, manipulated or avoided to reduce distress (Chambers et al., 2009). For example, by contrast a mindful understanding of mental phenomena holds that they are transitory mental events that therefore require no action (Chambers et al., 2009). From this perspective mindfulness practices may reasonably be argued to enhance adaptive emotion regulation in part by reducing the perceived need to regulate emotions and reducing the perceived strength of emotions to be regulated.

2.3.6. Decoupling of the ‘self’ from experiences, events, and mental processes

The term re-perceiving (also known as meta-cognitive awareness, or insight and often encompassed within decentring and defusion), is used within discourse around mindfulness to describe a process of seeing the transitory and insubstantial nature of thoughts, emotion and sensations and the separate nature of the ‘self’ (e.g., ego, self-concept) from such mental phenomena (Shapiro et al., 2006). It should be noted that this interpretation is strongly influenced by Buddhist discourse and reflects the author’s stance, not all interpretations go as far as considering the insubstantial nature of mental phenomena and the self-experiencing it. Re-perceiving is suggested to have a range of

psychological and behavioural consequences including interruption and de-automatisation of habitual thinking patterns and associated physical and behavioural reactions (Brown, Ryan, & Cresswell, 2007a). Preliminary evidence suggests that mindfulness training leads to increases in meta-cognitive awareness (Hargus, Crane, Barnhofer, & Williams, 2010; Teasdale et al., 2002) and reductions in rumination (Jain et al., 2007). Increases in meta-cognitive awareness, or decentring, may positively influence clinical outcomes such as depressive relapse (Bieling et al., 2012). Re-perceiving is proposed to provide the opportunity to modify potentially maladaptive behaviours that have become automatic (Dutton, 2008) and reinforcing due to the temporary relief they provide from internal aversive experiences (S. C. Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). For example, research provides evidence that mindfulness training alters how individuals relate and respond to negative emotions, enabling acceptance and decentred observation rather than escape and avoidant behaviours (Arch & Craske, 2006; Bieling et al., 2012). Although MBSR does not explicitly instruct participants to change relations to thinking or emotional reactivity, it has been shown to diminish the habitual tendency to emotionally react to and ruminate on transitory thoughts and physical sensations (Ramel, Goldin, Carmona, & McQuaid, 2004). In doing so mindfulness practices are proposed to weaken (or moderate) associations between aversive states, distress, and behavioural responses, reducing tendencies for such experiences to trigger impulsive often maladaptive patterns of reactive behaviour (Adams et al., 2012; Ostafin et al., 2012). For example, lower dispositional mindfulness is associated with greater self-reported emotional eating and reward motivated eating (Lattimore, Fisher, & Malinowski, 2011) and eating pathology (e.g. Lavender, Gratz, & Tull, 2011). Furthermore, dispositional mindfulness has been found to moderate associations between dysfunctional eating related thoughts (e.g. fear

of weight gain), disordered eating (Masuda, Price, & Latzman, 2012) and to weaken the relationship between automatic alcohol motivation (measured using Implicit Association Test of alcohol-motivation) and heavy drinking (Ostafin & Marlatt, 2008). Additionally randomised controlled trials indicate that mindfulness training can moderate relations between distress and smoking urges (Adams et al., 2013; Bowen & Marlatt, 2009) and weaken relations between automatic mental processes and alcohol use (Ostafin et al., 2012). Taken together these findings suggest that mindfulness practices may reduce the likelihood that automatic reactivity to emotions and thoughts are carried over into maladaptive behaviour.

Mindfulness practices are proposed to influence self-regulation of behaviour by creating the space to perceive a separation between the self and events, emotions, and experiences (Glomb et al., 2011). Mindfulness-based practices that train individuals to observe internal and external stimuli objectively, are proposed to create or enhance meta-awareness. The term meta-awareness describes the “the ability to take explicit note of the current contents of consciousness” (Schooler et al., 2011, p. 319) in which thoughts and emotions are experienced as transient mental events rather than as truths (Hargus et al., 2010). Low meta-awareness is characterized by an inability to distinguish the self from the *content* of negative thoughts and emotions, such that the self is defined by or is synonymous with negative mental phenomenon (Segal et al., 2002).

Mindfulness practices create the opportunity for individuals to perceive distance between themselves and their thoughts, emotions, and experiences in which ones thoughts are viewed as ‘events in the mind rather than necessarily being reflections of reality or accurate self-view’ (Feldman et al., 2010, p. 1002). When the ego is separated from events (internal or otherwise), negative events may be decoupled from the self and become less threatening (Glomb et al., 2011). For example, thoughts about what could

go wrong or potential failure at a task or in a difficult situation can be seen as “just those nerves talking,” rather than as a valid indication of inadequacy. Hargus, Crane, Barnhofer and Williams’ (2010) findings indicate that participating in an MBCT programme was associated with a significant improvement in meta-awareness, demonstrating that mindfulness can help people “learn to uncouple the sensory, directly experienced self from the ‘narrative’ self” (J. M. Williams, 2010, p. 1). Preliminary evidence has indicated that even temporarily heightened mindfulness (via experimental manipulation) increases separation between self-worth and experiences such as interpersonal rejection (Heppner et al., 2008). Preliminary neurobiological research, although not explicitly testing the decoupling hypothesis, supports the assertion that there may be less connectivity between emotion processing and self-relevant processing areas of the brains of mindfulness practitioners (Davidson, 2010). For example, one study found that when subjects were exposed to a manipulation designed to induce sadness, those who were trained in mindfulness techniques reported just as much sadness as others, but their fMRI scans showed less activity in the brain regions associated with self-referential processing (Farb et al., 2010). Farb and colleagues (2010) suggest that the differences in neural patterns may reflect objectification of emotions as sensory information rather than “affect laden threats to the self” (Farb et al., 2010, p. 31).

2.4. The role of difficulties in emotion regulation and habitual negative self-thinking

The current research programme examines the role of two potential mediating mechanisms in the relationship between mindfulness and reward motivated eating: difficulties in emotion regulation and habitual negative self-thinking. In reviewing

research examining proposed mechanisms of mindfulness it is evident that the way in which mental phenomena (e.g. emotions and thoughts) are experienced influences each of the mechanisms and associated outcomes. Furthermore, difficulties in emotion regulation and habitual negative self-thinking have been associated with an increased vulnerability to experiencing psychological problems related to disordered eating behaviour (Svaldi, Tuschen-Caffier, Lackner, Zimmermann, & Naumann, 2012; Verplanken & Tangelder, 2011). As reviewed previously mindfulness practices change how thoughts and emotions are related to (e.g. Shapiro et al., 2006), are regulated (Chambers et al., 2009) and in turn can influence behavioural outcomes (e.g. Caldwell et al., 2012).

2.4.1. Difficulties in emotion regulation

Many of the behaviours that people use to regulate or distract themselves from aversive emotional states are associated with poor health outcomes such as excessive eating or alcohol consumption (Baumeister & Heatherton, 1996). Regulating emotions can itself reduce already limited self-regulatory resources (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Individuals may use eating as a form of emotion regulation (emotionally motivated eating) with the intention of experiencing hedonically rewarding states (positive reinforcement) and reducing negative affect (negative reinforcement; Koole, 2009). Research indicates that individuals can associate eating with a reduction, temporary numbing or escape from the awareness of negative emotions (Deaver, Miltenberger, Smyth, Meidinger, & Crosby, 2003; Heatherton & Baumeister, 1991). Adopting a mindful accepting and non-reactive approach to negative experiences reduces associated negative affect and therefore reduces depletion of self-regulatory resources through emotion regulation (Terry & Leary, 2011). Depletion in self-regulatory resources has been shown to differently effect dieters' activation of reward

and self-control pathways compared to non-depleted dieters, providing evidence of the neurological facets of this observed reduced capacity to resist temptations (Wagner, Altman, Boswell, Kelley, & Heatherton, 2013).

2.4.2. Measuring Difficulties in Emotion Regulation

This programme of research uses a multidimensional measure of difficulties in emotion regulation (DERS; Gratz & Roemer, 2004) which measures awareness and understanding of emotions, acceptance of emotions, the ability to maintain goal directed behaviour and ability to access emotion regulation strategies when experiencing negative emotions (Gratz & Roemer, 2004). As such the DERS measures dimensions of intrinsic processes of self-regulation rather than the capacity to regulate other people's emotions or be regulated by others (extrinsic processes; Gross & Thompson, 2007). Difficulties in any of these dimensions is proposed to limit adaptive emotion regulation (Gratz & Tull, 2010). The DERS has been used in several key mindfulness research studies (e.g. Roemer et al., 2009). The construct of emotion regulation as conceptualised by Gratz and Roemer (e.g. 2004; 2010) brings together previous descriptions of emotion regulation (see 2.3.4-5) and extends the concept beyond that of control of either the generation of emotion or its expression. Gratz and Roemer's (2004) description of difficulties with emotion regulation includes the lack of capacity to experience, discriminate, and respond spontaneously to a full range of emotions (Gross & Muñoz, 1995). As such, adaptive emotion regulation involves flexibility in modulating the experience of emotions rather than controlling or eliminating certain undesirable emotions (Kashdan & Rottenberg, 2010). This modulation of the experience of emotions is thought to reduce the urgency associated with the emotion so that the

individual is able to control their behaviour as opposed to focussing on attempts to control the emotions themselves (Gratz & Roemer, 2004). Emotion regulation in the context of the present thesis and contemporary literature holds with a functionalist theory of emotions in which emotions provide information about the present moment and have the potential to guide behaviours (see for example Gross & Thompson, 2007; Teper et al., 2013). Therefore, no emotions or responses to emotions are considered maladaptive per se, rather how adaptive an emotion regulation strategy is based on the appropriateness of the response in the current situation (for discussion see Gross & Thompson, 2007).

Several psychological processes have been proposed to underpin the positive associations between mindfulness practice and adaptive emotion regulation. Firstly, increasing non-judgemental awareness is proposed to facilitate healthy engagement with thoughts and emotions (A. M. Hayes & Feldman, 2004). Secondly, mindfulness training of attention may result in an improved capacity to disengage from aversive emotional stimuli thereby enabling greater emotional flexibility (Lutz et al., 2008). Finally, mindfulness practice promotes meta-cognitive awareness; an ability to decentre from thoughts and emotions and see them as transient constructs rather than taking them as reality (Bishop et al., 2004; Kabat-Zinn, 1990). Decentring in this way allows disengagement from overt and covert habitual reactivity (J. M. Williams, 2008).

2.4.3. Habitual Negative Self-Thinking

The construct of habitual negative self-thinking is distinct from other forms of repetitive thought such as rumination, as it relates to the process rather than the content aspect of cognition (Verplanken, Friborg, Wang, Trafimow, & Woolf, 2007). Mental

habit thus is a characteristic of *how* we think (process) rather than *what* we think (content). It is characterised by automaticity, lack of awareness, mental efficiency, lack of control, lack of conscious intent and can become part of one's self-description (Verplanken, 2010). Automaticity of thinking can arise from different sources including learning from prior experiences and ingrained use of mental models (Glomb et al., 2011). Despite offering individuals a clear evolutionary benefit (i.e. quick information processing and responses to threatening stimuli), automaticity may reduce or negate the capacity to fully experience the present moment (Glomb et al., 2011). That is, automaticity provides mental efficiency at the cost of present-moment awareness and control (Bargh, 1994). For example, we may find ourselves eating at a particular time despite not being hungry because it is what we always do. We may complete tasks without remembering actually doing them because of deeply ingrained, automatic responses to environmental cues (Bargh & Chartrand, 1999). Verplanken (2007) provides empirical evidence that habitual negative self-thinking can be subject to meta-cognitive reflection encompassed in meta-awareness.

2.4.4. Measuring Habitual Negative Self-Thinking

Verplanken et al.'s (2007) measure of mental habit is used throughout this thesis allowing discrimination between the content, the degree of negativity and the habitual quality of thinking. Two cognitive content measures are derived from a thought listing task: the number of negative self-thoughts provided (TNL) and the degree of negativity of these thoughts (TNL_{av}). The habitual quality of the negative self-thinking is assessed with the 12-item Habit Index of Negative Thinking (HINT; Verplanken et al., 2007). This discrimination addresses the process oriented conceptions of mindfulness which suggest that the cultivation of mindfulness alters thought processes, how we think, rather than the content of thoughts (Teasdale et al., 2002).

Through observation of thoughts arising in the mind, mindful non-judging awareness may allow disengagement from automatic thought patterns and perceptual filtering driven by emotions and schemas from the past (Siegel, 2007). That is, individuals are able to experience ‘what is’ instead of a narrative about what is (Shapiro et al., 2006). Mindful awareness is suggested to allow individuals to consciously bring awareness to their thoughts and to have greater cognitive flexibility in response to thoughts (Siegel, 2007).

2.5. Eating behaviour

Eating behaviour is an example of a health behaviour that has far reaching consequences for both the individual and wider society. Obesity and being overweight significantly increases individuals’ risk of developing diet-related chronic diseases including type 2 diabetes, cardiovascular disease, stroke, and certain forms of cancer (World Health Organisation, 2009). At present in England one in four adults can be described as obese. It is predicted that this will rise to nine in ten by 2050 (Department of Health, 2013). Obesity has also been associated with negative psychological outcomes such as depression, lower self-esteem and perceived stigmatisation (Friedman et al., 2005; Puhl & Heuer, 2009). The exact causes of obesity vary individually but are likely to be a complex interaction between genetic, behavioural, environmental and psychosocial factors (Butland et al., 2007; Jebb, 1997).

Eating is essential to the survival of humans and is subject to intense regulation by the central nervous system. Research proposes two broad interacting systems that control food intake: homeostatic and hedonic systems (Blundell et al., 2005). The term homeostatic describes processes that serve a biological need balanced by a

physiological energy depletion signalling system (Blundell et al., 2005). If eating was controlled only by homeostatic mechanisms and not disturbed by other factors, most humans would be at their ideal body weight and eating would be a facet of existence considered in the same way as breathing or elimination (Saper, Thomas, & Elmquist, 2002). However, research indicates that the majority of eating, in a food-abundant environment, occurs to prevent hunger prior to the experience of significant energy depletion and associated physiologic signalling that forms part of the homeostatic system (Lowe, Van Steenburgh, Ochner, & Coletta, 2009). It is now recognised that much of the excessive energy intake contributing to overweight and obesity is driven by pleasure or the rewarding properties of readily available energy dense palatable foods (Appelhans, 2009). Humans will often continue to eat such palatable foods even when homeostatic signals indicate that energy requirements have been met. Hedonic factors (reward: taste, pleasure) play a large role in this type of eating. According to Lowe and Butryn (2007) food consumption in the absence of an energy deficit or associated physical signal of satiety is driven by hedonic hunger rather than homeostatic mechanisms. It is well known that certain foods, particularly those rich in sugars and fat, are potently rewarding (Lenoir, Serre, Cantin, & Ahmed, 2007). High calorie foods can promote overeating (eating that is uncoupled from energy needs) and trigger learned associations between the stimulus and the reward (conditioning). In evolutionary terms, this property of palatable foods and learned associations was advantageous in environments where food sources were scarce and/or unreliable as it ensured that food was eaten when available (Lowe, Bocarsly, & Del parigi, 2008). This enabled energy to be stored in the body (as fat) for future use (e.g. Lowe et al., 2008). Unfortunately, in western societies, like ours, where food is plentiful and constantly available, this adaptation has become a liability (e.g. van den Bos & de Ridder, 2006).

Reward motivated behaviour has been studied most extensively in the context of drug addiction where brain reward systems have been identified that allow the reinforcement of responses that have no homeostatic value (Saper et al., 2002). A number of studies draw parallels between the neural substrates, including the key role of opioid receptors, in both food reward and drug reward (Kelley et al., 2002). There is now evidence that comparable dopaminergic responses are linked with food reward and drug reward and that these mechanisms are likely to play a role in excessive food consumption and obesity (Volkow, Wang, Fowler, Tomasi, & Baler, 2012). In addition to the positive reinforcing properties of highly palatable foods, problematic reward motivated eating behaviours may be maintained by the temporary relief provided from aversive internal experiences (S. C. Hayes et al., 1996). For example, continued use of food in this way is negatively reinforced by the associated relief from uncomfortable thoughts, emotions and sensations. It is worth remembering, however, that the regulation of food intake behaviour is much more complex than that which regulates drugs; drug intake is predominantly mediated by the rewarding effects of drugs whereas food intake is modulated not just by its rewarding effects (hedonic factors) but also by multiple peripheral and central factors that sense nutrient requirements in the body necessary for survival (homeostatic factors; Volkow et al., 2012). Therefore, approaches are required that enable people to live in what has been described an obesogenic environment which may exploit biological predispositions (Blundell et al., 2005) and lead to chronic activation of the hedonic system (Lowe & Levine, 2005). Mindfulness practices have been proposed as a way to reconnect individuals with the body's innate homeostatic feedback mechanisms key to behavioural self-regulation (Caldwell et al., 2012; Kristeller, Baer, & Quillian-Wolever, 2006; Kristeller & Wolever, 2011; Wolever & Best, 2009) and promote adaptive responding to thoughts, emotions, and external

cues that may otherwise increase tendencies to engage in maladaptive behaviours such as emotional eating (e.g. Gilbert & Waltz, 2010). Emotional eating and eating in response to external cues have been shown to be two forms of reward motivated eating susceptible to change through mindfulness-based interventions (O'Reilly, Cook, Spruijt-Metz, & Black, 2014). The term reward motivated eating is used within this thesis to describe eating associated with the rewarding properties of food and the reward of altering emotional experience that may increase the tendency to overeat or eat in the absence of hunger.

2.5.1. Measuring reward motivated eating

Throughout this thesis, approach reward motivated eating behaviour is examined using the uncontrolled eating subscale and avoidance reward motivated eating behaviour by the emotional eating subscale of the Three Factor Eating Questionnaire (TFEQ-R18V2; Cappelleri et al., 2009). The Three-Factor Eating Questionnaire (TFEQ) is a self-report measure widely used in studies of eating behaviour in overweight and normal weight individuals (Cappelleri et al., 2009). The TFEQ is used throughout this research programme to extend previous research into the relations between dispositional mindfulness and each of the subscales (Lattimore et al., 2011). In its original form (51 items) the TFEQ assessed three dimensions of eating behaviour: Cognitive restraint, disinhibition and hunger (Stunkard & Messick, 1984). However, subsequent studies have provided mixed support for the factor structure. Two studies were unable to replicate the three factors (Karlsson, Persson, Sjostrom, & Sullivan, 2000; Mazzeo, Aggen, Anderson, Tozzi, & Bulik, 2003) the later applying confirmatory approach in a large sample (N= 1,510). In contrast, a third study based in an Australian population of undergraduates essentially confirmed the structure, however noting that the three main categories could be further subdivided (Bond, McDowell, & Wilkinson, 2001).

A revised shortened version of the TFEQ, the TFEQ-R18, was developed using data from severely obese individuals in Sweden (Karlsson et al., 2000). The revised structure maintained the cognitive restrained factor but notably measured uncontrolled eating and emotional eating factors that subsumed items previously measured within the disinhibition and hunger factors. Uncontrolled Eating refers to the tendency to eat more than usual when feeling hungry or when exposed to food stimuli and is made up of items from the original disinhibition and hunger scales. The emotional eating factor measures the tendency to overeat in response to negative mood states and comprises items from the disinhibition scale.

The TFEQ was refined further by the addition of three items on the emotional eating subscale to reduce ceiling and floor effects. The 21-item (TFEQ-R21) version demonstrated improved psychometric properties with a robust stable factor structure and evidence indicating construct validity in Swedish studies (Tholin, Rasmussen, Tynelius, & Karlsson, 2005) and in a diverse sample of obese and non-obese participants in the USA (Cappelleri et al., 2009). The latter study utilised confirmatory analysis further refining the measure by removing three items from the cognitive restraint scale whilst confirming the three factor structure: Cognitive Restraint, Uncontrolled Eating and Emotional Eating (TFEQ-R18V2). Currently researchers are using the more psychometrically robust versions of the TFEQ (TFEQ-R21 and TFEQ-R18V2); however, others continue to use the original 51-item version therefore caution is needed when making comparisons across studies.

Disinhibition and its effects on weight regulation have been reviewed concluding that based on its relations with, for example, Body Mass Index and weight regulation, the factor captures a psychological entity that can be described as trait like (Bryant, King, & Blundell, 2007). Trait disinhibition as measured by the TFEQ

Uncontrolled and Emotional Eating subscales measures the tendency to be over responsive to food stimuli in the environment and to eat in response to negative affect (Lattimore et al., 2011). Based on its associations with overeating it is considered a behavioural proxy for body weight variation (Bryant et al., 2007). The Uncontrolled and Emotional Eating subscales reflect a vulnerability to overeat in response to internal and external stimuli and therefore gain weight. This is evidenced in research highlighting associations with trait disinhibition and weight regain after completion of weight-loss programmes (Cuntz, Leibbrand, Ehrig, Shaw, & Fichter, 2001), and as a predictor of binge eating and dietary relapse (Bryant et al., 2007). An overeating disposition (repeatedly consuming energy beyond your energy needs) represents an appetitive vulnerability for normal weight individuals to gain weight (Lowe, Butryn, et al., 2009). The terms uncontrolled and emotional eating can both be said to describe forms of overeating dispositions or vulnerabilities which appear to have trait like qualities (Bryant et al., 2007). To avoid confusion surrounding the use of the term disinhibition with regard to the previous versions of the TFEQ the term reward motivated eating will be used throughout the thesis to describe uncontrolled and emotional eating as measured by the Three-Factor Eating Questionnaire: TFEQ-R18V2 (Cappelleri et al., 2009).

2.6. A mindful approach to addressing eating behaviours

Reviews of weight-loss and maintenance programmes clearly highlight the short term effectiveness of traditional methods that typically incorporate diet, physical activity and cognitive focused strategies' contrasted with the long term ineffectiveness of such approaches (Mann et al., 2007). Typically evidence suggests that most weight is regained within three years (Butryn, Webb, & Wadden, 2011). To date the majority of research examining the efficacy of MBIs to promote weight-loss and change eating behaviours are multi-component programmes in which mindfulness practices are

delivered as an adjunct to existing evidence based interventions (e.g. Forman, Butryn, Hoffman, & Herbert, 2009; Kristeller, Wolever, & Sheets, 2013). The following review provides an overview of the mindfulness-based approaches to eating (mindfulness-based approaches specifically designed to address eating behaviour are reviewed in chapter 6.2.3.). In contrast to more traditional approaches to behavioural change mindfulness-based approaches may attenuate conditioned relations between cue and response by increasing understanding of these emotional, cognitive and behavioural patterns of reactivity and knowledge of alternative response (Witkiewitz & Bowen, 2010). In doing so, MBAs may enable re-patterning of automatic behaviours (Dalen et al., 2010). In contrast to a focus on cutting calories, or the introduction of external behavioural rules (e.g. drastically reducing carbohydrate intake in the Atkins diet), a mindfulness-based approach may enable people to reduce or maintain weight and improve health outcomes by restoring the individual's sensitivity for, and ability to respond to, natural physiological cues of hunger and satiety (Dalen et al., 2010). For example, mindful awareness and reduced behavioural reactivity enabled by greater distress tolerance may reduce non-hunger eating in several ways (Kristeller et al., 2006; Kristeller & Wolever, 2011; Wolever & Best, 2009). Specifically mindful eating practices, explored and described in greater detail in chapter 6.2.4., may increase awareness of the physical sensations of hunger and fullness, resulting in decreased food intake and increased satisfaction (Kristeller et al., 2013). For example, by promoting a willingness to remain in contact with aversive emotions rather than using eating as an avoidant or escape oriented coping strategy mindfulness practices are proposed to reduce eating in response to aversive emotions (Alberts et al., 2012). Previous research provides evidence for intervention-related increases in exposure following participation in a standard MBSR programme (Carmody et al., 2009). Reduced reactivity is proposed

to enhance tolerance; therefore the cultivation of mindfulness becomes self-reinforcing (Caldwell et al., 2012). The cultivation of non-judgmental awareness also allows individuals practicing mindfulness to better understand and decouple automatic behaviours that have become linked to emotional reactions, negative or distorted thinking processes, or misattribution of physical sensations (Wolever & Best, 2009). Mindfulness practices are also proposed to cultivate self-acceptance and compassion, qualities that may disrupt the cycle of distress-overeating, negative emotions, and harsh self-judgement often accompanying compulsive eating (Gongora, Derksen, & van Der Staak, 2004). Together, these elements of mindful awareness and associated processes of exposure and distress tolerance are proposed to enable re-establishment of the body's innate feedback mechanisms key to behavioural self- regulation (Caldwell et al., 2012; Kristeller et al., 2006; Kristeller & Wolever, 2011; Wolever & Best, 2009).

Chapter Three:

Dispositional Mindfulness and reward motivated eating:

The role of emotion regulation and mental habit

3.1. Study overview

Evidence regarding the effectiveness of mindfulness-based interventions (MBIs) for health-related behaviours including eating behaviours is emerging and further studies are required to demonstrate potential benefits and underlying mechanisms of MBIs in these domains. Individual differences in dispositional mindfulness have been associated with reward motivated eating, specifically uncontrolled and emotional eating tendencies related to obesity and eating problems. It was expected that dispositional mindfulness would be negatively related to both uncontrolled and emotional eating and that these relations would be mediated by difficulties in emotion regulation and habitual negative self-thinking. Meditators, in comparison to non-meditators, were expected to have greater levels of dispositional mindfulness, fewer difficulties with emotion regulation and habitual negative self-thinking, and reduced uncontrolled and emotional eating tendencies. A cross-sectional survey was completed by self-selecting sample of female and male meditators and non-meditators (N = 632). The survey consisted of reliable and valid measures to assess dispositional mindfulness, difficulties in emotion regulation, habitual negative self-thinking, and uncontrolled and emotional eating. Analysis found that lower levels of dispositional mindfulness were associated with greater difficulties in emotion regulation, habitual negative self-thinking and both emotional and uncontrolled eating tendencies. Difficulties in emotion regulation significantly mediated the mindfulness-uncontrolled eating relationship whereas habitual negative self-thinking significantly mediated the mindfulness-emotional eating relationship. As predicted, meditators reported greater levels of dispositional

mindfulness, fewer difficulties with emotion regulation and habitual negative self-thinking and reduced uncontrolled eating tendencies. The findings provide evidence for the role of difficulties in emotion regulation and habitual negative self-thinking as mechanisms by which dispositional mindfulness may influence eating tendencies. The role and influence of these mechanisms are examined in an experimental study of the effects of a mindful induction on hedonic reactions to food (Study 3, chapter five) and in a mindful meditation practice based intervention (Study 4, chapter six). The difference between meditators and non-meditators on measures of dispositional mindfulness, reward motivating eating and the proposed mechanisms suggests that mindfulness meditation practice may reduce unhealthy reward motivated eating tendencies related to obesity and eating problems.

3.2. Introduction

Mindfulness-based interventions (MBIs) have recently been developed to address health-related behaviours including eating behaviours, weight management, alcohol consumption and physical activity (e.g. Ostafin et al., 2012; Salmoirago-Blotcher et al., 2013; Tapper et al., 2009). Further studies are required to demonstrate potential benefits and underlying mechanisms of MBIs in these domains. To date research has focused on the role of emotion regulation as a mechanism in the relationship between mindfulness and health-related behavioural outcomes (Chambers et al., 2009; Chiesa, Brambilla, & Serratti, 2010; Chiesa et al., 2013). The current study examines the theoretically and empirically based premise that difficulties in emotion regulation and habitual negative self-thinking mediates relations between dispositional mindfulness and reward motivated eating (see chapter 2.4.). The study also examines which facets of mindfulness explain unique variance in the eating outcome measures and tests the hypothesis that experience of mindfulness meditation will be associated with greater levels of dispositional mindfulness, reduced difficulties in emotion regulation, habitual negative self-thinking and uncontrolled and emotional eating. This study therefore extends previous research with the inclusion of mental habit and by examining the proposed relations in a non-clinical mixed gender sample. The outcome of these investigations will provide insight into potential mechanisms of change that may be relevant for the development of preventative and maintenance focused behavioural change programmes.

As a potent example of reward motivated behaviour governed by automatic processes (Lowe, Van Steenburgh, et al., 2009), eating behaviour provides a useful vehicle for studying proposed mechanisms of mindfulness. Mindfulness has been shown

to have the potential to moderate the influence of automatic processes associated with approach-avoidance tendencies evident in maladaptive reward motivated behaviour (e.g. Ostafin et al., 2012). Research examining the effects of mindfulness meditation and associations between dispositional mindfulness and substance abuse (reviewed in chapter 2.3.6.) indicates that mindfulness processes may decouple associations between stimuli and behaviour thereby moderating behavioural tendencies associated with addiction (e.g. craving and reactivity to negative affect; Ostafin et al., 2012). Such research provides insight into the potential of mindfulness as a process to effect behavioural change. The relevance of addiction research when considering the influence of mindfulness on eating behaviours is based on the premise that there are shared vulnerabilities rather than identical processes underlying substance addiction and obesity (e.g. difficulties in emotion regulation, cognitive rigidity, chronic relapsing conditions; Ziauddeen, Farooqi, & Fletcher, 2012).

Despite emergent research supporting the use of mindfulness-based approaches in the treatment of problematic eating tendencies there is limited research examining mechanisms of influence. Such an approach has the potential to improve the design and delivery of interventions and increase understanding of contexts, problems and populations for whom mindfulness-based approaches might be beneficial. Available research suggests that greater dispositional mindfulness is associated with a reduced tendency to experience problematic eating behaviours including bulimic symptoms (Lavender, Jardin, & Anderson, 2009), disordered eating-related cognitions (Masuda & Wendell, 2010), and uncontrolled and or emotional eating (Lattimore et al., 2011). However, with the exception of the latter study, mindfulness was measured using a one-dimensional mindfulness measure: the Mindful Attention and Awareness Scale (MAAS; Brown & Ryan, 2003) which does not address the multifaceted nature of mindfulness

and measuring ‘mindlessness’ rather than mindfulness (Van Dam, Earleywine, & Borders, 2010). A single study (Lavender et al., 2011) has examined the relations between eating pathology as measured by the Eating Attitudes Test-26 (Garner, Olmsted, Bohr, & Garfinkel, 1982) and multifaceted dispositional mindfulness as measured by the FFMQ (Baer, Smith, et al., 2006). The EAT-26 assesses attitudes and behaviours associated with anorexia and bulimia nervosa. Hierarchical regression analyses indicated that four facets of dispositional mindfulness were uniquely associated with eating pathology above and beyond self-reported anxiety and depression: *acting with awareness, non-reactivity, non-judgement, and describing* (Lavender et al., 2011). The current analysis examines the direct relations between multifaceted dispositional mindfulness (Baer, Smith, et al., 2006) and indicators of reward motivated eating which also reflects disordered eating tendencies therefore a similar pattern of results was expected.

In addition to the direct effects of increased mindfulness in daily life on eating behaviours the current study examines the mediating role of emotion regulation and habitual negative self-thinking. An overview of empirical and theoretical evidence for these as intervening variables was reviewed in chapter 2.2. Difficulties in emotion regulation are increasingly being viewed as a transdiagnostic factor in psychopathology and are evident in disorders where automatic reactivity to reward characterises unhealthy behavioural outcomes including eating disorders and addiction (Svaldi et al., 2012; Witkiewitz, Lustyk, & Bowen, 2013). Past research has provided evidence for associations between eating pathology and emotion regulation difficulties: lack of emotional clarity, non-acceptance of emotional responses, and limited access to effective emotion regulation strategies (Lavender & Anderson, 2010; Whiteside et al., 2007). Research has also demonstrated that the habitual component of negative self-

thinking accounted for unique variance in phenomena such as depression, anxiety and eating disorder propensity (Verplanken et al., 2007; Verplanken & Tangelder, 2011). Emotion regulation and forms of repetitive thinking sharing characteristics of habitual negative self-thinking, such as rumination, have been shown to be amenable to modification by mindfulness meditation (e.g. Chambers et al., 2009; Jain et al., 2007; Lutz et al., 2008).

Mindfulness meditation practices have been described as a tool by which adaptive emotion regulation and adaptive relations with thoughts and emotions may be enhanced (e.g. Bishop et al., 2004; Lavender et al., 2011). There is a growing appreciation of mindfulness meditation as a cognitive process that has the potential to enhance self-regulation and to disengage automatic emotional, cognitive or behavioural reactivity (e.g. Kristeller, 2007). Meditation practice, although not the only method to cultivate an ability to bring mindfulness to the present moment, is the predominant method employed within MBIs and the clinical applications of mindfulness in therapeutic settings. Practiced regularly over longer time spans of months and years, the state of mindfulness cultivated in mindfulness meditation is proposed to become a stable, dispositional tendency to be mindful across situations in daily life (Baer, Smith, et al., 2006; Brown, Ryan, & Cresswell, 2007). The theoretically inverse relationship between mindfulness and difficulties in emotion regulation and avoidant or rigid cognitive patterns supports the use of meditative mindfulness practices within interventions designed to reduce related problematic eating behaviours. A variety of studies provide evidence for an association between unhealthy eating patterns, difficulties in emotion regulation and avoidant cognitive strategies (e.g. Deaver et al., 2003; Whiteside et al., 2007), consistent with theoretical concepts of eating pathology such as the escape model (e.g. Heatherton & Baumeister, 1991). Difficulties in

awareness and understanding of emotions, acceptance of emotions, ability to maintain goal directed behaviour and to access emotion regulation strategies as measured by the DERS are proposed to limit adaptive emotion regulation (Gratz & Tull, 2010). The theoretical background for the DERS was described in chapter 2.4.2.

As a repetitive form of thought habitual negative self-thinking (described in chapter 2.4.4.) is encompassed within a growing literature suggesting that repetitive thinking is a feature evident across psychopathologies (Watkins, 2008). The quality and automaticity of habitual thought processing can lead to unquestioning acceptance and maladaptive responding to inaccurate and distorted constructions of reality (Brown, Ryan, & Cresswell, 2007; Kabat-Zinn, 1990) such as negative thoughts about the self. Negative self-thinking plays a key role in the escape model of binge eating (Heatherton & Baumeister, 1991). Individuals are proposed to hold negative self-views and experience aversive self-awareness from which they are motivated to avoid or escape, resulting in a narrowing of attention and weakened food inhibitions. However, most of the research in this area was conducted with chronic dieters in laboratory settings (Heatherton, Striepe, & Wittenberg, 1998; Jackson, Cooper, Mintz, & Albino, 2003). Despite this limitation the research highlights the importance of the self-referential nature of cognitive mood inductions when evidencing disinhibited eating in response to emotional distress (Heatherton et al., 1998). It is reasonable to expect that such effects would be ubiquitous if the negative self-thinking occurred at a habitual level in daily life.

Previous research has demonstrated that the habitual component of negative self-thinking accounted for unique variance in phenomena such as depression, anxiety and eating disorder propensity (Verplanken et al., 2007; Verplanken & Tangelder, 2011). In contrast to traditional approaches to alleviate dysfunctional thinking patterns, (e.g.

cognitive behavioural therapy) that focus primarily on the content of thoughts, the habitual component of thinking patterns may be more sensitive to process orientated approaches such as MBIs. Verplanken and Tangelder (2011) suggest two key processes by which mindfulness may mitigate dysfunctional effects of habitual negative thinking. Firstly, the awareness component may interrupt the automatic quality of habitual thinking, and secondly, the acceptance component may reduce the risk of dysfunctional consequences by alleviating the weight that negative thoughts are given (Verplanken & Tangelder, 2011). This may reduce emotional distress associated with experiencing habitual negative self-thinking and therefore in turn reduce engagement in emotional eating behaviours to alleviate aversive internal states (Heatherton & Baumeister, 1991). The current study uses both the cognitive content and The Habit Index of Negative Thinking (HINT; Verplanken et al., 2007) to measure the habitual quality of negative self-thinking.

Research has begun to examine the effects of mindfulness meditation specifically rather than the effects of multi component MBIs on a range of psychological, physical and behavioural outcomes including mindfulness, cognitive rigidity and flexibility, emotion regulation, thinking processes and self-control or regulation.

The phenomenological experience of mindfulness meditation involves learning to shift and focus the attention at will onto an object of choice, such as bodily sensations or an emotional experience, while disengaging from usual conditioned reactivity or elaborative processing (e.g. Bishop et al., 2004; Kristeller, 2007). The training of attention skills, central to most psychological and Buddhist conceptualizations of mindfulness practices (Lutz et al., 2008), is thought to underpin emotional and cognitive flexibility, bringing about the ability to maintain non-judging awareness of one's own

thoughts, feelings, and experiences in more general terms (Malinowski, 2013b). This is proposed to change the quality of one's behaviour and lead to positive health outcomes and well-being (Chiesa & Malinowski, 2011; Malinowski, 2013b; Wallace & Shapiro, 2006).

Mindfulness meditation, has been shown to positively enhance mechanisms involved in self-control including emotion regulation (Baer et al., 2004; Brown & Ryan, 2003), attention regulation (Hodgins & Adair, 2010; Jha, 2013; Jha, Krompinger, & Baime, 2007) working memory and response inhibition (Chan & Woollacott, 2007; Zeidan, Gordon, Merchant, & Goolkasian, 2010). Indeed, there is preliminary evidence that meditation training can result in increased control and more efficient use of limited brain resources (Slagter et al., 2007). Mindfulness meditation has been described as one of the few tools for systematic cultivation of emotional equanimity, an advanced level of stress and affect tolerance with which even beginner meditators may experience decreased reactivity and growing ability to "let things be" (Wallace & Shapiro, 2006). For example, participants who had engaged in a brief mindfulness meditation exercise have shown reduced negativity to repetitive thoughts (Feldman et al., 2010), reduced dysphoric mood compared to a rumination and a distraction control groups or a sham meditation condition (Broderick, 2005; Zeidan, Johnson, Gordon, & Goolkasian, 2010), less emotional interference when completing attention based tasks (Ortner, Kilner, & Zelazo, 2007) and greater emotion regulation inferred by lower self-reported negative affect in response to negative pictures and a greater willingness to expose oneself to negative pictures (Arch & Craske, 2006; Erisman & Roemer, 2010; Verplanken & Fisher, 2013). In addition, mindfulness meditation has been proposed to attenuate prolonged reactivity to emotional stimuli by enabling individuals to objectively appraise aversive stimuli as transitory that therefore may not warrant emotional reactions (e.g.

Cahn & Polich, 2006; Lutz et al., 2008; Ortner et al., 2007; Y. Y. Tang et al., 2007).

The ability to objectively appraise stimuli may be an explanatory component of mindfulness meditations association with adaptive emotion regulation evidenced in a range of studies (Chambers et al., 2009; Chiesa et al., 2013; Gratz & Tull, 2010; Kumar, Feldman, & Hayes, 2008) and cross-sectional surveys (e.g. Lykins & Baer, 2009). For example, Lykins and Baer (2009) report the findings of research that compared long-term meditators with demographically similar non-meditators on measures including mindfulness (FFMQ), psychological symptoms and well-being, cognition- related variables and emotion-related variables. In brief, meditators scored significantly lower on psychological symptoms and higher on psychological well-being in comparison to non-meditators. Group differences in the expected directions were also seen for cognitive failures, rumination, reflection, thought suppression, and difficulties in emotion regulation. Mediation analyses indicated that meditation practice was associated with increased mindfulness in daily life, which in turn was related to decreased rumination, decreased fear of emotion, and increased behavioural self-regulation (Lykins & Baer, 2009).

To examine the effects of mindfulness meditation researchers predominately compare meditators with non-meditators (e.g. Lykins & Baer, 2009) or measure the effects of brief mindfulness meditation practices on subsequent outcomes in comparison to a control condition (e.g. Greenberg, Reiner, & Meiran, 2012). As might be expected, mindfulness meditation experience has been shown to influence levels of self-reported mindfulness and, in turn, is associated with improved psychological well-being (Carmody & Baer, 2008; Josefsson, Larsman, Broberg, & Lundh, 2011; Lykins & Baer, 2009). For example, in comparison with non-meditators, experienced meditators have scored higher on all mindfulness facets of the FFMQ (Baer, Smith, et al., 2006) except

the *Describe* subscales (Josefsson et al., 2011). Multiple mediation analysis also found an indirect effect of meditation experience on psychological well-being via the five mindfulness facets (Josefsson et al., 2011). Mindfulness meditation is widely conceptualised as involving present moment awareness with a non-judgemental or accepting attitude (e.g. Bishop et al., 2004) as such it has been proposed to enhance cognitive flexibility (Moore & Malinowski, 2009) and reduce cognitive rigidity (Greenberg et al., 2012). Greenberg and colleagues (2012) provide support for this assertion showing that experienced meditators compared with non-meditators (experiment 1) and engagement in mindfulness meditation practice compared to a control task (experiment 2) reduced cognitive rigidity in tasks requiring sensitivity to change in the present moment and the letting go of previous contingencies to see alternative solutions. The implications for such findings are wide reaching as cognitive rigidity is seen as part of the aetiology of psychopathology (for review see Kashdan & Rottenberg, 2010) and maladaptive behaviours including eating disorders (e.g. Alberts et al., 2012; Schmidt et al., 2012; Shearin, Russ, Hull, Clarkin, & Smith, 1994).

Based on the findings reviewed, and theoretical associations, this first study aims to examine the relations between dispositional mindfulness, as measured by the Five-Facets of Mindfulness Questionnaire (FFMQ; Baer, Smith, et al., 2006), reward motivated eating, operationalised and measured by the Uncontrolled and Emotional Eating subscales of the Three-Factor Eating Questionnaire (TFEQ-R18V2; Cappelleri et al., 2009), difficulties in emotion regulation as measured by the Difficulties in Emotion Regulations Scale (DERS; Gratz & Roemer, 2004) and habitual negative self-thinking as measured by the Habit Index of Negative Thinking (HINT; Verplanken et al., 2007). The current study extends previous research by including a measure of habitual negative self-thinking and examining relations between dispositional mindfulness and reward

motivated eating tendencies in a non-clinical mixed gender population. The intention is that findings will inform further experimental examination and development of a programme to engender healthier relationships with food and eating associated with the proposed mechanisms. The data was gathered from a large sample of mindfulness meditators and meditation naive individuals through the use of an online survey (N=632) and addresses four key research questions.

Firstly, what is the nature of the relations between dispositional mindfulness, eating measures, difficulties in emotion-regulation, and habitual negative self-thinking? Based on previous research, it was expected that higher levels of dispositional mindfulness would be associated with lower scores on Difficulties in Emotion Regulation, Habitual Negative Self-Thinking, and Uncontrolled and Emotional Eating measures. Secondly, what are the specific relations between facets of mindfulness as measured by the FFMQ and measures of eating tendencies? Based on Lavender and colleagues (2011) findings, it was expected that four facets (*acting with awareness, non-reactivity, non-judgement, and describing*) would be uniquely negatively associated with uncontrolled and emotional eating. Due to previous research, in which the observing facet of mindfulness functions differently across individuals based on meditation experience (Baer et al., 2008), no specific hypotheses were made in relation to this facet. Therefore, standard multiple regression analyses were used to explore the extent to which facets of mindfulness measured by the FFMQ explained unique variance in the dependent variables of uncontrolled and emotional eating. Thirdly, to what extent is the relationship between dispositional mindfulness and eating measures mediated by difficulties in emotion regulation and/or habitual negative self-thinking? Finally, how do current meditators and individuals who have never meditated differ on measures of dispositional mindfulness, emotion regulation, negative self-thinking and

eating behaviours? It was expected that experienced mindfulness meditation practitioners would differ significantly from non-meditators on the above mentioned constructs in reporting greater dispositional mindfulness, fewer difficulties in emotion regulation, habitual negative self-thinking and reduced uncontrolled and emotional eating tendencies.

3.3. Method

3.3.1 Participants and design

A total of 632 participants (457 female; 88% Caucasian; Age: $M = 34\text{yr}$, $SD = \pm 14.2$, range 18 to 78) completed an online cross-sectional survey. The majority of participants were from the UK (413), the USA (126) or Australia (17), and 87% spoke English as their first language. In line with Lykins and Baer's (2009) research, comparing meditators and non-meditators, participants were classed as regular meditation practitioners if they engaged in at least one meditation session per week. Participants with previous meditation experience who did not maintain a current meditation practice ($N=13$) or those whose meditation experience was solely through guided relaxation at the end of yoga or tai chi classes or the use of self-hypnosis tapes ($N=65$) were not included when comparing meditators and non-meditators on psychological or eating measures. This strategy resulted in the inclusion of 233 meditators (62% female) and 321 non-meditators (76% female) responses for comparisons of meditators and non-meditators. 88.3% of the included meditators stated that the term mindfulness was regularly used in relation to the type of meditation they practiced and that the meditation involved an "open presence that is highly aware of all inner and outer experiences without further evaluation or conceptualisation". In appreciation of participation, respondents were offered the opportunity to be entered

into a prize draw to win Amazon shopping vouchers, ranging in value from £20-£100 (or equivalent in US dollars).

3.3.2 Measures

3.3.2.1. Mindfulness

Dispositional mindfulness was assessed using the 39-item Five-Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, et al., 2006). All of the measures used within this thesis are provided in full in appendices 3A.1-4. Validation studies conducted on two large-scale samples (Baer et al., 2006; Baer et al., 2008) suggests a five facet structure: 1) *Acting with awareness* describes attending to one's actions in the present moment and can be contrasted with automatic, impulsive or habitual behaving (FFMQ-A; 8 items), e.g., "*It seems I am running on automatic without much awareness of what I'm doing*"; 2) *Non-judging* of experience means refraining from value judgements or self-criticism (FFMQ-NJ; 8 items) "*I tend to evaluate whether my perceptions are right or wrong*"; 3) *Non-reactivity* to inner experience (FFMQ-NR; 7 items), e.g., "*I watch my feelings without getting lost in them*"; 4) *Describing* involves labelling internal experiences with words (FFMQ-D;8 items), e.g., "*When I have a sensation in my body, it's hard for me to describe it because I can't find the right words*"; 5) *Observing* (FFMQ-O;8 items) e.g., "*I intentionally stay aware of my feelings*". The response format comprises a five-point Likert scale (1 = never or very rarely true; 5 = very often or always true). For the mediation analyses the total score, representing the higher-order factor mindfulness, rather than the different mindfulness facets, was used. The facets of mindfulness were used in the regression analyses. Internal consistency for the total score was satisfactory ($\alpha = 0.88$). Internal consistency for the facets of mindfulness was also acceptable, ranging from $\alpha = .68$ to $\alpha = .92$ (see Table 3.2).

3.3.2.2. *Reward motivated eating behaviours*

Uncontrolled and emotional eating scales from the revised 18-item version of the Three-Factor Eating Questionnaire (TFEQ-R18V2; Cappelleri et al., 2009), shown to have satisfactory internal consistency, were used to examine reward motivated eating. The Uncontrolled Eating scale (TFEQ-UE) measures the tendency to lose control over eating when feeling hungry or when exposed to food stimuli (e.g. *When I see something that looks very delicious, I often get so hungry that I have to eat right away*). The emotional eating scale (TFEQ-EE) assesses the propensity to overeat in response to negative aversive states (e.g. *When I feel lonely, I console myself by eating*). The cognitive restraint scale (TFEQ-CR) measuring the tendency to control food intake in order to influence body weight and shape (e.g. *I consciously restrict how much I eat during meals to avoid gaining weight*). The TFEQ-CR subscale was not part of the current research questions addressed in this study and was therefore not included in analyses. However the subscale is included when examining the influence of the Mindful Eating Programme (Chapter six) on eating behaviour more generally. All items follow a four-point Likert scale response format (definitely true/mostly true/ mostly false/definitely false). Scores are summed to produce scale scores and the raw scores are transformed to a 0-100 scale. Higher scores are indicative of greater uncontrolled or emotional eating. Internal consistency was satisfactory for the TFEQ-UE and TFEQ-EE subscales ($\alpha = 0.85$ and 0.90 respectively).

3.3.2.3. *Difficulties in emotion regulation*

The 36-item Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) measures awareness and understanding of emotions, acceptance of emotions, the ability to maintain goal directed behaviour and ability to access emotion regulation

strategies when experiencing negative emotions (Gratz & Roemer, 2004). The total score and subscale scores were used in analysis. Higher scores are indicative of greater difficulties in emotion regulation. The DERS subscales include 1) Lack of emotional awareness (DER LOEA, 6 items); e.g. *“I pay attention to how I feel”*; 2) Lack of emotional clarity (DER LOEC, 5 items); e.g. *“I have difficulty making sense out of my feelings”*; 3) Non-acceptance of emotional responses (DER NAER, 6 items) e.g. *“When I am upset, I feel ashamed with myself for feeling that way”*; 4) Difficulties engaging in goal directed behaviour (DER DGDB, 5 items) e.g. *“When I am upset, I can still get things done”*; 5) Impulse control difficulties (DER ICD, 6 items); e.g. *“When I am upset, I feel out of control”*; and 6) Limited access to emotion regulation strategies (DER LER, 8 items); e.g. *“When I am upset, I believe that there is nothing I can do to make myself feel better”*. The total 36 item scale measures overall difficulties in emotion regulation (Gratz & Tull, 2010). Internal consistencies for the total ($\alpha = 0.95$) and subscale scores in this study were satisfactory (α range: 0.86 to 0.92) except for Limited access to emotion regulation strategies ($\alpha = 0.54$).

3.3.2.4. Habitual Negative Self-Thinking

The study included assessments of both the cognitive content and the habitual quality of negative self-thinking (Verplanken et al., 2007). Two cognitive content measures were derived from a thought listing task: the number of negative self-thoughts provided (TNNTL) and the degree of negativity of these thoughts (TNNTLav). Participants were given a thought listing task with the following instruction: *“We sometimes may think negatively about ourselves. Write down negative thoughts you may sometimes have about yourself. Write each specific thought in a separate box. Just use a few words to describe each thought is enough.”* They were provided with 10 boxes, in which to write their thoughts. Participants were then asked to rate the negativity of each thought

they had listed on a scale (1= somewhat negative to 5= very negative). The habitual quality of negative self-thinking was assessed by the Habit Index of Negative Thinking (HINT), a twelve item meta-cognitive instrument (for further details and validation studies see Verplanken et al., 2007). The HINT measures the extent to which the thoughts occur automatically and repetitively. Higher scores indicate a strong negative self-thinking habit. The HINT was formulated in the current study to assess the habitual quality of the thoughts that were listed in the thought elicitation task. The instruction was as follows: “We now want to know HOW the negative thoughts you wrote down on the previous page usually occur. Each question starts like this: “*Having those thoughts is something ...*”. This was followed by 12 items (e.g. “... *I do frequently*”, “... *I find hard not to do*”, “... *I start doing before I realize it*”, “...*That’s typically “me”*”). The HINT has been shown to have good internal consistency with Cronbach coefficients of $\alpha = 0.95$ ($\alpha = 0.89$ in the current study). The habitual quality of negative thinking was used in the primary analyses reflecting the process oriented conceptions of mindfulness which suggest that the cultivation of mindfulness alters thought processes, *how* we think, rather than the content of thoughts (Teasdale et al., 2002). The two cognitive content measures (total number of negative thoughts listed (TNTL) and the average perceived negativity of the thoughts listed (TNTLav), were included when examining the mediating role of habitual negative self-thinking in relations between dispositional mindfulness and emotional eating.

3.4. Procedure

Participants were recruited opportunistically through advertisements on a mindfulness research webpage of the University and emailed invitations to meditation

groups and university mailing lists. The survey was delivered via Bristol Online Survey (<http://www.survey.bris.ac.uk/>) and took approximately 20 minutes to complete.

3.4.1. Ethical considerations

The British Psychological Society's (BPS) Ethical Guidelines were strictly adhered to throughout the studies described in this thesis (BPS, 2009). Appropriate approval was obtained for each study from the Universities ethics committee. Ethical considerations for each study are outlined in each method section. For the current study participants were provided with a detailed information sheet and were given an opportunity to ask any questions and at least two weeks to consider taking part before consenting to participate. It was explained that completion and submission of the online survey indicated consent. On completion of the study participants were given debrief information which included details of how to contact the researcher if they had any feedback, further questions or wished to withdraw in the month following completion and have their data removed. All data was anonymised prior to analysis and when reporting findings.

3.5. Overview of data analysis strategies

Data analysis was performed using Pearson correlations and standard multiple regression analyses used to explore the extent to which facets of mindfulness measured by the FFMQ (Baer, Smith, et al., 2006) explained unique variance in the dependent variables of uncontrolled and emotional eating respectively. Bootstrapping techniques were used for regression analysis of mediation effects (Preacher & Hayes, 2008). As recommended by Preacher and Hayes (2008), bias corrected and accelerated Bootstrap percentile confidence intervals (5000 resamples) are presented for total and indirect

effects. The bootstrapping approach produces point estimates and percentile confidence intervals for total and indirect effects. Point estimates and 95% confidence intervals are considered to be significant where zero is not contained in the confidence intervals (Preacher & Hayes, 2008). Therefore if a variable meets this criterion it can be described as a mediator. A brief rationale for the use of such analyses in this context and explanation of this approach to mediation analyses is provided below. Independent t-tests were used to compare meditators and non-meditators.

3.5.1. Mediation analyses

Understanding the processes that underpin beneficial effects of mindfulness meditative practices employed in mindfulness-based interventions is one of the key aims of current research. Mediation analyses were conducted to study possible pathways through which mindfulness in daily life may influence reward motivated eating. Mediation analysis allows identification and comparisons to be drawn between direct and indirect pathways (A. F. Hayes, 2009). Mediation analyses are used to test models in which the independent variable (X) effects a dependant variable (Y) through intervening variables (M) in a causal pathway: a mediation or indirect effect model (A. F. Hayes, 2009). Total effects of X on Y can be examined and apportioned into the direct effects of X on Y (c') and the indirect effects on Y through M (ab).

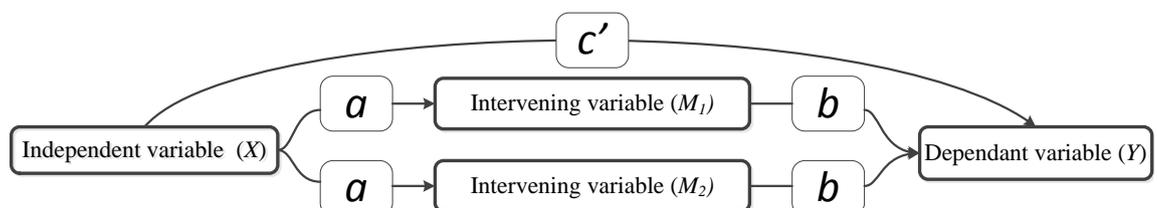


Figure 3.1. Graphical representation of a multiple mediation model.

Note. The Total effects (weight c) is composed of the direct effect (weight c') and the indirect effect (sum of all ab weights).

Multiple mediation analysis acknowledges the complexities of human behaviour in which it is unlikely that one variable affects another without multiple intervening processes. Recent focus on methods for testing multiple mediation hypotheses and the provision of easy to use and efficient software tools provide the opportunity to use this technique that is posited to have many advantages over the use of several simple mediation hypotheses. For example, multiple mediation models reduce the potential of parameter bias due to the omission of variables and allow the comparison of competing theories within a single model. It must be noted that in the context of multiple mediation the ability of M_2 for example to influence Y is not the same as in a simple mediation model. The indirect effect in a multiple mediation model represents the ability of a variable to mediate the relationship between X and Y in the presence of other mediators in the model. In multiple mediation models the quantification of indirect effects provides the opportunity for researchers to ask if specific indirect effects through alternative mediators vary in size (Preacher & Hayes, 2008). These effects can be compared without the need to transform or standardise the scales of the mediators (Preacher & Hayes, 2008) and are examined using pairwise contrasts. Multicollinearity, the strong correlation between predictors, reduces the ability to obtain estimates of the unique effects of a mediator. The effects of multicollinearity in multiple mediation models are much the same as in multiple regression; however, the effectiveness of rules of thumb to assess collinearity have been questioned in the context of multiple mediation.

There is a growing literature concerning methods for testing mediation, an overview of which is provided by McKinnon et al., (2002). The present study used a Bootstrapping approach to multiple mediation (Preacher & Hayes, 2008) which addresses limitations of previous mediation tests, notably the inferential nature

(Preacher & Hayes, 2008) and low power to detect effects (Fritz & MacKinnon, 2007) of the causal steps approach (Baron & Kenny, 1986). The Bootstrapping approach also has the advantage of not imposing assumptions of normality on the often asymmetric sampling distributions of the total and specific indirect effects required for the product of coefficients approach developed by Sobel (1982, 1986). The Bootstrapping approach simultaneously increases power and maintains reasonable control over Type 1 error (Preacher & Hayes, 2008).

Bootstrapping involves repeatedly sampling from the data set and estimating the indirect effects (X on Y through M) in each resampled data set. The repetition of this process enables an empirical approximation of ab to be created and used to construct confidence intervals for the indirect effects. ab is in simple terms the product of a and b , the indirect effect of X on Y through M. The current recommendation for the number of times the sample is resampled is 5000 (A. F. Hayes, 2009).

3.6. Results

Descriptive statistics and Pearson correlation coefficients for psychological and eating measures are displayed in Table 3.1. Higher dispositional mindfulness was associated with a reduced tendency to engage in both uncontrolled and emotional eating behaviour, lower scores on emotion regulation difficulties and lower frequency of habitual negative self-thinking. Higher scores on the uncontrolled and emotional eating scales were associated with greater difficulties in emotion regulation and more frequent habitual negative self-thinking.

Table 3.1. Pearson correlations (α , M/SD) between psychological and eating measures (N 632).

	Scale range	α	M	SD	2.	3.	4.	5.
1. FFMQ	39-195	.94	133.1	22.1	-.54**	-.79**	-.45**	-.27**
2. HINT	12-60	.89	40.5	8.9		.56**	.32**	.31**
3. DERS	36-180	.95	81.5	24.1			.41**	.27**
4. TFEQ-UE	0-100	.85	37.9	19.3				.58**
5. TFEQ-EE	0-100	.90	36.3	26.7				---

Note: ** $p < 0.01$; FFMQ Total= mindfulness; HINT Total = Habitual Negative Self-Thinking; DERS Total = Difficulties in Emotion Regulation; TFEQ-UE = Uncontrolled Eating; TFEQ-EE = Emotional Eating.

Standard multiple regression analyses was conducted to explore the extent to which facets of mindfulness measured by the FFMQ (Baer, Smith, et al., 2006) explained unique variance in the dependent variables of uncontrolled and emotional eating respectively. The data met the assumptions required to run multiple regressions with the exception of the presence of outliers (Z scores ± 2.58). Analyses were conducted with and without the inclusion of the outliers. There was no significant difference in the direction or magnitude of outcomes. As might be expected removing the cases improved the Mahalanobis distance reducing it to below the critical value of 16.27 (Tabachnick & Fidell, 2013). However, examination of the outlying cases revealed that these were not systematically associated with potentially confounding variance such as age or meditation experience. In addition only one individual had outlying scores on two variables. All subsequent analysis was therefore conducted on

the complete sample. Tests of multi-collinearity revealed no reason for concern when using ≥ 10 as the point at which to become concerned for the variance inflation factor (VIF) test of collinearity and below .2 for the tolerance statistic (in accordance with Field, 2009; Tabachnick & Fidell, 2013). In addition correlation analyses revealed that the intercorrelations between predictors were all below .50 ($p < .01$). Scatterplots of the independent variables and standardised residuals against predicted values, and Durban-Watson values (>2 ; Tabachnick & Fidell, 2013) provides evidence of independence (see figures 3.2-3.3).

Descriptive statistics and Pearson correlations for all variables measured are presented in Table 3.2. The results of the regression analysis indicate that the model, in which each facet of mindfulness are included, explains 23 per cent of variance in uncontrolled eating behaviour measured by the TFEQ-UE subscale. Of the five facets of mindfulness the largest unique contribution was *acting with awareness* followed by *non-judging*, all remaining facets did not make a significant unique prediction of the dependent variable (see Table 3.3). The results of the regression analysis indicate that the model in which each facet of mindfulness are included explains 12.7 per cent of emotional eating behaviour measured by the TFEQ-EE subscale. Of the five facets of mindfulness the largest unique contribution was *acting with awareness* followed by *non-judging*, *non-reacting* and *observing*. The *describing* facet did not make a significant unique prediction of the dependent variable (see Table 3.3). Contrary to expectations the unique associations between observing and emotional eating was positive, suggesting that the tendency to observe internal and external phenomenon is associated with higher levels of emotional eating.

Table 3. 2. Descriptive statistics (α , M/SD) and Pearson correlations for facets of mindfulness and eating measures (N 632).

	Scale range	α	M	SD	2.	3.	4.	5.	6.	7.
1. TFEQ-UE	0-100	.85	37.9	19.3	.58**	-.43**	-.38**	-.31**	-.28**	-.19**
2. TFEQ-EE	0-100	.90	36.3	26.7		-.31**	-.27**	-.23**	-.11**	-.03
3. FFMQ-AWA	8-40	.86	25.8	5.9			.49**	.43**	.39**	.26**
4. FFMQ-NOJ	8-40	.88	26.8	7.7				.49**	.41**	.20**
5. FFMQ-NOR	8-40	.78	22.6	4.9					.46**	.49**
6. FFMQ-DES	7-35	.92	29.1	6.5						.44**
7. FFMQ-OBS	8-40	.68	28.5	5.3						---

Note: * = $p < .05$; ** = $p < .01$; TFEQ-UE = Uncontrolled Eating; TFEQ-EE = Emotional Eating; FFMQ-AWA= acting with awareness; FFMQ-NOJ= non-judging of experience; FFMQ-NOR= non-reacting to experience; FFMQ-DES= ability to describe thoughts and emotions with words; FFMQ-OBS= observing experiences.

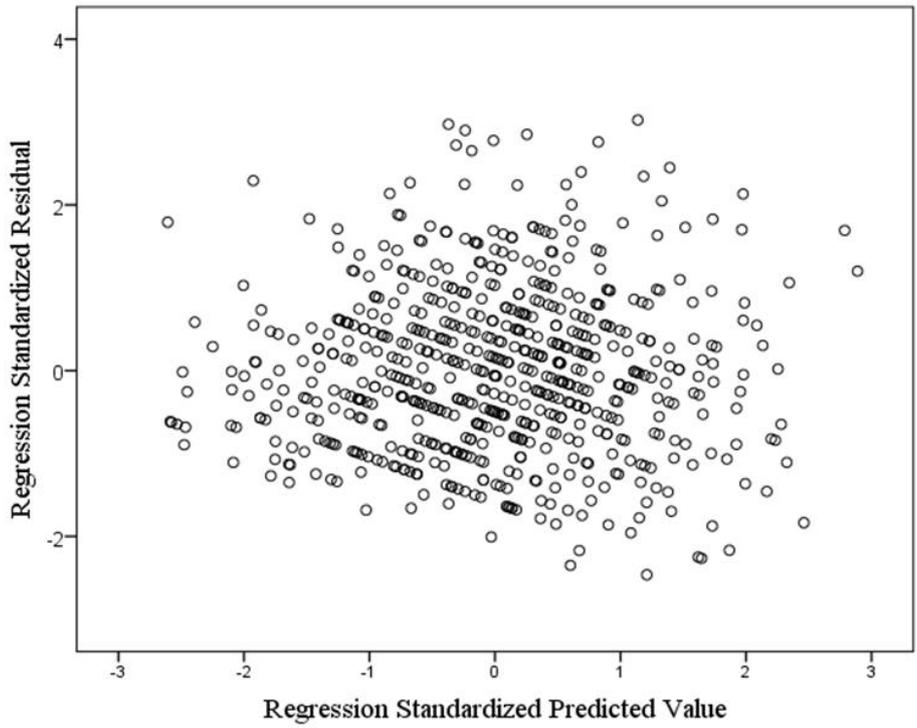


Figure 3.2: Plots of standardised residuals of facets of FFMQ against dependant value TFEQ UE.

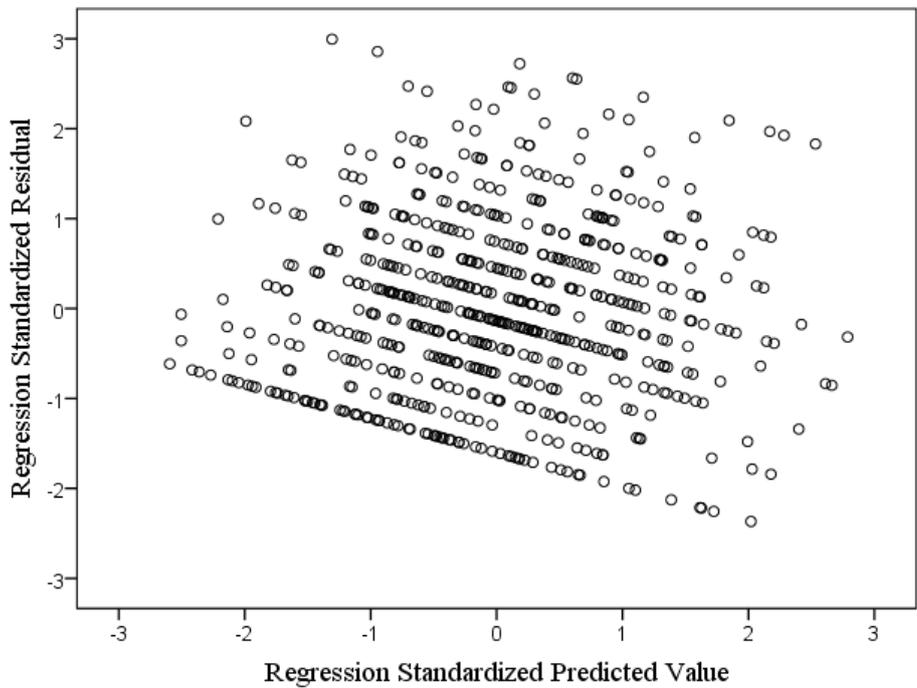


Figure 3.3: Plots of standardised residuals of facets of FFMQ against dependant value TFEQ EE.

Table 3.3. Standard Multiple regression analysis predicting uncontrolled eating and emotional eating.

Independent variable	Uncontrolled eating		Emotional eating	
	Standardised		Standardised	
	Coefficients		Coefficients	
	Beta	<i>t</i>	Beta	<i>t</i>
FFMQ-AWA	-.28	-6.62 ^{***}	-.23	-5.10 ^{***}
FFMQ-NOJ	-.19	-4.19 ^{***}	-.13	-2.75 ^{**}
FFMQ-NOR	-.06	-1.33	-.14	-2.74 ^{**}
FFMQ-DES	-.06	-1.41	.05	1.12
FFMQ-OBS	-.02	-.42	.10	2.28 [*]

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; FFMQ-AWA= acting with awareness; FFMQ-NOJ= non-judging of experience; FFMQ-NOR= non-reacting to experience; FFMQ-DES= ability to describe thoughts and emotions with words; FFMQ-OBS= observing experiences.

3.7.2. Mediation analysis

It was proposed that the relations between dispositional mindfulness and eating measures would be mediated by difficulties in emotion regulation and habitual negative self-thinking (see figure 3.2). Regression assumption diagnostics were all within acceptable ranges (linearity, independence of residuals). Prior to analysis, z-scores were computed for each measure, and eight participants were excluded from analysis because

their scores were above or below ± 2.5 standard deviations on the difficulties in emotion regulation scale.

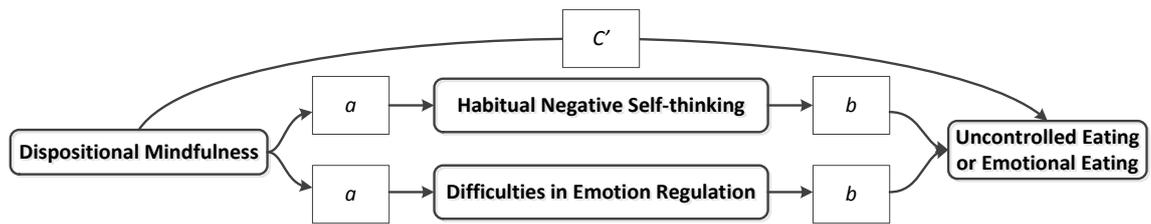


Figure 3.4. Graphical representation of the proposed mediation model.

Mediation tests were run with and without the inclusion of these scores. Because there were no substantive differences on any of the tests of mediation (point estimates, confidence intervals or path weights of direct, indirect and total effects) outcomes of the mediation analyses are reported for the complete sample. Tests of multi-collinearity were conducted revealing no concern when using ≥ 10 as the point at which to become concerned for the variance inflation factor (VIF) test of collinearity and below .2 for the tolerance statistic (in accordance with Field, 2009; Tabachnick & Fidell, 2013). In addition, intercorrelations between predictors were below .56^{**} (sig at .01). In addition, the two mediators measure two theoretically different constructs.

Firstly, dispositional mindfulness had a significant direct effect on uncontrolled eating ($B = -0.26$; $SE = 0.05$; $t = -5.16$, $p < .001$) but not emotional eating ($B = -0.08$; $SE = 0.07$; $t = -1.24$, $p > .05$). Overall, the results of the multiple mediation analysis presented in Tables 3.4 and 3.5 indicate that difficulties in emotion regulation and habitual negative self-thinking are significant mediators of the mindfulness-eating relationship. Examination of the specific indirect effects indicates that for uncontrolled eating only difficulties in emotion regulation is a significant mediator, as its 95% confidence intervals do not pass through zero (Table 3.4). That is, habitual negative self-thinking

does not contribute to the indirect effect above and beyond difficulties in emotion regulation. By contrast, the specific indirect effect for emotional eating indicates that only habitual negative self-thinking is a significant mediator, as its 95% confidence intervals do not pass through zero (Table 3.5). That is, difficulties in emotion regulation do not contribute to the indirect effect above and beyond habitual negative self-thinking.

Table 3.4. Mediation statistics for the effect of dispositional mindfulness on uncontrolled eating through habitual negative self-thinking and difficulties in emotion regulation.

	Product of coefficients			BCa 95% CI	
	Estimate	SE	Z	Lower	Upper
Multiple indirect effects					-
1. HINT	-.0357	.0207	-1.7270	-.0765	.0057
2. DERS	-.0911*	.0401	-2.2720	-.1728	-.0053
Total indirect effect	-.2049*	.0540	-3.7980	-.2085	-.0446
Contrasts: 1 vs. 2	.0554	.0497	1.1153	-.0496	.1564

Table 3.5. Mediation statistics for the effect of dispositional mindfulness on emotional eating through habitual negative self-thinking and difficulties in emotion regulation.

	Product of coefficients			BCa 95% CI	
	Estimate	SE	Z	Lower	Upper
Multiple indirect effects					
1. HINT	-.1302*	.0286	-4.5484	-.1915	-.0710
2. DERS	-.0747	.0534	-1.3995	-.1806	-.0371
Total indirect effect	-.2049*	.0540	-3.7980	-.3135	-.0889
Contrasts: 1 vs. 2	-.0555	.0666	.8330	-.1957	-.0739

Notes for tables 3.4-3.5. * $p < .05$; HINT = Habit Index of Negative Thinking; DERS = Difficulties in Emotion Regulation Scale Total.

Examination of the sub-scales of the DERS as mediators between mindfulness and uncontrolled eating indicates that, of the six subscales, only difficulties engaging in goal directed behaviour significantly mediated the effect of mindfulness on uncontrolled eating (CI = [-.1031, -.0053], $p < .05$; all other $p > .05$). This scale comprises statements such as “*When I am upset, I can still get things done*” (reverse scored) and “*When I am upset, I have difficulty focusing on other things*” with higher scores indicating greater difficulties engaging in goal-directed behaviours. Examination of the pairwise contrasts of the indirect effects shows that the difficulties engaging in goal directed behaviour subscale was significantly larger than the effects of any other of the remaining DERS subscales.

Examination of the components of habitual negative self-thinking: the number of negative self-thoughts listed, the perceived negativity and habitual quality of such thoughts revealed that both the perceived negativity and the habitual quality of negative self-thinking emerged as significant mediators (CI = [-.0704, -.0149] and [-.1659, -.0476] respectively, $p < .05$; number of negative self-thoughts listed $p > .05$), while the number of negative self-thoughts listed did not significantly mediate the relationship. Examination of the pairwise contrasts of the indirect effects shows that the perceived negativity and habitual quality of negative self-thinking were significantly larger than the number of negative self-thoughts.

3.7.3. Between groups differences

A series of independent sample t-tests were conducted to examine the differences between meditators and non-meditators on the measured variables (see Table 3.6). Prior to analysis, z-scores were computed for each measure used in t-test comparisons and a total of 29 participants (21 from the non-meditators group) were excluded from analysis

because their scores were above or below ± 2.5 SD. As hypothesised, meditators reported significantly higher levels of dispositional mindfulness, fewer difficulties in emotion regulation, less habitual negative self-thinking and lower levels of uncontrolled eating, when compared to non-meditators. Although meditators reported lower levels of emotional eating the difference was not significant. For dispositional mindfulness, difficulties in emotion regulation, habitual negative self-thinking and uncontrolled eating effect sizes were medium to large. The effect size for emotional eating was small.

Table 3.6. Differences between meditators and non-meditators on psychological measures.

	Meditation Experience							
	None (N = 321)		Experienced (N = 229)		<i>t</i> (548)	<i>d</i>	LL95%	UL95%
	M	SD	M	SD				
FFMQ	124.2	17.6	149.2	17.6	16.13**	1.40	1.21	1.58
DERS ^a	89.7	24.4	65.9	12.6	13.54**	-1.17	-1.35	-0.99
HINT ^b	42.9	8.3	37.9	7.2	7.38**	-0.64	-0.81	-0.47
TFEQ- UE	42.7	18.3	28.6	15.8	9.57**	-0.83	-1.00	-0.65
TFEQ- EE	36.5	23.4	31.4	22.2	2.47*	-0.21	-0.38	-0.04

Note. * $p < .05$; ** $p < .01$; *d* = Cohen's *d* effect size; FFMQ Total = mindfulness; DERS Total = Difficulties in Emotion Regulation scale; HINT Total = Habitual Negative Self-Thinking; TFEQ-UE = Uncontrolled Eating; TFEQ-EE = Emotional Eating. ^a *df* = 531.65; ^b *df* = 513.47.

3.7. Discussion

The present study tested the hypotheses that dispositional mindfulness would be negatively associated with indicators of reward motivated eating and that this relationship would be mediated by difficulties in emotion regulation and habitual negative self-thinking. The findings support these hypotheses as lower dispositional mindfulness was significantly associated with greater difficulties in emotion regulation, stronger negative self-thinking habits, and uncontrolled and emotional eating tendencies. Further analysis revealed emotion regulation difficulties and habitual negative self-thinking as mechanisms by which dispositional mindfulness influences uncontrolled eating and emotional eating, respectively. Examination of the relations between facets of mindfulness and uncontrolled and emotional eating indicate that *acting with awareness* followed by *non-judging* explained significant unique variance in uncontrolled eating, and *acting with awareness* followed by *non-judging*, *non-reacting* and *observing* explained significant unique variance in emotional eating. As predicted, in comparison to non-meditators, meditators scored significantly lower on difficulties in emotion regulation, habitual negative self-thinking, uncontrolled eating and lower on emotional eating tendencies, providing some indication that meditation practice might be a way of influencing eating tendencies via the mechanisms examined here.

The significant negative correlations between dispositional mindfulness and uncontrolled and emotional eating tendencies are consistent with those identified using similar methodology in a sample of female undergraduate students (Lattimore et al., 2011) and individuals diagnosed with an eating disorder (Lattimore, Mead, Carson, & Malinowski, In process). The positive associations between uncontrolled and emotional eating tendencies and difficulties in emotion regulation and habitual negative self-thinking supports previous research indicating that emotion regulation and mental habit

may be associated with an increased vulnerability to experience problematic eating behaviours (Sim & Zeman, 2004; Verplanken & Tangelder, 2011; Verplanken & Velsvik, 2008; Whiteside et al., 2007). Taken together the correlations identified in the current study support the notion that emotion regulation and mental habit may be involved in the relation between mindfulness and undesirable health-related behaviours evidenced in prior research (Ostafin et al., 2012; Svaldi et al., 2012; Witkiewitz et al., 2013). When considered in conjunction with the fact that meditators had significantly higher dispositional mindfulness, fewer difficulties in emotion regulation and habitual negative self-thinking, it is reasonable to suggest that mindfulness meditation may be associated with reduced reward motivated eating tendencies. Indeed, previous evidence supports the proposition that sustained mindfulness practice enhances awareness and inhibitory control of disruptive emotions through a process of acceptance of, and non-reactivity to, aversive internal states that typically engage in habitual reactivity (Chambers et al., 2009; Chiesa et al., 2010; Chiesa et al., 2013). The strength and pattern of relations are consistent with current conceptions of mechanisms of mindfulness and warrant experimental examination. However, it is not clear what is being induced in experimental examination of the influence of mindfulness practice on subjective measures and behavioural outcomes. Therefore, it was necessary to conduct systematic analysis of mindful induction scripts (Study 2) which informed the development of the mindful attention induction (MAI) used in Study 3.

Examination of the relations between facets of mindfulness and uncontrolled and emotional eating indicate that *acting with awareness* followed by *non-judging* explained significant unique variance in uncontrolled eating, and *acting with awareness* followed by *non-judging*, *non-reacting* and *observing* explained significant unique variance in emotional eating. These findings suggest that greater attention to, and acceptance of,

internal experiences, and the ability to maintain behavioural control during times of distress, are associated with lower levels of uncontrolled eating and the ability to observe internal experiences without reacting or getting caught up in them was associated with lower levels of emotional eating. Interestingly, however, despite providing evidence for the expected associations between the aforementioned facets of mindfulness and eating behaviours, results revealed an unexpected unique positive association between the *observing* facet and emotional eating. This finding suggests that a greater tendency to observe internal and external experiences is associated with greater emotional eating tendencies. A subsequent study examining the relationship of the FFMQ mindfulness facets to a variety of problematic eating behaviours assessed through diagnostic interviews in a clinical sample of 820 patients seeking bariatric surgery demonstrates a similar pattern of results (Levin, Dalrymple, Himes, & Zimmerman, 2014). Results indicated that greater mindfulness on specific facets, particularly *acting with awareness*, were related to less binge and emotional eating. Greater mindfulness was related, though less consistently, to less habitual overeating and grazing. The *observing* facet was generally unrelated to problematic eating, but for some participants being more observant related to having greater eating problems. This relationship is perhaps not unexpected as past findings have shown that the *observing* facet of mindfulness functions differently across individuals based on prior meditation experience (Baer et al., 2008) and has unexpected relations with related psychological constructs (e.g. Baer, Smith, et al., 2006). Indeed, the observe facet has been found to be positively associated with negative psychological symptoms among individuals without meditation experience (Baer et al., 2004). Given the non-significant correlation between observing and emotional eating, one explanation for this finding may be that the aspect of observing that remains after controlling for the aspects that overlap with a non-

judging and non-reacting approach towards internal experiences may be ineffective and/or non-mindful. This and the lack of unique variance explained by the describing facet may reflect the importance of the nature of a mindful approach to experiences when examining relations between mindfulness and eating behaviours. The unexplained variance in each of the models may be accounted for by psychological constructs not measured in the current study, such as past behaviour, perceived stress, or mood. The range of variables which may explain eating behaviours is illustrated in the full systems diagram of the Foresight report (Tackling obesity: future choices; Butland et al., 2007). The omission of further measures was based on practical considerations about the length of a survey conducted online and response validity or fatigue.

Tests of multiple mediation, in which both difficulties in emotion regulation and habitual negative self-thinking were entered simultaneously, indicated that they differently mediated aspects of reward motivated eating. Difficulties in emotion regulation significantly mediated the mindfulness-uncontrolled eating relationship whereas habitual negative self-thinking significantly mediated the mindfulness-emotional eating relationship. The mediating role of difficulties in emotion regulation is consistent with theoretical and empirical accounts of emotion regulation as a mechanism of mindfulness meditation and MBIs (e.g. Bishop et al., 2004; Chambers et al., 2009; Chiesa et al., 2010; Chiesa et al., 2013). The mediating role of habitual negative self-thinking in the relation between dispositional mindfulness and the reduced tendency to eat in response to aversive emotions may in part be attributable to the decoupling of self from experience that arises from mindfulness practice (e.g. Bieling et al., 2012). Stressful or negative events often trigger derailing negative, self-critical, reactive, and judgmental thoughts; attempts to avoid dealing with these challenging threats to the self reduces goal pursuit (Teasdale, Segal, & Williams, 1995). By

allowing negative thoughts and emotions to occur without judgment and reaction, the thoughts and concomitant frustration dissipate, allowing successful goal pursuit (Brown, Ryan, & Cresswell, 2007). Rather than being absorbed in a dysfunctional cycle of repetitive thinking, mindfulness enhances individuals' ability to maintain cognitive focus (Chambers et al., 2009; Chambers et al., 2008). Verplanken and Tangelder (2011) have also suggested that the awareness component may interrupt the automatic quality of the mental habit, and the acceptance component may reduce the risks of dysfunctional consequences by alleviating the weight that negative thoughts are given. This may reduce emotional distress associated with experiencing habitual negative self-thinking and therefore in turn reduce engagement in emotional eating behaviours to alleviate aversive internal states (Heatherton & Baumeister, 1991).

Tests of mediation which examined the extent to which the subscales of the DERS mediated the mindfulness-uncontrolled eating relationship indicated that the DERS subscale *Difficulties engaging in Goal Directed Behaviour* in the presence of negative emotions, was the only significant mediator. This scale comprises statements such as 'When I am upset, I can still get things done' (reverse scored) and 'When I am upset, I have difficulty focusing on other things'. The discovered mediation suggests that greater dispositional mindfulness improves the ability to carry out goal directed behaviour in emotionally challenging situations, which in turn leads to a reduced tendency to engage in uncontrolled eating behaviours. In other words, increased dispositional mindfulness reduces the tendency to engage in uncontrolled eating by enhancing individuals' ability to control behaviours whilst experiencing negative emotions. Examination of the potential for components of habitual negative self-thinking (number of thoughts listed, perceived negativity and habitual quality of thoughts) revealed that both the perceived negativity and the habitual quality of negative

self-thinking significantly mediated the dispositional mindfulness-emotional eating relations. This finding highlights the importance of considering how thoughts occur as well as having the thoughts when addressing cognitive processes to effect behavioural change.

In addition to the influence of mindfulness on indicators of reward motivated eating through mediators, its direct effect on uncontrolled eating indicates that mindfulness may directly influence the tendency to engage in uncontrolled eating. This evidence is in agreement with recent research indicating that MBIs can reduce reactivity to internal sensations or environmental cues that cause problematic eating behaviour (Alberts, Mulkens, Smeets, & Thewissen, 2010; Alberts et al., 2012). Practicing mindfulness meditation is proposed to increase awareness of sensations (body, thoughts and emotions) thereby improving discrimination between hunger and hedonic hunger (Gilbert & Waltz, 2010). In this respect mindfulness practice permits 'connection' with internal experiences (e.g. hunger) and consequently reduces the likelihood of reacting to external and emotional cues to eat (Kristeller & Wolever, 2011). An additional benefit of mindfulness practice is the potential to develop capacity to reduce identification with dysfunctional thoughts about food, weight and body shape (Albers, 2011) and to bolster self-regulation in the face of negative affect associated with impulsive reactivity (Fetterman, Robinson, Ode, & Gordon, 2010). The observed differences between regular meditators and non-meditators support the emerging evidence that sustained mindfulness practice may enable greater self-regulation of emotions and behaviours.

3.8.1. Conclusions

This study set out to examine potential mechanisms by which mindfulness influences reward motivated behaviour. Taken together the findings provide evidence to support the relevance of mindfulness in the context of enabling individuals to engage in health-related behaviours specifically reducing reward motivated eating behaviours. In addition to the direct effects of greater dispositional mindfulness, the findings indicate that reducing difficulties in emotion regulation and habitual negative self-thinking patterns may also reduce tendencies to engage in uncontrolled and emotional eating. In doing so the study supports the proposed structure of the Liverpool Mindfulness Model (Malinowski, 2013b) in that emotional and cognitive factors are relevant mechanisms in relations between mindfulness and behavioural outcomes. Although the design of the study was cross-sectional, the theoretical review and mediation analysis provide preliminary support for causal relations between mindfulness, emotion regulation, habitual negative self-thinking and indicators of reward motivated eating. The differences between meditators and non-meditators on each of these measures speak in favour of using mindfulness meditation practices as a way of enhancing dispositional mindfulness and reducing difficulties in emotion regulation, negative self-thinking and uncontrolled and emotional eating. The findings warrant further exploration and inform the design of studies three and four. Specifically the third study (chapter five) examines the evidenced relations specifically between facets of mindfulness shown to influence uncontrolled eating tendencies in an experimental setting. In order to understand what is being induced in experimental examinations of mindfulness practice systematic analysis of available induction scripts is conducted (study two, chapter four) and used to develop a Mindful Attention Induction used in study three. The fourth study (chapter six) examines the influence of mindfulness meditation practice on eating and psychological

experiences associated with emotion regulation, habitual thinking and reward motivated eating in a longitudinal study.

Chapter Four:

An examination of the anatomy of experimental mindfulness inductions

4.1. Study overview

The current study examines scripts used in inductions or manipulations of mindfulness in experimental settings in which outcomes are attributed to ‘mindfulness’ or where the manipulation was a mindfulness meditation. A systematic process of analysis was used to deconstruct and describe the components, composition and emphasis of each script to determine differences and similarities, and the extent to which components of current conceptions of mindfulness described in chapter 1.1.2-3 are addressed. The aims were to provide a framework based on the outcomes by which mindfulness experimental scripts can be classified and selected and to inform the development of a Mindful Attention Induction (MAI). The MAI used in study three (chapter four) was designed to induce attention with a mindful attitude. Attention is a core process in the LMM (Malinowski, 2013b), and a central feature of the dominant models of mindfulness reviewed in chapter 1.1.3. Attention is fundamental to acting with awareness a component of dispositional mindfulness (as measured by the FFMQ; Baer, Smith, et al., 2006) shown to explain unique variance in reward motivated eating in Study 1. This is the first known study to directly examine experimentally induced mindfulness and relate the findings to current theoretical conceptions of mindfulness and the mechanisms of mindful practices.

The study makes two important contributions to knowledge firstly by providing a methodology to explore our understanding of the mechanisms underlying the effects of mindfulness and enable the qualified use of the term, clarifying how it has been operationalised, manipulated or measured in mindfulness inductions. The second

contribution is a script validated through systematic analysis and situated within current theoretical accounts of mindfulness which can be used to demonstrate the effect of attention with a mindful attitude in experimental settings. The MAI, developed based on the findings of the current study, is used in a food cue exposure study three (chapter four) demonstrating the influence on attention with a mindful attitude on reactivity to food cues and subsequent food intake (described in chapter five).

4.2. Introduction

Despite mounting evidence of beneficial effects of mindfulness-based practices and the surge in published research, caution is required when interpreting these findings and attributing beneficial effects to mindfulness per se (Grossman & Van Dam, 2011). These concerns extend beyond debate over definitions and measurement of mindfulness, or the potentially different effects of multicomponent interventions and stand-alone mindfulness practice. The concern addressed here is how to interpret effects of ‘induced mindfulness’ or mindfulness manipulations in experimental settings in which outcomes are attributed to ‘mindfulness’ or a mindful meditation practice used. This is an important stage in the development of mindfulness research and necessary to progress understanding of the mechanisms underlying beneficial effects of mindfulness. To do this, it is necessary to qualify the use of the term, how it has been operationalised, manipulated or measured in each context (Davidson, 2010). The intention in conducting the analysis is not reductionist; it is a necessary phase of research when increasing understanding of mechanisms of action in mindfulness practices (Brown, Ryan, & Creswell, 2007) and preserve the integrity of the term. It is also necessary to clarify what aspects of mindfulness are addressed in experimental research and disentangle the effects of mindfulness practices used in multicomponent MBI’s (Brown, Ryan, & Creswell, 2007). The extent to which these experimental tasks address the complexity or embody ‘mindfulness’ as currently described within research is unclear. Despite the small number of published studies involving inductions of mindfulness in experimental settings there are a range of methods used to induce or manipulate mindfulness, ways in which mindfulness is described, and facets of mindfulness targeted or to which subsequent outcomes are attributed.

This study aims to provide a framework by which experimental scripts and the extent to which they address components of mindfulness can be clarified. This is a necessary step to increase the validity of experiment examination of the influence of mindfulness inductions of subjective and behavioural outcomes in this research programme and the wider research field. It is also important to increase understanding of the processes and influence of mindful breath based practices used both in experimental and intervention settings. The findings of this study informed the practices taught within the mindful eating programme (Study 4). As such this study is a demonstration of deconstruction type studies needed to test the validity of components of multicomponent interventions and proposed mechanisms of mindful meditation practices.

A literature search was conducted from which peer reviewed studies examining the effects of mindfulness induced or manipulated in experimental settings were identified and read. The initial Boolean search terms were ‘mindful’, ‘induct’ and ‘experiment’. The references from identified studies were used to find further studies. Induction scripts were requested and received from authors if not included in the publications. Criteria for inclusion in the the analysis were as follows 1) being used in published studies examining the effects of an induced state described as a state of mindfulness; 2) with outcomes being attributed to this state or an ‘increase in mindfulness’; 3) available when requested or in publication. Three induction scripts met these criteria although they differed in style, length, original intended purpose and were described slightly differently: mindfulness intervention (4A.1.; Erisman & Roemer, 2010); mindfulness induction task (4A.2.; Heppner et al., 2008); mindfulness of breathing session (4A.3.; Verplanken & Fisher, 2013). A fourth induction script was included (4A.4.; Wenk-Sormaz, 2005) as it used a concentrative breath meditation from

a Mindfulness-Based Stress Reduction programme (MBSR; Kabat-Zinn, 1990). Despite not mentioning mindfulness throughout the induction or write up, the script is included based on the source of the meditation and the observation that over 50% of authors citing the study use the term mindfulness to describe the meditation and its effects.

The following section briefly reviews studies for which scripts were not available, were not received when requested or which used acceptance-based inductions but are often cited as mindfulness studies. The review focuses on how the inductions were described and to what findings were attributed. The outcomes of the analysis with reference to how they were described and to what findings were attributed to are presented in the chapter discussion. Arch and Craske (2006) conducted a study in which the mindfulness condition involved a focused breathing induction adapted from a sitting mindfulness meditation (Kabat-Zinn, 1990; Segal et al., 2002). The instructions are described as focusing on the attention aspects of mindfulness with less emphasis on what attitude participants were invited to adopt. The focusing breathing group reported lower negative affect and overall emotional volatility in response to the post-induction images compared to a group instructed to worry, and greater willingness to view highly negative slides than an unfocused attention group (Arch & Craske, 2006). The findings were taken to provide evidence that mindfulness ‘induced’ in an experimental setting or a temporary state of mindfulness decreased emotional reactivity (Arch & Craske, 2006). This induction was used in two further studies. The first found that what they described as a brief mindfulness meditation attenuated effects of lowered self-control resources on subsequent self-control (Friese, Messner, & Schaffner, 2012). The authors suggest that the findings provide evidence that a brief mindfulness meditation may operate as a ‘quick and efficient strategy to foster self-control under conditions of low resource’ (Friese et al., 2012, p. 1016). The authors attribute the effects to increased awareness of

inner experiences and relaxation or their joint contribution (Friese et al., 2012, p. 1020). Increased awareness of inner experiences and relaxation have both been described as underlying processes in previous theoretical accounts of the effects of mindfulness meditation (e.g. Baer, 2003; Bishop et al., 2004; Brown, Ryan, & Cresswell, 2007). In the second study using the mindfulness induction task as described by Arch and Craske (2006) the task is described as mindful breathing. Feldman, Greeson and Senville (2010) found that mindful breathing may help to reduce reactivity to repetitive thoughts in comparison to progressive muscle relaxation and loving kindness meditation. The authors suggest that the study provides evidence for decentring as a mechanism that distinguishes mindfulness practice from other credible stress-management approaches (Feldman et al., 2010). Broderick (2005) examined the effects of a short guided mindfulness meditation developed by Kabat-Zinn (1990) which focused on self-acceptance and awareness of the breath. The induction offers guidance on mindful attention and attitude. Participants in the mindfulness condition had significantly lower levels of negative mood following a mood induction than those in either of the two other conditions (distraction or rumination; Broderick, 2005). The effects were attributed to increased focus on present moment somatic awareness, a beneficial form of self-focused attention and increased relaxation which indicating that mindfulness meditation was more adaptive and effective than distraction (Broderick, 2005). Similar findings and inferences are also described in Singer and Dobson's (2007) examination of the effects of brief acceptance training based on a practice used in Mindfulness-Based Cognitive Therapy for depression (Segal et al., 2002; see appendix 4C for available extract). Effects of two further 'acceptance' based inductions indicate that induced acceptance is associated with increased willingness to tolerate uncomfortable emotions and sensations compared with control or suppression (e.g. Eifert & Heffner,

2003; Levitt et al., 2004). Both studies are frequently cited as supporting evidence for the positive effects of experimentally induced mindfulness (e.g. Arch & Craske, 2006; Brown, Ryan, & Cresswell, 2007) and are included in an empirical review of the effects of mindfulness on psychological health (Keng et al., 2011). However, the methods and attribution of effects by the authors refer to acceptance rather than mindfulness. Levitt et al. (2004) induction task includes acceptance instructions based on ACT (Hayes, Strosahl, & Wilson, 1999) and Eifert and Heffner (2003) use a finger trap metaphor and exercise. The finger trap exercise “lets participants discover that attempting to reduce and control essentially uncontrollable symptoms, while seemingly logical and understandable (like pulling out of the finger trap), only results in more tension and perpetuates the struggle’ (Eifert & Heffner, 2003, p. 8).

4.3. Analysis of induction scripts

The literature search was conducted in which the words mindful, induct and experiment were entered as Boolean search terms into PsychInfo and Web of Science from which further peer reviewed studies using mindfulness inductions were identified. The systematic approach to the analysis broadly follows that of thematic analyses but differs in the focus on components and composition rather than themes.

The analysis was inductive and therefore data driven (Braun & Clarke, 2006). The process of coding and descriptions of components was conducted without trying to fit the data to a particular question or theoretical stance (see Table 4.1.). However, the researcher was familiar with current conceptions of mindfulness and has experience as a participant and an assistant instructor on MBSR programmes. In addition the researcher is co-author in the study described as Verplanken and Fisher (2013). The script was

used in the study in the original form (20 minute recorded meditation by Kabat-Zinn, 2002). It was selected by the authors as it was considered to be representative of mindfulness meditation practices delivered throughout both MBSR and MBCT programmes. Meyrick's (2006) guidance on conducting qualitative research in Health Psychology was adopted to ensure the rigour, transparency and the quality of this research. The validity of the arising components was discussed with Dr Peter Malinowski.

Table 4.1 Systematic process of analysis adapted from Braun and Clarke (2006)

Phase	Description of the process
1. Familiarising with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas (see appendix 4A.).
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code (see appendix 4B.1).
3. Searching for components:	Collating codes into potential components, gathering all data relevant to each potential component (see appendix 4B.2-3).
4. Reviewing components:	Checking if the components work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a 'map' of the analysis.
5. Defining and naming components:	On-going analysis to refine the specifics of each component, and the overall story the analysis tells, generating clear definitions and names for each component (see appendix 4B.4).
6. Producing the report:	The final opportunity for analysis. Selection of representative extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

The final descriptions and organisation of components are discussed in the context of current concepts and models of mindfulness within Western psychology. Throughout this chapter, the four inductions are referred to by the authors who published the study in which the induction is used. Commonalities and differences are noted in the descriptions of components.

The emergent components, subcomponents and their organisation are presented in a matrix (Table 4.2) and described in chronological order as each extract had a beginning, middle and end. Although the components are described as discrete, the contents are to a large extent intertwined, building or expanding on previous phases.

4.3.1. Introduction Phase

The induction scripts were designed for different purposes such as an experimental manipulation (Erisman & Roemer, 2010) or to guide sitting meditation and subsequently used in an experiment (Verplanken & Fisher, 2013). The introductions reflect these differences in function varying in the narrative used to increase the likelihood that instructions will be followed. Within the introductions there are two broad components: *setting the scene* and *describing mindfulness*. In setting the scene the narrator describes the task informing the listener about their role and the listener's role, implicitly and explicitly setting expectations. In describing mindfulness, the narrator describes mindfulness in relation to the listeners' previous experiences, providing examples and analogies. These introductory components are not present in Wenk-Sormaz's (2005) concentrative breath meditation which is described and taught as an attention technique beginning with postural instructions.

Table 4.2. Matrix of components and subcomponents emerging from systematic analysis of induction scripts.

Phase	Components	Sub-components	Erisman & Roemer, 2010	Heppner et al., 2008	Verplanken & Fisher, 2013	Wenk-Sormaz, 2005
Introduction	Setting the scene:	Describing the task	X	X	X	
		Role of the individual	X	X	X	
	Describing mindfulness:	Description	X	X		
		Relating to individuals previous/normal experiences	X	X	X	X
Guided exercise	Instructions:	Object of focus	X	X	X	X
		Quality of awareness	X	X	X	X
		The Observing self	X		X	X
		Use of rhetorical devices				
Ending	What next:	Application beyond the guided session			X	

Describing the task

In *describing the task* the narrators explain that the individual will be asked to try something: a particular kind of awareness (Erisman & Roemer, 2010), to do a task ‘called a mindfulness exercise’ (Heppner et al., 2008) or to spend a period of time practicing sitting meditation (Verplanken & Fisher, 2013). Through explanation of the task (Erisman & Roemer, 2010) and direct instruction (Verplanken & Fisher, 2013) the narrator invites the listener to arrive here, beginning the process of bringing awareness to the present moment, thereby anchoring the temporal context of the task to the here and now.

Role of the participant

This subcomponent captures the relationship between the narrator and the participant. The participant’s role in all induction scripts is one of an individual being asked to follow instructions. The amount of perceived choice and silence (ranging from none to five minutes) varies across the induction scripts reflecting the intended amount of explicit control over the participant’s experience. For example, in the purposely designed experimental mindfulness manipulations participants are asked or told that the narrator ‘will have them do’ (Erisman & Roemer, 2010) exercises for which the instructions are continuous. Notably, Heppener et al.’s (2008) task based around eating a raisin ‘mindfully’ includes the suggestion of a phenomenological experience (‘notice the immediate change in the intensity of the flavour’). By contrast, the sitting meditation offers choices including, for example, the physical object of focus (e.g. Verplanken & Fisher, 2013). In addition, in ‘allowing the breath to remind’ the participant to return to the present moment the guidance can be described as coming from within the

participant rather than from the narrator. Therefore, in the sitting meditation, the narrator becomes an aid to a process to which the participant is already engaged with silent space provided in which to practice. In contrast, Erisman and Roemer (2010) leave no silent space therefore reducing opportunities for the mind to wander but also not allowing self-guided returning to the breath and the present moment. Heppener et al.'s (2008) task provides guidance and then space to practice.

4.3.2. Describing mindfulness

Description

This subcomponent captures both the explicit (provided definitions) and implicit descriptions of mindfulness as a process. Mindfulness is described as a particular kind of awareness or attention (Erisman & Roemer, 2010) or a technique that ‘encourages you to stop and smell the roses’ (Heppner, et al., 2008), both emphasising the temporal focus on what is happening now. In Verplanken and Fisher (2013), participants are invited to ‘bring mindfulness’ to either the present moment or in the rest of the day, in each phrase mindfulness is used as a noun implying that mindfulness is an approach or a way of being. Only Erisman and Roemer (2010) describe mindfulness within the context of eastern spiritual and religious traditions. This attribution is qualified with a statement that mindfulness is a valid part of psychology and that it can be helpful ‘without the spiritual and religious context’ (Erisman & Roemer, 2010, p. 14).

Relating to individuals’ previous experiences

This subcomponent encompasses descriptions of what is ‘normal’ to experience and how mindfulness differs from this. For example, mindfully eating a raisin ‘differs

from normal' (Heppner et al., 2008) and bringing attention or focus to the present moment differs from normal worrying about the past or thinking about the future (Erisman & Roemer, 2010). The difference from normal processes is also addressed by Erisman and Roemer's (2010) instructions describing the quality of attention. For example, mindful attention is contrasted with close attention that can be critical or painful and may result in attempts to avoid experiences. Thus, mindfulness is placed between a lack of awareness about what is going on now and over awareness. The observed normal human tendency to judge experiences is acknowledged in the assertion that mindfulness involves 'practicing not judging our tendency to have judgments!' (Erisman & Roemer, 2010, p. 15). The guided meditation used by Verplanken and Fisher (2013) is commensurate with descriptions of mindfulness practices as non-striving, reminding the listener that they are not trying to get anywhere or feel anything different. In doing so, the instructions acknowledge that it is normal to engage with a task with the intention to do, get or be judged successful. Both of these induction scripts describe mindfulness as a process that can be practiced rather than something that can be achieved once and for all.

4.3.3. Induction of mindfulness phase: Instruction

The instruction component encompasses what (*Object of focus*) and how (*Quality of awareness*) to focus on experiences in the present moment. The pace and maintenance of the experience is guided by the *use of rhetorical devices*. Throughout this phase, the notion of *the observing self* is invoked implicitly by instructing the individual to observe phenomena or explicitly by guiding the observation of the self as an observer. Verplanken and Fisher (2013) and Wenk-Sormaz (2005) provide guidance

on the posture of the listeners body invoking a physical embodiment of mindfulness as a stable, upright, discerning stance from which to observe changing experiences.

Object of focus

The instructions all begin with a narrowing of the focus to a specific physical object in the present moment with the invitation for the individual to bring their attention to the object of focus. The objects of focus vary from internal physical experiences of breathing (Erisman & Roemer, 2010; Verplanken & Fisher, 2013; Wenk-Sormaz, 2005) to experiences of an external object (the raisin) and the individuals' physical or emotional responses to it (Heppner et al., 2008).

Quality of the awareness

The quality of the awareness or attitude to the maintenance of this awareness (not addressed in Heppner's raisin task) is described as open and curious, gentle, kind, careful, non-judging, not critical or condemning of any loss of focus. The instructions on how to bring awareness and the quality of awareness guides the individual to allow loose noticing of what is here in this moment 'allowing things we can't control to be as they are' (Erisman & Roemer, 2010) and 'with a lack of self-condemnation, clinging to content, rejection or suppression of the experience' (Verplanken & Fisher, 2013). In doing so, the instructions capture a mindful approach to experiencing phenomenon in the present moment by attending, letting be or letting go. This subcomponent is only nominally addressed in Heppner's raisin task (2008).

The observing self

The narrators invite the participant to observe or notice the body, mind, emotions and attention, implicitly suggesting that the observing self is separate from the

thoughts, feelings, emotions, bodily sensations or simply ‘whatever is’ (Verplanken & Fisher, 2013). The language describing the observing self as separate from the mind and attention suggests that they can therefore be operated upon and brought back by the individual. The observational self is not addressed in Heppner et al’s. (2008) raisin task in which the focus remains on experiencing eating a raisin, there are no references to emotions, thoughts or the possibility that attention may wander.

Use of rhetorical devices

The language in all the induction scripts is simple, rhythmical and repetitive particularly in the breath based meditations in which the phrasing emulates the physical experience of breathing (e.g. Verplanken & Fisher, 2013; Wenk-Sormaz, 2005). The silences and to a lesser extent pauses provide brief opportunities for the mind to wander and the gentle guidance on what to do in response in itself sets a rhythm of observing and returning. With the exception of Heppner et al.’s (2008) raisin task it is assumed and acknowledged that the mind/attention/focus will wander or be carried off by streams of thoughts, sensations etc. The way in which mind/attention/focus are brought back is one of gentleness and a release from striving to achieve a special state, get somewhere or to have a different experience to what is. The pace of the experience is set explicitly by Heppner et al. (2008) in the raisin task with the note that the experimenter provides instruction using a slow methodical rhythm and implicitly with the use of rhetorical devices such as repeated phrases in the remaining induction scripts. Analogies and references to water or wave like motions are used in Verplanken and Fisher’s (2013) implying a naturalness of mindfulness and the wandering nature of mind.

4.3.4. Ending

What next

The final component, *what next* and subcomponent of *application beyond the guided session* relate in the main to the meditation in Verplanken and Fisher (2013), this again reflecting the different functions of the induction scripts. However, implicit in the use and design of all the induction scripts is the notion that a mindful approach is something that can be brought to situations and activities (Heppner et al., 2008), and any emotional experience (Erisman & Roemer, 2010). For example, although the learning or exercise are not explicitly mentioned when completing a subsequent task, Erisman and Roemer (2010, p. 7) invite individuals in the mindfulness condition to adopt a mindful approach to the experience suggesting ‘if you notice any emotions during the film, try to just acknowledge and accept them as they are, without trying to change your experience in anyway’.

Application beyond the guided session

The guided meditation in Verplanken and Fisher (2013) ends with the explicit suggestion that the time spent practicing mindfulness can be applied to the ‘various situations and activities you will encounter today’. The benefits outlined include the opportunity to find a way to live all moments with greater harmony and effectiveness, responding consciously rather than automatically to the various events and challenges in life. This suggestion is included as the instructions are taken from what is described as a formal meditation practice taught as advanced training or practice for living rather than an outcome in itself (Kabat-Zinn, 1990).

4.4. The development of the mindful attention induction (MAI)

The mindful attention induction (MAI) includes instructions that address all the components described in the analysis (see Appendix 5A.1.). The form of the MAI follows the framework of the breath based mindfulness meditation used in Verplanken and Fisher (2013) including silent spaces to bring attention to the experience of the present moment with a mindful attitude. The instructions guide the practice of the core processes of the Liverpool Mindfulness Model (Malinowski, 2013b) by bringing attention to phenomena with a mindful attitude and the space to practice emotional and cognitive flexibility. The induction begins with participants reading a description of mindfulness which sets the scene and relates mindfulness to previous or normal experience. The participants are guided through the breath based mindful meditation. The possibility of applying attention with a mindful attitude to all experiences is explicitly stated in order to increase confidence in attributing differences in subjective and behavioural measures between groups to the induction. The MAI was piloted on meditation naive and experienced meditators with experience of teaching mindful meditation ensuring for example that there was no ambiguous language.

4.5. Discussion

Discussion of the thematic analysis begins with examination of the extent to which components of current conceptions of mindfulness are addressed. Secondly, the authors attributions of effects are discussed with specific reference to the emergent components and aspects of mindfulness addressed in each script. Finally, a pragmatic approach to accurately describing what is being manipulated in mindful inductions is offered.

The authors of the three studies using tasks with the intention of inducing a state of mindfulness (Erisman & Roemer, 2010; Heppner et al., 2008; Verplanken & Fisher, 2013) define or describe mindfulness in accordance with the widely used two component description involving attention to the present moment with a non-judgmental accepting attitude (e.g. Kabat-Zinn, 2003). Despite the inclusion of the two component description in the introduction of mindfulness in each of the studies it is noteworthy that the raisin task (Heppner et al., 2008) does not refer implicitly or explicitly to an attitude of mindfulness in the task. The task does describe experiencing the object of focus as if seen for the first time but does not instruct a non-evaluative or non-judgmental attitude. Therefore, perhaps the raisin task which requires participants to notice and pay close attention to one object may be more accurately described as an observation task rather than a mindfulness induction. The remaining inductions and Wenk-Sormaz's (2005) address the attitudinal component by including the invitation to bring attention or focus on the present moment and to return to the breath gently, with care and without judgment.

With regard to the Liverpool Mindfulness Model the induction techniques, with the exception of Heppner's (2008), focus on the role of attention. This is most evident in Verplanken and Fisher (2013) which guides attention and provides the space to practice emotional and cognitive flexibility. None of the inductions address all components described in multifaceted conceptions of mindfulness and vary in the extent to which they address and provide space in which to practice attitudinal components. These findings reiterate the need for caution when interpreting experimental examinations of induced mindfulness and using the term mindfulness without further clarification.

Despite the commonalities between the induction tasks, the researchers emphasise different aspects of mindfulness or use the term mindfulness to describe a

single component entity when interpreting the findings. Erisman and Roemer (2010, p. 10) state that the findings do indicate that it is possible to “produce the phenomenon of mindfulness in an experimental situation”, whilst adding the caveat that it is likely to be a “modest representation of mindfulness that is better achieved through more extensive practice”. In addition, Erisman and Roemer (2010) use pre compared to post manipulation scores on the two subscales (decentring and curiosity) of the Toronto Mindfulness Scale (Lau et al., 2006) as evidence that the mindfulness induction did increase mindfulness. However, the experimental manipulation was only associated with significant between group differences on self-reported decentring and not on the curiosity scale. This, by the researchers own admission, indicates that the brief intervention likely did not reproduce the full experience of mindfulness. Having noted these limitations, the authors actually then refer to mindfulness as a single component construct when referring to the current and previous research rather than attributing the effects to mindful decentring or aspects of the induction task itself (e.g. mindfulness of difficult emotions). Verplanken and Fisher (2013, p. 1) also attribute the between group differences to a state of consciousness described as ‘experimentally induced mindfulness’. When interpreting the findings, Verplanken and Fisher (2013) refer to the two component description of mindfulness: the self-regulation of attention to focus on the immediate experience and an attitude of curiosity and acceptance towards whatever arises in the stream of consciousness (e.g. Bishop et al., 2004). These components map inversely onto habitual worrying, which is characterized by mental time travelling (e.g. anticipating future negative outcomes) and a fearful, non-accepting attitude (cf. Borkovec, 2002; Verplanken, 2012). Importantly, both of these components are explicitly and experientially addressed in the mindful breathing meditation giving face validity to the assertion to the interpretation of effects of the mindfulness induction.

However, the authors state that the results may be limited in scope as it was not possible to determine to which of these components the between groups differences may be attributed. Noting this limitation the findings do provide support for the assertion that short-lived effects can be obtained, thus providing ‘proof of concept’ (Verplanken & Fisher, 2013). A full measure of mindfulness as a manipulation check was not used to reduce potential priming of responses; however, participants in the mindful group reported being less distracted by thoughts, feelings or bodily sensations, found it less difficult to let go of thoughts and to observe thoughts, and felt no more or less relaxed than the control group (Verplanken & Fisher, 2013).

Wenk-Sormaz’s (2005) study used an induction task that is in essence the guided breath based meditation section of the task used by Verplanken and Fisher (2013). There are no manipulation checks within the experimental session, however participants were asked if they had fallen asleep and the extent to which they had tried to follow the instructions. In attributing the findings, Wenk-Sormaz (2005) focuses on the role of attention, specifically the practice of reinvesting attention to what had become automatic, such as reading in the Stroop task. Wenk-Sormaz (2005) concludes that attention to previously habitual actions and cognitions leads to the more flexible use of information through increasing the number of response alternatives by non-typical encoding or retrieval of information, thereby reducing the prominence of a habitual response. This is described as evidence that meditation can lead to the de-automatisation of responding. Heppner et al. (2008) state that their findings indicate that experimentally heightening individuals’ mindfulness can result in less-aggressive behaviour following a salient social rejection. Specifically, the authors attribute this to participants letting “go of their expectations, goals, and aspirations with suspension of judgment and distraction” which is practiced or taught in the raisin task (Kabat-Zinn,

2003, p. 148). However, in the discussion the authors go on to associate the “(temporarily induced) mindfulness” or ‘heightened mindfulness’ with authentic appraisal of ‘what is’ previously hypothesized to promote secure forms of high self-esteem (e.g. Ryan & Brown, 2006). Alternative interpretations offered by the authors include the suggestion that mindfulness attenuates aggression in part by inducing enhanced self-control and self-other overlap. Self-other overlap describes a sense of connection with others that may increase compassion and selflessness (Heppner et al., 2008).

Based on the definitions of mindfulness and attributions of the between group differences it is apparent that none of the studies draw on a description of mindfulness that includes more than two components: attention and attitude (e.g. Bishop et al., 2004). This in part represents the pragmatic issue of what can be encompassed within a brief induction task. However, attention and attitude as a quality of attention are described within all models of mindfulness and addressed in measures of mindfulness (reviewed in chapter 1.1.3.). Three of the five facets of mindfulness (non-reactivity, non-judgement and observing) included in the FFMQ (Baer, Smith, et al., 2006) are addressed to varying degrees. However, there is a problem in operationalising mindfulness in terms of measurement as it remains unclear to what extent mindfulness is directly accessible and to what extent it can be indirectly assessed by its behavioural effects (e.g. as in ‘acting with awareness’ subscale of the FFMQ). The use of measurement tools to operationalise mindfulness can therefore lead to confusion in what is meant by mindfulness or mindful actions. This illustrates the importance of clearly describing what has been induced or trained in a ‘mindfulness’ manipulation rather than attributing outcomes to ‘mindfulness’ per se. Of the four tasks reviewed here, each could be more accurately described within the literature, for example as a ‘mindful

breathing attitude and attention task' (Verplanken & Fisher, 2013) or a mindful attention task (Wenk-Sormaz, 2005). Such an approach has subsequently been adopted in a study conducted after the completion of this research programme by Westbrook and colleagues (2013). Mindful attention training in an experimental setting has been described as reducing subjective and neural reactivity to smoking cues in smokers in comparison to a control condition (Westbrook et al., 2013). The mindful attention training involved participants being instructed to actively focus on their response to the picture, including thoughts, feelings, memories and bodily sensations, while maintaining a non-judgmental attitude toward those responses. Instructions explicitly asked participants to 'notice and accept' their internal experience. (Westbrook et al., 2013, p. 4). The inclusion of the attitudinal component of attending is what supports the use of the term mindful attention and allows comparison with an attention task as a control condition.

4.5.1. Summary

In sum, this systematic analysis begins to address concerns about widespread confusion stemming from using mindfulness as an umbrella term without further clarification (Davidson, 2010). In reviewing available mindful induction or manipulation tasks the analysis illustrates not only differences in the components addressed in different studies but also the range of interpretations and extent to which mindfulness is operationalised or described as a nebulous entity to which effects are attributed. In doing so the findings may increase researchers' ability to interpret and attribute outcomes of previous and future investigations to proposed components of mindfulness practices and mindfulness-based interventions. The findings that a mindful

‘state of consciousness’ can be induced following such a brief induction and that it can have measurable effects demonstrates the potential importance of mindfulness as a state of consciousness that warrants further exploration (Verplanken & Fisher, 2013). As the evidence base grows, it becomes particularly important to be clear as to exactly what is being measured and how it relates to mindfulness (Davidson, 2010; Grossman & Van Dam, 2011; J. M. Williams, 2010). For example, it is plausible that when considering multiple dimensions of mindfulness some may be of greater relevance as seen in the findings of the first study in this thesis in which *acting with awareness* and *non-judging* were seen to explain greater unique variance in eating tendencies when compared with the *describe* facet. Therefore, it may be that certain facets are more appropriate dependent on the outcome of interest or methodological limitations of the experimental setting. Therefore throughout the thesis and review of previous research what is being described by the term mindfulness (e.g. state, dispositional, practice, attentional process or attitude) will be made explicit.

Chapter Five:

Mindful attention attenuates hedonic reactions following food-cue exposure

5.1. Study overview

The findings of the online study (chapter three) suggest that greater dispositional mindfulness and mindful meditation practice may be associated with reduced tendencies to eat in response to external cues. This is consistent with evidence from intervention studies suggesting that mindfulness techniques (MTs) attenuate reactivity to food-cues thereby reducing behavioural reactivity that leads to overeating. MTs that increase attention with a mindful attitude are taught within MBIs and have been used in experimental settings to measure the effect of mindfulness on psychological and behavioural outcomes. The aim of the current study was to explore further the relationship between mindfulness meditation practice and aspects of uncontrolled eating evidenced in study one. The study examines the effects of bringing attention with a mindful attitude (mindful attention) to individual's hedonic reactions to high energy convenient-to-consume foods and actual intake. Measures of difficulties in emotion regulation and habitual negative self-thinking were used to determine if they influenced subjective or behavioural outcomes.

Exposure to high-calorie food-cues in experimental settings has been shown to increase appetitive responses (e.g. hunger, desire to eat) and food intake. It was expected that the Mindful Attention Induction and food-cue exposure (M-FCE) would be associated with less reactivity to high-calorie food-cues, food craving and less intake of food, compared to standard food-cue exposure (S-FCE). Forty females were randomly allocated to either food-cue exposure condition. Measures of dispositional mindfulness, emotional regulation, habitual thinking and reward motivated eating were completed prior to attending the experimental session. Appetitive state was assessed

pre, post and ten minutes after post-cue exposure (delay), food craving was measured post-cue exposure. A large plate of cookies was used as a surreptitious means of measuring food intake. Hunger decreased and fullness increased for the M-FCE compared to the S-FCE participants (p 's < .05); feel-like-eating ratings reduced for M-FCE compared to S-FCE participants approached significance ($p = .08$). There was no significant between groups difference in food craving after food-cue exposure. Significantly more cookies were eaten ten minutes post-exposure by S-FCE compared to M-FCE participants (M= 22g/125kcal vs. 7g/40kcal; range: 0-3 vs. 0-7 cookies; $p < .001$). Results support the proposition that MTs can attenuate reactivity to food-cues and influence cue related intake providing evidence for the use of MTs to counteract appetitive vulnerabilities for weight-gain. The findings demonstrate the effect of attention with a mindful attitude in an experimental setting using a script validated through systematic analysis and related to theoretical accounts of mindfulness. Importantly, the difference in actual intake despite no subjective differences in craving or by that point appetitive measures illustrates how a mindful approach may influence behavioural change without reliance on translation of intentions into actions. The implications and potential applications of which are discussed further in (See chapter 7.2. The outcomes of this study are used to determine and tailor mindfulness practices incorporated into the Mindful Eating Programme pilot study (see chapter 6.2.1.).

5.2. Introduction

The current study examines the effects of bringing mindful attention to individual's hedonic reactions to high energy convenient-to-consume foods. The experiment creates conditions shown to increase calorie intake (i.e. presence of attractive, diverse, and widely available high convenient-to-consume food) reflecting modern food environments (for discussion of humans interaction with an obesogenic environment see chapter 2.5; Wardle, 2007). It is within this environment that individuals are estimated to make over 200 food related decisions every day, such as repeated choices about what, when and how much to eat (Wansink & Sobal, 2007). Exposure to high-calorie food-cues in experimental settings has been shown to increase appetitive responses (e.g.hunger,desire to eat; Ferriday & Brunstrom, 2008; Jansen, Nederkoorn, Van Baak, Kierse, & Guerrieri, 2009; Jansen et al., 2003) and increase the desire to eat cued and non-cued foods (Ferriday & Brunstrom, 2010). Mindfulness techniques (MTs) have been proposed as a way to attenuate hedonic hunger and the power of food-cues to motivate eating (Rejeski et al., 2012). Hedonic hunger, the motivation to consume food for pleasure rather than for homeostasis, is often associated with increased susceptibility to environmental food cues and presents a barrier to successful weight management or behaviour change (Lowe & Butryn, 2007; O'Neil, Theim, Boeka, Johnson, & Miller-Kovach, 2012).

Mindfulness techniques that increase attention with a mindful attitude are taught within MBIs and, as reviewed in chapter four, have been used in experimental settings to measure the effect of mindfulness on psychological and behavioural outcomes. Attention is a core construct in the process of being mindful and models of mechanisms by which mindfulness confers positive beneficial effects (chapter 2.3.1.). With regard to the Liverpool Mindfulness Model (LMM; Malinowski, 2013b) the Mindful Attention

Induction(MAI; see appendix 5A.1) invites attention to the present moment and provides the space to practice emotional and cognitive flexibility (core processes) bringing non-judging awareness (mental stance) without reactivity. The MAI and food-cue exposure (M-FCE) provides the opportunity for participants to adopt a decentred observational stance to physical sensations, thoughts and emotions arising in response to properties of food, seeing them as transitory events from which attention can be shifted. In contrast the standard food-cue exposure (S-FCE; see appendix 5A.2) brings attention to the properties of the food without providing guidance on how to process any reactions or providing information on the automatic quality of reactions to food that can influence eating behaviours.

Many of the factors that influence eating behaviours cannot be explained by reason-action based models (Fishbein & Ajzen, 2010) or individuals' self-reported conscious trade-offs (Wansink, 2010). Rather, behaviours may be influenced at a perceptual or preconscious level by food characteristics (sights, smells, texture and nutritional value), sensitivity to and awareness of competing internal sensations including physical hunger and emotions (a rumbling sensation in the stomach) or the food environment (food saliance or portion size; Kahn & Wansink, 2004; Wansink, 2004, 2010). Cued responses may be reactions to the characteristics of the food (e.g. the smell or sight of chocolate) or habitual reactions that, although previously initiated with deliberation and choice, are now relatively automatic in certain contexts (e.g. chocolate as a break from writing or to improve subjective mood). Behaviours may also reflect the use of food to satiate emotional needs such as to regulate affective states (for discussion see Evers, Stok, & de Ridder, 2010). That is, in the moment where food is available the characteristics of the individual, the food or food environment may exert influences that individuals may not wholly be aware of. The expression of automatic behaviour is in

part dependent upon awareness of the environmental cues that activate it (Bargh, 1997). Attempts to influence or enable dietary change through informing individuals about the micro nutrient values of foods or long term outcomes of overconsumption are therefore limited by the extent to which eating behaviours are governed by automatic processes (Rothman, Sheeran, & Wood, 2009; Webb & Sheeran, 2006). Such evidence supports the need to develop interventions and guidance that increases awareness rather than relying on knowledge based approaches.

Awareness and attention directed at psychological and behavioural processes is likely to serve a “de-automatisation” function and facilitate self-regulation of behaviours such as eating (Bargh, 1997; Baumeister, Heatherton, & Tice, 1994; Heatherton & Baumeister, 1991; Lattimore & Maxwell, 2004). For example, research indicates that when somatic and mental events go unrecognised they may trigger automatic reward motivated behaviours like eating (Caldwell et al., 2012). Enhanced awareness of and focused attention on internal cues and cued responses may therefore attenuate guidance of behaviours by, for example, external cues and thus reduce eating in response to external cues (Alberts et al., 2012; Bays, 2009; Kristeller & Hallett, 1999; Kristeller et al., 2013). A mindful state of enhanced receptive awareness and attention to present reality compared to normal functioning (Brown & Ryan, 2003), has been shown to enable discrimination of hunger from other sensations such as emotions (Baer, Fischer, & Huss, 2006). The findings are consistent with a dysregulation model of obesity in which overeating reflects the lack of ability to recognise or respond to internal cues to eat or terminate eating episodes (Dalen et al., 2010; Kristeller, 2003). Bringing mindful attention to eating opportunities allows the individual to stop and bring attention to their present state and ask if they are hungry, full, want to eat or ask what they hunger for before reaching out and beginning to eat (Bays, 2009). For example,

when mindfully eating a meal, one can be attuned to the changing moment-to-moment taste experience while also peripherally aware of the increasing physical sensations of fullness in one's stomach (Brown & Ryan, 2003).

These propositions are supported in a recent series of three studies in which 'mindful attention' specifically was shown to reduce approach responses to appetitive foods, an effect that remained after a five minute distraction phase (Papies, Barsalou, & Custers, 2012). Adopting a mindful approach in the moment where food is available was proposed to reduce the subjective realism of thoughts and simulated experiences evoked by the attractive properties of foods (Papies et al., 2012). Simulated experiences include imagining consuming the foods and the accompanying pleasure and reward (e.g. Barsalou, 2009). Mindful attention to the transient nature of mental events may decrease experiencing them as subjectively real events in the moment, reducing desires and impulses and their translation into behaviour, thereby facilitating successful self-regulation (Papies et al., 2012). Results from implicit approach-avoidance tasks using images of attractive foods found that spontaneous approach reactions were fully eliminated for meditation naive individuals who had undergone mindful attention training compared to controls (Papies et al., 2012). The mindful attention training described by Papies et al. (2012) involved introducing the concept that thoughts are transient mental constructions that can be observed rather than reacted to as part of the reality of the moment (described as metacognitive insight). The findings support the proposition that mindful attention can alter responses to attractive stimuli and provide the opportunity to modify potentially maladaptive automatic behaviours (Dutton, 2008). This differs from approaches to managing impulses and automatic reactions through action planning or avoidance in which initial approach reactions to stimuli still occur

(Verplanken & Faes, 1999). Specifically mindful attention is proposed to allow individuals to separate the processing of stimuli from reactions to it (Papies et al., 2012).

The study was designed to examine the following research questions and related hypotheses. Firstly, how does the M-FCE effect self-reported levels of appetite and craving in comparison to the S-FCE? It was expected that participants in the mindful attention condition would not report as great increases pre vs. post in hunger, feeling like eating and desire to eat food or reductions in fullness compared to the control condition. Secondly, would there be differences in amount of food eaten in an ad libitum eating situation between groups? It was expected that participants in the M-FCE would not eat as many cookies in the ad libitum eating situation compared to participants in the S-FCE condition. Thirdly, how long lasting are differences found between conditions post-cue exposure. This was examined by including a third time point ten minutes after post-cue exposure.

5.3. Methods

5.3.1. Design

In a mixed design participants were randomly allocated to either a mindful attention (M-FCE) or standard (S-FCE) food-cue exposure condition. Appetite and state craving were assessed pre-exposure (Time 1), post-cue exposure (Time 2) and following a delay or consolidation period (M-FCE) or delay (S-FCE) of 10 minutes (Time 3). Data collected at Time 3 was used to examine the longevity of any effects seen at Time 2. A

large plate of cookies was used as a surreptitious means of measuring food intake (Time 3).

5.3.2. Participants

Participants were recruited through the Psychology Research Participants Panel and internal staff email lists. Ethical approval for the study was obtained from the University Ethics Committee. Participants were invited to contact the research team if they were female, between 18-50 and liked chocolate. Following a brief screening telephone interview participants meeting inclusion criteria 1) regularly eating between meals; 2) liking crisps and chocolate, were invited to complete an online survey prior to the experimental session. Exclusion criteria were 1) BMI < 18.5 or > 39.5; 2) currently pregnant; 3) presence of food allergy; 4) diabetes diagnosis; 5) having sought medical help in past six months for eating disorder and/or mental health problems; 6) current use of anti-depressant and/or weight-loss medication; 7) any previous formal or informal meditation experience (including yoga and self-help books or audio recordings). Of the 87 females who expressed an interest in taking part 41 females (*M/SEM*: 30yrs, ± 1.2 ; $25.4\text{kg/m}^2 \pm 0.7$) were eligible and able to take part in the experimental session. One participant's data was excluded from analyses due to personal circumstances meaning that she was unable to provide reliable responses, leaving a total of 40 participants (20 in each condition) whose data were used in subsequent analyses. All participants reported liking and eating chocolate and crisps and eating between meals at least once a week with 72.5 % eating between meals almost every day. To control for readiness to eat participants were asked not to eat or have any caffeinated drinks two hours prior to the experimental session.

5.3.3. *Ethical considerations*

Prospective participants were provided with a detailed information sheet and took part in a screening interview in which they were given an opportunity to ask any questions before consenting to participate. The screening interview was intended to ensure participants met the inclusion criteria, and were fully informed of the nature and commitment involved in the research before giving informed consent. If it was established that an individual did not meet the eligibility criteria they were given details of other current research for which they met the criteria, and or offered the details of relevant support organisations. The study involved an element of deception in that it was advertised and described as involving food and attention rather than mindfulness and that participants were led to believe that the experiment had finished at the point that food was offered. The intention was to reduce expectation, reduce self-selection based on participant's interest in learning or experiencing mindfulness and to gain as accurate measure of food intake as possible. On completion of the study participants were told about what the experiment was measuring, including food intake, and were given written debrief information. Participants were all given a voucher to thank them for their participant, given the opportunity to provide feedback about the experience and to withdraw their data from the study within the two subsequent weeks. All data was anonymised prior to analysis and when reporting findings.

5.3.4. Pre-experimental measures

Measures of individual differences (uncontrolled and emotional eating, dispositional mindfulness, difficulties in emotion regulation, habitual negative self-thinking) were administered via Bristol Online Survey (<http://www.survey.bris.ac.uk/>)

at least two weeks prior to the experimental session. Measures of reward motivated eating tendencies (TFEQ) are described in chapter three. In the current sample internal consistency was satisfactory with Cronbach alphas of 0.83, 0.93, 0.74 for uncontrolled, emotional and cognitive restraint respectively.

Measures of Dispositional mindfulness, Difficulties in Emotion Regulation and Habitual Negative self-thinking are also described in chapter three. In the current sample, internal consistency was satisfactory for the total Five-Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, et al., 2006) with a Cronbach α of 0.88 and acceptable for the twelve item HINT (Verplanken et al., 2007) with a Cronbach α of 0.67. In the current sample internal consistency was good (Cronbach $\alpha = 0.93$) for the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004).

5.3.5. Experimental measures

During the experimental session all participants completed the following self-report measures: appetite Visual Analogue rating Scales (VAS; hunger, fullness, felt like eating and desire to eat food; T1, T2, T3); state craving (T2, T3); VAS ratings of non-reactivity, noticing of physical sensations, thoughts, emotions and the effect of foods (T1, T2, T3); and mood (happy and relaxed; T1, T2, T3). Participants could not refer to their previous ratings when providing VAS ratings. The use of VAS scales in appetitive research has been shown to be sensitive to subtle changes and have good test-retest reliability (Stubbs et al., 2000).

5.3.5.1. *Appetite ratings*

VAS rating scales anchored at each end with words expressing the most positive (left) and negative (right) ratings were used to assess hunger, fullness, feeling like

eating, desire to eat. Each VAS item was preceded by the phrase “Right now, I feel...”, and participants marked a 0 – 100mm line to indicate the extent of, for example, their desire to eat (100mm = very strong), how hungry (100mm = very hungry) and how full (100mm = very full).

5.3.5.2. *State craving*

State craving was measured using the 15 item state Food-Cravings Questionnaires (Nijs, Franken, & Muris, 2007). The G-FCQ-S has five subscales: 1) *An intense desire to eat* (e.g. ‘I have an intense desire to eat something tasty’); 2) *Anticipation of relief from negative states and feelings as a result of eating* (e.g. ‘Satisfying my appetite would make me feel less grouchy and irritable’); 3) *Craving as a physiological state* (e.g. If I ate right now, my stomach wouldn’t feel as empty); 4) *Obsessive preoccupation with food or lack of control over eating*; (e.g. ‘I know I’m going to keep on thinking about tasty food until I actually have it’, ‘If I had something tasty to eat, I could not stop eating it’); 5) *Anticipation of positive reinforcement that may result from eating* (e.g. ‘If I were to eat what I’m desiring, I am sure my mood would improve’). Higher scores indicate greater state craving.

5.3.5.3. *Non-reactivity, noticing of physical sensations, thoughts, emotions and the effect of foods*

All participants completed six VAS (labelled M1-6 in results section) designed to measure the extent to which participants noticed internal and external phenomenon. Items asked how much of the time in the experimental session (0-100mm = Never-All the time) participants noticed their thoughts without reacting to them; felt themselves getting carried away by thoughts rather than just noticing them; paid attention to their thoughts and feelings; were aware of their thoughts, feelings and bodily sensations;

noticed how the food affected their thoughts and feelings; and the extent to which their thoughts and feelings were affected by the food (0-100mm = Not at all-very much). The items were adapted from validated mindfulness scales and piloted in order to ensure that they made sense and captured aspects of mindfulness predicted to be manipulated in the MAI.

5.3.4.4. Ratings of foods used in the cue exposure task

Post cue-exposure task participants completed VAS ratings indicating the strength of their desire to eat (100mm = a very strong desire to eat), and how much they liked the cued food (100mm = really like this food).

5.3.5. Exit questions and food intake

On completion of the study participants were asked for feedback on their experience of the food-cue task. Participants were also asked how much they would like to eat if they had the opportunity right now (1= much less to 5= a lot more than usual).

5.3.5.1. Food intake

Having been told that the experiment was over, a plate of 12 Maryland chocolate chip cookies was used as a surreptitious ad libitum eating opportunity. The number of cookies consumed provided a measure of food intake.

5.3.6. Procedure

Participants were tested individually in the same set of testing rooms of the appetite laboratory. On arrival participants gave informed consent and then were randomly allocated to either a mindful attention (M-FCE) or standard (S-FCE) food-cue

exposure condition, each 12 minutes in duration. Participants had an equal chance of assignment to either of the experimental conditions. A quasi-blind randomisation procedure by a third party blind to nature of conditions was followed concealing allocation until after completion of the consent form and baseline assessments (Time1).

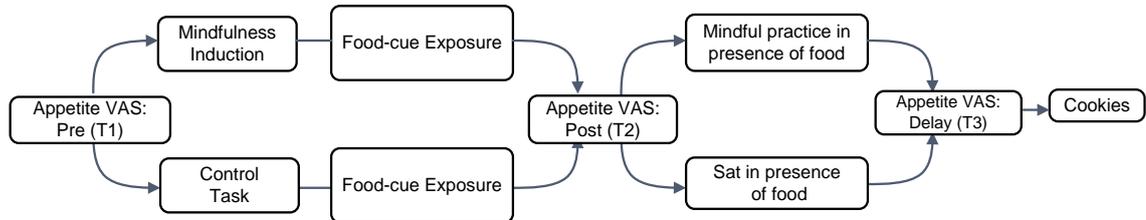


Figure 5.1. Participant flow through experimental procedure

All participants were exposed to four high-calorie foods (cheese and onion Pringles, Tesco's Rocky Road Clusters, Green and Blacks organic milk chocolate and Twix's; see appendix 5B.1 for nutritional details) using a procedure based on Jansen et al. (2009). Two pieces of each food were experienced and then sealed in separate airtight opaque containers after exposure. The experimenter described and modelled the exposure procedure for each participant. Participants were asked to hold, smell intensely, touch against their lips, rotate between their fingers and look intensively at each piece of food. Participants washed their fingers and took a sip of water between each food type. They were told not to eat or taste the food. A stopwatch was used to time exposure (one minute for each piece of food - 10 minutes in total, including transition times in between).

After food-cue exposure (T2) participants rated their appetite, liking and desire to eat the cued foods. Following the cue exposure task, participants in the M-FCE condition were instructed to practice the mindful breathing practice from the MAI in the presence of the packaged cue exposure foods (consolidation period). Participants in the

S-FCE condition were also left in the presence of the packaged cue exposure foods being told that they would be left for a few minutes to reflect on their experiences during the session. All participants were told not to worry if it felt longer than a few minutes, the researcher would come back.

Participants were then informed that the study was over, taken to another room, asked to complete the final appetite ratings (T3) and provide feedback on ‘the food task’ that was being piloted. Having completed the feedback participants were given a plate of 12 cookies and a glass of water from which they could have as much as they wanted as they were ‘a token of appreciation and as they had not eaten for two hours and may have to return to work or drive somewhere’. Participants were left alone with the cookies for five minutes. Finally, weight and height were measured in a separate room.

5.3.7. Manipulations

5.3.7.1. *Mindful attention condition*

Participants were given written information describing mindfulness and were then guided through a brief mindfulness meditation practice providing the opportunity to experience of bringing mindful attention to the sensations of breathing (see full script in appendix 5A.1.). Prior to the food-cue exposure task participants in the M-FCE were told that mindful attention could be brought to everyday experiences including experiences of food. During the food-cue exposure task participants in the M-FCE were asked to notice thoughts, emotions and physical sensations that arose whilst completing the same physical actions as those in the standard food-cue exposure. The script for the MAI and food-cue exposure was based on the Jansen et al. (2009) protocol. The

development of the MAI is described in chapter 4.4 and was informed by systematic analyses of constituent components of published experimental mindfulness inductions and review of current literature. The script included descriptions and language that focused on mindfulness as a form of non-reacting, non-judgemental attention and awareness.

5.3.7.2. *Control condition*

In the control condition the presence of the experimenter and effects of being given information in written and oral forms were controlled for by the researcher substituting the mindfulness scripts with a script describing an exploration of the Venezuelan Rain forest (see appendix 5A.2.). The Venezuelan Rain forest text was read in the same tone and for the same duration as the mindfulness meditation. In the S-FCE the focus was on the foods without mention of reactions, judgments or awareness.

5.4. Results

5.4.1. Data analyses overview

Analyses of variance (ANOVAs) were conducted to test the following hypotheses: Firstly, that there would be significant difference between conditions (Group: M-FCE v's S-FCE) in self-reported levels of appetite and craving. Specifically, participants in the mindful attention condition would not report as great an increase pre vs. post-cue exposure in hunger, feeling like eating and desire to eat food or reductions in fullness compared to the control condition. Secondly, participants in the mindful attention condition would not eat as many cookies in the ad libitum eating situation compared to the control condition. Effect sizes were calculated for analyses, $\eta_p^2 = .06$,

$\eta_p^2 = .14$ are considered medium and large effect sizes respectively for partial eta squared (Cohen, 1988). Mixed ANOVAs were used to examine the longevity of any significant differences found between conditions post-cue exposure by including a third time point ten minutes after post-cue exposure (Time: pre vs post vs delay).

5.4.2. Data exploration

5.4.2.1. Physiological, dietary, demographic and psychological participant characteristics.

Physiological, dietary, demographic and psychological participant characteristics are presented in table 5.1. Assumptions for all baseline measures including age, BMI, uncontrolled eating, emotional eating, cognitive restraint, dispositional mindfulness, difficulties in emotion regulation, and habitual negative self-thinking met assumptions required for running parametric tests. Z-scores were within the range of +/- 2.5 for all the baseline measures described above for both conditions. There were no significant differences in variance between conditions for all pre-experimental measures ($p > 0.5$). Multivariate ANOVAs (Table 5.1) revealed no significant between group differences on all pre-experimental individual measures (dispositional mindfulness, eating tendencies, difficulties in emotion regulation, habitual negative self-thinking), mood and food preferences ($p > 0.5$).

5.4.2.2. Pre-cue exposure ratings.

Distributions of pre-cue exposure appetite VAS ratings (hunger, fullness, feeling like eating and desire to eat food) were examined to ensure they met assumptions required to run parametric analyses. Exploration of the data revealed no outlying scores

in either condition on appetite VAS ratings. Z-scores for both conditions were within the range of +/- 2.5 for all the appetite ratings. Variance between conditions were not significantly different for all the appetite ratings ($p > .05$). Distributions of pre-cue exposure mood VAS ratings (how happy and relaxed) were examined. Exploration revealed no outlying scores in either condition. Z scores for the M-FCE condition ranged between -2.76 and 1.49 for happiness and were within the +/- 2.5 for relaxedness. In the S-FCE condition Z-scores ranged between -2.75 and 1.21 for happiness and were within the +/- 2.5 for relaxedness. The variances between conditions were not significantly different ($p > .05$). Multivariate ANOVA (Table 5.2) revealed no significant differences on the pre-exposure appetite or mood ratings ($p > .05$).

5.4.2.3. Dependent measures

Assumptions required to conduct mixed design ANOVAs were met for each of the appetite VAS ratings post cue exposure for both conditions. One way ANOVAs revealed no significant differences between groups on all dependant measures (appetite and food intake).

Table 5.1. Baseline measures of physiological, dietary, and psychological characteristics: range, mean, standard error, standard deviation and *F* values from multivariate ANOVA (N=40).

	Cue exposure Condition							<i>F</i> values (<i>df</i> =1,38)
	<i>Range</i>	Mindful attention			Control			
		<i>M</i>	<i>SEM</i>	<i>SD</i>	<i>M</i>	<i>SEM</i>	<i>SD</i>	
Age	(21- 46)	30.65	2.04	9.15	29.50	1.37	6.12	.22
BMI (kg/m ²)	(20-39)	25.40	.83	3.72	25.40	1.08	4.84	.00
TFEQ-UE	(11-78)	49.07	4.26	19.03	43.33	3.63	16.25	.37
TFEQ-EE	(0-72)	49.44	7.19	32.14	44.16	5.53	24.74	2.18
TFEQ-CR	(0-100)	38.05	3.69	16.55	46.11	4.01	17.94	1.05
FFMQ Total	(95- 172)	128.00	3.96	17.73	125.55	3.86	17.25	.34
DER Total	(44 - 130)	79.85	4.90	21.94	78.65	4.60	20.56	.05
HINT Total	(12 -60)	41.15	2.59	11.59	41.85	1.89	8.45	.20
EBM	(3-5)	4.75	.12	.55	4.65	.11	.49	.61
Last Ate	(1-15)	3.96	.74	3.29	3.44	.75	3.36	.50

Note: TFEQ UE = uncontrolled eating; TFEQ EE = emotional eating; TFEQ CR= cognitive restraint; FFMQ Total= mindfulness; DER Total= Difficulties in emotion regulation; HINT Total = Habitual negative self-thinking; EBM = Eating between meals frequency, 4 = 2-3 times per week and 5= almost every day; last ate = hours and minutes since last ate.

Table 5.2. Pre-cue exposure appetite and mood measures: range, mean, standard error, standard deviation and *F* values from multivariate ANOVA (N=40).

	Cue exposure Condition							<i>F</i> values (<i>df</i> =38)
	Mindful attention (N=20)			Control (N=20)				
	<i>Range</i>	<i>M</i>	<i>SE</i> <i>M</i>	<i>SD</i>	<i>M</i>	<i>SEM</i>		
Hungry	(2-96)	54.75	6.72	30.06	44.85	5.63	25.18	1.28
Full	(1-82)	28.65	4.89	21.86	36.40	5.04	22.53	1.22
Feel like eating	(11-95)	70.50	3.99	17.83	57.30	5.37	24.01	3.90
Desire to eat food	(6-97)	64.65	5.34	23.88	57.20	5.67	25.32	.92
Happy	(20-100)	71.90	4.21	18.84	74.05	3.50	15.66	.15
Relaxed	(39-87)	68.05	3.16	14.13	62.55	3.13	14.00	1.53

5.4.3. Primary outcome analyses: Appetitive ratings and food intake

5.4.3.1 Assumptions required to conduct mixed design ANOVAs were met for each of the appetite VAS ratings post-cue exposure for both conditions. A two (Group: MFCE vs. SFCE) x two (Time: pre vs. post) ANOVA (Table 5.3) revealed significant and medium effect sized time-by-condition interactions for hunger and fullness. The SFCE group reported a significant ($p < .00$) increase in hunger pre ($M = 44.85$, $SD = 25.18$) to post ($M = 57.90$, $SD = 22.61$) cue exposure. The MFCE group reported a significant ($p < .00$) decrease in hunger pre ($M = 54.75$, $SD = 30.06$) to post ($M = 46.95$, $SD = 26.64$) cue exposure and significant increases ($p < .00$) in fullness pre ($M = 28.65$, $SD = 21.86$) to post ($M = 48.00$, $SD = 25.12$) cue exposure. The time-by-condition

interaction for feel like eating approached significance ($p = .08$) with a medium to large effect size (see table 5.3) such that there was a significant ($p = <.00$) decrease in feeling like eating pre ($M = 70.50$, $SD = 17.83$) to post ($M = 63.00$, $SD = 24.25$) cue exposure

Table 5.3. Appetite ratings pre and post-cue exposure: mean and standard error with results of the mixed ANOVAs (N=40).

Variable	Cue exposure condition				<i>F</i> values (<i>df</i> = 1,38)		
	Mindful attention (N=20)		Control (N=20)				
	Pre	Post	Pre	Post	T	C	T x C
	M <i>SEM</i>	M <i>SEM</i>	M <i>SEM</i>	M <i>SEM</i>			
Hungry	54.75 6.72	46.95 5.96	44.85 5.63	57.90 5.06	.27 [.01]	.01 [.00]	4.19* [.10]
Full	28.65 4.89	48.00 5.62	36.40 5.04	35.35 4.49	4.02 [.10]	.20 [.01]	4.99* [.12]
Feel like eating	70.50 3.99	63.00 5.42	57.30 5.37	63.75 4.52	.02 [.00]	1.21 [.03]	3.18 [.08]
Desire to eat food	64.65 5.34	64.55 5.24	57.20 5.66	66.85 4.31	1.36 [.04]	.10 [.01]	1.42 [.04]

Note: * indicates significance at $p < .05$. T = Time main effect; C = Condition main effect; T x C = Time by Condition interaction. Partial Eta squared effect sizes in [].
in the MFCE and a significant ($p = <.00$) increase pre ($M = 57.30$, $SD = 24.01$) to post ($M = 63.75$, $SD = 20.20$) in the SFCE condition.

5.4.3.2. State craving measures post cue exposure

Distributions of the total general state craving scale scores (GSC total) and subscales met assumptions required to run parametric statistical analyses. Due to the similarity in means in each condition at T2 and T3 no further analyses were conducted (see tables 5.4 and 5.5).

Table 5.4. General state craving total and subscales post cue exposure: Cronbach alpha, range, mean, standard error and standard deviation (N=40).

Variable	α	Range	Cue exposure Condition					
			Mindful attention (N=20)			Control (N=20)		
			<i>M</i>	<i>SEM</i>	<i>SD</i>	<i>M</i>	<i>SEM</i>	<i>SD</i>
GSC - total	.93	(19- 59)	41.65	2.90	12.96	42.60	2.19	9.79
GSC - IDE	.77	(3-13)	7.30	.85	3.79	6.75	.53	2.36
GSC - ARFN	.87	(3-14)	9.00	.61	2.71	8.75	.57	2.55
GSC - CPS	.93	(4-14)	8.00	.59	2.64	8.45	.63	2.82
GSC - OPF	.77	(4-15)	9.35	.75	3.34	10.50	.57	2.54
GSC - APR	.77	(3-12)	8.00	.64	2.85	8.15	.51	2.30

Table 5.5. General state craving total and subscales following consolidation or delay: Cronbach alpha, range, mean, standard error and standard deviation (N=40).

Variable	α	Range	Cue exposure Condition					
			Mindful attention (N=20)			Control (N=20)		
			<i>M</i>	<i>SEM</i>	<i>SD</i>	<i>M</i>	<i>SEM</i>	<i>SD</i>
GSC - total	.96	(17- 68)	42.40	3.67	16.43	41.20	2.55	11.42
GSC - IDE	.97	(3-15)	7.25	.91	4.08	6.70	.65	2.90
GSC - ARFN	.88	(3-15)	9.00	.80	3.58	8.70	.59	2.64
GSC - CPS	.89	(3-14)	7.85	.74	3.33	7.95	.64	2.86
GSC - OPF	.85	(3-15)	9.60	.82	3.67	9.95	.73	2.25
GSC - APR	.85	(3-14)	8.70	.76	3.89	7.90	.54	2.40

Note for tables 5.4 and 5.5: IDE= Intense desire to eat; ARFN= Anticipation of relief from negative states and feelings; CPS = Craving as a physiological state; OPF= Obsessive preoccupation with food or lack of control over eating; APR= Anticipation of positive reinforcement that may result from eating.

5.4.3.3. *Food intake*

Distributions of the number of cookies eaten were non normal with multiple outliers in the S-FCE condition although only one Z-score fell out of the ± 2.5 range (Z-score = 3.28). The exclusion of the score made no difference to the direction or magnitude of the results. Results are reported with the score included. Non-parametric equivalent of the independent samples t-test was conducted: Mann-Whitney test. The number of cookies eaten by the M-FCE group (Range between 0-3; mean = .7; *Mdn* = 0) differed significantly from the number eaten by the S-FCE group (Range between 0-7, mean = 2.25; *Mdn* = 2), $U = 69.00$, $z = -3.70$, $p < .001$, $r = -.58$.

5.4.4. Ancillary analyses: Potential confounding variables

5.4.4.1. *Liking and desiring to eat foods used in cue exposure and amount of food desired*

Liking and desire to eat foods used in the cue exposure ratings met assumptions required to run parametric tests. Multivariate ANOVAs revealed no significant between group differences in the extent to which participant liked or desired to eat the cued foods or the amount of food participants felt like eating at delay and prior to the opportunity to eat ($p > .05$).

5.4.4.2. *Happy and relaxed VAS ratings*

Ratings met assumptions required to run mixed ANOVA. There was a main effect of time, participants in both conditions felt significantly happier and more relaxed post-cue exposure tasks compared to pre exposure ($F(1,38) = 4.16$, $p < .05$, $\eta_p^2 = .10$ and $F(1,38) = 12.96$, $p < .01$, $\eta_p^2 = .25$ respectively). There was also a significant main effect of time for both conditions pre/post and delay such that participants in both conditions

felt more relaxed ($F(2,76) = 6.75, p < .01, \eta_p^2 = .15$). Regarding the significant main effect of time two t-tests post hoc tests using simple Bonferroni corrections (alpha divided by two = .025) revealed that participants were significantly ($p < .025$) more relaxed post ($M = 75.23, SD = 17.08$) compared to pre ($M = 65.30, SD = 14.16$) and delay ($M = 74.18, SD = 18.69$) compared to pre. The comparison between post and delay was not analysed as visual inspection of the means and standard deviations showed no meaningful change post to delay. There were no significant time-by-condition interactions.

5.4.4.3. Non-reactivity, noticing of physical sensations, thoughts, emotions and the effect of foods

Mixed ANOVA were conducted on M2-6, M1 revealed significant pre-exposure group differences ($F(1,38) = 4.84, p = .03$) and was therefore excluded from subsequent analyses. There were no significant time, condition or time-by-condition effects for 'I feel myself getting carried away by my thoughts rather than just noticing them' (M2), 'I pay attention to my thoughts and feelings' (M3) or 'I am aware of my thoughts, feelings and bodily sensations' (M5). There was a main effect of time pre/post and pre/post/delay food cue exposure on 'Food affects my thoughts and feelings' (M6) for both conditions ($F(1,38) = 6.15, p < .05, \eta_p^2 = .14$ and $F(2,76) = 3.53, p < .05, \eta_p^2 = .16$ respectively). Regarding the significant main effect of time two single tailed paired-samples t-test revealed significant differences using simple Bonferroni corrections (alpha divided by two = .025). Participants reported that food affected their thoughts and feelings significantly more ($p < .01$) post ($M = 69.85, SD = 24.16$) compared to pre ($M = 58.50, SD = 21.47$) and delay ($M = 69.98, SD = 20.73$) compared to pre ($p < .01$). The comparison between post and delay was not analysed as visual inspection

of the means and standard deviations showed no meaningful change post to delay.

There was also a main effect of time pre/post/delay on 'I notice how food affects my thoughts and feelings' (M4) for both conditions ($F(2,76) = 5.55, p < .01, \eta_p^2 = .12$).

Regarding the significant main effect of time three single tailed paired-samples t-test using simple Bonferroni corrections (alpha divided by three = .016) revealed significant differences pre ($M = 56.90, SD = 25.78$) to delay ($M = 70.45, SD = 23.12$); $p < .01$). The difference between means pre and post ($M = 64.93, SD = 26.477$) and post compared to delay were not significant based on revised alpha levels (both $p = .04$).

5.4.5. Secondary outcome analyses: longevity of effects

Analysis was conducted to ascertain if effects post cue-exposure were evident after a consolidation period (M-FCE) or delay (S-FCE) of 10 minutes (T3).

Assumptions required to run parametric tests for appetite ratings from T3 were met. The results of mixed ANOVAs indicate no significant main effects of condition on appetite ratings (see table 5.6). For the hunger ratings there was a significant main effect of time and the time-by-condition interaction approached significance ($p = .076, \eta_p^2 = .12$).

Planned comparisons indicated significant differences in pre- and post-hunger, and post- and delay-hunger (p 's $< .05$). For the fullness ratings the main effect of time approached significance ($p = .06, \eta_p^2 = .07$) and the time by condition interaction was significant.

Planned comparisons of time-by-condition interactions revealed a significant decrease in fullness between post- and delay-fullness in the M-FCE condition ($p = .03$). The mean scores at T3 show that there were no between group differences in appetite ratings suggesting that the effects seen post cue exposure can be described as relatively short lived.

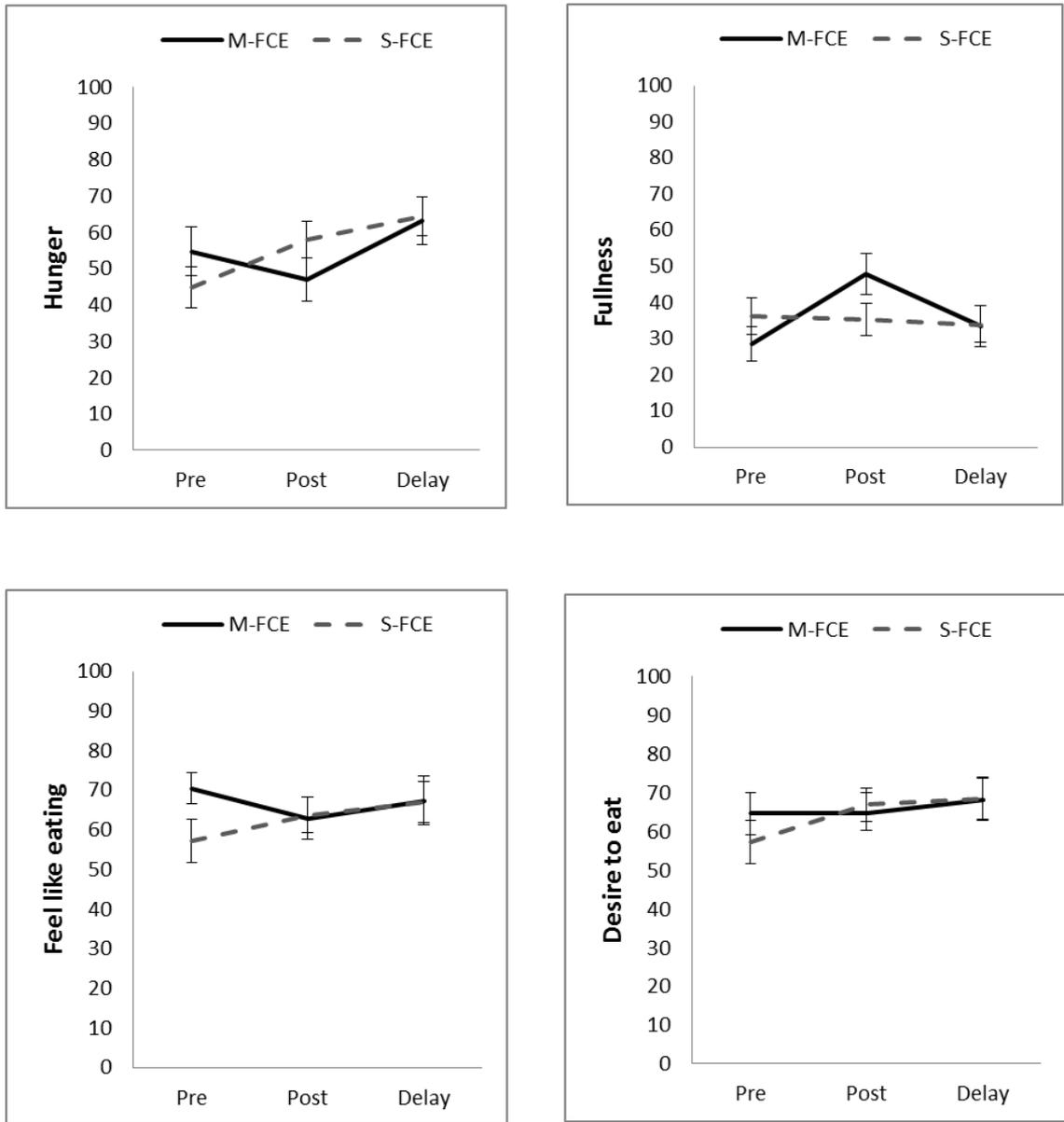


Figure 5.2. Graphical representation of appetite ratings Pre, Post-Cue exposure and following a 10 minute delay: mean and standard error bars.

Table 5.6. Appetite ratings Pre, Post-Cue exposure and following a 10 minute delay results of the mixed ANOVAs with (N40).

Variable	ANOVA		
	T	C	T x C
Hungry	5.39* [.28]	.01 [.00]	2.67 [.12]
Full	2.91 [.07]	.08 [.00]	3.16* [.08]
Feel like eating	.68 [.05]	.52 [.01]	2.29 [.08]
Desire to eat food	1.99 [.05]	.07 [.00]	.96 [.04]

Note: * indicates significance at $p < .05$. T = Time main effect; C= Condition main effect; T x C= Time by Condition interaction. Degrees of freedom for condition = 1, 38; for time and time by condition= 2,76. Partial Eta squared effect sizes in [].

5.5. Discussion

The study examined whether bringing mindful attention to the experience of high energy, easy to consume foods would attenuate hedonic reactions (appetite ratings, food craving) and reduce the amount of subsequent food intake compared to a control condition. Analyses revealed that mindful attention (MAI) significantly attenuated the effects on perceived levels of hunger and fullness of exposure to food characteristics in comparison to standard cue exposure. A reduction in feel-like-eating ratings for the mindful food-cue exposure condition compared to the standard control condition approached significance. Regarding the longevity of effects there was a significant increase in hunger across both conditions and decrease in fullness post- to delay in the

mindful attention group. Although there were no differences between conditions on post-cue state craving or appetite measures after a delay of ten minutes as predicted participants in the mindful food cue-exposure condition did not eat as many cookies in comparison to the control condition.

The difference in post exposure appetitive ratings suggests that mindful attention can influence self-reported reactions to foods. The mindful attention induction and food-cue-exposure provided the opportunity for participants to adopt a decentred observational stance to physical sensations, hedonic thoughts and emotions arising in response to properties of food, seeing them as transitory events from which attention can be shifted. In contrast the standard food cue-exposure brought attention to the properties of the food associated with hedonic reactions without providing guidance on how to process any reactions or providing information on the automatic quality of reactions to cravings. It is to the combination of mindful attitude and attention that the findings are attributed.

Interestingly, participants in both conditions were comparably hungry, full felt like eating, craved food and liked the cued food at the point they were faced with an eating opportunity. Despite this lack of difference such subjective experiences did not automatically translate into behaviour for individuals who had experienced the MAI. This lends support for the potential of mindful attention to disrupt relations between internal experiences and observable behaviours and is commensurate with the idea that mindfulness may bridge or address the intention-behaviour gap as described in theories of planned behaviour (Chatzisarantis & Hagger, 2007). The difference in actual food consumption despite the lack of differences in subjective ratings also supports the notion that mindfulness operates on how thoughts are processed rather than changing the content of thoughts (e.g. Brown, Ryan, & Cresswell, 2007; Teasdale et al., 2002).

The changes in ratings between post cue exposure and the third time point highlights the transitory effects of a brief MAI on meditation naïve individuals in experimental settings. Following a ten minute time period participants in both conditions were similarly hungry, full, felt like eating or desired to eat food. This may reflect the overriding effect of exposure to the food or a time effect such that individuals' appetite increased over the experimental session. In the present study the effects of the MAI are attributed to a temporary state rather than a change in dispositional mindfulness. Further research is required to ascertain how much mindfulness practice is required to see longer term benefits or changes in response tendencies in daily life to obesogenic environments. This is in part addressed in Study 4 which examines the influence of mindful meditation and mindful eating practices on participants relationships with food, eating and psychological experiences.

The lack of between group differences of reported state cravings following the cue exposure tasks may indicate that bringing mindful attention to experiences of food does not influence food cravings. It is also plausible that the lack of difference may be attributable to pre food-cue exposure differences unmeasured in the current study or alternatively a lack of sensitivity of the scale. However, mindfully attending smoking cues (noticing, accepting non-judgementally) has been shown to reduce self-reported craving in comparison to normal attention (Westbrook et al., 2013). No pre measure of craving was completed in this study as the items were deemed too transparent and may therefore bias participants' responses post-cue exposure.

The findings are consistent with Verplanken and Fisher (2013) in which an induced 'state of mindfulness' was shown to affect behavioural outcomes in comparison to controls. In both Verplanken and Fisher (2013) and the current study, no instruction was given that mindfulness was a tool to aid restraining desires or actual eating

behaviours. In addition participants were led to believe that the opportunity to eat cookies was not part of the experimental session. Furthermore, analyses indicates that the difference in amount eaten was not associated with any of the three trait eating patterns (uncontrolled or emotional eating or cognitive restraint) as there was no between group differences on these measures. Taken together this provides further evidence that induced mindful attention may temporarily overcome trait tendencies and may facilitate temporary health behaviour changes.

By employing a randomised controlled design in an experimental setting potential confounding factors were minimised. The study aimed to capture one component of determinants of eating behaviour, namely the effects of how we bring attention to experiences of food. The way in which attention was brought was designed to address core processes and mental states described in the LMM (Malinowski, 2013b), specifically attention and emotional and cognitive flexibility to engender a state of non-judging awareness. The current findings provide tentative evidence for the role of these components; however, the model also includes motivational factors and wider ranging behavioural outcomes. Further research is required to explore the role of these components and establish if the present findings generalise to experiences outside of the laboratory.

There are several important limitations to consider. Most notably, this laboratory based study had a small sample size which reduced the statistical power of the analyses. For this reason, effect sizes were reported in order to meaningfully examine non-significant findings and to obtain information about which findings may be important to pursue in future studies. The small sample size, coupled with the number of analyses conducted, raises the possibility that the findings that emerged could be due to chance. Clearly, studies with larger sample sizes are needed before firm conclusions can be

drawn about the effects of mindful attention on exposure to food. Secondly, despite the perhaps surprising finding that the brief MAI had measurable effects it should be noted that these effects were shown to be short-lived. It is likely that more enduring effects can only be attained by intensive meditation training or therapy (Verplanken & Fisher, 2013). In this respect, the present results are limited in scope. Yet the fact that short-lived effects can be obtained supports the suggestion that mindfulness is a powerful and interesting state of consciousness worth further exploration as noted by Verplanken and Fisher (2013). The findings do indicate that the application of a mindfulness technique as a tool when needed (rather than as a trait developed over a longer period) may hold some benefit. For instance, one could use this technique to induce a mindful state whenever a food or situation is encountered identified as being associated with overeating. This finding directly informs the inclusion in the Mindful Eating Programme of mindful eating and breathing space at either regular intervals or at times where 'difficult' situations or foods are experienced.

5.5.1. Summary

This study has demonstrated that the MAI developed through systematic analysis to increase transparency about what aspects of concepts of mindfulness it addresses has a measurable effect on subjective and behavioural measures. The brevity of induction means that it may have a practical application in daily life to be used as a tool or technique to reduce undesired eating tendencies in response to environmental cues. The difference in actual intake despite lack of difference on subjective measures of craving illustrates how mindfulness approaches may offer an alternative way to address the gap between intentions and behaviours. The evidenced reductions in

hedonic reactivity, both subjectively and behaviourally, warrant further investigation to examine for example the potential of repeated practice of mindful attention techniques to attenuate food-cue reactivity in daily life. Given the frequency to which individuals are exposed to eating opportunities and choices exploring the effects of bringing mindful attention to cues to eat will enhance our ability to develop interventions to promote healthful eating. The MAI and the outcomes of this study and studies one and two inform the content of approach of the Mindful Eating Programme pilot described in chapter six.

Chapter Six:

A Mindful Eating Programme for a community sample wanting to develop a healthy relationship with food: A mixed methods pilot study.

6.1. Study overview

This study brings together understandings of conceptions of mindfulness within current literature and the findings of studies 1-3 examining the relationship between mindfulness, emotion regulation, habitual thinking and eating behaviours. The Mindful Eating Programme (MEP) was formulated to test the generated understanding of how mindfulness training may influence eating behaviour and underlying mechanisms. All the information, insights and findings gained in conducting these studies were used to plan, design and formulate the MEP. A mixed method approach was used to explore the influences and underlying processes of mindful practices and to evaluate the acceptability and efficacy of the MEP rather than focus on statistical effects. Outcomes of statistical analyses are reported to demonstrate changes that may warrant further examination with greater sample sizes to increase statistical power. The MEP is the first known study to address reward motivated eating in the context of discovering a healthy 'relationship with food' through mindful meditative practice rather than weight-loss or nutritional advice. Qualitative analysis provides an insight into what the term relationship with food means to participants and what tendencies they use to describe it. The analysis highlights considerable overlap with behaviours, thoughts and emotions described in diagnostic settings. A self-selected community sample wanting to discover a healthy relationship with food (N=21) were randomly assigned to a seven week MEP or a waitlist control group. Qualitative analyses were conducted to explore the lived experience of individuals' relationship with food pre and post participation and their experience and evaluation of the programme. Measured outcomes included dispositional

mindfulness, emotion regulation, habitual negative self-thinking, and mental well-being. Eating measures assessed reward motivated eating and mindful eating. Based on recruitment, attendance and pre and post qualitative findings the MEP was found to be acceptable and associated with positive changes in relationships with food. These include greater awareness of antecedents such as sensations of different forms of hunger, emotions and situations and reduced thinking about food and less food related negative self-thinking. Several participants describe changing actual intake including reduced snacking, comfort eating, portion sizes and the ability to stop when feeling full. Quantitative findings showed that the MEP increased dispositional mindfulness, reduced difficulties in emotion regulations and habitual negative thinking and BMI but not at a statistically significant level. There were no reported changes on measures of mental well-being. The evaluation of the programme provides evidence supporting the findings of studies 1 and 3 that evidence the potential for mindful practices to influence eating tendencies. The findings also provide preliminary support for the MEP as a formulation to address eating behaviours through teaching mindful practices in a non-clinical community sample. Participant's feedback and reasons for wanting to take part support the importance of addressing difficulties in emotion regulation and habitual thinking through mindfulness practices in relation to reward motivated eating behaviours. The study is discussed in the context of comparable mindfulness intervention research. The potential implications for addressing the gap between intentions and behaviours, and changing eating tendencies associated with obesity and overweight are described.

6.2. Introduction

The purpose of this study was to test the understanding of how mindfulness practices influence eating behaviour and underlying mechanisms generated through analysis of current conceptions of the mechanisms mindfulness and empirical studies conducted thus far. The Mindful Eating Programme (MEP) was designed to test the premise that mindfulness practices and a mindful approach to eating would influence reward motivated eating tendencies. Dispositional mindfulness, emotion regulation and habitual thinking were examined as outcomes and underlying mechanisms by which mindfulness may influence eating behaviour. The studies formulation enabled the evaluation of acceptability and efficacy of the MEP for a self-selected community sample wanting to develop a healthy relationship with food and offer recommendations for future MBIs. Although there have been several recent studies applying mindfulness and acceptance-based strategies to the problem of weight-loss or weight-loss maintenance (e.g. Dalen et al., 2010; Forman et al., 2009), this is the first study to focus on individuals relationship with food as a way of addressing eating and psychological experiences associated with overweight and obesity. In addition the majority of studies exploring mindfulness and various aspects of eating behaviours have utilised quantitative data, which while helpful in determining changes in measured outcome variables, are less able to explore the means through which mindfulness works. Mindfulness as an experiential phenomenon and process of change is particularly suited to qualitative study (Depraz, Varela, & Vermersch, 2003). The mixed method approach provides narratives to give insight into the meaning of the quantitative findings and increase understanding of effects that may not have be captured by quantitative methods (Johnson & Onwuegbuzie, 2004). The qualitative research methods also enables understanding of both the outcomes of mindfulness practice, and the mechanisms of

change through which it operates (Woolhouse, Knowles, & Crafti, 2012). The fit between theory and method demonstrates coherence a criteria for judging the validity of qualitative research (Yardley, 2000; described in method section 6.4.3).

6.2.1. Approach to development of the MEP

The MEP was developed and implemented in accordance with a “problem formulation” approach such that different components of mindfulness and mindful practices were matched to the underlying mechanisms and behavioural expression of a problem in a specific population (Teasdale, Segal, & Williams, 2003). Despite growing evidence that tailoring mindfulness practices to the specific presenting problems provides the most benefit to individuals (Woolhouse et al., 2012) studies specifically designed on this approach are still limited in number, design and sample size (e.g. Timmerman & Brown, 2012). Examples include the use of mindfulness practices such as “urge surfing” in addressing addictive behaviours (Bowen & Marlatt, 2009), practicing a mindful body scan to support pain management for individuals with chronic physical pain (Kabat-Zinn, 1990) and emphasising self-compassionate aspects of mindful meditation exercises may be well-suited for clients experiencing low self-esteem (Neff, 2003). The development of the MEP was informed by current literature and the findings presented in this thesis such as the evidence for negative associations between dispositional mindfulness and eating behaviours that may increase the risk of overweight (described in chapter three; Lattimore et al., 2011; Lavender et al., 2011) and the potential for mindful eating practices to influence reactions to cues to eat (described in chapters four and five). Details of programme development are provided in 6.4.2.

6.2.2. Understanding the problem and limitations of standard weight-loss programmes

It is widely understood that in the aetiology of obesity: “Genes load the gun, the environment pulls the trigger.” (Bray, 2006, p. 4003). However, genetic predispositions accounts for less than half of the variance explained in BMI (Wadden, Brownell, & Foster, 2002). This is because changes in eating and activity behaviours, rather than genetic predispositions, appear to underpin increases in the prevalence of obesity (J. O. Hill & Peters, 1998). That is, how we navigate our internal and external environments in daily life including our relationship with the food environment are important factors in determining our risk of overweight and obesity. Estimates in 2011 suggest that in England the percentage of overweight including obese increased from 57.6% to 65.0% in men and from 48.6% to 58.4% in women between 1993 and 2011 (HSCIC, 2013).

The prescribed behavioural changes in standard behavioural treatments (SBT) to aid weight management, typically involving dietary restriction or change and increased physical activity, if adhered to lead to large weight-losses and minimal weight regain (Klem, Wing, McGuire, Seagle, & Hill, 1997). However, many participants do not adhere to advised regimes and lose substantially less weight than would be expected or regain substantial, if not all, weight lost within five years (Brownell & Jeffery, 1987; Butryn et al., 2011). These weight regains are not accounted for by changes in metabolic efficiency occur during weight-loss (Weinsier et al., 2000). Failure to lose weight and weight regain are attributed to difficulties making and/or maintaining behavioural changes taught within SBT for obesity (Forman et al., 2013). Therefore evidencing a need for broader lifestyle approaches including psychological components rather than a sole focus on weight management to facilitate health and sustainable weight management (Kidd, Graor, & Murrock, 2013).

6.2.3. Review of mindfulness and acceptance based interventions relating to eating behaviours

Participation in mindfulness and acceptance based interventions briefly introduced chapter 1.1.1. have been associated with: decreased body mass index (BMI; Tapper et al., 2009); decreased binge eating (Baer, Fischer, & Huss, 2005; Courbasson, Nishikawa, & Shapira, 2011; Dalen et al., 2010; Kristeller & Hallett, 1999; Leahey, Crowther, & Irwin, 2008; B. W. Smith, Shelley, Leahigh, & Vanleit, 2006); decreased external eating (Daubenmier et al., 2011); decreased emotional eating (Forman et al., 2009); increased self-efficacy (Kidd et al., 2013; Leahey et al., 2008); weight-loss in emotional eaters (Niemeier, Leahey, Palm Reed, Brown, & Wing, 2012); and decrease of food cravings (Alberts et al., 2010; Alberts et al., 2012). A wide range of benefits have been implied in the interventions described. Most found significant weight-loss over the course of the intervention (Alberts et al., 2010; Dalen et al., 2010; Forman et al., 2009). In addition, there was evidence to suggest improvements on a variety of psychological well-being measures including reduced anxiety, depression and stress (Alberts et al., 2010; Dalen et al., 2010; Daubenmier et al., 2011; Forman et al., 2009; Tapper et al., 2009). However, despite this overall impression, there are variations in how the outcomes are measured and a number of methodological limitations that must also be considered. For example, only four studies included randomised comparison groups (Alberts et al., 2010; Daubenmier et al., 2011; Tapper et al., 2009). In these studies there was either no weight-loss (Daubenmier et al., 2011; Tapper et al., 2009) or all participants lost weight equally (Alberts et al., 2010). Only one study had participant numbers above fifty (Tapper et al., 2009); the small sample size was acknowledged as a limitation in four of the five other studies (Alberts et al., 2010; Dalen et al., 2010; Daubenmier et al., 2011; Forman et al., 2009). Only one study indicated that the analysis had sufficient statistical

power (Tapper et al., 2009). However, Tapper et al. (2009) only included participants that were already attempting independent weight-loss meaning that this variable could not be fully controlled for. It is also worth noting that not all the studies participants could be described as overweight or experiencing disordered eating symptoms. In general, there was a good description about the use of mindfulness in each study. However, it is evident in reviewing and comparing these interventions that there is considerable variation with which mindfulness was incorporated into interventions making it difficult to isolate the actual effect of mindfulness on outcomes. This needs to be addressed in future research to avoid mindfulness becoming a set of techniques that are incorporated as an add-on to other interventions (Kabat-Zinn, 2003). In addition 'trait' or dispositional mindfulness was only measured in four of the studies (Dalen et al., 2010; Daubenmier et al., 2011; Forman et al., 2009; Tapper et al., 2009) which means that it is not possible to clarify the extent to which this variable influenced others or if it was increased through participation in the interventions. However, two studies do suggest that mindfulness was related to changes in body fat distribution (Forman et al., 2009) and weight-loss (Daubenmier et al., 2011) based on mediation analyses.

6.2.4. Using a mindful approach to address limitations

Based on the review of previous eating related MBIs, theoretical and empirical literature described here and in chapter 1.1.1., and the studies in this thesis mindfulness-based approaches to eating behaviour and behaviour change can address many limitations of SBT and individuals approaches to manage their weight. Four limitations inherent in many SBTs and the specific aspects of mindfulness approaches incorporated into the current study are described. Firstly, calorie restriction core to most SBTs requires individuals to ignore physical cues to hunger. This may undermine long term weight management as it does not facilitate recognition and appropriate responding to

hunger cues (Caldwell et al., 2012). Mindfulness practices restore sensitivity and appropriate responding to emotions and hunger signals thereby enabling weight regulation (Kidd et al., 2013). As part of the MEP participants are introduced to mindful eating practices designed to increase awareness of thoughts, emotions and hunger aiding balanced eating responses rather than reactivity (Kristeller & Wolever, 2011). As a practice mindful eating brings the focus to the moment with ‘‘non-judgmental awareness of physical and emotional sensations while eating or in a food-related environment’’ (Framson et al., 2009, p. 1439). The seven forms of hunger described by Bays (2009) were incorporated into the MEP to provide a framework to aid understanding of subjective experiences of hunger.

Secondly, teaching individuals to attempt to directly control the content of thoughts or emotions associated with food and eating (e.g., distraction or suppression based strategies) has been shown to be ineffective or even paradoxically increase distressing internal experiences (Abramowitz, Tolin, & Street, 2001; Wegner, Schneider, Carter, & White, 1987). Attempts to ignore or suppress emotional signals may also lead to dysregulation and the automatization of thoughts and behaviours (B. W. Smith et al., 2006). Indeed, the more cognitive ‘‘work’’ (e.g., distraction or solving puzzles) in which dieting individuals engage, the more disinhibition of eating occurs, suggesting that cognitively intensive strategies may reduce self-regulation rather than enhance it (Ward & Mann, 2000). In addition, evidence suggests that people formulate verbal constructions only after they have implicitly made decisions, calling into question the efficacy of targeting cognitions in interventions (Osman, 2004). It is proposed that interventions should teach psychological skills needed to initiate and maintain behavioural changes necessary to modify or prevent weight gain (Forman et al., 2013). Mindfulness practices are distinct from cognitive skills most commonly taught for

weight management, such as meal planning, record keeping, and portion control. For example, mindful eating may be a helpful weight-loss or maintenance skill as it engenders awareness of why one eats as well as what one eats (Framson et al., 2009). To support the development and application of a mindful attitude to phenomenon in daily life, the MEP taught breath based meditations including the practice of taking a breathing space to create space either at regular intervals in the day or in response to previously identified situations.

Thirdly, high attrition rates present problems for both behavioural and pharmacological interventions. Meta-analysis has identified dropout rates of up to 65% in diet and exercise interventions (Wu, Gao, Chen, & Van Dam, 2009) and a systematic review of pharmacological weight-loss trials reported dropout of up to 52% (Fabricatore et al., 2009). Surgical interventions have different patterns of drop out (e.g. individuals not losing the required amount of weight pre surgery) or weight regain that also support the need for alternative approaches. The issue of attrition supports the need to focus on preventing weight gain rather than waiting until someone is obese before providing an intervention (e.g. Lemmens, Oenema, Klepp, Henriksen, & Brug, 2008). The recruitment process was designed so that participants had the opportunity to talk through questions, were aware of the time and home practice commitments involved in taking part and had met myself prior to the start to the research.

Finally, focusing on avoiding weight gain paradoxically increases the likelihood of weight gain as increasing the importance of weight-loss is associated with reduced self-esteem and self-efficacy that reinforces attitudes that contribute to long-term weight gain (Ball & Crawford, 2006). Therefore from the point of advertising the study, screening interviews and throughout the delivery of the programme the aim was

described as development of a healthy relationship with food through mindfulness meditation practices rather than weight-loss.

6.2.5. Specific mindful eating practices

Mindful eating practices have been shown to be a potentially effective approach to changing eating behaviours and reducing obesity (Forman et al., 2009; Tapper et al., 2009). Cross-sectional studies show that higher self-reported mindful eating as measured by the 'Mindful Eating Questionnaire' (MEQ; Framson et al., 2009) has been shown to be positively associated with lower BMI in a convenience sample of 510 adults (Framson et al., 2009), a community sample (N = 171; Beshara, Hutchinson, & Wilson, 2013) and in university students (N = 90; Moor, Scott, & McIntosh, 2012). Higher scores on the MEQ are proposed to indicate an awareness of and responsiveness to physiological indicators of hunger and satiety. They also indicate an attentiveness to the characteristics of the food consumed (i.e., texture and taste) as well as the environment and triggers for overconsumption. These characteristics are captured by the MEQ's five domains, which include: disinhibition, external cues, emotional response, awareness and distraction. Beshara et al. (2013) found that mindful eating, rather than dispositional mindfulness, had a greater influence on serving size, lending support for tailored interventions. In addition, the components of mindful eating most related to serving size were emotional and disinhibited eating as measured by the MEQ. However, serving size is only one aspect of eating behaviour. It is likely that when aiming to influence interactions with the antecedents as well as actual eating behaviours dispositional mindfulness may be of equal importance.

6.3. Aims and related hypotheses

The purpose of this pilot study was to test the relations between mindfulness (dispositional and mindfulness practices) and reward motivated eating evidenced in studies 1 and 3 and the reviews of current literature and theoretical accounts of underlying mechanisms of mindfulness-based approaches. The MEP was designed to increase dispositional mindfulness and address emotion regulation, habitual negative self-thinking as mechanisms of change and outcomes in themselves. The cognitive restraint subscale measures the tendency to control food intake in order to influence body weight and shape such as restricting portion size and avoiding certain high fat food. Previous research has found that higher cognitive restraint scores among overweight individuals were associated with greater weight-loss and maintenance of weight-loss (Foster et al., 1998; Keränen et al., 2009), whereas eating beyond satiety (high disinhibition) was associated with greater body weight and obesity (Bryant, Kiezerbrink, King, & Blundell, 2010; Dykes, Brunner, Martikainen, & Wardle, 2003; Keränen, Strengell, Savolainen, & Laitinen, 2011). However, in the development of the Mindful Eating Questionnaire (MEQ) the cognitive restraint subscale was found to be inversely correlated with all subscales (Framson et al., 2009). This relationship was interpreted as providing evidence that cognitive weight management strategies (use of calorie counting, weight monitoring and other cognitive strategies) are independent from the construct of mindful eating. However, the actual items that make up the subscale may also be described as measuring self-regulatory behaviour. There is therefore a need to clarify what is meant by self-regulation, control or restraint when describing findings and explaining the concept of mindfulness to participants.

The aims and related hypotheses of the pilot study were:

- 1) The overarching aim of the qualitative analyses was to understand participant's experience of their relationship with food, including their understanding of antecedents and consequences of eating behaviour, and to examine if and how taking part in the MEP influenced these experiences. Thematic analyses were used to gain a picture of changes and what underlying mechanisms or to what practices changes were ascribed.
- 2) Quantitative measures were used to examine the direct effects of the programme on dispositional mindfulness, emotion regulation, the habitual quality of negative self-thinking, mental well-being and eating measures (uncontrolled and emotional eating). It was expected that there would be an increase in dispositional mindfulness and mental well-being, and a decrease in difficulties in emotion regulation and the habitual quality of negative self-thinking compared to the waitlist control group. It was also expected that reward motivated eating behaviours (emotional eating, uncontrolled eating) would decrease and the mindful quality of eating would increase compared to the waitlist control group.
- 3) To evaluate the acceptability and efficacy of the Mindful Eating Programme delivered in the context of developing healthier relationships with food through mindfulness meditation practices.

6.4. Methods

6.4.1. Participants and procedure

Participants were recruited through adverts placed in local community cafes and libraries, advertisement in the Liverpool Echo and internal staff email lists (see appendix 6A.1). All adverts stated that the Mindful Eating Programme would introduce mindful living and eating to individuals who would like to discover a healthy relationship with food using mindfulness techniques. Participants were invited to contact the researcher if they were interested in learning mindfulness meditation, mindful eating practices and discovering a healthy relationship with food (See figure 6.1). Ethical approval for the study was obtained from the University Ethics Committee.

A brief screening telephone interview was conducted to ensure participants met inclusion criteria, understood the nature of the intervention and that it would involve being in a group. Participants meeting the following inclusion criteria were randomly assigned to either the Mindful Eating Programme or a waitlist control group: 1) willing to practice mindfulness meditation in sessions and at home; 2) willing and able to attend each of the sessions; 3) willing to complete research components, were invited to complete an online survey prior to random allocation to either the Mindful Eating Programme or wait list control. Exclusion criteria were 1) BMI < 18.5 or > 39.5; 2) currently pregnant; 3) presence of food allergy; 4) diabetes diagnosis; 5) having sought medical help in past six months for eating disorder and/or mental health problems; 6) current use of anti-depressant and/or weight-loss medication; 7) any previous formal or informal meditation experience (including yoga and self-help books or audio recordings); 8) Availability for course dates and follow-up measures.

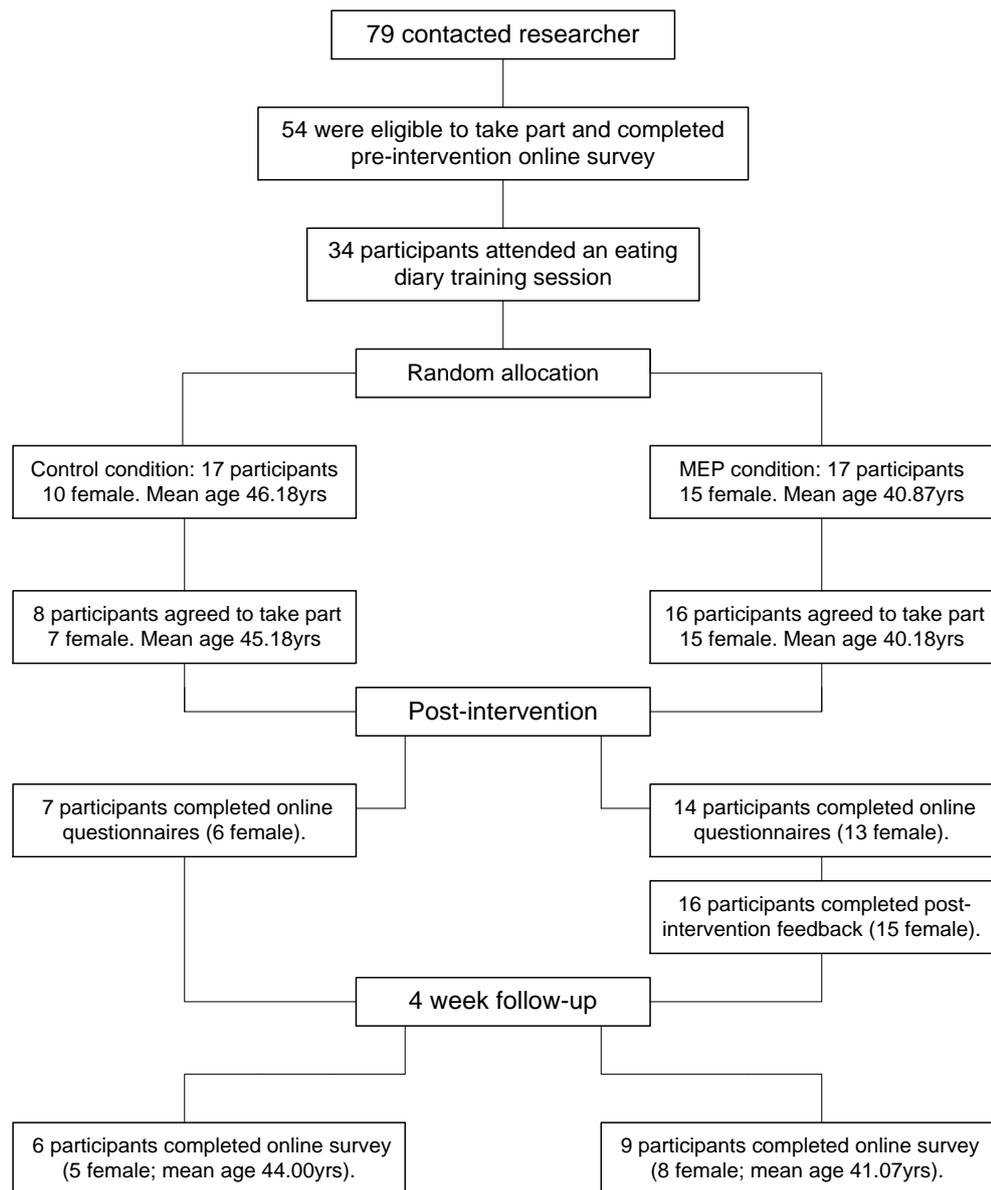


Figure 6.1. Procedure overview and number of participants completing each research phase.

6.4.2 Ethical considerations

Prospective participants were provided with a detailed information sheet and took part in a screening interview in which they were given an opportunity to ask any questions before consenting to participate. The screening interview was intended to ensure participants met the inclusion criteria, and were fully informed of the group

nature and commitment involved in the research before giving their informed consent. If it was established that an individual did not meet the eligibility criteria they were given details of other current research for which they met the criteria, and or offered the details of relevant support organisations. Individuals not meeting criteria which included the ability to attend weekly session were also given details of relevant mindfulness books (Mindful eating: A guide to rediscovering a healthy and joyful relationship with food; Bays, 2009; e.g. Mindfulness: a practical guide to finding peace in a frantic world; M. Williams & Penman, 2011). Participants meeting inclusion criteria were given at least a month to consider taking part in the research after the screening interview and completing an online survey. Participants were informed that they would be randomly assigned to either a MEP group starting in the following month or an MEP starting two months later. It was explained that participants could withdraw from the research components at any point and that this would not affect their ability to attend the programme or, having completed the programme, receiving a voucher to offset any expenses incurred in attending. Participants were informed that on withdrawal from the study their data would be destroyed and not included in the analyses. All participants assigned to the second group were contacted after the completion of the first MEP and were invited to attend the MEP. On completion of the study participants were given debrief information and offered the opportunity to ask any questions, offer feedback about their experience or to withdraw their data within the subsequent month. To ensure data confidentiality, all participant's information and responses were assigned an ID code. While confidentiality could not be guaranteed for group discussions during in the Mindful Eating Programme, the issue of confidentiality was discussed and participants were asked not to disclose the names of other participants or anything discussed outside of the group.

6.4.3. Mindful Eating Programme development, overview and delivery.

The programme content was designed so that skills taught, experienced and practiced were discussed and built upon or the application extended at subsequent sessions. Formal practice was introduced as a way of practicing approaches to phenomena and to support the application of mindfulness in daily life. Emphasis was placed on bringing mindful awareness to situations, antecedents and eating experiences.

The Mindful Eating Programme was delivered over seven weeks; a gap was given after week four. The intention of the gap was to address barriers that arise when integrating mindfulness practice and approaches to life when not having weekly guidance and as the session would have fallen on a half-term week. Participants attended one of two weekly group sessions (Tuesday or Thursday evening) lasting ninety minutes; participants remained in the same group which they started. The sessions were co facilitated by Dr Peter Malinowski, Dr Liliana Shalamanova and myself. Peter is lay Buddhist teacher within the Diamond Way Buddhism of the Karma Kagyü School of Tibetan Buddhism with twenty-one years international teaching experience. Over the last nine years, Peter has developed and delivered a range of secular mindfulness-based programmes in non-clinical settings. Liliana has been practicing meditation for sixteen years within the Diamond Way Buddhism of the Karma Kagyü School of Tibetan Buddhism and has been involved in instructing and guiding meditation practitioners for ten years. I myself have been practicing mindfulness (Vipassana) meditation for six years and delivered personal development programmes for a range of clients as well as having experience supporting the delivery of MBSR and MBCT programmes at Bangor's Centre for Mindfulness Research. Weekly group sessions lasted ninety minutes and consisted of mindfulness meditation practice and guidance on application to eating and living. The programme was delivered

as a group intervention as previous research suggests group interventions are more effective than individual interventions in changing eating habits (T. S. Tang, Funnell, & Anderson, 2006). An overview of the programme and home practices is provided in table 6.1. Material included in sessions and the supporting resources (hand-outs) are shown in table 6.2. Sessions followed a general format, beginning with a centring breathing meditation designed to bring awareness to the present moment with a mindful attitude. Participants then discussed homework assignments and experiences related to application of approaches in the intervening weeks. Further meditative practices or ways of seeing experiences mindfully such as the seven forms of hunger (see tale 6.3., as described by Bays, 2009) were introduced and experienced. Co-facilitators helped participants become more aware of and understand different cues to eat, eating patterns and emphasised the potential to develop a healthier relationship with food through mindful practices.

Table 6.1. Overview and session outline of Mindful Eating Programme

Title and week	Session content and <i>home practice</i>	Supporting resources
1. Introducing Mindfulness and Mindful Eating	Raisin exercise & enquiry. Breathing meditation & enquiry. <i>Daily 15 minute breath based meditation.</i> <i>To mindfully eat a snack/meal each day.</i>	Written material: Raisin task. Mindful eating. Breathing meditation CD
2. Tuning in: Body and Mind	Feedback from home practice. 20 minute Body Scan. <i>Daily 20 minute body scan meditation.</i> <i>Noticing eating events.</i>	Written material: Guided body scan. Space to record experience.
3. Exploring Hunger	Feedback from home practice. Introduce types of hunger: mind, heart, stomach. <i>Daily 15 minute breath based meditation</i> <i>Noticing different types of hunger</i>	Written material: Mindful practice. 7 types of hunger. Mindful eating instructions exploring hunger.
4. Breathing space: patterns and habits	Feedback from home practice. Introduce automaticity of responding. Introduce and guide breathing space. Make intentions about practicing over the GAP. <i>Daily 15 minute breath based meditation.</i> <i>Daily mindful eating task.</i> <i>Regular breathing space: 3 times a day.</i>	Written material: Breathing space instructions.
5.	Gap	
6. Loving kindness... for ourselves and others	Feedback from home practice over the GAP. Loving kindness meditation for self and others. <i>Mindful eating task.</i> <i>Regular breathing space.</i>	Written material: Loving kindness instructions and Background.
7. Looking backwards and looking forwards	Feedback from home practice. Reflection on the course Mindful eating. Mindfulness what it means to you now. Mindful practices. Carrying forward the learning building on work in the sessions.	Written material: Rainbow light instructions.

Table 6.2. Mindful Eating Programme material and source

Description	Source based upon published resources
The Raisin task Breath based meditation. Guided body scan.	Full catastrophe living: using the wisdom of your body and mind to face stress, pain and illness (Kabat-Zinn, 1990),
Mindful eating. 7 types of hunger.	Mindful eating: A guide to rediscovering a healthy and joyful relationship with food (Bays, 2009).
Mindful eating: exploring hunger.	Mindful eating: A guide to rediscovering a healthy and joyful relationship with food (Bays, 2009).
Mindful eating	Mindful eating mindful life: Savour every moment and every bite (Hanh & Cheung, 2011)
Breathing Meditation (CD)	DR Peter Malinowski
Breathings space	The Mindful way Through Depression: Freeing yourself from Chronic Unhappiness (J. M. Williams, Teasdale, Segal, & Kabat-Zinn, 2007)
Loving kindness Meditation.	Instructions and background. Mindful eating: A guide to rediscovering a healthy and joyful relationship with food (Bays, 2009).
Rainbow light Meditation.	Lama Ole Nydhal © Diamond Way Buddhist centres (Nydahl, 2008)

Table 6.3. Seven types of hunger with definitions (Bays, 2009).

Form	Definition by Bays (2009)
Eye hunger	Hunger based on the visual properties of food/beverage
Nose hunger	Hunger based on the smell of the food or beverage
Mouth hunger	Physiological responses in the mouth to the food or beverage
Stomach hunger	Physical sensations of fullness or emptiness in the stomach
Cellular hunger	Physical sensations in the body indicating desire to consume food
Mind hunger	"shoulds" or "musts." What the mind 'says' about food or drink
Heart hunger	Hunger for comfort or soothing

6.4.3. Data collection procedures

Qualitative data

Thematic analyses were conducted in accordance with Yardley's (2000, 2008) four guiding principles to promote validity: Sensitivity to context; Commitment and rigour; Transparency and coherence; Impact and importance. The practical process of conducting the analyses is described in Table 6.4 and encompasses Braun and Clarke's (2006) guide used as an analysis process in Study 2 (Table 4.1, pg.102). The examples of stages of analyses provided in the appendices (referred to in table 6.4) demonstrate the transparency of the method and the depth and breadth of analysis illustrates the rigour of this study. The impact and importance of the study's findings are discussed in 6.8 and the thesis general discussion (7.2.).

Participants described why they were interested in taking part prior to random allocation to groups and provided descriptions and examples of their relationship with food via open-ended questions on Bristol Online Survey (<http://www.survey.bris.ac.uk/>). Participants who attended the MEP provided descriptions and examples of their relationship with food post-intervention and gave post-intervention feedback via email. With the exception of the post-intervention feedback, respondents understood that their responses were anonymous and were not used for group allocation or referred to in any context. Prior to analysis post-intervention feedback was anonymised. Consent was gained to use non-identifying quotes verbatim in the reporting of analyses. Provision of responses to questions was optional and no limits were placed on the length of written responses. With the exception of the post-intervention feedback, the questions were not from those delivering the MEP.

Table 6.4. Overview of thematic analyses protocol

Protocol for the qualitative components of study
<ol style="list-style-type: none"> 1. Responses were anonymous being allocated at source with an identifying number. This allowed comparisons between pre and post experiences where appropriate. 2. Responses to specific questions or clusters of responses pertaining to the same research question were organised into a document (e.g. appendix 6D.5.c). 3. Responses were read through at least three times before being annotated (Braun & Clarke, 2006). 4. Annotations and the source material were reviewed and emergent themes and potential clustering's noted (e.g. appendix 6D.1b). 5. Responses were read again to ensure no data was overlooked or overemphasised 6. Emergent themes with corresponding identification numbers were roughly mapped in Visio word (e.g. appendix 6D.1c.). This allowed themes to be moved, grouped or subsumed. Processes at this stage included abstraction, subsumption, polarisation and contextualisation (J. A. Smith & Osbourn, 2009, pp. 96-98). Although numeration was not the emphasis of the analysis the Visio format enabled repeated themes to be represented and therefore commented on when described later. 7. During this period a second researcher (either PL or PM) read and annotated the source material. Emergent themes and the reasoning behind them were discussed in order to reduce bias of a sole researcher and to develop ways of presenting the themes in a coherent, truthful representative manner. 8. The lead researcher (myself) then organised the themes based on ongoing discussions. Care was taken to ensure that the themes represented the data rather than forcing the data to fit the themes or theoretical accounts (e.g. appendix 6D.1d.). 9. The themes were written up with quotes chosen that best represented the source material and the point being described. Responses that were in conflict with the majority or expectations based on theoretical or previous empirical work were examined, discussed and included (e.g. appendix 6D.1e.). 10. The write up was reviewed by the supporting researchers and commented on.

6.4.4. Psychological and eating measures quantitative measures

Measures of individual differences (eating tendencies including cognitive restraint, dispositional mindfulness, difficulties in emotion regulation, habitual negative self-thinking and mental well-being) were administered via Bristol Online Survey (<http://www.survey.bris.ac.uk/>) pre, post-intervention and at 4 weeks follow-up. With the exception of the mindful eating and mental well-being questionnaires, the measures have been described in chapter 3.3.2: reward motivated eating tendencies, dispositional mindfulness, habitual negative self-thinking difficulties in emotion regulation. Cronbach alphas for all pre-study measures are shown in appendices tables 6C1-3.

6.4.4.1. Mindful Eating Questionnaire

The 28-item Mindful Eating Questionnaire (MEQ) measures five categories of mindful eating: disinhibition, awareness, external cues, emotional response, and distraction (Framson et al., 2009). Disinhibition refers to an individual's inability to stop eating even when full; external eating refers to eating in response to environmental cues, and emotional response describes eating in response to negative emotions. The awareness subscale assesses individuals' awareness of food specific characteristics, as well as the sensory experience of eating. The distraction subscale assesses the extent to which individuals focus on other thoughts, or rush when eating. Participants were asked to rate each item on 4-point Likert scales (1 = Never/rarely to 4 = Usually/always). Items were recoded so higher scores indicated greater degrees of mindful eating. The instrument has established internal consistency (Cronbach alpha of 0.64) and construct validity, but test-retest reliability and predictive validity have not been reported (Framson et al., 2009).

6.4.4.2. Mental well-being

The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS; Tennant et al., 2007) was used. The scale is designed to capture a broad conception of well-being including affective emotional aspects, cognitive–evaluative dimensions and psychological functioning. The scale consists of 14 items answered on a 5-point Likert scale ranging from 1 (none of the time) to 5 (all of the time). Sample items include ‘I’ve been feeling optimistic about the future’ and ‘I’ve been feeling close to other people’. The scale focuses entirely on the positive aspects of mental health, including positive emotions, satisfying interpersonal relationships and positive functioning. The scale was found to be reliable, have good validity, internal consistency (Chronbach alphas of 0.89-0.91) and test-retest reliability (0.83) with a large (N=354) sample of students and a very large (N=2075) sample of the general population (Tennant et al., 2007).

6.4.4.3. Measure of happiness with current relationship with food

Participants were asked if they were happy/unhappy or neither with their relationship with food and if they considered their relationship to be healthy/unhealthy or neither pre, post and at follow-up.

6.4.4.4 Food and drink consumption diaries

Participants completed food diaries recording food and drink intake over three days periods pre, post and at follow-up. However, examination of the data revealed that it was not complete or consistent enough to conduct any meaningful or reliable analyses.

6.4.5. Evaluation of the Mindful eating programme

The evaluation of the MEP incorporated quantitative and qualitative analyses to determine the acceptability, efficacy/outcomes and suggested amendments (for overview see table 6.5.)

Table 6.5. Sources of data and form of analysis on which evaluation was based.

Programme evaluation	Source of data	Form of Analysis
Acceptability	Recruitment details	Quantitative
	Demographics	Quantitative
	Why interested in MEP	Thematic analysis
	Attendance	Quantitative
	Practice Logs	Quantitative
	Post intervention feedback Expectations	Thematic analysis
Efficacy/ Outcomes	Psychological measures	Quantitative
	Eating measures	Quantitative
	Relationship with food Changes	Thematic analysis
	Post intervention feedback Gains	Thematic analysis
	Changes	Thematic analysis
	Expectations	
Amendments	Post intervention feedback Expectations	Thematic analysis
	Better	Thematic analysis
	Comments	Thematic analysis
	Researchers observations	
	Session deliverer observations	

6.5. Results

6.5.1. Quantitative data overview and results

It was expected that there would be an increase in dispositional mindfulness and mental well-being, and a decrease in difficulties in emotion regulation and the habitual quality of negative self-thinking compared to the waitlist control group. It was also expected that there would be a reduction in reward motivated eating behaviours (emotional eating and uncontrolled eating), and that the mindful quality of eating would increase compared to the waitlist control group. However, no significant reductions were expected in BMI due to the time span and emphasis of the MEP.

6.5.2. Demographic details for quantitative analyses

Age, gender and self-reported BMI are provided in table 6.6 for the quantitative analyses. The sample comprised predominantly individuals in full-time employment (MEP: 57%, WLC: 62.5%) with the remainder being in part-time employment and full-time education in equal proportions in each group. Participants described their ethnic origin as white with the exception of one who described themselves as Chinese.

Table 6.6. Demographic details for both conditions at each time point: range, mean and standard deviations.

		Pre		Post		Follow-up	
Range		MEP (n14; 13f)	WLC (n8; 5f)	MEP (n14; 13f)	WLC (n7; 5f)	MEP (n9; 8f)	WLC (n6; 4f)
Age	<i>M</i> (26-60)	41.07	44.00	41.07	43.14	43.22	40.83
	<i>SD</i>	9.43	12.34	9.43	13.07	10.04	12.37
BMI	<i>M</i> (23-33.20)	27.28	28.55	26.81	28.24		
	<i>SD</i>	4.72	3.39	4.40	4.41		

Mean scores for all psychological and eating scales and subscales were examined to determine if there were differences across time and between groups. Means and standard deviations on all psychological and eating measures at each point are presented in appendices tables 6C.1-3. To reduce the probability of type two errors repeated measures were not conducted if no differences in means was seen.

6.5.3. Psychological measures

Mixed factorial ANOVA (condition: MEP vs WLC) with repeated factor of time (pre vs post) were conducted where there was a difference between means evident in tables in the appendices 6C.1-3). Estimated effect sizes were calculated for analyses, $\eta_p^2 = .06$, $\eta_p^2 = .14$ are considered medium and large effect sizes respectively (Cohen, 1988).

Changes pre to post for participants in the MEP group were in the expected directions for total, and subscales of, measures of dispositional mindfulness, difficulties in emotion regulation and habitual negative self-thinking. For mindfulness and emotion regulation these changes were only seen in the MEP group; however, for habitual negative self-thinking the reductions were equal to those evidenced in the WLC group. There was no change or between group differences for the measure of mental well-being. Selected mixed factorial ANOVA (condition: MEP vs WLC) with repeated factor of time (pre v's post v's follow-up) revealed no significant main effects or interactions.

6.5.4. Eating measures

Changes pre to post for participants in the Mindful Eating Programme were in the expected directions for measures of reward motivated eating: Uncontrolled and Emotional Eating, for the Mindful Eating total and subscales. Mixed factorial ANOVA

(condition: MEP vs WLC) with repeated factor of time (pre vs post) ANOVAs revealed an approaching significant interaction between condition and time on the *Cognitive Restraint* subscale of the TFEQ ($F(1,19)=5.03, p=.09, \eta_p^2=.21$). That is, MEP participants were more likely to control food intake to influence weight and body shape following the programme whereas the WLC group were less likely to control food intake in comparison to pre-measures. There was a significant main effect of time on the Mindful Eating Questionnaire subscale entitled *Disinhibition* ($F(1,19)=5.14, p=.04, \eta_p^2=.21$). That is, all participants those in the MEP and WLC group reported being more able to stop eating when full than at baseline measurement.

Mixed factorial ANOVA (condition: MEP vs WLC) with repeated factor of time (pre v's post v's follow-up) revealed a significant main effect of condition on the *Emotional Eating* subscale of the TFEQ ($F(1,12)=6.31, p=.03, \eta_p^2=.35$). That is, MEP participants were less likely to eat in response to emotions in comparison to the WLC group. There was also a main effect of condition on the *total* ($F(1,12)=6.52, p=.03, \eta_p^2=.35$) and *External Cues* subscale of the MEQ ($F(2,24)=3.30, p=.05, \eta_p^2=.22$). That is, MEP participants were more likely to eat mindfully and specifically be more aware of the properties of food and less likely to eat when full or in response to external cues. There were approaching significant main effects of condition on both the *Awareness*, and *Disinhibition* subscales of the MEQ ($F(1,12)=3.67, p=.08, \eta_p^2=.23; F(1,12)=4.08, p=.07, \eta_p^2=.25$). There was a slight decrease in BMI in the MEP group. Findings indicate no change or between group differences on measures of mental well-being.

6.5.5. Recruitment, attrition, attendance, engagement and weekly practice records

The process, including the number of individuals who contacted the researcher, met eligibility criteria, completed online surveys, through to completion and follow-up

is illustrated in figure 6.1. The amount of practice, form and attendance is displayed for each individual in table 6.7 and as a group in table 6.8. Attendance and reported practice give an indication as to the level of engagement with the programme. However it should be noted that these are only proxy measures as engagement itself is not observable. Despite this caution the experience of delivering the sessions and level of interaction between participants and ourselves suggests a degree of engagement.

Table 6.7. Form, frequency and duration of practice, and sessions attended for each participant (n14).

ID	Breathing		Eating		Body Scan		Breathing Space		Loving kindness		Total time mins	Att.
	Fr	Du	Fr	Du	Fr	Du	Fr	Du	Fr	Du		
3	27	450	22	120	21	104	13	29	0	0	703	6
5	12	168	10	63	1	3	12	26	0	0	260	6
6	16	485	14	394	9	82	5	15	0	0	976	6
7	13	97	39	356	4	24	7	21	0	0	588	6
8	9	77	2	3	1	1	1	3	0	0	84	5
9	44	216	3	6	2	2	0	0	0	0	226	4
10	24	236	18	29	5	7	11	33	1	2	306	5
12	5	60	7	35	3	40	2	6	0	0	141	6
13	32	369	12	48	5	15	30	90	0	0	522	6
14	32	370	15	102	11	87	9	27	0	0	586	6
16	34	685	29	235	28	255	32	96	7	35	1271	6
19	41	734	2	9	17	182	34	102	5	44	1071	6
20	0	0	0	0	0	0	0	0	0	0	0	6
21	29	226	19	95	8	38	17	51	0	0	410	4

Notes: Fr=frequency; Du= duration; Att.= Number of the six sessions attended

Table 6.8. Summary of weekly practice: form, frequency and duration.

Week	Practice	Frequency (Days)			Total weekly duration (Minutes)		
		Range	Mean	SD	Range	Mean	SD
W1 (n14)	Mindful breathing	0-7	3.43	2.65	0-125	50.1	40.32
	Mindful eating	0-7	3.43	2.62	0-80	26.93	27.53
	Mean weekly total					77.03	
W2 (n14)	Mindful breathing	0-7	3.64	2.24	0-90	53.64	29.26
	Body scan	0-5	2.21	1.89	0-60	17.18	18.44
	Mindful eating	0-8	3.71	2.52	0-130	29.93	36.68
	Mean weekly total					100.75	
W3 (n14)	Mindful breathing	0-14	4.71	3.52	8-205	63.79	53.14
	Body scan	0-7	1.79	2.15	0-70	16.29	23.4
	Mindful eating	0-10	2.79	3.19	0-140	25.21	38.74
	Mean weekly total					105.29	
W4 (n14)	Mindful breathing	0-14	5.43	3.86	0-178	74.86	58.2
	Breathing space	0-14	4.14	4.24		12.42	
	Body scan	0-7	1.36	2.17	0-45	9.5	15.36
	Mindful eating	0-6	1.79	2.39	0-110	18.86	32.19
	Mean weekly total					115.64	
W5 (n14)	Mindful breathing	0-9	5.57	2.56	0-140	59.21	41.76
	Breathing space	0-16	4.79	5.39		14.37	
	Body scan	0-7	1.64	2.34	0-51	12.57	20.38
	Mindful eating	0-4	1.36	1.55	0-25	5.64	7.73
	Mean weekly total					91.79	
W6 (n12)	Mindful breathing	0-12	4.17	4.22	0-198	52.5	68.55
	Breathing space	0-14	5	4.75		15	
	Body scan	0-7	2	2.33	0-45	10.58	14.7
	Mindful eating	0-7	1.92	2.23	0-70	11.88	20.17
	Loving kindness	0-7	1.22	2.28	0-35	7.78	12.81
	Rainbow light	0-3	1.67	1.53	0-21	13.67	11.84
	Mean weekly total					111.41	

Differences in the duration and frequency between forms of practice is, in part, explained by at what point the practices were introduced and how often they were given

as part of home practice. However, based on the weekly and individual averages mindful breathing was most consistently and extensively practiced.

Table 6.9. presents a summary of individuals reported practice with change scores from baseline pre to post intervention and pre to follow-up for each of the total scale scores and the TFEQ subscales for Uncontrolled and Emotional Eating. The change scores for each of the subscales are provided in appendices 6C.6-9. Examination of the scores shows those participants, 16 and 19, reporting the greatest total practice reported the greatest increases in dispositional mindfulness, reductions in difficulties in emotion regulation, habitual quality of thinking, Uncontrolled and Emotional Eating and increases in mindful eating measures. Consistent with the lack of main effects of time on total and subscales on the psychological and eating related measures, only half of participants reported change in the expected directions. Additionally some participants reported decreases pre to post or greater increases pre to follow-up.

Table 6.9. Participants total practice time with change scores on total measures of Dispositional Mindfulness, Difficulties in Emotion Regulation, Habitual Negative Self-Thinking, Mental Wellbeing, Mindful Eating and TFEQ subscales pre to post and pre to follow-up

ID	Total time mins	FFMQ Total			DERS Total			HINT			WEMWBS			UE-transformed			EE-transformed			MEQ Total		
		Base-line	Pre-Post	Pre-Fu	Base-line	Pre-Post	Pre-Fu	Base-line	Pre-Post	Pre-Fu	Base-line	Pre-Post	Pre-Fu	Base-line	Pre-Post	Pre-Fu	Base-line	Pre-Post	Pre-Fu	Base-line	Pre-Post	Pre-Fu
3	703	114	+18	+16	78	-4	-8	34	+6	-7	47	-5	-11	11	-7	-7	0	0	0	20	-1	+1
5	260	114	+21	_	93	-1	_	51	-6	_	42	+72	_	63	-15	_	89	-11	_	14	+4	_
6	976	160	-9	-5	58	+6	+14	32	0	0	60	-11	-20	37	0	-4	17	-17	-11	21	+2	+4
7	588	144	-12	-3	69	+12	-7	23	+13	+11	46	-5	-2	22	0	+8	11	-5	-5	23	-2	-1
8	84	104	+2	+9	124	-25	-32	39	+1	+5	43	-1	+6	44	-7	+12	50	0	0	17	-1	+1
9	226	118	-8	-6	89	+2	+10	46	0	+6	53	-4	-6	59	-3	-3	39	+11	+33	19	-1	0
10	306	123	-21	-17	72	+6	+15	48	-5	-5	46	-2	+4	44	+8	+26	83	-16	-11	16	0	0
12	141	127	-1	_	93	-13	_	43	-7	_	46	-5	_	37	+19	_	50	-11	_	21	-4	_
13	522	106	+18	_	92	-11	_	34	+9	_	51	+8	_	11	+26	_	33	0	_	16	+3	_
14	586	152	-20	-9	50	+3	0	36	+1	+	54	+2	-2	26	0	0	22	-11	-11	23	-1	+1
16	1271	110	+71	+82	94	-55	-52	29	0	-1	63	+7	+7	22	-15	+8	22	-22	-22	18	+9	+9
19	1071	84	+55	+67	127	-67	-80	52	-7	-15	41	+13	-13	67	-23	-62	100	-77	-100	15	+9	+9
20	0	112	-3	_	106	-4	_	52	-6	_	40	-1	_	56	0	_	61	+6	_	20	+1	_
21	410	109	+10	_	90	-13	_	45	-1	_	38	+4	_	44	-3	_	50	+6	_	18	0	_

Notes: ID= anonymous identifier; FFMQ Total= mindfulness; DERS Total = Difficulties in Emotion Regulation; HINT = Habitual Negative Self-Thinking; WEMWBS= Warwick and Edinburgh mental wellbeing scale total; TFEQ-UE = Uncontrolled Eating; TFEQ-EE = Emotional Eating; Mindful Eating Questionnaire.

6.6. Qualitative overview and results.

The outcomes of thematic analyses are integrated to provide a picture of firstly, what motivated members of the general public to volunteer to take part in this research including their relationship with food prior to study. Demographic details in table 6.8.

Secondly, what changes were experienced as a result of taking part in the MEP and what processes do participants describe as underlying any change. Finally, in conjunction with measures such as attendance, post-intervention feedback is used to evaluate the acceptability and efficacy of the MEP and to identify amendments. Page

Table 6.10. Demographics for qualitative components.

	Qualitative component			
	Why interested (N54)	RWF: Pre intervention (N21)	RWF: Post intervention (N21)	Feedback: Post intervention (N16)
	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>
Age	43.49	42.14	43.29	44.92
<i>SD</i>	10.95	10.38	10.13	10.45
Range	(22-61)	(22-60)	(26-60)	(26-60)
BMI	27.55	27.77	28.24	28.11
<i>SD</i>	4.32	4.20	4.55	4.44
Range	(19-38)	(21-38)	(21-38)	(21-38)
Gender				
Male	11	4	1	1
Female	41	17	13	15
Neither of above	2			
Occupation				
Full time employment	4	3	2	3
Part time employment	36	13	8	8
Full time education	7	2	2	2
Part time education	5	3	2	2
None of above	2			
Ethnic origin				
White	51	20	13	15
Chinese	2	1	1	1
None of options offered	2			
Relationship with food				
Happy				
Unhappy		3	6	8
Neither		14	7	7
Healthy		4	1	1
Unhealthy		3	6	8
Neither		12	5	5
		6	3	3

Note: RWF=Relationship with food, M= mean, SD=standard deviation, BMI= Body mass index.

numbers in the descriptions refer to appendices 6D. The superordinate themes and subthemes (table 6.8) are not discreet and interrelations are noted in the descriptions.

Table 6.11. Summary and organisation of emergent themes describing why interested in taking part (N=54) and descriptions of current relationships with food (N=21.)

Summary and organisation of themes and subthemes
<p>Wanting to change (6.6.1.1)</p> <p>Eating experience</p> <ul style="list-style-type: none"> Wanting an alternative relationship and use of food <ul style="list-style-type: none"> Examples used to illustrate current relationship Uses or functions of food and eating Judgment of relationship. Food preparation Ambivalent and complicated. Internal/external struggle. Wanting to increase awareness. Understand and control eating behaviour. <p>Physical state</p> <ul style="list-style-type: none"> Wanting a sustainable approach to weight-loss/ attaining a healthy weight. Health concerns. <p>Psychological Experiences</p> <ul style="list-style-type: none"> Impact of physical state on psychological state Negative current psychological experiences: Negative self-image Relaxation and help with stressful situations. <p>Mindfulness (6.6.1.2)</p> <p>An approach or technique</p> <ul style="list-style-type: none"> Developing awareness of the self. Peace and the ability to live in the moment. <p>Meditation</p> <ul style="list-style-type: none"> Interesting/enjoyable/beneficial or just a ‘good thing’. Useful tool for eating and for life. <p>Value of taking part in research (6.6.1.3)</p> <p>What the process can offer the individual</p> <ul style="list-style-type: none"> Expected positive experience and giving back to the research process. <p>Value of and potential implications of research</p>

6.6.1. Exploration of why participants were interested in taking part and current relationships with food

Thematic analysis was conducted to understand what interested or motivated potential participants to want to take part in the MEP, make contact and complete an initial online survey.

6.6.1.1. *Wanting to change*

As might be expected in view of the nature of the advertised programme, almost all of the potential participants stated that part of their interest was based on wanting to change. Often descriptions included current experiences and hoped-for outcomes as well as examples of previous attempts and barriers to change. The following themes are organised around the phenomenon individuals wanted to change: *Eating experiences*, *Physical state* and *Psychological experiences*. These subthemes are interdependent. For example, psychological experiences such as stress are described as antecedents of eating which is associated with physical state and negative self-thoughts around self-image and an inability to control eating. Descriptions of current relationships with food are provided alongside the subthemes in wanting to change to present a coherent picture.

Eating experiences

Wanting an alternative relationship and use of food

Many individuals described wanting to find an alternative relationship with food and its consumption as a reason for wanting to take part for example:

“I think I need to explore my relationship with food I am not looking for weight-loss but I need to explore why I use food as a comfort I would like to be able to really explore my emotions and get out of the cycle of using food as an answer to problems I

would like to be able to look at other ways of coping.” (ID 49, pg.86; seen also in ID 38, pg.84).

Wanting to change use of food to satisfy needs other than homeostatic hunger for example to “anaesthetise myself, to stop me feeling negative emotions” (ID 4, [WLC], pg.76) was described further with illustrative examples when describing current relations with food. Current *uses or functions ascribed to food* included eating at times of upset to: “express” emotions (ID5, [MEP], pg.106), ease homesickness (ID7, [MEP], pg.106), cope with emotions (ID10, [MEP], pg.107), or as an emotional crutch (ID19, [MEP], pg.108) with one describing themselves as an ‘emotional eater’: “I eat to celebrate, commiserate in fact most emotions I have will be dampened with food” (ID13, [MEP], pg.108). Food was also used to either procrastinate before starting a task, when bored or stressed (ID10, pg.107), to rest or relax (ID14, pg.108), celebrate (ID7, pg.106), or reward selves having [MEP], completed a task (ID16 & 19, [MEP], pg.108). Not all uses of food were described as needing change for example use of food to reaffirm cultural identity (ID7 &10, [MEP], pg.106-107), as fuel (ID9, [MEP], pg.107), and necessary to live (ID3, [MEP], pg.106).

Themes emerging from descriptions of current relationships with food were *judgement, ambivalence* and the experience of *internal/external struggle*.

The majority of participants *judged* their relationship negatively describing it as “not a happy one” (ID5, [MEP], pg.106), “too strong basically I think about food far too often” (ID20, [MEP], pg.108), and hating or being controlled by their relationship with food: “I feel the need for it even when I'm not hungry and feel it controls me” (ID19, [MEP], pg.108). The act of eating was seen as bad when at the “wrong time” (ID14, [MEP], also ID18, [WLC], pg.108) and had negative consequences when not hungry:

“Sometimes I know I'm not hungry but can't seem to stop eating - then I just feel terrible” (ID5, [MEP], pg.106). Lack of or short lived control (ID5, [MEP], pg.106; ID11, [WLC], pg.107), “picking” at food throughout the day (ID15, [WLC], pg.108), or snacking on “rubbish” when stressed (ID4, [WLC], pg.106), were not desired eating patterns. Whereas others described eating as enjoyable (ID18, [WLC], pg.108), and liked when eating healthily (ID7, [MEP], pg.107). Food itself was described variously as the object of “love” (ID1, [WLC], pg.106), “liked” (ID21, [MEP], pg.108), “important” (ID7, [MEP], pg.106), a “big part of life” (ID10, [MEP], pg.107), “fuel” (ID9, [MEP], pg.107), “the enemy” (ID13, [MEP], pg.108), or something individuals were “bored with” (ID8, [MEP], pg.106). Food or eating were described as preoccupying the mind with future eating opportunities being thought about “even when currently eating” (ID5, [MEP], pg.106) or needed “even when not hungry” (ID19, [MEP], pg.108). In contrast two individuals described their relationship as “ok” (ID12, [MEP], pg.107) or that they simply eat to live (ID3, [MEP], pg.106). Attitudes towards *food preparation* ranged from it being a source of compliments and pleasure (ID10, [MEP], pg.107), with enjoyment of spending time preparing for one’s family (ID6/7, [MEP], pg.106), to not being interested (ID8, [MEP], pg.106), an issue of convenience (ID21, [MEP], pg.108), and seeing it as something that should be learnt (ID9, [MEP], pg.107),

For many the relationship itself was *ambivalent* and *complicated* relationship was described with phrases such ‘it’s good, but...’ (ID2, [WLC] 6, [MEP], 10, [MEP], 14[MEP], pg.’s 106-108):

“I also enjoy eating food which suggests I have a good relationship with food however, I also use food as a crutch / coping strategy - when I am bored or stressed or trying to procrastinate, I eat. My relationship with food is complicated - whilst I

derive much pleasure from it, it can also be my greatest enemy” (ID10, [MEP], pg. 107).

Others describe an inconsistency: “Sometimes it is my best friend and other times my worst enemy. I have had times when I have felt in control of it but it never seems to last” (ID11, pg.107; also supported by ID 8, [MEP], 10, [MEP], & 21[MEP], pg.’s 106-108).

The *internal/external struggle* was reflected in several descriptions of barriers to change within themselves such as tiredness or laziness (ID9, [MEP], pg. 107), failed previous attempts to change (ID15, [WLC] pg. 108), or an inability to break cycles despite knowing what to eat:

“I like good food and I know what I should eat, however I think I use it as an emotional crutch and I definitely snack more and eat rubbish when I am stressed, so I know what the problem is but I can't break the cycle” (ID4,[WLC],pg. 106).

External influences included the presence or absence of others with food used as “comfort when I am on my own” (ID16, [MEP], pg. 108), or the positive influence of others such as having to think of their young baby (ID9, [MEP], pg.107). External influences also involved external rules about when (ID14, [MEP], pg. 108), what (ID21, [MEP], pg.108), and how much of a food to eat (ID15, [WLC] pg. 108).

Examples of broad desired changes were provided when describing current relationships with food: “to relax around food and not worry about it and my weight” (ID11,[WLC], pg.107), “to eat more regularly and healthy” (ID8, [MEP], pg.106) or “to add more fruit and veg and variety to my diet” (ID9, [MEP], pg.107). More detailed ways in which changes with relationship with food were described when provided as

reasons for wanting to take part. These included wanting to increase awareness and to increase understanding and control over eating behaviour

Increase awareness

The desire to bring more awareness or be more attentive was for some associated with desired changes in eating behaviour and negative psychological outcomes as shown by one individual's desire to "be more attentive to what I am eating instead of just bingeing then feeling guilty" (ID 8, [MEP], pg.77). The desired increase in awareness was also associated with wanting to increase enjoyment and appreciation for eating and food (ID12, [MEP], pg. 78).

Understand and control eating behaviour.

Understanding current eating behaviour was described as a desired outcome in itself (ID 41, pg.84) and as a step to gaining control of overeating (ID 10, [MEP], pg.77-78). For example, "I am aware that I often eat to excess I would like to understand why this happens and if it is possible to stop" (ID 43, pg.84-85). One individual also wanted to take part to understand the reasons they were overweight and "to gain control over the thoughts that trigger my eating" (ID 19, [MEP], pg.80). Many individuals described wanting to gain control over eating behaviours (e.g. ID 5[MEP], 19 [MEP], pg. 80; 50, 51 & 53, pg.'s 86-87), for one individual this was the sole reason for wanting to take part: "to understand/control my relationship with food" (ID 39, pg.84). Eating experiences were described by several as having a habitual quality (ID 5[MEP], pg. 76-77; 14[MEP], pg. 78-79; 21[MEP], pg. 80; 22, pg. 80; 38, pg. 84; & 51, pg. 86).

Physical state*Sustained weight-loss to achieve a healthy weight*

Closely related with eating and psychological experiences was the desire to change physical state (most frequently weight; ID 19, [MEP], pg.80). Most succinctly put here “I am interested in dealing with my weight/eating habits, mindfulness interests me, I would like to explore having a more positive outlook” (ID 21, [MEP], pg.80).

Several participants cited *health concerns* as reasons for wanting to change eating behaviours such as the negative impact of being overweight on health (ID 23, pg.81) and wanting healthier eating patterns and diet (ID 29, pg.82). For one individual it was more specific: “Heart disease runs in my family; this scares me and I'm frustrated in my seeming helplessness.” (ID 26, pg.81-82).

It is clear from reading the descriptions of eating experiences, current or hoped for, that knowledge about healthy ways of eating were not lacking or what individuals are seeking from the programme. For example, one individual stated that “I know I need to eat less and exercise more to lose some weight, that 'diets' do not work and it is more my lifestyle approach that needs to change... I know the answers! It's the doing it that's difficult!” (ID 34, pg.83). The frustration with dieting is illustrated again:

“I've been on the 'dieting wheel of torture' for most of my life; I'd lose weight, nearly get to my 'target', put it back on again, and so on. I realised that it just wasn't helpful” (ID 26, pg.581-82).

Several wanted to take part in the hope that the programme would facilitate greater understanding of current eating (ID 49, pg.86) and teach more thoughtful approaches (ID 43, pg.84-85) that would lead to sustained weight-loss which they

would be “able to keep it up and make it part of my life” (ID 7, [MEP], pg.77). A mindful approach was seen as “something new in approaching being a healthy weight” (ID 34, pg.83) also seen in ID 5, [MEP], pg.76-77) and different from standard or previously tried weight-loss interventions: “I am tired of trying every fad diet and having pre-diet and post diet clothes” (ID 42, pg.84).

Psychological experiences

Impact of physical state on psychological state

The associations between feelings of not being in control of eating, risking ill health, negative self-image and frustrations with dieting were evident in the majority of reasons for wanting to take part. For example, when describing previous dieting attempts one individual stated that “I don't like how it makes me feel when I buy clothes in a smaller size then have to buy bigger, but that feeling doesn't make me lose weight, it makes me eat!” (ID 51, pg.86). Several participants described how their physical state and associated beliefs impacted on their psychological state

“I was judging my every waking moment on food and the success/failure of dieting, and all of my present was spent feeling guilty for not being 'thin enough' and therefore very weak on the one hand, and looking forward to a time when I would be 'thin enough' to enjoy life and reach my potential.” (ID 26, pg. 81-82).

Negative current psychological experiences: Negative self-image

In addition, some individuals wanted to take part to directly address negative current psychological experiences or self-image not specifically relating to eating or physical state:

“Learn to adopt a more positive mental attitude. > Learn how to feel better about myself. > Increase my confidence levels. > Learn how to deal more effectively with my stresses. > Not to be so governed by my emotions.” (ID 35, pg.83).

Another felt that the programme could be helpful (ID 13,[MEP], pg.78) describing their current state and hope for the future “low on where my life is at.... Just generally give myself a hard time... it might do me the world of good.” (ID 44, pg.85).

Relaxation and help with stressful situations.

Relaxation was mentioned by many of the individuals, the context ranged from wanting to find an alternative to eating to relax (ID 22, pg.80; ID 36, pg.83), the desire to be more relaxed in life (ID 10, [MEP], pg.77-78; ID 14, [MEP], pg.78-79), that taking part was an opportunity to take time out to relax (ID 37, pg.84) and finally that the programme might teach people techniques to relax (ID 12, [MEP], pg.78; ID 3, [MEP], pg.76). Associated with this was the hope that it would help with stressful situations (ID 8, [MEP], pg.77) which is explored more when describing reasons for wanting to take part associated with perceived benefits of mindfulness and meditation.

6.6.1.2. Mindfulness

For many mindfulness was cited as a reason for being interested in taking part in the programme. It is not however clear what individuals meant by mindfulness and if for example mindfulness was seen as being separate or synonymous with meditation practice. Therefore, the subthemes reflect participant’s use of the terms mindfulness, meditation and mindful meditation as described in the source material. Subthemes are organised around how mindfulness as offered in the MEP was perceived: *mindfulness*

as an approach or technique, meditation and associated positive impacts of mindfulness and meditation.

An approach or technique

Mindfulness was described as being of interest (ID 3, [MEP], pg.76; ID 21, pg.80) and beneficial (ID24, pg.81) in relation and unrelated to eating. As an approach or technique mindfulness and mindful eating were described as “something new in approaching being a healthy weight” (ID34, pg.83; also seen in ID10, [MEP], pg.77-78) and as a tool to use to change psychological experiences particularly being useful for those who experience stress (seen in ID 6, [MEP], pg.77; ID 17, [WLC], pg.79-80; ID 32, pg.82-83; ID 35, pg.83). For example, one individual stated that “I am interested in learning mindfulness as a tool I can use for when I feel stressed and possibly to aid my concentration” (ID 40, pg.84).

Developing awareness of the ‘self’, peace and the ability to live in the moment

Mindfulness was also seen as a way of developing awareness of the ‘self’ (ID 27, pg.82) and “the general practice of being aware of situations and our own minds and bodies” (ID 15,[WLC], pg.79). Another individual described their current experience of life and outlined how they hoped mindfulness would change that experience:

“I often yearn for a better sense of peace and the ability to live in the moment. I am aware of my mind racing at times and my stomach churning, hence I am often anxious and I feel that being more mindful of the actual moment will help me live each day in a more relaxed and appreciative manner” (ID 14, [MEP], pg.78-79).

The potential influence of mindfulness was seen in one individual’s spiritual life as well as the way they think and behave (ID 14, [MEP], pg. 78-79).

Meditation: Interesting/enjoyable/beneficial or just a 'good thing'

When referring to meditation specifically individuals described it as an object of interest (ID 8, [MEP], pg.77; ID 9, [MEP], pg.77; ID 13, [MEP], pg.78; ID 19, [MEP], pg.80 ; ID 33, pg.83; ID 37, pg.84) enjoyable/beneficial for life (ID 17, [WLC], pg.4) or just a “good thing” (ID 53, pg.87). For one individual the interest in mediation was seen ‘quite separately from my relationship with food’ (ID 23, pg.81) another stating that meditation was:

“something I am keen to explore as I have read many books that suggest meditation can combat all sorts of issues and I think it could be a useful tool, not just for the eating pattern study but, equally, for life use” (ID 20, [MEP], pg.80).

Useful tool for eating and for life

In addition to the hope that meditation could help to assist healthy lifestyle changes, control over eating and weight-loss (ID 19, [MEP], pg.80; ID 47, pg.85; ID 53, pg.87) it was hoped that mediation would help achieve a “calmer, peaceful mind”. (ID 36, pg.83), a “more positive approach to healthy living, and self-esteem” (ID 42, pg.84) “to become a positive thinker” (ID 47, pg.85). The positive perceptions of learning about mindfulness and meditations are echoed in benefits of taking part for the individual.

6.6.1.3. Value of taking part in research

The final cluster of themes describes the perceived value of taking part in research for *what the process can offer the individual, expected positive experience and giving back to the research process.*

What the process can offer the individual

Taking part was seen to offer the opportunity of training or learning (ID14, [MEP], pg.79; ID15,[WLC], pg.82; ID28, pg. 82; ID52, pg. 86-87) specifically about the self (ID30, pg. 82) and increase understanding of mindfulness and eating (ID 46, pg.85 also seen in ID 31, pg.82) and for one individual the programme offered the opportunity to learn a beneficial practice and “as a platform for (hopefully) life-long commitment to the practice” (ID24, pg.81). Another cited the opportunity to gain group support (ID23, pg.81).

Many of the individuals had had positive previous experience with conducting or participating in research and liked helping with research studies (e.g. ID32, pg.82-83). There was also a sense of reciprocity and giving back to the research process (ID12, [MEP], pg.78; ID23, pg.81) most explicitly captured in the following. “Appreciating the difficulty in getting people motivated to take part in similar projects. The 'Volunteer' in me! The inconvenience factor is low” (ID41, pg.84) and “I am currently studying my Masters and am about to do my dissertation and will require people to take part in my research - so I see this as reciprocal” (ID17,[WLC], pg.79-80).

Value of and potential implications of research

The research itself was described as sounding interesting e.g. (ID52,20,45,18,7,32,12 & 24) and of value (ID15, pg.79) with one individual stating that “I am happy to be able to help where I can in research that I believe is of real importance to the betterment of humans” (ID24, pg.81). However, for one individual the promise of a £40 voucher was a main reason for wanting to take part (ID13, [MEP], pg.78).

6.6.2. Changes associated with taking part

Thematic analyses were conducted on post-intervention feedback and descriptions of relationships with food to gain a picture of what, if any, changes were experienced as a result of taking part in the MEP and what processes participants describe as underlying or explaining any change. Participant's full responses to feedback questions (listed in table 6.9) and descriptions with examples of post intervention relationships with food are provided in chapter six appendix 6D.3.

Table 6.12. Post-intervention feedback questions.

-
1. In a few sentences, what - if anything - have you gained from the Mindful Eating Programme?
 2. What were your expectations and have these been met?
 3. What part or aspect of the programme was most useful to you and why?
 4. Do you plan to use any aspect of the programme in the future? If yes, which aspect(s)?
 5. Was there anything missing from the programme or was there anything we could have done better?
 6. Do you have any other comments not covered by the questions?
-

Responses include those from two participants previously not included in quantitative or relationship with food analyses as they did not complete these components (technical issue with online surveys). There was considerable overlap in responses to feedback questions and descriptions of relationships with food therefore feedback was analysed together and integrated with emergent themes from relationships with food. Emergent themes and their subsequent organisation into super ordinate and subthemes are shown in table 6.10. The emergent themes are described under three broad headings: *Experienced changes*, *programme evaluation* and *suggested amendments*.

Table 6.13. Summary and organisation of emergent themes from responses to Post intervention feedback questions and descriptions of relationship with food (N=16).

Experienced changes (6.6.2.1)

Changes in eating related behaviour

Changes in relationship with food

Increased awareness of antecedents and consequences of eating

Awareness of different types of hunger

Wisdom of the body

Changes in psychological experiences

Changes in thoughts around food

Programme evaluation (6.6.2.2)

Useful components

Planned to use in future

Suggested amendments (6.6.2.3)

Content and running of the sessions

Data collection

6.6.2.1. Experienced changes

Experienced changes and described underlying reasons encompasses the superordinate theme of *changes in eating related behaviour* and *changes in psychological experiences*. The themes are based on responses to feedback questions 1 and 2 and post-intervention descriptions of relations with food with an illustrative example of eating. Participants provided information about the exemplar eating experiences under the following subheadings: 1) Reasons for starting, 2) Initiating situation, 3) Reasons for stopping 4). Initiating feeling/mood/thought or emotion. A summary of provided examples are shown in appendix 6D.5f., responses under

subheadings 1-3 were summed under ‘starting’ and 3-4 under ‘stopping’. Participant’s full responses are provided in chapter six appendices 6D.5a-d.

Changes in eating related behaviour

Several participants described changing eating behaviours such as no longer “buying and eating some rubbish junk food” and snacking less, attributing the change to increased sensitivity to the properties of foods such as smell (ID7, pg.114 & 128), stopping eating when full, even in social situations such as parties (ID7, pg.128), “no longer eat[ing] for eating sake or to calm me down at night” (ID13, pg.128-129) and wanting to making the effort to eat well (ID9, pg.147) ,“eat better quality of food not quantity” (ID20, pg.115). For one, the changes were small but favourable in comparison to unsustainable “drastic changes” as described here when describing what their expectations had been and if they had been met:

“To lose about 1/2 a stone in weight! This hasn't happened: (weight 68.4KG)! I think this will come in time due to the small changes that we are making to our eating habits rather than making drastic change that is not sustainable” (ID16, pg.123-124).

Changes in relationship with food

Of the individuals completing the MEP, ten of the fourteen reported and provided examples that indicated a changed relationship with food. When describing the behaviour that illustrated current relations with food, participants reported no longer overeating when full (ID14, pg.147), reducing portion size (ID13, pg.147) and gaining a sense of control over eating behaviours. For example, stating that “I feel good as I am in control, this is a new way of eating for me” (ID13, pg.163). For some, the changes were around a particular form of undesired eating such as eating unhealthily when alone (ID8,

pg.147) or comfort eating when stressed, upset, or anxious. For example, “Since engaging in Mindfulness I have been using the different types of meditation to deal with these situations and for about 6 weeks I have not 'comfort eaten' once” (ID19, pg.129). Two participants described these changes as fluctuating: “can be 'up and down' - the more I seem to try and 'control' my intake; the more I'll have a 'backlash' where I feel slightly out of control a few days” (ID5, pg.147) or a bit hectic but making the effort to eat well at times (ID9, pg.147).

Increased awareness of antecedents and consequences of eating

Several participants reported increased noticing or awareness of relationships between emotions and eating in several ways. For example, recognising emotion based reasons for eating (ID16, pg.147) and that meditation can satisfy emotional needs rather than eating. For example, “I now use meditation to satisfy my emotion needs rather than consuming food thoughtlessly” (ID19, pg.164). For one participant they had noticed that emotions shaped outcomes rather than emotions being shaped by eating explaining that how they felt after eating “depends upon my emotions at the time I either feel satisfied or disappointed” (ID8, pg.163). One participant had also become aware that different foods were eaten to reduce boredom compared to hunger: “Eating junk is down to boredom, the rest of my eating habits are usually because I'm hungry” (ID21, pg.165).

Increased awareness was described as being directly associated with changes in behaviour. For example “I have become more aware of what I eat and have made a conscious effort to eat healthier” (ID8, pg.114) and that “I feel I have gained more self-control around food and an increased awareness of what I want to eat” (ID13, pg.114).

Participants also reported increased noticing how they used food. Firstly, an undesired reliance on a use of food: “I think it would best to stop relying on chocolate as a quick fix to stave my hunger off and plan my meals better. I have noticed I can tell when I am doing this now” (ID9, pg.163) or food used intentionally as a distraction: “I want to distract myself from any thoughts I don't like” (ID5, pg.162). Secondly that feeling in control of consumption reduced distress associated with being upset or stressed with family/work situations felt to be uncontrollable: “being upset and stressed, in order to stay in control I need to find a routine and find that regulating and planning my food is one way of doing this” (ID8, pg.163). Another had become more aware of the positive impact of food use to ease homesickness by connecting to cultural roots and confident in using food and it's preparation as an expression of love explaining:

“OK, let me talk about cooking home-made food. That reminds me what my parents, particularly my father who always prepares lovely, delicious and healthy food for the family. I feel that I should prepare home-made food for my children as I want them to eat healthily and also it is a way to show my love to them” (ID7, pg.167).

Awareness of different types of hunger and wisdom of the body

Several participants described increased awareness of different types of hunger and how this influenced eating such as the habitual quality (ID19, pg.115). Examples of increased awareness included noticing eating in the absence of hunger due to the availability of food (ID24, pg.115), or experiencing emotions (ID24, pg.124), such as boredom (ID12, pg.128) or in response to emotions and the need “to calm down” (ID13, pg.128).

The ability to discern and respond to different types of hunger is captured by the *wisdom of the body* subtheme and is closely associated with changes in behaviour and changes in thinking but specifically refers to the awareness of physical experiences such as mind (ID5, pg.162) or stomach hunger (ID13, pg.163). Two individuals described experiencing pleasant fullness as compared to previous experiences of being overly full for example, stating that the reason for stopping eating was that they were “no longer hungry. Pleasantly full but not overly full” (ID16, pg.164) and “I now only eat this way when I'm hungry. I am able to recognise when I am full and stop” (ID19, pg.164; also seen in ID14, pg.164). One participant explained that:

“Being able to recognise the different types of hunger and think more about why I'm eating before I do it and to really think about whether I want to eat, and if I don't then I'm more able to not eat” (ID12, pg.114).

The ability to recognise physical fullness and being able to stop eating was described as being associated with reduced aversive thoughts, emotions and sensations around eating.

Increased awareness was often attributed to meditative practice but one individual also noted that keeping a food diary raised their eating awareness and made them consider “exactly what, and how much, my intake was on a daily basis” (ID6, pg.128). It is important to note that not all individuals reported experiencing changes with one individual who became involved because they like to take part in research stated that they “did not gain very much from the course” concluding that “maybe it was not my sort of programme” (ID3, pg.114).

Changes in psychological experiences

Responses from several participants demonstrated applications beyond eating such as shifts in approach to daily life, relations with 'self' and others:

“My expectation before undertaking Mindfulness was that it would be some sort of self-hypnosis session about dealing with my hunger pangs. It has not really been anything like I expected but has been much more than that. I have changed my eating habits, but not in the way I expected but the bonus has been how I now view life, not just mine but everyone else's too. I actively want to be sympathetic even to those people in my life who hurt or upset me, I haven't quite achieved this to the degree I want to just yet but I'm confident that with continued practice and some more time I will get there” (ID19, pg.124).

Several participants describe reduced experiences of stress and a greater acceptance of 'what is' at work and home (ID16, pg.115) and the use of particular mindful techniques such as the breathing space to for example help “me focus on my work and also avoid unnecessary conflicts with family” (ID7, pg.132). For one individual, the change was profound and witnessed by others:

“I have spoken to a number of people who have been aware of how stressed I've been and they have all noticed a real difference in my outlook on life and handling my stress levels, especially my family. Before undertaking the mindfulness study, I felt as if I was in a big Sea of water, frantically treading water in order to keep going. Although I still feel I am in the water, I now know I'm only up to about my knees and very soon I will be on the beach just looking

at the water. I feel that for a long time I have been trying to repair my broken plug with all kind of useless implements but Mindfulness has now given me the screwdriver I needed and I can finally fix what's broken” (ID19, pg.139).

Changes in thoughts around food

These themes describe observed changes in thoughts about food and thoughts about ‘self’ after eating provided by participants to illustrate changed relationships with food post-intervention. For example, a reduction in the strength of thoughts about available and tempting foods and reductions in negative self-talk evidenced in the following examples:

“I finally convinced myself I’d had enough. I experienced feelings of shame about this - but to put it in context, the feelings of having to eat them weren't as strong as they sometimes are - I do think the mindfulness practice helps” (ID5, pg.162).

Reductions in negative self-thinking were attributed to being able to think about all the days intake and put the eating event into the context of reality for example: “after I [eat] normally I am annoyed with myself if I eat the whole bar or cake. Then think back to what else I have eaten in the day remind myself if it has been good or simply junk” (ID9, pg.163). The final change was an improved relationship with food due to the ability to actively choose to engage mindfully with food and eating or not bringing conscious choice to the experience “Much better than previous to the study. I now recognise why I am eating and can take part in either mindful or mindless eating depending on what I choose to do” (ID16, pg.147).

6.6.2.2. Programme Evaluation

Useful Components

This cluster of themes captures what components of the programme participants felt to be useful or that would be continued in the future. Meditative practices such as the breathing space (e.g. ID7, pg.132) and breath based meditations (ID9, pg.132; ID25, pg.133) were the most frequently described as useful and were cited when describing changes associated with participation. Learning about mindfulness theory and practice (e.g. ID6, pg.114) particularly the guidance on different types of hunger (ID 7,10,12,13) was also described as useful. Meditative practices were described variously as “coping mechanisms for everyday life” (ID8, pg.128), an “escape” (ID20, pg.115), a way of learning how to relax. (ID24, pg.115, ID21, pg.7), “a fantastic tool giving me some me time” (ID14, pg.7) and “even get to sleep” (ID9, pg.114). For one meditation had not been part of their reason for wanting to take part: “I didn't think about having meditation as one of my expectations and the benefits this brings: this is outstanding” (ID16, pg.124).

Planned to use in future

Perhaps unsurprisingly the meditative practices were most frequently cited when stating if they planned to use any aspect of the programme in the future (ID14, pg.132; ID20, pg.133; ID19, pg.133). For example, “I am definitely going to incorporate meditation into my life...it is so easy to fit in a short meditation into my day and I feel so peaceful afterwards - and it's free!” (ID25, pg.9). One participant stated that:

“I will continue with the mindful eating, not the type we did with the raisin as I find this difficult to do, but the aspect of eating more slowly, enjoying the taste of what I'm eating and stopping when I know I'm full” (ID19, pg.133).

6.6.2.3. Suggested amendments

Most participants did not think anything could have been done better, replying no to the question ‘was there anything missing from the programme or was there anything we could have done better?’, or did not suggest improvements. The amendments that were suggested regarded the *content or running of the sessions* and *data collection*.

Content or running of the sessions

Suggestions regarding session content describe issues with group discussion with one individual explaining that:

“I did not expect the 'group therapy' element of the course and this is the aspect I enjoyed least. I felt that too much time was given over to the group talking about their experiences (some of which was irrelevant) and insufficient time was left to introducing new concepts and ideas. In future, a better balance would ensure group discussion did not dominant the sessions” (ID10, pg.136).

The group discussions provided an opportunity to discuss experience or questions arising from introduced meditative practices or concepts and share experiences of home practices and their application to daily life. For one they were “somewhat awkward” due to others non-participation (ID6, pg.136), in contrast another thought they felt “like a group therapy session where the conversation seemed to go off on a tangent” (ID21,

pg.137) both suggested more direction from the facilitator. Others had expected the weekly hour and a half sessions to mainly be spent practicing meditation (ID21, pg.124, ID10, pg.136). Two individuals wanted to have had more direction with mindful eating and its application (ID16, pg.136) and meditation in general stating that “at times, I was never sure what I was doing was correct and more practical sessions would have been helpful” (ID10, pg.123). Although only mentioned by one participant (ID24, pg.137) CD recordings for all the meditations and perhaps mindful eating itself would have been useful.

The only other suggested amendments regard data collection:

“I think a better system for collecting data from the beginning - I know this was complicated by Naomi's absence - maybe an online version similar to the food diary collection or the paper versions we were using towards the end” (ID16, pg.136).

6.7. Summary of qualitative findings

The first part of the analysis focused on trying to understand why potential participants were interested in taking part in the MEP and to gain a picture of participants current relationships with food. The emergent themes illustrated the range of aspects of eating related behaviour or experiences used to describe current relationships with food experiences and what components of the MEP interested potential participants. These analyses are used to determine the acceptability of the programme and provided examples of what about relationships with food participants would like to change. The second part of the analysis provides an understanding of the

experience of the Mindful Eating Programme and if, what and how changes, including their relationship with food, were described. These analyses informed the evaluation of the programme based on efficacy and outcomes and associated with participation.

When describing why individuals were interested in taking part *wanting to change* was a main theme encompassing eating experiences, psychological experiences and physical state. Mindfulness and meditation were seen as an alternative sustainable approach to change and was compared favourably to previous attempts to manage weight. Mindfulness was seen as a tool or technique that the programme would provide the opportunity to learn, this was seen as beneficial to individuals and part of the value of taking part. Many enjoyed taking part in research or saw the value of increasing understanding about eating and mindfulness.

The themes of wanting to change and descriptions of relationships with food were closely linked both in content and in providing the motivation and phenomenon individuals wanted to change. Many wanted to change their relationship with food describing their relationship as being negative, controlling, ambivalent, inconsistent, or just complicated. Part of the experienced ambivalence was evidenced in competing internal and external influences such as the felt need for comfort in times of upset verses the knowledge about how to eat healthily. Description of relationships with food included themes around use of food, food preparation and eating experiences related often to negative psychological or physical outcomes.

For all but one of the individuals the post-intervention feedback and descriptions of relationships with foods showed that they had experienced some form of change in a desired direction. For some this related to eating behaviours such as increased awareness of what led to certain forms of eating, sensations of hunger and an increased

ability to stop eating when full. This was closely related to increased awareness of psychological experiences that previously led to undesired eating such as the influence of others, stress or the effects of attempts to control intake on subsequent intake. For others, the changes related to psychological experience in a change of life view or ability to adopt a mindful approach and reduce stressful situations that would have previously led to undesired eating behaviours. The changes reflected the mindful exploration of what leads to certain eating behaviour and space for alternative responses to identified antecedents. Increased awareness, adoption of a mindful approach or use of a specific mindful practice to reduce stress in situations or to relax were described as processes underlying changes in thoughts around food, a sense of control or actual intake. In relation to mindful eating many reported finding the introduction and getting in touch with sensations of different types of hunger to be most useful and having the greatest impact on actual intake.

Analysis of post-intervention feedback identified programme components or aspects found to be most useful or that participants felt willing and able to continue post-intervention. Typically these included the meditative practices such as the breathing space found useful for handling difficult situations, mindful eating practices and the seven types of hunger to aid understanding of hunger. The most common suggested amendments were changing the balance between group discussion and meditation practice towards practice and improving data collection procedures for recording home practice.

Taken together the qualitative components of the analysis provide preliminary support for the efficacy of delivering mindfulness in a six week Mindful Eating Programme to positively change individuals relationship with food in a self-selecting

non-clinical sample. Based on the speed of recruitment and amount of interest, attendance and feedback, the programme was predominately experienced as acceptable.

6.8. Discussion

The formulation of the Mindful Eating Programme (MEP) enabled the testing of understanding of how mindfulness training may influence eating behaviour and underlying mechanisms generated in the previous studies in this thesis and from analysis of current literature. Mixed methodological analyses were used evaluate the acceptability and efficacy of the piloting of the Mindful Eating Programme (MEP) in a self-selected community sample wanting to develop a healthy relationship with food. The format of the discussion follows the exploratory and evaluative aims of this pilot study. Findings derived from analyses and how they relate to the previous studies and reviewed literature are discussed under three main subheadings: acceptability, efficacy and recommended amendments. Changes in relationships with food, eating behaviour and psychological experience are discussed in the context of what they add to our understanding of the underlying mechanisms of mindfulness.

6.6.1. Acceptability

Based on the experience of recruiting for the Mindful Eating Programme (i.e. level of interest, speed of recruitment and range of individuals making contact) the approach and topic of the programme appeared to be acceptable and of interest to the general public. Three main factors were described when potential participants were asked why they were interested in taking part. The overarching reason was *wanting to*

change: eating experiences, psychological experiences and, for some, their physical state. Secondly, mindfulness and meditation as an approach or technique expected to have beneficial effects on eating tendencies and daily life were cited as reasons for wanting to take part. Thirdly, taking part in the research process was seen as potentially beneficial for the individual and of value having potentially positive implications for research and practice.

The acceptability of participating in the Mindful Eating Programme was also determined based on retention, attendance and home practice. Retention is different from attrition through the research process as it reflects the experience of the sessions rather than the research process which, as mentioned previously, was not conducted as intended due to unavoidable absences. The sixteen who started the programme attended at least four of the six sessions suggesting that they found the experience of the sessions acceptable. This level of attrition is consistent with previous studies that observed 100% completion rates (Alberts et al., 2010; Dalen et al., 2010; Niemeier et al., 2012). However, the small sample size may have decreased the likelihood of dropout. When considered with reference to the strict exclusion criteria (e.g. no psychiatric comorbidities, pregnant women or medication) it could be argued that attrition may have been greater if the intervention had been open to a broader range of people.

Home practice records indicate that there was wide variance in the amount of practice completed. This in itself suggests less desire to please the researchers as some stated not practicing at all rather than fabricating more desirable records. Online time coded practice records may improve the reliability of home practice recording and enable analyses in which practice time is used as a variable. When examined in relation to changes in quantitative measures individuals practice records do suggest that those reporting greater duration and frequency of mindfulness practices, particularly mindful

breathing, also reported greater changes. This is most evident in reported increases in dispositional mindfulness, and reductions in Difficulties in Emotion Regulation, Uncontrolled and Emotional eating. These observations in conjunction with participant's attendance and interactions within the sessions support the use of practice records as an indicator of engagement. However it should be noted, with reference to the subscales of the FFMQ, that not all participants reported changes in the expected direction. This finding illustrates several of the limitations outlined by Grossman and Van Dam (2011). It is not possible, for example, to state reported reductions in acting with awareness or non-judgement compared to baseline reflect reductions or greater awareness of a lack awareness associated with bringing attention to daily life. The addition of an opportunity for participants to reflect and describe how their perception and awareness may have altered how items are understood and responded to may in part address this issue.

Although there have been several recent studies applying mindfulness and acceptance-based strategies to the problem of weight-loss or weight-loss maintenance, this is the first known study to address individuals relationship with food as a way of changing eating and psychological experiences associated with overweight and obesity. Framing the programme in the context of relationships with food meant that it was open to a wide range of individuals who recognised that even if they were not experiencing negative physical consequences of their current eating behaviours they felt that it would be of benefit to address their relationship with food. This was evident in screening interviews in which several individuals stated that if the programme had been advertised as a weight-loss intervention they would not have made contact. However, for others, despite reiteration by the researcher that weight-loss was not the goal of the programme weight-loss was, at least initially, a goal expressed.

Importantly for researchers and health practitioners, developing programmes to reduce behaviours associated with overweight and obesity many characteristics of eating experiences described pre-intervention to illustrate current relationships with food are seen in the DSM-V criteria for ‘Binge-Eating Disorder’ (American Psychiatric Association, 2013). DSM-V criteria for Binge-eating include: 1) eating larger amounts within a short period of time than what most people would eat under the same circumstances and within the same time frame with an associated feeling of a lack of control over the eating. 2) eating until physically uncomfortably full or eating large amounts of food when not hungry, 3) feeling negative emotions (e.g. disgust, depression or guilt) after the binge-eating episode, 4) experiencing distress regarding their eating. The overlap between characteristics of eating experiences and clinical criteria, and the wide range of individuals interested in taking part illustrates the potential of mindful approaches to relationships with food to engage the general public and have clinical relevance.

6.6.2. Efficacy and Outcomes

Quantitative findings indicate that participation in the MEP was associated with increased dispositional mindfulness, reduced difficulties in emotion regulations, habitual negative thinking and BMI but not at a statistically significant level. No changes were seen in measured mental well-being. In regard to eating measures, quantitative findings showed significant reductions in the emotional eating subscale. Increases were also seen in two subscales of mindful eating: *awareness* of food specific characteristics including the sensory experience of eating and reduced likelihood to eat when full or in response to *external cues* at follow-up. Eating in response to physiological cues to eat rather than environmental or emotional cues to eat has been

proposed to help individuals sustain healthy eating patterns (Miller, Kristeller, Headings, Nagaraja, & Miser, 2012). Reduced disinhibition in comparison to the control group post-intervention approached significance at follow-up. Disinhibition refers to an individual's inability to stop eating even when full. These findings were supported by accounts of increased awareness of eating emotional and situational antecedents of undesired eating and an increased sense of control attributed to mindfulness practices. The majority of participants reported increased awareness and understanding of phenomena associated with eating with many ascribing this to learning about different types of hunger such as heart hunger (hunger for comfort and intimacy; Bays, 2009). Phenomena included negative thoughts, emotions, experiences of stress and situations previously associated with eating of high energy dense foods or overeating. These observations are consistent with proposed mechanisms of influence described in chapters one and two (1.1.3. & 2.4.; Alberts et al., 2012; Dalen et al., 2010; Rott et al., 2008; Tapper et al., 2009) and qualitative accounts of outcomes and the processes to which individuals have attributed change (Woolhouse et al., 2012).

The adoption of a mindful approach to identified situations that would have previously elicited hunger illustrates the interrelations between processes described in the LMM and the multiple levels at which emotion regulation occurs. For example, a mindful approach to work situations reduced associated emotion and stress. This meant that there were less negative emotions experienced to regulate and a reduced need to regulate them. Where participants identified reactions to emotions, thoughts and sensations these were described as occurring with greater awareness, and alternatives to eating were reported such as the use of specific meditation practices. This in turn was associated with reduced reported negative self-thoughts around eating that contravened

external rules and increased positive self-thoughts about being able to stop eating when full.

Post-intervention, participants in the MEP reported increased cognitive restraint scores whereas those in the control group reported reductions. Cognitive restraint measures the tendency to control food intake in order to influence body weight and shape. Thematic analyses of post-intervention relationship with food suggests that increased awareness directly influenced actual intake through enabling individuals to recognise uses of food and signals of different forms of hunger and respond to sensations of fullness and reduce portion size. Portion size also has relevance for weight management in that it has been shown to effect energy intake in normal-weight and overweight men and women (Rolls, Morris, & Roe, 2002). The translation of awareness into behaviour without instruction to make changes, illustrates the potential for mindful approaches to enable individuals to change processes relevant to themselves rather than compliance to teacher led external rules.

What is not clear from the current study is the extent to which changes are associated with the intervention per se or the person delivering the intervention or group interactions during the programme. This is an issue that arises across interventions delivered by practitioners in a group setting. Delivering the programme through a manual or online may enable future research to determine the effectiveness of the material and mindfulness practices without the influence of interactions between the participant and teacher or other participants. Alternatively conducting interviews following participation may enable researchers to disentangle the perceived influence of the delivery and interactions from the course content. In the current study participants feedback attributed changes to mindfulness practices rather than delivery style or the personalities of the teachers or other participants.

The current findings and processes described by participants particularly with regard to reduced ‘comfort eating’ and increased ability to stop eating or not eat when not hungry are consistent with the self-regulatory benefits seen in Kidd et al. (2013) in which women improved regulation of eating and made healthier choices, as greater awareness of emotions and stress enabled them to recognize that they didn't need the food. For example, the mindful breathing exercise was used to find comfort directly replacing food. Others spoke of beginning to bring attention to and change routines that were associated with less mindful eating as seen in the current study in reports of no longer buying snack foods or using certain foods as a quick fix. Taken together, these findings provide qualitative support for the assertion that through increasing purposeful and sustained attention to internal dialogues and bodily cues, mindfulness practicing may facilitate assessment and potential re-patterning of automatic behaviours (Dalen et al., 2010). The described changes in how psychological and eating behaviours inform each other demonstrates the influence of mindfulness (theory and practice) on reward motivated eating tendencies through altering emotion regulation seen in study one. Increased awareness associated by participants with mindfulness breath based and eating meditation practices demonstrates the potential of mindful attention to influence subjective experience and actual intake shown in study 3 in an experimental setting in daily life. This could be a particularly salient feature in changing conditioned patterns of eating which typically have developed over years (Dalen et al., 2010). The qualitative descriptions also show how negative self-thinking in particular can be seen as both a mediator and is also influenced by eating experiences.

Two exceptions were seen to the overall pattern of positive change in eating experiences and individuals relationship with food. One individual's relationship with

food was described as one in which periods of control were followed by a backlash of undesired eating behaviour. This illustrates some of the evidenced deleterious effects of attempts to control behaviours (Abramowitz et al., 2001; Wegner et al., 1987). The same individual suggested greater direction from the delivery team on whether they were 'doing it right' in the mindfulness meditations and eating practices. They also reflected in the post-intervention feedback that the programme had been brief and that they had begun to experience and make changes in, for example, eating behaviours but had not achieved all that they had expected. For the second participant, there was no reported change in either eating or psychological experiences. Examination of pre and post-intervention responses indicated that, for these participants taking part in research was the sole motivating factor with no desire or perceived need to change before or after the MEP. This illustrates the importance of asking people why they are taking part in research, as the specific aims of the programme may not be personally relevant and lack of effects may influence the evaluation of an approach. The range of changes including the lack of them and critical or negative feedback is important for increasing understanding and demonstrating that participants communicated their experience rather than what they felt researchers wanted to hear.

The validity of the qualitative analyses and therefore confidence in findings was demonstrated throughout this study from design to drawing conclusions within the framework described in Yardley's (2000) four principles of quality. For example, the experience of the deliverers of the MEP demonstrates the commitment and in-depth engagement with the topic. Whilst the method of data collection was intended to reduce influences of the social cultural situation on responses by ensuring responses were anonymous and in no way influenced their participation. However, semi-structured interviews would allow further exploration of experiences.

6.6.3. Amendments

Two areas for amendments were evident from post-intervention feedback the content of the session and data collection. The balance of time between meditation practice and group discussion was attributed to discussions taking up too much time, being felt as “somewhat awkward” or “going off on a tangent”. For one individual the desire for more meditation practice in sessions was explained as they felt that they were not sure if they were doing it right. These descriptions of how group discussions were experienced and wanting confirmation that they were doing the meditation right reflect an inherent characteristic of mindful approaches. Mindfulness practices, in contrast to how standard behavioural approaches to behavioural change, are not about attaining a goal, learning or following a rule or receiving external praise. The suggestions about balance and group discussions support the need for those delivering interventions as in the current study to be experienced mindfulness practitioners who also have group facilitations skills. During the course of the programme each of the researchers was unable to do all that they had intended due to unavoidable absences. This, thanks to the support of another researcher who took over the delivery, had minimal implications for delivery of the sessions but did impact the efficiency of data collection.

6.6.4. Strengths and limitations

While the current study has a number of strengths there are several limitations that should be acknowledged. For example, a strength is the relative single component nature of the intervention (mindfulness practices) without additional elements such as nutritional advice enhancing the ability to attribute changes to mindful practice.

However, even so the delivery of the intervention which included group discussion about the application of mindfulness practices in daily life, may account for some of the

increased awareness of eating experiences. Additional research in which the MEP is dismantled would be needed to examine the relative influence of mindfulness practices and group discussion as potential mechanisms of action in the MEP.

Quantitative analysis in small samples is exploratory and effect sizes were reported in order to meaningfully examine non-significant findings and to obtain information about which findings may be important to pursue in future studies. However, changes were seen in the psychological and eating measures in expected directions and the adoption of a mixed method approach provided understanding of the lived experience for participants and positive changes that were significant to the individual if not statistically significant. Clearly, studies with larger sample sizes and longer follow-up periods are needed before firm conclusions can be drawn about the effects of the MEP and the long-term impact of such training (Miller et al., 2012).

A related consideration was the limited demographic diversity of the sample. Nearly all of the participants in the current sample were Caucasian females in their 40s and 50s. Whilst this demonstrates a degree of support for mindfulness interventions with this group further research is needed with other groups before results can be generalised (Niemeier et al., 2012).

Finally, the length of post-treatment follow-up (i.e., 4 weeks) did not allow an investigation of efficacy of long-term maintenance. It was not expected that there would be significant changes in weight in this short timeframe. Weight-loss has been observed in studies with longer follow-up. This may indicate that it may take longer than the four week follow-up to understand and apply mindfulness practices in a way that would influence psychological and eating measures. For example, mindfulness did not emerge as a mediator of weight-loss until data collection at 6-months (Forman et al., 2009). In addition, three studies (Daubenmier et al., 2011; Forman et al., 2009; Tapper et al., 2009)

found a dose response, such that the effect of the approach was greater for individuals that reported applying mindfulness techniques more. Unfortunately, the records of weekly practices were not considered reliable enough to support dose response analyses. Bearing these facts in mind it might therefore be that the short follow-up periods that were employed in this and other studies may actually missed the potential benefits that could occur over the long-term following a mindfulness intervention.

6.6.5. Conclusion

The qualitative analyses provides a picture of how mindfulness practices can influence relationships with food and eating behaviour providing support for the role of emotion regulation shown in Study 1. The attribution of changes in psychological and eating related experiences to increased awareness resulting from mindfulness practices supports the findings of Study 3 in which mindful attention was shown to influence subjective hunger and actual intake. The described changes and evaluation of the programme provides preliminary support for the MEP as a vehicle to address eating behaviours and relationship with food in a non-clinical community sample and clearly warrants further empirical research.

Chapter 7:

Thesis Conclusions

7.1. Overview and key findings

This mixed methods programme of research was conducted with the aim of increasing understanding about the relations between mindfulness (dispositional, experimentally manipulated, and cultivated through practice) and eating tendencies as a health-related outcome. Difficulties in emotion regulation and habitual negative self-thinking were examined as potential underlying mechanisms in the relationship between mindfulness and behavioural outcomes. The programme used the Liverpool Mindfulness Model (LMM; Malinowski, 2013b) as a guide to research into mechanisms of mindfulness practices and associated behavioural and psychological change.

There were four studies within the research programme each adopting different methodologies to investigate the proposed relations (see Figure 1, pg.15). Firstly, a cross-sectional survey was used to examine proposed direct and indirect influences of dispositional mindfulness on psychological and eating experience outlined in the review of current literature (sections 1.1.1. & 2.6.). Lower levels of dispositional mindfulness were shown to be associated with greater difficulties in emotion regulation, habitual negative self-thinking and both emotional and uncontrolled eating tendencies. Difficulties in emotion regulation significantly mediated the mindfulness-uncontrolled eating relationship whereas habitual negative self-thinking significantly mediated the mindfulness-emotional eating relationship. Dispositional mindfulness also had a direct effect on uncontrolled eating. As predicted, participants classed as meditators reported greater levels of dispositional mindfulness, fewer difficulties with emotion regulation, less habitual negative self-thinking and reduced uncontrolled eating tendencies. Based

on the findings it was concluded that difficulties in emotion regulation and habitual negative self-thinking are mechanisms by which dispositional mindfulness may influence eating tendencies. Dispositional mindfulness was shown to have a stronger relationship with uncontrolled eating in comparison with emotional eating and therefore this was the emphasis of the experimental phase (Study 3). The findings of study three suggest that mindfulness meditation practice may reduce unhealthy reward motivated eating tendencies shown to be related to obesity and eating problems. This supported the inclusion and emphasis on mindful meditative practices in the Mindful Eating Programme (Study 4).

The range of ways in which the term mindfulness has been used or operationalised (see 1.1.2. & 1.1.4.) demonstrates the importance of accurately operationalising the term mindfulness in this and future research. Not doing so prevents accurate comparisons between studies holding back the research field and risks presenting mindfulness as a set of techniques that can be incorporated as an add-on to other interventions (Kabat-Zinn, 2003). The need for clarity and transparency within mindfulness research was directly addressed in the development of the Mindful Attention Induction. Systematic analysis deconstructed and described constituent components available experimental mindfulness manipulations used in studies in which outcomes were attributed to 'mindfulness' (Study 2). The resultant matrix of components and subcomponents informed the development of a Mindful Attention Induction (MAI). The analysis highlighted commonalities and differences in components and emphasis of how mindfulness inductions in previous experiments, thus confirming the need to clarify what is meant by mindfulness in each research context. A randomised controlled cue-exposure experiment (Study 3) was designed to examine the effect of the MAI on experiences and behaviours related to reward motivated eating.

The analysis in study two enabled the effects of the MAI to be attributed to manipulated changes in mindful attention rather than to mindfulness per se or increased attention without mindful attitude. The findings indicated that the MAI attenuated hedonic reactions following food-cue exposure. Perceived hunger decreased and fullness increased for the mindful-food cue-exposure (M-FCE) compared to the standard food cue-exposure (S-FCE) participants. There was also a reduction in feel-like-eating ratings for M-FCE compared to S-FCE participants that approached statistical significance. There was no significant between group differences in food craving post food-cue exposure. A third time point following post manipulation measures was included to examine the longevity of any effects. The differences in hunger, fullness and feel-like-eating ratings were not evident at the third time point suggesting that the effects were short lived. Despite the lack of differences on subjective measures at that point, participants in the S-FCE ate significantly more cookies post-exposure compared to M-FCE participants. It was concluded that the findings support the proposition that a mindfulness attention induction can attenuate hedonic reactivity to food-cues and limit cue related intake. As such, the findings illustrate how mindfulness techniques that manipulate mindful attention may counteract appetitive vulnerabilities for weight-gain. Despite providing evidence for the effectiveness of a brief mindfulness induction, the effects were short-lived and not delivered within the context of a mindfulness-based programme in which individuals had chosen to participate. As such the experimental phase examined, to varying degrees, the processes described in four of the five tiers of the Liverpool Mindfulness Model (LMM; Malinowski, 2013b) without addressing motivation, intention, expectation or attitudes (tier one). The emphasis was on the role of attention as a core process (tier three), measures relating to emotional and cognitive flexibility were completed prior to the experimental session; however, analysis revealed

no significant relationships between all dependant measures (appetite and food intake) and pre-experimental individual differences (dispositional mindfulness, eating tendencies, difficulties in emotion regulation, habitual negative self-thinking), mood and food preferences. This may reflect different influences on eating tendencies in experimental contexts compared to daily life. It was therefore important to explore the role of the variables shown to be relevant in study one beyond an experimental setting in daily life.

Study four, the evaluation of the acceptability and efficacy of a seven week Mindful Eating Programme (MEP) for individuals wanting to discover a healthy relationship with food, presents a synthesis of findings from studies 1-3 and review of current literature. The formulation of the study enabled exploration of the influence of mindful meditation practices on participant's relationship with food and lived experiences in daily life. Thematic analyses of described changes associated with participation created a picture of the mechanisms and processes to which participants ascribed change. This enabled examination of the relations evidenced in Study 1 between mindfulness and eating behaviour directly and through reductions in difficulties in emotion regulation and habitual negative self-thinking. The study also explored the potential for mindful attention techniques to influence subjective and behavioural changes demonstrated in Study 3 in daily life. All of the tiers of the LMM were addressed affording the opportunity to explore which and how aspects of processes were evident in individuals' experience of a mindfulness practices based intervention for individuals wanting to discover a healthy relationship with food.

Based on recruitment, attendance and pre and post qualitative findings the MEP was found to be acceptable and associated with positive changes in participants' relationships with food. Quantitative findings showed increases in dispositional

mindfulness, reduced difficulties in emotion regulations, habitual negative self-thinking and reductions in BMI but not at a statistically significant level compared to those in the control group. There was no change on measures of mental well-being in either group. Thematic analyses provided a picture of changes associated with taking part and underlying mechanisms to which changes were ascribed. These included increases in awareness of antecedents such as sensations of different forms of hunger, emotions and situations, reduced thinking about food and less negative self-thinking around food. Several participants described changes in actual intake including reduced snacking, comfort eating, smaller portion sizes and the ability to stop eating when feeling full. A mindful approach to situations previously associated with undesired eating was described as influencing the emotions experienced and offered an alternative approach to emotion regulation. The findings illustrate how mindful meditation practices may reduce difficulties in emotion regulation and reduce negative self-thinking associated with negative self-views of physical state and perceived inability to understand, change or control eating behaviours. It was concluded that the study provides preliminary support for the MEP as an approach to address eating behaviours and relationship with food in a non-clinical community sample that warrants further empirical research.

7.2. General discussion

In this section outcomes of the research programme are discussed with regard to how they increase our understanding of the mechanisms underlying mindful approaches to behaviour change, the extent to which the aims were met and what was learnt about conducting research into the mechanisms of mindfulness. The understanding gained is also discussed in the context of research that attempts to address the intention-behaviour

gap. The aim of this research was to increase understanding about the mechanisms of mindfulness, specifically difficulties in emotion regulation and habitual negative self-thinking, by increasing transparency about how mindfulness meditation practice enables or influences change. The mediation analyses and participant's descriptions of changes associated with the mindful eating programme do support the role of these proposed mechanisms. Regarding emotion regulation the use of a multicomponent measure enabled examination of what aspects may be associated with dispositional mindfulness, notably in study one, difficulties in goal directed behaviour when experiencing negative emotions. Insight into how mindfulness meditation practice influence aspects of emotional regulation was gained from MEP participants descriptions of reduced experienced emotions associated with situations previously perceived as 'stressful'. Alternatively how an increased capacity to understand others perspective and therefore not to become as upset in situations previously associated with family conflict. The change in perspective about 'stressful' situations or altered interactions with others was associated with insight into the nature of thoughts, emotions and feelings. This included understanding of themselves and relations between experienced phenomenon, actions and consequences. For some participants this enabled changes in interactions, actions or reactions to situations that could not be changed or avoided. This is different from what is typically described in models of emotion regulation (e.g. Gross & Thompson, 2007) and or what is captured by aspects of psychological flexibility concerned with emotions (e.g. Kashdan & Rottenberg, 2010). The use of terms such as regulation and flexibility are discussed with reference to aspects of the LMM (7.2.1.; pg.228).

Regarding habitual negative self-thinking participants described fewer negative self-thoughts when describing antecedents of undesired eating post MEP. Participants did not use the term habit to describe the quality of such thinking or in comparison to

emotions when describing the antecedents of undesired eating. The habitual quality of thinking was operationalised as automaticity, lack of awareness, mental efficiency, lack of control, lack of conscious intent and part of one's self-description (Verplanken, 2010). Although the self-descriptive and lack of control elements were used to describe by participants the term habit was not explicitly used. This may reflect differences in understanding of the habit construct by the researcher and participants. Negative self-thoughts may also be felt and acted upon without identification as a thought (Grabovac et al., 2011) this is more likely paradoxically if they occur habitually, such that habitual negative self-thoughts may have been less accessible to participants. An alternative approach to gaining understanding of how the habitual quality of thought is influenced by mindfulness meditation practice and influences behavioural outcomes may be to focus on habitual worry. Features of mindful cognitive processing map inversely on habitual worrying, which is characterized by mental time travelling (e.g. anticipating future negative outcomes) and a fearful, non-accepting attitude (cf. Borkovec, 2002; Verplanken, 2012). As a construct worries can be experienced as constructive and unconstructive (Watkins, 2008) and participants may be more aware of and willing to reflect and describe habitual worries compared to negative self-thoughts. Participants did describe less negative content and frequency of negative self-thoughts post participation in the MEP these changes in perception were associated with changes perceptions and behaviours previously related with self-critical thoughts. Increasing non-judgemental awareness of the present moment reduces consumption associated with negative self-thoughts about lack of control or self-worth described as antecedents in examples of many participants' relationships with food.

The current research programme demonstrates the value of using the LMM as a guide to research and as a way of increasing understanding about health behaviour

change that goes beyond those addressing intentions. The findings do support the inclusion of the components in the LMM and evidences the interrelated and facilitating relationship between the components of change (Hölzel et al., 2011; Malinowski, 2013b). For example, for several participants in the MEP the increase in non-judging awareness (tier four) reduced habitual negative self-thoughts (tier three) changing individuals motivation and expectations (tier one) around why they engaged with mindful practices which improved both their mental and physical well-being and attempts to control food intake (tier five). These changes involved the core processes of emotional and cognitive flexibility grounded in the practice of bringing attention to the present moment (tier three). The intention of this research programme with regard to the LMM was not to conduct path analyses or to test the LMM, rather it was used as a pragmatic guide to the research.

The findings and research approach guided by the LMM illustrates how well placed the model is to explore variables that may inform the intention-behaviour gap. Arguably the dominant models in health behaviour change over the past four decades have been those encompassed within the reasoned action approach (RAA; Fishbein & Ajzen, 2010). RAA are a group of related models, including the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Integrated Behaviour Model (IBM). RAA models are represented in parsimonious path diagrams that can be applied to many contexts and converge on the proposition that the most proximal and important predictor of a person's behaviour is their intention to perform it. The assumption is that people do what they intend to do and do not do what they do not intend (Sheeran, 2002). The RAA models are perhaps more accurately described as an intention rather than an action models in that they focus on the motivational aspects of behaviour change (Schwarzer, 2014). However, in health behaviour change there are

two basic processes: motivation (goal setting, intention formation) and volition (goal pursuit, action). Research into the relationship between intention and behaviour has therefore developed constructs to address this gap most notably with the growing body of research into intention-implementations (Gollwitzer, 1999). The LMM models processes of both the motivational and volitional phases of behaviour change. In doing so the LMM models a mindful approach that may be of benefit for more complex behaviours and longer term goals than those for which implementation-intentions have been shown to be effective.

As described in introducing relevant constructs in this thesis, individuals reporting greater dispositional mindfulness, specifically heightened awareness and attention to inner and external experiences, are more likely to translate their intentions into behaviours than less mindful individuals (Chatzisarantis & Hagger, 2007). It is proposed that a mindful approach to experience may enhance the capacity to fulfil intentions by strengthening self-regulation abilities, that is, the ability to stay focused on the fulfilment of plans and control counter intentional cues that can distract people from acting on their intentions (Chatzisarantis & Hagger, 2007). However, it is argued that the findings of this research programme illustrate alternative ways in which mindfulness practices may enable behaviour change. Focusing on intentions and their implementation as a way of enabling behaviour change may be limited in several key ways that a mindfulness approach can address. Firstly, intentional control may be a great deal more limited than research into implementation-intentions might suggest. For example, Wegner and Wheatley (1999) suggest that ". . . the real causal mechanisms underlying behaviour are never present in consciousness. Rather, the engines of causation are unconscious mechanisms of the mind" (p. 490) and that the idea that intentions cause behaviour is in fact an illusion. They cite a series of experimental

studies in which participants can be led to believe that their intention caused a particular action when the experimental situation ruled out the possibility that intention was the causal factor. Therefore, the intention-behaviour relationship may reflect perceived attributions rather than what actually happened (Sheeran, 2002). Relatedly, Bargh (e.g. Bargh, 1997; Bargh & Chartrand, 1999) suggests that behaviour may be governed either by intentions or guided by automatic processes described as “unconscious mechanisms of the mind”. Mechanisms include the direct link between perception and behaviour, such that priming stereotypes or traits outside participants’ awareness automatically produces behaviour consistent with those constructs. Second, the direct link between goals and behaviour, such that goals activated outside of participants’ conscious awareness produce predictable shifts in their behaviour. Each of these mechanisms are seen in reward motivated eating. The description of current relationships with food post-intervention indicate that mindfulness practices increase awareness thereby increasing what is inside what Bargh describes as ‘participant’s conscious awareness’. In doing so, the likelihood of behaviour being triggered or primed without awareness is reduced, as participants described post MEP and suggested in the direct negative relationship between dispositional mindfulness and uncontrolled eating in (Study 1). The findings in both the experimental and intervention based studies (3-4) demonstrate how mindfulness practices can influence self-regulation differently to reinforcing or planning the implementation of intentions to act or to increase efforts not to act. Firstly, by reducing the experienced sensations or situations that require regulation, reducing the perceived need to regulate phenomenon, and finally by teaching a process by which self-regulation can happen in an adaptive and flexible way across situations rather than in response to a pre-determined cue or situation. For example, in study 3 hedonic reactions did not increase as much as for those in the mindful attention group following

exposure to properties of food compared to the control group who brought attention to the food. Although differences in hunger and fullness post intervention were not seen after a delay when offered unhealthy energy dense cookies less were eaten by those in the mindful attention group compared to the control group. In the intervention study a mindful approach to others reduced interpersonal conflict such that aversive emotions were not experienced and therefore did not require regulation. The use of a mindful approach in relating to others illustrates the flexibility with which mindful practices were applied by participants. That is, mindful practices influenced *the how*, the process of interacting with phenomena which could be applied and adapted across settings. This process is mapped out in the LMM.

7.2.1. Suggested revision of the LMM.

It should, however, be noted that the components within the LMM have not been fully defined or operationalised, rather they describe different aspects that should be considered when studying processes involved in mindfulness practice (Malinowski, 2013a). The model reflects the authors experience and aspects shown in the literature to be part of how mindfulness practice may influence changes in physical and mental wellbeing, and behaviour. This is the first series of studies that has used the LMM as a structure to examine mechanisms of mindfulness. Based on the findings and experience of conducting the research several aspects are clarified, the role and definition of flexibility is explored, and an additional tier is suggested (see figure 7.1.).

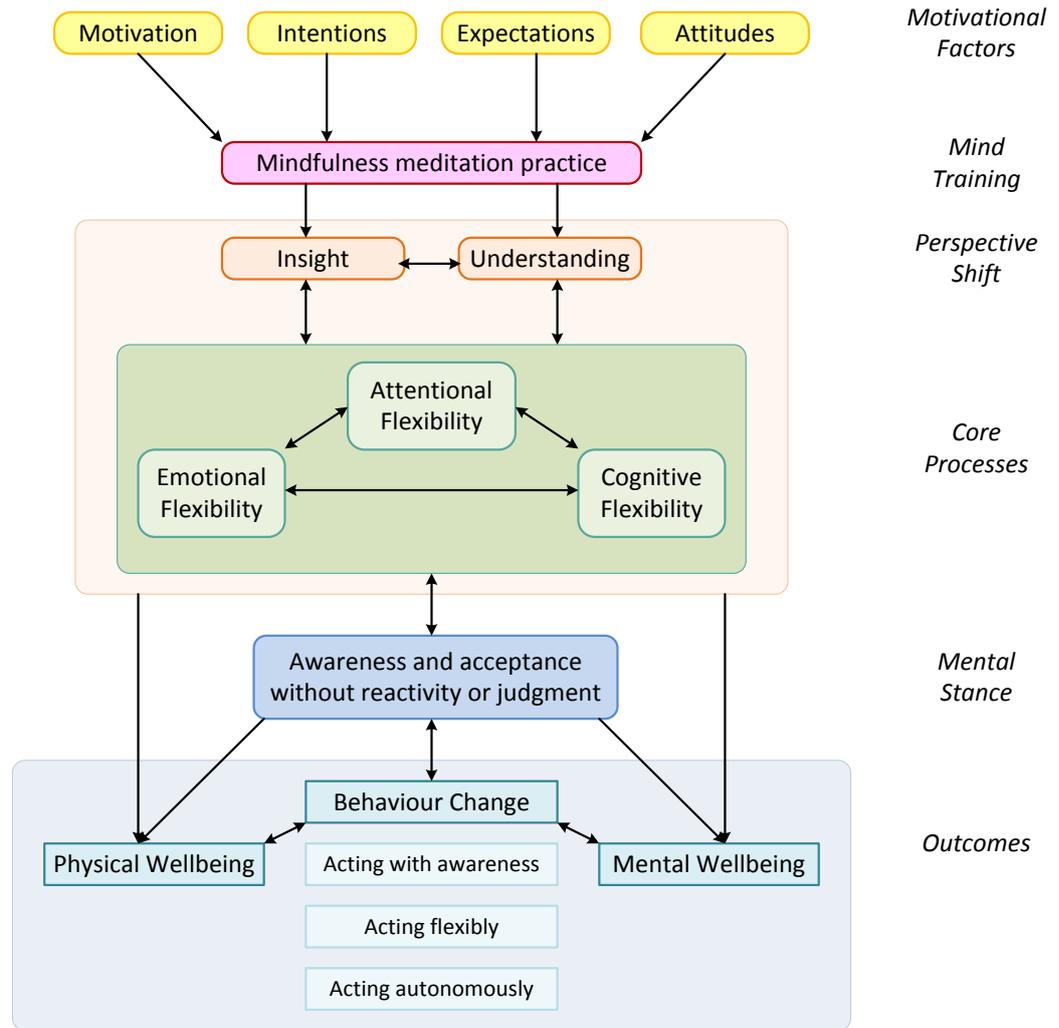


Figure 7.1. Revised Liverpool Mindfulness Model

Firstly *Mind Training* (tier 2) is defined as mindfulness meditation practice. It is suggested that it is the repeated practice of moment to moment awareness with mindful attitude that provides the scaffolding to support and integrate guidance on how to approach life mindfully. Although exploratory, examination of relations between reported practice and increases in measures of facets and total dispositional mindfulness and positive changes in approaches to life supports the importance of repeated frequent mindfulness meditation practice. The *Perspective Shift* tier, comprising ‘Insight’ and ‘Understanding’, is added to provide the mechanistic details of the change process

associated with mindfulness meditation practice and core processes of flexibility. The role of insight has been described in Grabovac et al. (2011) Buddhist Psychological Model of the mechanisms of mindfulness. ‘Insight’ describes insight into the nature of phenomenon such as thoughts, emotions and sensations as transient, not part of the self and if reacted to habitually by trying to avoid, or hold them constant or take them as accurate reflections of reality leads to suffering (Grabovac et al., 2011). The inclusion of insight in the model is consistent with processes of change described as defusion (Fresco, Segal, Buis, & Kennedy, 2007), reperception (Shapiro et al., 2006) and metacognitive awareness (Segal et al., 2002). Understanding is closely bound with insight, the practice of moment to moment awareness provides insight into the nature of thoughts, emotions and illuminates patterns of thought, emotional reactivity. The resultant ‘Understanding’ refers to how and why we interact and are guided by our internal and external environment.

The second area of clarification concerns the *Core Processes* and the role of flexibility: Emotional, Cognitive and in this version Attentional flexibility. Psychological flexibility outlined in the context of adaptive emotion regulation in this thesis (REFER to) has recently been presented as model that “fully integrates cognitive and behavioural principles and includes a process-oriented approach of treatment development” (McCracken & Morley, 2014, p. 221). This description demonstrates how psychological flexibility may inform and overlap with many of the aspects in the LMM. However it should be noted that mindful meditation practice leads to the refinement of attentional skills, not only the ability to flexibly monitor and control one’s own cognitive and emotional states but also the ability to voluntarily sustain attention (Malinowski, 2013b; Moore & Malinowski, 2009; Teper & Inzlicht, 2013). This improved attentional stability and psychological flexibility underpins the ability to

relate in a non-judging and accepting way to experiences (*Mental Stance* tier), in particular those that are experienced as threatening and distressing (Chambers et al., 2009). Use of the terms self-regulation or flexibility require the same level of clarification as mindfulness as both are already rooted in multiple approaches to behaviour change. As a mindful practitioner the subtleties of perspective shifts and attentional stability negating the need to regulate may be understood but particular care is needed in the use of such terms when describing mindfulness approaches to participants. The *Mental Stance* tier is refined to include acceptance and non-reactivity adding detail to the process of change and relationships between the *Outcomes* are shown as bi-directional. The addition of extra arrows, emphasis on bi-directional relationships and overlap between tiers illustrated in the revised version of the LMM is intended to reemphasise the interrelated nature of processes that evolve with practice, integration and application. This is hoped to reduce ambiguity or misperceptions of the LMM as a staged model.

7.3. The Contribution of the Research

Each phase of this research programme increases understanding about the nature of direct and indirect relations between mindfulness (dispositional, induced and practiced) and eating behaviours. The thesis provides evidence supporting theoretical relations between dispositional mindfulness, difficulties in emotion regulation, habitual negative self-thinking and reward motivated eating. This is the first series of studies known to examine habitual negative self-thinking as a mediator and as an outcome. Firstly, the findings of a large survey suggest that emotion regulation and mental habit are mechanisms by which mindfulness can influence eating behaviour. The findings of study three provide evidence that mindful attention can temporarily change subjective

hedonic reactions and food intake without altering intentions. This has implications for those trying to promote weight management. The qualitative analysis of the MEP demonstrates how mindful approaches to experience can alter the need and form of emotion regulation and reduce negative self-thought around food and self-control. Participant's responses demonstrate how mindfulness practices can influence emotion regulation before emotion regulation is often thought to occur and that habitual negative self-thinking can be reduced by changing undesired eating tendencies. Each of these relations between mindfulness and eating are novel and provide a clearer narrative for processes suggested in previous quantitative research.

The research programme also offers several novel contributions to knowledge on a methodological level. Firstly, the analysis deconstructing and describing constituent components and resulting matrix provides a framework by which experimental mindfulness inductions can be better designed and understood, increasing transparency and clarity about what effects can be attributed to. Secondly, the empirically developed Mindful Attention Induction scripted manipulation shown to influence hedonic reactions to high energy dense foods and actual food intake is available for future research. Thirdly, the evaluated MEP is offered as an approach to change eating behaviours in the context of developing a healthy relationship with food. The framing of the intervention within relations with food demonstrates the efficacy of such an approach to reach individuals describing clinically relevant eating behaviours unlikely to engage or who have lost heart with standard behavioural weight management approaches.

7.4. Strengths and Limitations

The strength of this research programme lays in the multiple approaches employed to increase understanding about the relations between mindfulness and eating as a behavioural outcome. The advantage is of using multiple approaches is that both the statistical significance and personal importance of relationships between mechanisms and outcomes were evidenced. Qualitative methods provide narratives that gave insight into the meaning of the quantitative findings and increased understanding of processes that may not have been captured by quantitative methods. By conducting systematic analysis to examine previous mindful induction scripts and using the outcomes to inform the development of the Mindful Attention Induction confidence is increased in the findings and interpretation of the cue exposure study. A further strength are the insights into underlying mechanisms from the MEP that show for example how increased awareness relates to reducing difficulties in emotion regulation and subsequent negative thinking. By including findings from responses to open ended questions and requests for feedback the research explored what and how personally significant changes occurred as well as what is statistically significant. Emergent themes can be used to design future research and tailor interventions to comparable populations. The approaches in studies 1-3 enabled the development of the MEP as an empirically, evidenced based intervention. The evaluation of the MEP including acceptability and efficacy of the programme can therefore inform the design and delivery of future research. The analyses provide new insights into the role of increased awareness in influencing emotion regulation processes and habitual thinking as a consequence and as underlying mechanisms.

There are of course several limitations to the research programme notably the limited generalisability of the findings due to the stringent exclusion criteria and lack of

diverse demographics. However, the findings do increase our understanding of the relations between mindfulness and eating tendencies through emotion regulation and habitual thinking in an older sample (average ages of 34, 30 and 42 across studies 1, 3-4) of individuals in employment extending previous research mainly based in clinical or student samples. A second notable limitation is the small sample size in the pilot intervention study which almost certainly reduced the statistical power of the research and meant that mediation analyses were not possible. However, the majority of the effect sizes were medium to large indicating that the MEP was able to directly influence eating behaviours and effect difficulties in emotion regulation and habitual negative self-thinking.

7.4.1. Suggested further research

Importantly the inclusion of the opportunity for participants to describe their experiences means that it was possible to find out what was important for them. The use of mixed methods for exploratory research and the evaluation of mindfulness-based interventions is recommended (Woolhouse et al., 2012). Further clinical trials on a larger scale are therefore now justified. The post-intervention feedback illustrated the need for larger sample sizes and evaluation of interventions tailored to address specific 'problems'. Being aware of individual's motivation (e.g. taking part in research) may reduce the chances of interventions being falsely deemed as ineffective based on statistical criteria particularly in smaller sample sizes. Several specific suggestions for research to gain further understanding of the roles of difficulties in emotion regulation and habitual negative self-thinking are offered. Firstly the addition of a qualitative component to repeated measures of dispositional mindfulness is suggested to explore changes in how the items are interpreted and responded to. This would begin to address concerns outlined and illustrated within the current research specifically exploring the

effects of introducing mindfulness and mindfulness meditation practice to those who have never practiced before. Secondly, the inclusion of a semi-structured interview post intervention to allow exploration of changes associated with or beyond what is described by the mechanisms examined, such as life events or the influence of social circumstances not addressed directly in measures of individual differences. Thirdly, focusing on habitual worry would offer an alternative approach to gaining understanding into how the habitual quality of thought is influenced by mindfulness meditation practice and influences behavioural outcomes.

7.5. Recommended approach to Future Research

Mindfulness research and claims of potential benefits associated with MBIs applied to an increasing range of human conditions and situations are best viewed through a mindful lens. Doing this may avoid the creation and inevitable bursting of a bubble of over enthusiastic undiscerning mindfulness applications. At its heart a mindful approach is about seeing ‘what is’ with compassion, non-judgment and acceptance. There are ever increasing numbers of words used to describe the process, outcomes and lived experience of living mindfully, however it should be noted that to a certain extent these variations reflect the bias of the narrator. For example, clinicians may be seeking a panacea, researchers looking for empirical support and publications, mindfulness meditation teachers trying to hold back the surge of interest and associated misrepresentation to preserve the integrity of the term and the value of their role. In a recent comment, Malinowski (2014) contrasts conclusions that are currently supported by rigorous empirical research with contrast to those inferred. Malinowski (2014) refers to a systematic review and meta-analysis of current evidence for the effectiveness of

meditation-based approaches for stress and mental well-being that states the evidence for conditions other than anxiety, depression and stress is less clear and that the field is limited by a lack of high quality research (Goyal et al., 2014). Goyal et al.'s (2014) conclusion offers a cautionary perspective on the surge in claims made about mindfulness which are often made in the media with a reference to scientifically confirmed benefits or to the UK's National Institute for Health and Care Excellence (NICE., 2009) inclusion of mindfulness in their guidance on treatments to be offered for depression. However, when referencing the NICE (2009), guidelines relating to mindfulness, the omission of detail is misleading. The guidelines are very specific recommending that when recommending psychological intervention or cognitive behavioural therapy 'mindfulness-based cognitive therapy [may be recommended] for people who are currently well but have experienced three or more previous episodes of depression.' That is, it is not mindfulness per se but Mindfulness-Based Cognitive Therapy (MBCT) that is recommended for one specific situation and set of symptomology. MBCT is not the recommended treatment for most cases of depression or for those currently experiencing symptoms of depression. This is inconsistent with the view of mindfulness portrayed in the media in which mindfulness is seen as a panacea for mental suffering (Malinowski, 2014). In addition a subsequent set of NICE. (2013) guidelines provides a clear 'do not' with reference to mindfulness: 'Do not routinely offer mindfulness-based interventions or supportive therapy to treat social anxiety disorder.' This cautionary reflection on the current state of mindfulness research is not meant to be taken as evidence that mindfulness-based interventions do not work in other situations or address other symptoms. Rather that, if using NICE guidance as an indication of the existence of strong evidence for an approach or intervention, the

evidence is not convincing enough yet to be considered as such by NICE and therefore not as strong as may be inferred in the media (Malinowski, 2014).

The findings of this research programme do suggest real beneficial influences of mindfulness on psychological and eating experiences and may inform research into ways of bridging the intention-behaviour gap evidenced in tests of the explanatory value of behavioural change models (e.g. Fishbein & Ajzen, 2010). The current findings add to growing evidence supporting the potential for mindfulness-based approaches to offer an acceptable and effective vehicle for addressing eating tendencies associated with overweight and obesity.

References

- Abramowitz, J. S., Tolin, D. F., & Street, G. P. (2001). Paradoxical effects of thought suppression: A meta-analysis of controlled studies. *Clinical Psychology Review, 21*(5), 683-703.
- Adams, C. E., Benitez, L., Kinsaul, J., McVay, M. A., Barbry, A., Thibodeaux, A., & Copeland, A. L. (2013). Effects of brief mindfulness instructions on reactions to body image stimuli among female smokers: an experimental study. *Nicotine & Tobacco Research, 15*(2), 376-384.
- Adams, C. E., McVay, M. A., Stewart, D. W., Vinci, C., Kinsaul, J., Benitez, L., & Copeland, A. L. (2012). Mindfulness Ameliorates the Relationship Between Weight Concerns and Smoking Behavior in Female Smokers: A Cross-sectional Investigation. *Mindfulness, 1-7*.
- Albers, S. (2011). Using mindful eating to treat food restriction: A case study. *Eating Disorders, 19*, 97-107.
- Alberts, J. E. M., Mulkens, S., Smeets, M., & Thewissen, R. (2010). Coping with food cravings. Investigating the potential of a mindfulness-based intervention. *Appetite, 55*, 160-163.
- Alberts, J. E. M., Thewissen, R., & Raes, L. (2012). Dealing with problematic eating behaviour. The effects of a mindfulness-based intervention on eating behaviour, food cravings, dichotomous thinking and body image concern. *Appetite, 58*(3), 847-851.
- American Psychiatric Association. (2013). *The Diagnostic and Statistical Manual of Mental Disorders: DSM 5*. US: Bookpoint.

- Anderson, N. D., Lau, M. A., Segal, Z. V., & Bishop, S. R. (2007). Mindfulness Stress Reduction and Attentional Control. *Clinical Psychology and Psychotherapy*, *14*, 449-463.
- Appelhans, B. M. (2009). Neurobehavioral Inhibition of Reward driven Feeding: Implications for Dieting and Obesity. *Obesity Research*, *17*(4), 640-647.
- Arch, J. J., & Craske, M. G. (2006). Mechanisms of Mindfulness: Emotion Regulation Following a Focused Breathing Induction *Behaviour research and therapy*, *44*, 1849-1858.
- Baer, R. A. (2003). Mindfulness Training as a Clinical Intervention: A Conceptual and Empirical Review. *Clinical Psychology: Science and Practice*, *10*, 125-143.
- Baer, R. A. (2011). Measuring Mindfulness. *Contemporary Buddhism*, *12*(241-261).
- Baer, R. A., Fischer, S., & Huss, D. B. (2005). Mindfulness-based Cognitive Therapy Applied to Binge Eating: A case study. *Cognitive and behavioural practice*, *12*, 351-358.
- Baer, R. A., Fischer, S., & Huss, D. B. (2006). Mindfulness and acceptance in the treatment of disordered eating. *Journal of Rational-Emotive & Cognitive - Behaviour Therapy*, *23*(4), 281-300.
- Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of Mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. *Assessment*, *11*, 191-206.
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*, 27-45.
- Baer, R. A., Smith, G. T., Lykins, E. L. B., Button, D., Krietemeyer, J., & Sauer, S. e. a. (2008). Facets of self-reported mindfulness in experienced meditators. *Assessment*, *15*, 329-342.

- Ball, K., & Crawford, D. (2006). An investigation of psychological, social and environmental correlates of obesity and weight gain in young women. *International Journal of Obesity, 30*(8), 1240-1249.
- Bargh, J. A. (1994). *The Four Horsemen of Automaticity: Awareness, Intention, Efficiency, and Control in Social Cognition* (Vol. 1). Hillsdale, NJ: Erlbaum.
- Bargh, J. A. (1997). *Automaticity in social psychology*. New York: Guilford.
- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54*(7), 462-479.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality & Psychology, 51*, 1173-1182.
- Barsalou, L. W. (2009). Simulation, situated conceptualization, and prediction. *Philosophical Transactions of the Royal Society: Biological Sciences, 364*(1521), 1281-1289.
- Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? . *Journal of Personality and Social Psychology, 74*, 1252-1265.
- Baumeister, R. F., & Heatherton, T. F. (1996). Self Regulation Failure: An overview. *Psychological Inquiry, 7*(1), 1-15.
- Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation*. San Diego Academic.
- Bays, J. C. (2009). *Mindful eating: A guide to rediscovering a healthy and joyful relationship with food*. Boston MA: Shambhala Publications.
- Bergomi, C., Tschacher, W., & Kupper, Z. (2012). The assessment of mindfulness with self-report measures: existing scales and open issues. *Mindfulness, 1*-12.

- Bergomi, C., Tschacher, W., & Kupper, Z. (2013). Measuring mindfulness: first steps towards the development of a comprehensive mindfulness scale. *Mindfulness*, 4(1), 18-32.
- Beshara, M., Hutchinson, A. D., & Wilson, C. (2013). Does Mindfulness Matter? Everyday mindfulness, mindful eating and self-reported serving size of energy dense foods among a sample of South Australian Adults. *Appetite*, 67, 25-29.
- Bieling, P. J., Hawley, L. L., Bloch, R. T., Corcoran, K. M., Levitan, R. D., Young, L. T., & Segal, Z. V. (2012). Treatment-specific changes in decentering following mindfulness-based cognitive therapy versus antidepressant medication or placebo for prevention of depressive relapse. *Journal of Consulting and Clinical Psychology*, 80(3), 365.
- Bishop, S. R., Lau, M., Shapiro, S. L., Carlson, L., Anderson, N. C., Carmody, J., & Segal, Z. V. (2004). Mindfulness: A Proposed Operational Definition. *Clinical Psychology: Science and Practice*, 11, 230-241.
- Blundell, J. E., Stubbs, R. J., Golding, C., Croden, F., Alam, R., & Whybrow, S., et al. (2005). Resistance and susceptibility to weight gain: Individual variability in response to a high-fat diet. *Physiology and Behavior*, 86, 614-622.
- Bodhi, B. (2011). What does mindfulness really mean? A canonical perspective. *Contemporary Buddhism*, 12, 19-39.
- Bond, M. J., McDowell, A. J., & Wilkinson, J. Y. (2001). The measurement of dietary restraint, disinhibition and hunger: an examination of the factor structure of the Three-Factor Eating Questionnaire (TFEQ). *International Journal of Obesity*, 25, 900-906.
- Borkovec, T. D. (2002). Life in the future versus life in the present. *Clinical Psychology: Science and Practice*, 9, 76-80.

- Bowen, S., & Marlatt, A. (2009). Surfing the urge: brief mindfulness-based intervention for college student smokers. *Psychology of Addictive Behaviors, 23*(4), 666-671.
- BPS (Ed.). (2009). *Code of ethics and conduct: Guidance published by the ethics committee of the British Psychological Society*. Leicester: England: The British Psychological Society.
- Bränström, R., Kvillemo, P., Brandberg, Y., & Moskowitz, J. T. (2010). Self-report mindfulness as a mediator of psychological well-being in a stress reduction intervention for cancer patients-a randomized study. *Annals of behavioral medicine, 39*(2), 151-161.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*, 77-101.
- Bray, G. A. (2006). Obesity: the disease. *Journal of medicinal chemistry, 49*(14), 4001-4007.
- Brefczynski-Lewis, J. A., Lutz, A., Schaefer, H. S., Levinson, D. B., & Davidson, R. J. (2007). Neural correlates of attentional expertise in long-term meditation practitioners. *Proceedings of the national Academy of Sciences, 104*(27), 11483-11488.
- Breslin, C. F., Zack, M., & McMains, S. (2002). An Information-Processing Analysis of Mindfulness: Implications for Relapse Prevention in the Treatment of Substance Abuse *Clinical Psychology: Science and Practice, 9*(3), 275-299.
- Broderick, P. C. (2005). Mindfulness and Coping with Dysphoric Mood: Contrasts with Rumination and Distraction *Cognitive therapy and research, 29* (5), 501-516.
- Brown, K. W., & Ryan, R. M. (2003). The Benefits of Being Present: Mindfulness and it's Role in Psychological Well-being. *Journal of Personality and Social Psychology, 84*, 822-848

- Brown, K. W., & Ryan, R. M. (2004). Perils and promise in defining and measuring mindfulness: Observations from experience. *Clinical Psychology: Science and Practice, 11*, 242-248.
- Brown, K. W., Ryan, R. M., & Cresswell, J. D. (2007). Mindfulness: Theoretical Foundations and Evidence for it's Salutory effects *Psychological Inquiry, 18*(4), 211-237.
- Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Addressing fundamental questions about mindfulness. *Psychological Inquiry, 18*(4), 272-281.
- Brownell, K. D., & Jeffery, R. W. (1987). Improving long-term weight loss: pushing the limits of treatment. *Behavior Therapy, 18*(4), 353-374.
- Bryant, E. J., Kiezerbrink, K., King, N. A., & Blundell, J. E. (2010). Interaction between disinhibition and restraint: Implications for body weight and eating disturbance. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity, 15*(1-2), 43-51.
- Bryant, E. J., King, N. A., & Blundell, J. E. (2007). Disinhibition: its effects on appetite and weight regulation. *Obesity reviews, 9*(5), 409-419.
- Buchheld, N., Grossman, P., & Walach, H. (2001). Measuring mindfulness in insight meditation and mediation-based psychotherapy: The development of the Frieburg Mindfulness Inventory (FMI). *Journal for Meditation and Meditation Research, 1*, 11-34.
- Butland, B., Jebb, S., Kopelman, P., McPherson, K., Thomas, S., Mardell, J., & Parry, V. (2007). Foresight. Tackling obesities: future choices. *Foresight. Tackling obesities: future choices* (Vol. Project report). UK: Government Office for Science.

- Butryn, M. L., Webb, V., & Wadden, T. A. (2011). Behavioral treatment of obesity. *The Psychiatric clinics of North America*, 34(4), 841-859.
- Cahn, B. R., & Polich, J. (2006). Meditation States and Traits: EEG, ERP, and Neuroimaging Studies *Psychological Bulletin*, 132 (2), 180-211.
- Caldwell, K. L., Baime, M. J., & Wolever, R. Q. (2012). Mindfulness based approaches to obesity and weight loss maintenance. *Journal of Mental Health Counseling*, 34(3), 269-282.
- Cappelleri, J. C., Bushmakin, A. G., Gerber, R. A., Leidy, N. K., Sexton, C. C., Lowe, M. R., & Karlsson, J. (2009). Psychometric analysis of the Three-Factor Eating Questionnaire-R21: results from a large diverse samples of obese and non-obese participants. *International Journal of Obesity*, 33, 611-620.
- Cardaciotto, L., Herbert, J. D., Forman, E. M., Moitra, E., & Farrow, V. (2008). The Assessment of Present-Moment Awareness and Acceptance The Philadelphia Mindfulness Scale. *Assessment*, 15(2), 204-223.
- Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of behavioral medicine*, 31(1), 23-33.
- Carmody, J., Baer, R. A., Lykins, E., & Olendzki, N. (2009). An empirical study of the mechanisms of mindfulness in a mindfulness-based stress reduction program. *Journal of Clinical Psychology*, 65(6), 613-626.
- Chadwick, P., Hember, M., Symes, J., Peters, E., Kuipers, E., & Dagnan, D. (2008). Responding mindfully to unpleasant thoughts and images:Reliability and validity of the Southampton mindfulness questionnaire. *British Journal of Clinical Psychology*, 47, 451-455.

- Chambers, R., Gullone, E., & Allen, N. B. (2009). Mindful emotion regulation: An integrative review. *Clinical Psychology Review, 29*, 560–572.
- Chambers, R., Lo, B. C. Y., & Allen, N. B. (2008). The impact of intensive mindfulness training on attentional control, cognitive style, and affect. *Developmental Psychology, 45*(4), 303-322.
- Chan, D., & Woollacott, M. (2007). Effects of level of meditation experience on attentional focus: is the efficiency of executive or orientation networks improved? *The Journal of Alternative and Complementary Medicine, 13*(6), 651-658.
- Chatzisarantis, N. L., & Hagger, M. S. (2007). Mindfulness and the Intention-Behaviour Relationship within the Theory of Planned Behaviour. *Personality and Social Psychology Bulletin, 33*(5), 663-676.
- Chiesa, A. (2012). The difficulty of defining mindfulness: current thought and critical issues. *Mindfulness, 1*-14.
- Chiesa, A., Brambilla, P., & Serratti, A. (2010). Functional neural correlates of mindfulness meditations in comparison with psychotherapy, pharmacotherapy and placebo effect. Is there a link/. *Acta Neuropsychiatrica, 22*(3), 104-117.
- Chiesa, A., & Malinowski, P. (2011). Mindfulness based interventions: are they all the same? *Journal of Clinical Psychology, 67*(4), 404-424.
- Chiesa, A., & Serratti, A. (2009). Mindfulness-based Stress Reduction for Stress management in Healthy People: A review and Meta Analysis. *Journal of Alternative and Complementary Medicine, 15*(5), 593-600.
- Chiesa, A., & Serretti, A. (2010). A systematic review of neurobiological and clinical features of mindfulness meditations. *Psychological Medicine, 40*(8), 1239-1252.

- Chiesa, A., & Serretti, A. (2011). Mindfulness-based interventions for chronic pain: a systematic review of the evidence [Review]. *Journal of Alternative and Complementary Medicine*, *17*(1), 83-93.
- Chiesa, A., Serretti, A., & Jakobsen, J. C. (2013). Mindfulness: Top-down or bottom-up emotion regulation strategy? *Clinical Psychology Review*, 82-96.
- Coffey, K. A., & Hartman, M. (2008). Mechanisms of action in the inverse relationship between mindfulness and psychological distress. *Complementary Health Practice Review*, *13*(2), 79-91.
- Coffey, K. A., Hartman, M., & Fredrickson, B. L. (2010). Deconstructing mindfulness and constructing mental health: understanding mindfulness and its mechanisms of action. *Mindfulness*, *1*(4), 235-253.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.
- Conner, M., & Norman, P. (2005). *Predicting Health Behaviour: A Social Cognition Approach Copy*. UK: Open University Press.
- Courbasson, G. M., Nishikawa, Y., & Shapira, L. B. (2011). Mindfulness-action-based cognitive behavioral therapy for concurrent binge eating disorder and substance use disorders. *Eating Disorders*, *19*, 17-33.
- Cuntz, U., Leibbrand, R., Ehrig, C., Shaw, R., & Fichter, M. M. (2001). Predictors of post-treatment weight reduction after in-patient behavioural therapy. *International Journal of Obesity and Related Metabolic Disorders*, *25*, S99-101.
- Dalen, J., Smith, B. W., Shelley, B. M., Sloan, A. L., Leahigh, L., & Begay, D. (2010). Pilot study: Mindful eating and living (MEAL): Weight, eating behavior, and psychological outcomes associated with a mindfulness-based intervention for people with obesity. *Complementary Therapies in Medicine*, *18*(6), 260-264.

- Daubenmier, J., Kristeller, J. L., Hecht, F. M., Maninger, N., Kuwata, M., Jhaveri, K., . . . Epel, E. (2011). Mindfulness intervention for stress eating to reduce cortisol and abdominal fat among overweight and obese women: an exploratory randomized controlled study. *Journal of obesity*, 1-13.
- Davidson, R. J. (2000). Affective Style, Psychopathology, and Resilience: Brain Mechanisms and Plasticity. *American Psychologist*, 55, 1196-1214.
- Davidson, R. J. (2010). Empirical Explorations of Mindfulness: Conceptual and Methodological Conundrums. *Emotion*, 10(1), 8-11.
- de Ridder, D., & de Wit, J. (2007). Current Issues and New Directions in Psychology and Health: Back to the future: What good are health goals in the presence of immediate interests? *Psychology and Health*, 22(5), 513-516.
- Deaver, C. M., Miltenberger, R. G., Smyth, J., Meidinger, A., & Crosby, R. (2003). An Evaluation of Affect and Binge Eating. *Behaviour Modification*, 27(4), 578-599.
- Department of Health. (2013). Obesity information. from [<http://www.dh.gov.uk/en/Publichealth/Healthimprovement/Obesity/index.htm> ≥]
- Depraz, N., Varela, F. J., & Vermersch, P. (2003). *On becoming aware: A pragmatics of experiencing* (Vol. 43): John Benjamins Publishing.
- Dutton, G. R. (2008). The role of mindfulness in health behavior change. *ACSM's Health & Fitness Journal*, 12(4), 7-12.
- Dykes, J., Brunner, E. J., Martikainen, P. T., & Wardle, J. (2003). Socioeconomic gradient in body size and obesity among women: the role of dietary restraint, disinhibition and hunger in the Whitehall II study. *International Journal of Obesity*, 28(2), 262-268.

- Eifert, G. H., & Heffner, M. (2003). The Effects of Acceptance verses Control Contexts on Avoidance of Panic-related Symptoms. *Journal of Behavioural Therapy and Experimental Psychiatry*, 34, 293-312.
- Erisman, S. M., & Roemer, L. (2010). A Preliminary Investigation of the Effects of Experimentally Induced Mindfulness on Emotional Responding to Film Clips. *Emotion*, 10(1), 72-82.
- Evers, C. F., Stok, F., & de Ridder, D. T. D. (2010). Feeding your feelings: Emotion regulation strategies and emotional eating. *Personality and Social Psychology Bulletin*, 36, 792-804.
- Fabricatore, A. N., Wadden, T. A., Moore, R. H., Butryn, M. L., Gravallesse, E. A., Erondy, N. E., & Nguyen, A. M. (2009). Attrition from randomized controlled trials of pharmacological weight loss agents: a systematic review and analysis. *Obesity reviews*, 10(3), 333-341.
- Farb, N. A., Anderson, A. K., Irving, J. A., & Segal, Z. V. (2013). Mindfulness interventions and emotion regulation. In G. J. J. (Ed.), *Handbook of Emotion Regulation* (2 ed.). New York: Guilford Publications.
- Farb, N. A., Anderson, A. K., Mayberg, H., Bean, J., McKeon, D., & Segal, Z. V. (2010). Minding one's emotions: Mindfulness training alters the neural expression of sadness. *Emotion*, 10(1), 25-33.
- Felder, M. T., Zvolensky, M. J., Eifert, G. H., & Spira, A. P. (2003). Emotional avoidance: An experimental test of individual differences and response suppression using biological challenge. *Behaviour research and therapy*, 41, 403-411.
- Feldman, G., Greeson, J., & Senville, J. (2010). Differential effects of mindful breathing, progressive muscle relaxation, and loving kindness meditation on decentering

and negative reactions to repetitive thoughts. *behavior Research and Therapy*, 48, 1002-1011.

Feldman, G., Hayes, A., Kumar, S., Greeson, J., & Laurenceau, J. P. (2007).

Mindfulness and Emotional Regulation: The Development and Initial Validation of the Cognitive and Affectiveness Mindfulness Scale-Revised (CAMS-R).

Psychopathology and Behavioural Assessment, 29, 177-190.

Ferriday, D., & Brunstrom, J. M. (2008). How does food-cue exposure lead to larger meal sizes? *British Journal of Nutrition*, 100(6), 1325-1332.

Ferriday, D., & Brunstrom, J. M. (2010). 'I just can't help myself': effects of food-cue exposure in overweight and lean individuals. *International Journal of Obesity*, 35(1), 142-149.

Fetterman, A. K., Robinson, M. D., Ode, S., & Gordon, K. H. (2010). Neuroticism as a risk factor for behavioral dysregulation: A mindfulness-mediation perspective. *Journal of Social and Clinical Psychology*, 29(3), 301-321.

Field, A. (2009). *Discovering statistics using SPSS*. London: Sage Publications Limited.

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York: Psychology Press.

Forman, E. M., Butryn, M. L., Hoffman, K. L., & Herbert, J. D. (2009). An open trial of an acceptance based behavioural intervention for weight loss. *Cognitive and behavioural practice*, 16(223-235).

Forman, E. M., Butryn, M. L., Juarascio, A. S., Bradley, L. E., Lowe, M. R., Herbert, J. D., & Shaw, J. A. (2013). The mind your health project: A randomized controlled trial of an innovative behavioral treatment for obesity. *Obesity Research*, 1119-1126.

- Foster, G. D., Wadden, T. A., Swain, R. M., Stunkard, A. J., Platte, P., & Vogt, R. A. (1998). The Eating Inventory in obese women: clinical correlates and relationship to weight loss. *International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity*, 22(8), 778-785.
- Framson, C., Kristal, A. R., Schenk, J. M., Littman, A. J., Zeliadt, S., & Benitez, D. (2009). Development and Validation of the Mindful Eating Questionnaire. *Journal of the American Dietetic Association*, 109(8), 1439-1444.
- Fredrickson, B. L., Cohn, M. A., Coffey, K. A., Pek, J., & Finkel, S. M. (2008). Open Hearts Build Lives: Positive Emotions, Induced Through Loving-Kindness Meditation, Build Consequential personal Resources. *Journal of Personality and Social Psychology*, 95(5), 1045-1062.
- Fresco, D., Segal, Z. V., Buis, T., & Kennedy, S. (2007). Relationship of posttreatment decentering and cognitive reactivity to relapse in major depression. *Journal of Consulting and Clinical Psychology*, 75, 447-455.
- Fresco, D. M., Moore, M. T., van Dulmen, M. H., Segal, Z. V., Ma, S. H., Teasdale, J. D., & Williams, J. M. (2007). Initial psychometric properties of the experiences questionnaire: Validation of a self-report measure of decentering. *Behavior Therapy*, 38, 234-246.
- Friedman, K. E., Reichmann, S. K., Costanzo, P. R., Zelli, A., Ashmore, J. A., & Musante, G. J. (2005). Weight Stigmatisation and Ideological Beliefs: Relation to Psychological Functioning in Obese Adults. *Obesity Research*, 13(5), 907-916.
- Friese, M., Messner, C., & Schaffner, Y. (2012). Mindfulness meditation counteracts self-control depletion. *Consciousness and cognition*, 21(2), 1016-1022.

- Fritz, M. S., & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science*(18), 233-239.
- Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The eating attitudes test: psychometric features and clinical correlates. *Psychological Medicine*, 12(4), 871-878.
- Gilbert, D., & Waltz, J. (2010). Mindfulness and Health Behaviours. *Mindfulness*, 1, 227- 234.
- Glomb, T. M., Duffy, M. K., Bono, J. E., & Yang, T. (2011). Mindfulness at work. *Research in personnel and human resources management*, 30, 115-157.
- Gollwitzer, P. M. (1999). Implementation intentions: strong effects of simple plans. *American Psychologist*, 54(7), 493-503.
- Gongora, V. C., Derksen, J. J., & van Der Staak, C. P. F. (2004). The role of specific core beliefs in the specific cognitions of bulimic patients. *Journal of Nervous and Mental Disease*, 191, 297-303.
- Goyal, M., Singh, S., Sibinga, E. M., Gould, N. F., Rowland-Seymour, A., Sharma, R., & Haythornthwaite, J. A. (2014). Meditation programs for psychological stress and well-being: A systematic review and meta-analysis. *JAMA internal medicine*. doi: 10.1001/jamainternmed.2013.13018.
- Grabovac, A., Lau, M., & Willett, B. (2011). Mechanisms of mindfulness: A Buddhist psychological model. *Mindfulness*, 2, 154 -166.
- Gratz, K. L., & Roemer, L. (2004). Multidimensional Assessment of Emotion Regulation and Dysregulation: Development, Factor Structure, and initial Validation of the Difficulties in Emotion Regulation Scale. *Journal of Psychopathology and Behavioural Assessment*, 26 41-54.

- Gratz, K. L., & Tull, M. T. (2010). Emotion Regulation as a Mechanism of Change in Acceptance and Mindfulness-Based Treatments. In R. E. Baer (Ed.), *Assessing Mindfulness & Acceptance: Illuminating the theory of Practice and Change* (pp. 102-135). U.S.: New Harbinger Publications.
- Greenberg, J., Reiner, K., & Meiran, N. (2012). “Mind the Trap”: Mindfulness Practice Reduces Cognitive Rigidity. *PLoS ONE*, 7(5), e36206.
- Gross, J. J., & Muñoz, R. F. (1995). Emotion regulation and mental health. *Clinical Psychology: Science and Practice*, 2(2), 151-164.
- Gross, J. J., & Thompson, R. A. (2007). *Emotion Regulation: Conceptual Foundations*. New York: Guilford Press.
- Grossman, P. (2010). Mindfulness for psychologists: Paying kind attention to the perceptible. *Mindfulness*, 1, 87-97.
- Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness- based stress Reduction and Health benefits: A Meta-analysis. *Journal of Psychosomatic Research*, 57, 35-43.
- Grossman, P., & Van Dam, N. T. (2011). Mindfulness, by another name...: Trials and tribulations of Sati in Western psychology and Science. *Contemporary Buddhism*, 12, 219-239.
- Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin*, 136, 495-525.
- Hargus, E., Crane, C., Barnhofer, T., & Williams, J. M. (2010). Effects of mindfulness on meta-awareness and specificity of describing prodromal symptoms in suicidal depression. *Emotion*, 10(1), 34-42.

- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical Mediation Analysis in the New Millenium. *Communication Monographs*, 76(4), 408-420.
- Hayes, A. M., & Feldman, G. (2004). Clarifying the Construct of Mindfulness in the Context of Emotion Regulation and the Process of Change in Therapy. *Clinical Psychology: Science and Practice*, 11, 255-262.
- Hayes, S. C., Strosahl, K., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behaviour change*. The Guilford Press: New York.
- Hayes, S. C., & Wilson, K. G. (2003). Mindfulness: Method and Process. *Clinical Psychology: Science and Practice*, 10(2), 161-165.
- Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: a functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology*, 64(6), 1152-1168.
- Heatherton, T. F., & Baumeister, R. F. (1991). Binge Eating as Escape from Self-awareness. *Psychological Bulletin*, 110 (1), 86-108.
- Heatherton, T. F., Striepe, M., & Wittenberg, L. (1998). Emotional Distress and the Disinhibited Eating: The Role of Self. *Journal of Personality and Social Psychology*, 24(3), 301-313.
- Heppner, W. L., Kernis, M. H., Lakey, C. E., Campbell, W. K., Goldman, B. M., Davis, P. J., & Cascio, E. V. (2008). Mindfulness as a means of reducing aggressive behavior: Dispositional and situational evidence. *Aggressive behavior*, 34(5), 486-496.
- Hill, C. L., & Updegraff, J. A. (2012). Mindfulness and its relationship to emotional regulation. *Emotion*, 12(1), 81-90.

- Hill, J. O., & Peters, J. C. (1998). Environmental contributions to the obesity epidemic. *Science*, 280, 1371-1374.
- Hodgins, H. S., & Adair, K. C. (2010). Attentional processes and meditation. *Consciousness and cognition*, 19(4), 872-878.
- Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science*, 6, 537-559.
- Howard, G. S., Dailey, P. R., & Gulanick, N. A. (1979). The feasibility of informed pretests in attenuating response-shift bias. *Applied Psychological Measurement*(3), 481-494.
- HSCIC. (2013). *Statistics on obesity, physical activity and diet: England, 2013*.
- Jackson, B., Cooper, M. L., Mintz, L., & Albino, A. (2003). Motivations to eat: Scale development and validation. *Journal of Research in Personality*, 37, 297-318.
- Jain, S., Shapiro, S. L., Swanick, S., Roesch, S. C., Mills, P. J., Bell, I., & Schwartz, G. E. R. (2007). A Randomized Controlled Trial of Mindfulness Meditation Versus Relaxation Training: Effects on Distress, Positive States of Mind, Rumination, and Distraction. *Annals of behavioral medicine*, 33(1), 11-21.
- Jansen, A., Nederkoorn, C., Van Baak, L., Kierse, C., & Guerrieri, R. (2009). High-restrained eaters only overeat when they are also impulsive. *Behaviour research and therapy*, 47, 105-110.
- Jansen, A., Theunissen, N., Slechten, K., Nederkoorn, C., Boon, B., Mulken, S., & Roefs, A. (2003). Overweight children overeat after exposure to food cues. *Eating Behaviors*, 4(2), 197-209.
- Jebb, S. (1997). Aetiology of obesity. *British Medical Bulletin*, 53(2), 264-285.

- Jha, A. P. (2013). Mindfulness can improve your attention and health. *Scientific American, March*(2013).
- Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective, & Behavioral Neuroscience, 7*(2), 109-119.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher, 33*(7), 14-26.
- Josefsson, T., Larsman, P., Broberg, A. G., & Lundh, L. G. (2011). Self-reported mindfulness mediates the relation between meditation experience and psychological well-being. *Mindfulness, 2*(1), 49-58.
- Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry, 4*, 33-47.
- Kabat-Zinn, J. (1990). *Full catastrophe living: using the wisdom of your body and mind to face stress, pain and illness*. New York: Delacorte.
- Kabat-Zinn, J. (2002). 20 Minute Sitting Meditation. *On Guided Mindfulness Meditation: Series Two*. USA: UMass Center for Mindfulness.
- Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology-Science and Practice, 10*(2), 144-156.
- Kahn, B. E., & Wansink, B. (2004). The influence of assortment structure on perceived Variety and consumption quantities. *Journal of Consumer Research, 30*, 519-533.
- Karlsson, J., Persson, L.-O., Sjostrom, L., & Sullivan, M. (2000). Psychometric properties and factor structure of the Three- Factor Eating Questionnaire (TFEQ)

in obese men and women. results from the Swedish Obese Subjects (SOS) study. *International Journal of Obesity*, 24, 1715-1725.

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, 30(7), 865-878.

Kelley, A. E., Bakshi, V. P., Haber, S. N., Steininger, T. L., Will, M. J., & Zhang, M. (2002). Opioid modulation of taste hedonics within the ventral striatum. *Physiology and Behavior*, 76(3), 365-377.

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

Keränen, A. M., Savolainen, M. J., Reponen, A. H., Kujari, M. L., Lindeman, S. M., Bloigu, R. S., & Laitinen, J. H. (2009). The effect of eating behavior on weight loss and maintenance during a lifestyle intervention. *Preventive medicine*, 49(1), 32-38.

Keränen, A. M., Strengell, K., Savolainen, M. J., & Laitinen, J. H. (2011). Effect of weight loss intervention on the association between eating behaviour measured by TFEQ-18 and dietary intake in adults. *Appetite*, 56(1), 156-162.

Kidd, L. I., Graor, C. H., & Murrock, C. J. (2013). A Mindful Eating Group Intervention for Obese Women: A Mixed Methods Feasibility Study. *Archives of Psychiatric Nursing*.

Klem, M. L., Wing, R. R., McGuire, M. T., Seagle, H. M., & Hill, J. O. (1997). A descriptive study of individuals successful at long-term maintenance of substantial weight loss. *The American journal of clinical nutrition*, 66(2), 239-246.

- Koole, S. L. (2009). The Psychology of Emotion Regulation: An integrative review. *Cognition and Emotion, 23* (1), 4-41.
- Kostanski, M., & Hassed, C. (2008). Mindfulness as a concept and a process. *Australian Psychologist, 43*, 15-21.
- Kring, A. M., & Sloan, D. M. (Eds.). (2009). *Emotion regulation and psychopathology: A transdiagnostic approach to etiology and treatment*: Guilford Press.
- Kristeller, J. L. (2003). Mindfulness, Wisdom and Eating: Applying a Multi-Domain Model of Meditation Effects. *Journal of Constructivism in the Human Sciences, 8*(2), 107-118.
- Kristeller, J. L. (2007). Mindfulness Meditation. In P. Lehrer, R. L. Woolfolk & W. E. Sime (Eds.), *Principles and Practices of Stress Management* (3 ed., pp. 393-427). New York: Guilford Press.
- Kristeller, J. L., Baer, R. A., & Quillian-Wolever, R. (Eds.). (2006). *Mindfulness-based approaches to eating disorders*. San Diego, CA: Academic Press.
- Kristeller, J. L., & Hallett, C. (1999). An Exploratory Study of a Meditation-based Intervention for Binge Eating Disorder. *Journal of Health Psychology, 4*(3), 357-363.
- Kristeller, J. L., & Wolever, R. (2011). Mindfulness-based eating awareness training for the treating binge eating disorder: The conceptual foundation. *Eating Disorders, 19*, 49-61.
- Kristeller, J. L., Wolever, R. Q., & Sheets, V. (2013). Mindfulness-Based Eating Awareness Training (MB-EAT) for Binge Eating: A Randomized Clinical Trial. *Mindfulness, 1-16*.

- Kumar, S., Feldman, G., & Hayes, A. (2008). Changes in Mindfulness and Emotion Regulation in an Exposure-Based Cognitive Therapy for Depression. *Cognitive therapy and research, 32*, 734-744.
- Kuyken, W., Byford, S., Taylor, R. S., Watkins, E., Holden, E., & White, K. (2008). Mindfulness-based Cognitive Therapy to Prevent Relapse in Recurrent Depression. *Journal of Consulting and Clinical Psychology, 76*(6), 966-978.
- Langer, E. J. (1989). Minding matters: The consequences of mindlessness-mindfulness. *Advances in experimental social psychology, 22*(12), 137-173.
- Lattimore, P., Fisher, N., & Malinowski, P. (2011). A Cross-sectional Investigation of Trait Disinhibition and its Association with Mindfulness and Impulsivity *Appetite, 56*(2), 241-248.
- Lattimore, P., & Maxwell, L. (2004). Cognitive load, stress and disinhibited eating. *Eating Behaviors, 5*, 315-324.
- Lattimore, P., Mead, B. R., Carson, R., & Malinowski, P. (In process). Psychological Inflexibility In Eating Disorders: Relationships Between Mindfulness, Impulsivity And Eating Disorder Inventory (EDI-3) Profiles In Eating Disorder Patients
- Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., & al., e. (2006). The Toronto Mindfulness Scale: Development and Validation. *Journal of Clinical Psychology, 62*, 1445-1467.
- Lau, M. A., & McMain, S. F. (2005). Integrating mindfulness meditation with cognitive and behavioural therapies: The challenge of combining acceptance-and change-based strategies. *Canadian Journal of Psychiatry, 50*(13), 863-869.

- Lavender, J. M., & Anderson, D. A. (2010). Contribution of emotion regulation difficulties to disordered eating and body dissatisfaction in college men. *International Journal of Eating Disorders, 43*(4), 352-357.
- Lavender, J. M., Gratz, K. L., & Tull, M. T. (2011). Exploring the relationship between facets of Mindfulness and Eating Pathology in Women. *Cognitive and Behavioral Therapy, 0*(0), 1-9.
- Lavender, J. M., Jardin, B. F., & Anderson, D. A. (2009). Bulimic symptoms in undergraduate men and women: Contributions of mindfulness and thought suppression. *Eating Behaviours, 10*, 228-231.
- Leahey, T. M., Crowther, J. H., & Irwin, S. R. (2008). A Cognitive-Behavioral Mindfulness Group Therapy Intervention for the Treatment of Binge Eating in Bariatric Surgery Patients. *Cognitive and Behavioral Practice, 15*(4), 364-375.
- Lemmens, V. E. P. P., Oenema, A., Klepp, K. I., Henriksen, H. B., & Brug, J. (2008). A systematic review of the evidence regarding efficacy of obesity prevention interventions among adults. *Obesity reviews, 9*(5), 446-455.
- Lenoir, M., Serre, F., Cantin, L., & Ahmed, S. H. (2007). Intense Sweetness Surpasses Cocaine Reward. *PLoS ONE, 2*(8). doi: 10.1371/journal.pone.0000698
- Leon, G. R., Fulkerson, J. A., Perry, C. L., & Early-Zald, M. B. (1995). Prospective analysis of personality and behavioral vulnerabilities and gender influences in the later development of disordered eating. *Journal of Abnormal Psychology, 104*(1), 140-149.
- Levin, M. E., Dalrymple, K., Himes, S., & Zimmerman, M. (2014). Which facets of mindfulness are related to problematic eating among patients seeking bariatric surgery? *Eating Behaviors, 15*(2), 298-305.

- Levitt, J. T., Brown, T. A., Orsillo, S. M., & Barlow, D. H. (2004). The Effects of Acceptance Versus Suppression of Emotion on Subjective and Psychophysiological Response to Carbon Dioxide Challenge in Patients with Panic Disorder *Behavior Therapy, 35*(4), 747-766.
- Linehan, M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. New York: Guilford Press.
- Lowe, M. R., Bocarsly, M. E., & Del parigi, A. (2008). *Human eating Motivation in Times of Plenty: Biological, Enviromental, and psychosocial influences* (first ed.): CRC Press.
- Lowe, M. R., & Butryn, M. L. (2007). Hedonic hunger: A new dimension of appetite? *Physiology and Behavior, 91*, 432-439.
- Lowe, M. R., Butryn, M. L., Didie, E. R., Annunziato, R. A., Thomas, J. G., Crerand, C. E., . . . Halford, J. (2009). The Power of Food Scale. A new measure of the psychological influence of the food environment. *Appetite, 53*(1), 114-118.
- Lowe, M. R., & Levine, A. S. (2005). Eating motives and the controversy over dieting: eating less than needed versus less than wanted. *Obesity Research, 13*(5), 797-806.
- Lowe, M. R., Van Steenburgh, J., Ochner, C., & Coletta, M. (2009). Neural correlates of individual differences related to appetite. *Physiology and Behavior, 91*, 432-439.
- Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in cognitive sciences, 12*(4), 163-169.
- Lykins, E. L. B., & Baer, R. A. (2009). Psychological Functioning in a Sample of Long-Term Practitioners of Mindfulness Meditation. *Journal of Cognitive Psychotherapy: An International Quarterly, 23*(3), 226-241.

- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological methods*, 7(1), 83-104.
- Malinowski, P. (2013a). The Liverpool Mindfulness Model. Retrieved from <http://meditation-research.org.uk/2013/02/the-liverpool-mindfulness-model/>
- Malinowski, P. (2013b). Neural mechanisms of attentional control in mindfulness meditation. *Frontiers in Neuroscience*, 7(8), 1-11.
- Malinowski, P. (2014). Mindfulness research - where are we here and now? Retrieved from <http://meditation-research.org.uk/2014/02/mindfulness-research-where-are-we-here-and-now/>
- Mann, T., Tomiyama, A. J., Westling, E., Lew, A.-M., Samuels, B., & Chatman, J. (2007). Medicare's search for effective obesity treatments: Diets are not the answer. *American Psychologist*, 62, 220-233.
- Masuda, A., Price, M., & Latzman, R. D. (2012). Mindfulness moderates the relationship between disordered eating cognitions and disordered eating behaviors in a non-clinical college sample. *Journal of psychopathology and behavioral assessment*, 34(1), 107-115.
- Masuda, A., & Wendell, J. W. (2010). Mindfulness mediates the relation between disordered eating- related cognitions and psychological distress. *Eating Behaviors*, 11, 293-296.
- Mazzeo, S. E., Aggen, S. H., Anderson, C., Tozzi, F., & Bulik, C. M. (2003). Investigating the structure of the eating inventory (Three-Factor Eating Questionnaire): A confirmaitaty approach. *Int J Eat Disord*, 34, 255-264.

- McCracken, L. M., & Morley, S. (2014). The psychological flexibility model: A basis for integration and progress in psychological approaches to chronic pain management. *The Journal of Pain, 15*(3), 221-234.
- Metcalf, J., & Mischel, W. (1999). A Hot/Cool Systems Analysis of Delay of Gratification: Dynamics of willpower. *Psychological review, 106*, 3-19.
- Meyrick, J. (2006). What is Good Qualitative Research?: A First Step towards a Comprehensive Approach to Judging Rigour/Quality. *Journal of Health Psychology, 11*(5), 799-808.
- Miller, C. K., Kristeller, J. L., Headings, A., Nagaraja, H., & Miser, W. F. (2012). Comparative effectiveness of a mindful eating intervention to a diabetes self-management intervention among adults with type 2 diabetes: a pilot study. *Journal of the Academy of Nutrition and Dietetics, 112*(11), 1835-1842.
- Moor, K. R., Scott, A. J., & McIntosh, W. D. (2012). Mindful Eating and Its Relationship to Body Mass Index and Physical Activity Among University Students. *Mindfulness, 1-6*.
- Moore, A., & Malinowski, P. (2009). Meditation, mindfulness and cognitive flexibility. *Consciousness and cognition, 18*(1), 176-186.
- Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology, 74*(3), 774-789.
- Neff, K. (2003). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity, 2*(2), 85-101.
- Ng, D. M., & Jeffery, R. W. (2003). Relationships between perceived stress and health behaviors in a sample of working adults. *Health Psychology, 22*(6), 638.

- NICE. (2009). Depression in adults: The treatment and management of depression in adults CG90. from <http://www.nice.org.uk/>
- NICE. (2013). Do not routinely offer mindfulness-based interventions or supportive therapy to treat social anxiety disorder CG159. Retrieved 14/04/14, 2014, from <http://www.nice.org.uk/usingguidance/donotdorecommendations/detail.jsp?action=details&dndid=1347>
- Niemeier, H. M., Leahey, T., Palm Reed, K., Brown, R. A., & Wing, R. R. (2012). An acceptance-based behavioral intervention for weight loss: a pilot study. *Behavior Therapy, 43*(2), 427-435.
- Nijs, I. M. T., Franken, I. H. A., & Muris, P. (2007). The modified Trait and State Food-Cravings Questionnaires: Development and validation of a general index of food craving. *Appetite, 49*(1), 38-46.
- Nydahl, O. (2008). *The Way Things Are: A Living Approach to Buddhism for Today's World*. Winchester: O Books.
- Nyklíček, I., & Kuijpers, K. F. (2008). Effects of mindfulness-based stress reduction intervention on psychological well-being and quality of life: Is increased mindfulness indeed the mechanism? *Annals of behavioral medicine, 35*(3), 331-340.
- O'Neil, P. M., Theim, K. R., Boeka, A., Johnson, G., & Miller-Kovach, K. (2012). Changes in weight control behaviors and hedonic hunger during a 12-week commercial weight loss program. *Eating Behaviors.*
- O'Reilly, G. A., Cook, L., Spruijt-Metz, D., & Black, D. S. (2014). Mindfulness-based interventions for obesity-related eating behaviours: a literature review. *Obesity reviews, 15*(6), 453-461.

- Oman, D., Shapiro, S. L., Thoresen, C. E., Plante, T. G., & Flinders, T. (2008). Meditation lowers stress and supports forgiveness among college students: A randomized controlled trial. *Journal of American College Health, 56*(5), 569-578.
- Ortner, C. N., Kilner, S. J., & Zelazo, P. D. (2007). Mindfulness Meditation and Reduced Emotional Interference on a Cognitive task. *Motivation and Emotion, 31* 271-283.
- Osman, M. (2004). An evaluation of dual-process theories of reasoning. *Psychonomic Bulletin & Review, 11*(6), 988-1010.
- Ostafin, B. D., Bauer, C., & Myxter, P. (2012). Mindfulness decouples the relation between automatic alcohol motivation and heavy drinking. *Journal of Social and Clinical Psychology, 31*(7), 729-745.
- Ostafin, B. D., & Marlatt, G. A. (2008). Surfing the urge: Experiential acceptance moderates the relation between automatic alcohol motivation and hazardous drinking. *Journal of Social and Clinical Psychology, 27*(4), 404-418.
- Papies, E. K., Barsalou, L. W., & Custers, R. (2012). Mindful attention prevents mindless impulses. *Social Psychological and Personality Science, 3* (3), 291-299.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptomatic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*(3), 879-891.
- Prevedini, A. B., Presti, G., Rabitti, E., Miselli, G., & Moderato, P., (). (2011). Acceptance and commitment therapy (ACT): the foundation of the therapeutic model and an overview of its contribution to the treatment of patients with

- chronic physical diseases. *Giornale Italiano di Medicina del Lavoro ed Ergonomia*, 33(1 Suppl A), A53-63.
- Puhl, R. M., & Heuer, C. A. (2009). The stigma of obesity: a review and update. *Obesity Research*, 17(5), 941-964.
- Ramel, W., Goldin, P. R., Carmona, P. E., & McQuaid, J. R. (2004). The effects of mindfulness meditation on cognitive processes and affect in patients with past depression. *Cognitive therapy and research*, 28(4), 433-455.
- Rejeski, W. J., Burdette, J., Burns, M., Morgan, A. R., Hayasaka, S., Norris, J., . . . Laurienti, P. J. (2012). Power of food moderates food craving, perceived control, and brain networks following a short-term post-absorptive state in older adults. *Appetite*, 58(3), 806-813.
- Roberts, K. C., & Danoff-Burg, S. (2010). Mindfulness and health behaviors: is paying attention good for you? *Journal of American College Health*, 59(3), 165-173.
- Robins, C. J., Keng, S. L., Ekblad, A. G., & Brantley, J. G. (2012). Effects of mindfulness-based stress reduction on emotional experience and expression: a randomized controlled trial. *Journal of Clinical Psychology*, 68(1), 117-131.
- Roemer, L., Lee, J. K., Salters-Pedneault, K., Erisman, S. M., Orsillo, S. M., & Mennin, D. S. (2009). Mindfulness and emotion regulation difficulties in generalized anxiety disorder: Preliminary evidence for independent and overlapping contributions. *Behavior Therapy*, 40(2), 142-154.
- Roemer, L., & Orsillo, S. M. (2002). Expanding Our Conceptualization of and Treatment for Generalized Anxiety Disorder: Integrating Mindfulness Acceptance-Based Approaches with Existing Cognitive-Behavioral Models. *Clinical Psychology: Science and Practice*, 9(1), 54-68.

- Rolls, B. J., Morris, E. L., & Roe, L. S. (2002). Portion size of food affects energy intake in normal-weight and overweight men and women. *The American journal of clinical nutrition*, 76(6), 1207-1213.
- Rosenzweig, S., Greeson, J. M., Reibel, D. K., Green, J. S., Jasser, S. A., & Beasley, D. (2010). Mindfulness-based stress reduction for chronic pain conditions: variation in treatment outcomes and role of home meditation practice. *Journal of Psychosomatic Research*, 68(1), 29-36.
- Rothman, A. J., Sheeran, P., & Wood, W. (2009). Reflexive and automatic processes in the initiation and maintenance of dietary change. *Annals Behav Med*, 38(Suppl 1), S4-S17.
- Rott, C. A., Seaborn, C., Schmidt, C., Tafalla, R., Pejisa, J., & Evers, N. (2008). An eight week mindful eating education program increases self efficacy and weight loss. *Journal of the American Dietetic Association*, 108(9), A37.
- Ryan, R. M., & Brown, K. W. (Eds.). (2006). *What is optimal self-esteem? The cultivation and consequences of contingent vs. true self-esteem as viewed from the self-determination theory perspective*. New York: Psychology Press.
- Salmoirago-Blotcher, E., Hunsinger, M., Morgan, L., Fischer, D., & Carmody, J. (2013). Mindfulness-Based Stress Reduction and Change in Health-Related Behaviors. *Cardiovascular medicine Publications and Presentations, Paper 87*.
- Saper, C. B., Thomas, C. C., & Elmquist, J. K. (2002). The need to feed: homeostatic and hedonic control of eating. *neuron*, 36(2), 199-211.
- Schmidt, U., Oldershaw, A., Jichi, F., ternheim, L., Startup, H., McIntosh, V., & Treasure, J. (2012). Out-patient psychological therapies for adults with anorexia nervosa: randomised controlled trial. *The British Journal of Psychiatry*, 201(5), 392-399.

- Schooler, J. W., Smallwood, J., Christoff, K., Handy, T. C., Reichle, E. D., & Sayette, M. A. (2011). Meta-awareness, perceptual decoupling and the wandering mind. *Trends in cognitive sciences, 15*(7), 319-326.
- Schwarzer, R. (2014). Life and death of health behaviour theories. *Health Psychology Review, 8*(1), 53-56.
- Segal, Z. V., Williams, J. M., & Teasdale, J. D. (2002). *Mindfulness-based cognitive therapy for depression: A new approach for the prevention of relapse*. New York: The Guildford Press.
- Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of Mindfulness. *Journal of Clinical Psychology, 62*, 373-386.
- Shearin, E. N., Russ, M. J., Hull, J. W., Clarkin, J. F., & Smith, G. P. (1994). Construct validity of the Three-Factor Eating Questionnaire: Flexible and rigid control subscales. *International Journal of Eating Disorders, 16*(2), 187-198.
- Sheeran, P. (2002). Intention-behavior relations: A conceptual and empirical review. *European review of social psychology, 12*(1), 1-36.
- Siegel, D. J. (2007). *The Mindful Brain: Reflection and Attunement in the Cultivation of Well-Being (Norton Series on Interpersonal Neurobiology)*: WW Norton & Company.
- Sim, L., & Zeman, J. (2004). Emotion awareness and identification skills in adolescent girls with bulimia nervosa. *Journal of Clinical Child and Adolescent Psychology, 33*, 760-771.
- Singer, A. R., & Dobson, K. S. (2007). An experimental investigation of the cognitive vulnerability to depression. *Behaviour research and therapy, 45*(3), 563-575.

- Slagter, H. A., Lutz, A., Greischar, L. L., Francis, A. D., Nieuwenhuis, S., Davis, J. M., & Davidson, R. J. (2007). Mental training affects distribution of limited brain resources. *PLoS biology*, 5(6), e138.
- Smith, B. W., Shelley, B. M., Leahigh, L., & Vanleit, B. (2006). A preliminary study of the effects of a modified mindfulness intervention on binge eating. *Complement Health Practice Review*, 11(3), 133-143.
- Smith, J. A., & Osbourn, M. (2009). *Interpretive phenomenological Analysis*. London: Sage.
- Sobel, M. E. (Ed.). (1982). *Asymptotic confidence intervals for indirect effects in structural equation models*. San Francisco: Jossey-Boss.
- Sobel, M. E. (Ed.). (1986). *Some new results on indirect effects and their standard errors in covariance structure models*. Washington, DC: American Sociological Association.
- Stubbs, R. J., Hughes, D. A., Johnstone, A. M., Rowley, E., Reid, C., Elia, M., & Blundell, J. E. (2000). The use of visual analogue scales to assess motivation to eat in human subjects: a review of their reliability and validity with an evaluation of new hand-held computerized systems for temporal tracking of appetite ratings. *British Journal of Nutrition*, 84(04), 405-415.
- Stunkard, A. J., & Messick, S. (1984). The Three-Factor Eating Questionnaire to Measure Dietary Restraint, Disinhibition and Hunger. *Journal of Psychosomatic Research*, 29(1), 71-83.
- Svaldi, J., Tuschien-Caffier, B., Lackner, H. K., Zimmermann, S., & Naumann, E. (2012). The effects of emotion regulation on the desire to overeat in restrained eaters. *Appetite*, 59(2), 256-263.

- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.-International ed ed.). Boston: Pearson.
- Tang, T. S., Funnell, M. M., & Anderson, R. M. (2006). Group education strategies for diabetes self-management. *Diabetes Spectrum, 19*(2), 99-105.
- Tang, Y. Y., Ma, Y., Wang, J., Fan, Y., Feng, S., Lu, Q., & Posner, M. I. (2007). Short-term meditation training improves attention and self-regulation. *Proceedings of the National Academy of Sciences of the United States of America, 104*(43), 17152-17156.
- Tapper, K., Shaw, C., Ilsley, J., Hill, A. J., Bond, F. W., & Moore, L. (2009). Exploratory randomised controlled trial of a mindfulness-based weight loss intervention for women. *Appetite, 52*(2), 396-404.
- Teasdale, J. D., Moore, R. G., Hayhurst, H., Pope, M., Williams, S., & Segal, Z. V. (2002). Metacognitive Awareness and Prevention of Relapse in Depression: Empirical Evidence. *Journal of Consulting and Clinical Psychology, 70*, 275-287.
- Teasdale, J. D., Segal, Z. V., & Williams, J. M. (1995). How does Cognitive Therapy Prevent Depressive Relapse and why should Attentional Control (mindfulness) training help? . *Behaviour Research and Therapy, 33*(1), 25-39.
- Teasdale, J. D., Segal, Z. V., & Williams, J. M. (2003). Mindfulness Training and Problem Formulation *Clinical Psychology: Science and Practice, 10* (2), 157-160.
- Teasdale, J. D., Segal, Z. V., Williams, J. M., Ridgeway, V. A., Soulsby, J. M., & Lau, M. A. (2000). Prevention of Relapse/Recurrence in major depression by mindfulness-based cognitive therapy. *Journal of Consulting and Clinical Psychology, 68* 615-623.

- Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S., . . . Stewart-Brown, S. (2007). The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation. *Health and Quality of Life Outcomes*, 5, 63-74.
- Teper, R., & Inzlicht, M. (2013). Meditation, mindfulness and executive control: the importance of emotional acceptance and brain-based performance monitoring. *Social cognitive and affective neuroscience*, 8(1), 85-92.
- Teper, R., Segal, Z. V., & Inzlicht, M. (2013). Inside the Mindful Mind: How Mindfulness Enhances Emotion Regulation Through Improvements in Executive Control. *Psychological Science*, 1-6.
- Terry, M. L., & Leary, M. R. (2011). Self-compassion, self-regulation, and health. *Self and Identity*, 10, 352-362.
- Tholin, S., Rasmussen, F., Tynelius, P., & Karlsson, J. (2005). Genetic and environmental influences on eating behavior: the **Swedish** Young Male Twins Study. *American Journal of Clinical Nutrition*(81), 564-569.
- Thompson, B. L., & Waltz, J. (2007). Everyday mindfulness and mindfulness meditation: Overlapping constructs or not? *Personality and Individual Differences*, 43(7), 1875-1885.
- Tice, D. M., & Bratslavsky, E. (2000). Giving in to Feel Good: The Place of Emotion Regulation in the Context of General Self-Control. *Psychological Inquiry*, 11(3), 149-159.
- Timmerman, G. M., & Brown, A. (2012). The Effect of a Mindful Restaurant Eating Intervention on Weight Management in Women. *Journal of nutrition education and behavior*, 44(1), 22-28.

- Van Dam, N. T., Earleywine, M., & Borders, A. (2010). Measuring mindfulness? An item response theory analysis of the mindful attention awareness scale. *Personality and Individual Differences, 49*(7), 805-810.
- van den Bos, R., & de Ridder, D. (2006). Evolved to satisfy our immediate needs: Self-control and the rewarding properties of food. *Appetite, 47*, 24-29.
- Verplanken, B. (2012). When bittersweet turns sour: adverse effects of nostalgia on habitual worriers. *European Journal of Social Psychology and Health, 42*, 285-289.
- Verplanken, B. (Ed.). (2010). *Habit: From Overt Action to Mental Events*. New York: Oxford University Press.
- Verplanken, B., & Faes, S. (1999). Good intentions, bad habits, and effects of forming implementation intentions on healthy eating. *European Journal of Social Psychology and Health, 29*(5-6), 591-604.
- Verplanken, B., & Fisher, N. (2013). Habitual Worrying and Benefits of Mindfulness. *Mindfulness*.
- Verplanken, B., Friberg, O., Wang, C. E., Trafimow, D., & Woolf, K. (2007). Mental Habits: Metacognitive reflection on negative self-thinking. *Journal of Personality and Social Psychology Bulletin, 92*, 526-541.
- Verplanken, B., & Tangelder, Y. (2011). No Body's Perfect: The Significance of Habitual Negative Thinking about Appearance for Body Dissatisfaction, Eating Disorder Propensity, Self-Esteem, and Snacking. *Psychology and Health, In Press*.
- Verplanken, B., & Velsvik, R. (2008). Habitual negative body image thinking as psychological risk factor in adolescents. *Body Image, 5*(2), 133-140.

- Vidrine, J. I., Businelle, M. S., Cinciripini, P., Li, Y., Marcus, M. T., Waters, A. J., & Wetter, D. W. (2009). Associations of mindfulness with nicotine dependence, withdrawal, and agency. *Substance Abuse, 30*(4), 318-327.
- Volkow, N. D., Wang, G. J., Fowler, J. S., Tomasi, D., & Baler, R. (Eds.). (2012). *Food and drug reward: overlapping circuits in human obesity and addiction* (Vol. 11).
- Wadden, T. A., Brownell, K. D., & Foster, G. D. (2002). Obesity: responding to the global epidemic. *Journal of Consulting and Clinical Psychology, 70*(3), 510-525.
- Wagner, D. D., Altman, M., Boswell, R. G., Kelley, W. M., & Heatherton, T. F. (2013). Self-regulatory depletion enhances neural responses to rewards and impairs top-down control. *Psychological Science, 24*(11), 2262-2271.
- Wallace, A. G., & Shapiro, S. L. (2006). Mental Balance and Well-being: Building bridges between Buddhism and western psychology. *American Psychologist, 61*, 690-701.
- Wansink, B. (2004). Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annu. Rev. Nutr, 24*(455-79).
- Wansink, B. (2010). From mindless eating to mindlessly eating better. *Physiology and Behaviour, 100*, 454-463.
- Wansink, B., & Sobal, J. (2007). Mindless Eating: The 200 Daily Food Decisions We Overlook. *Environment and Behavior, 39*(1), 106-123.
- Ward, A., & Mann, T. (2000). Don't mind if I do: disinhibited eating under cognitive load. *Journal of Personality and Social Psychology, 78*(4), 753-763.
- Wardle, J. (2007). Eating behaviour and obesity. *Obesity reviews, 8* (1), 73-75.
- Watkins, E. R. (2008). Constructive and Unconstructive Repetitive Thought. *Psychological Bulletin, 134* (2), 163-206.

- Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin*, 132(2), 249-268.
- Wegner, D. M., Schneider, D. J., Carter, S. R., & White, T. L. (1987). Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology*, 53(1), 5-13.
- Wegner, D. M., & Wheatley, T. (1999). Apparent mental causation: Sources of the experience of will. *American Psychologist*, 54(7), 480-492.
- Weinsier, R. L., Nagy, T. R., Hunter, G. R., Darnell, B. E., Hensrud, D. D., & Weiss, H. L. (2000). Do adaptive changes in metabolic rate favor weight regain in weight-reduced individuals? An examination of the set-point theory. *The American journal of clinical nutrition*, 72(5), 1088-1094.
- Wenk-Sormaz, H. (2005). Meditation can reduce habitual responding. *Advances in Mind-Body Medicine*, 11, 42-58.
- Westbrook, C., Creswell, J. D., Abibnia, G., Julson, E., Kober, H., & Tindle, H. A. (2013). Mindful attention reduces neural and self-reported cue-induced craving in smokers. *Social cognitive and affective neuroscience*, 8(1), 73-84.
- Whiteside, U., Chen, E., Neighbors, C., Hunter, D., Lo, T., & Larimer, M. E. (2007). Difficulties regulating emotions: Do binge eaters have fewer strategies to modulate and tolerate negative affect? *Eating Behaviors*, 8, 162-169.
- Williams, J. M. (2008). Mindfulness, Depression and Modes of Mind. *Cognitive therapy and research*, 32, 721-733.
- Williams, J. M. (2010). Mindfulness and Psychological Process. *Emotion*, 10(1), 1-7.

- Williams, J. M., Teasdale, J. D., Segal, Z. V., & Kabat-Zinn, J. (2007). *The Mindful way Through Depression: Freeing yourself from Chronic Unhappiness* New York Guilford Press.
- Williams, M., & Penman, D. (2011). *Mindfulness: a practical guide to finding peace in a frantic world*. London: Piatkus.
- Witkiewitz, K., & Bowen, S. (2010). Depression, craving, and substance use following a randomized trial of mindfulness-based relapse prevention. *Journal of Consulting Clinical Psychology, 78*, 362-374.
- Witkiewitz, K., Lustyk, M. K., & Bowen, S. (2013). Retraining the Addicted Brain: A Review of Hypothesized Neurobiological Mechanisms of Mindfulness-Based Relapse Prevention. *Psychology of Addictive Behaviors, 27*(2), 351-365.
- Wolever, R., & Best, J. (Eds.). (2009). *Mindfulness-based approaches to eating disorders*. New York: NY: Springer Science + Business Media.
- Woolhouse, H., Knowles, A., & Crafti, N. (2012). Adding Mindfulness to CBT Programs for Binge Eating: a mixed-methods evaluation. *Eating Disorders, 20*(4), 321-339.
- World Health Organisation. (2009). Facing the Facts: The impact of chronic disease in the United Kingdom (Vol. 2009).
- World Health Organization. (2013). Global Health Observatory (GHO):NCD mortality and morbidity. Retrieved 09/07/2013, 2013
- Wu, T., Gao, X., Chen, M., & Van Dam, R. M. (2009). Long-term effectiveness of diet-plus-exercise interventions vs. diet-only interventions for weight loss: a meta-analysis. *Obesity reviews, 10*(3), 313-323.
- Yardley, L. (2000). Dilemmas in qualitative health research *Psychology and Health, 15*(2), 215-228.

- Yardley, L. (2008). Demonstrating validity in qualitative psychology. In J. A. Smith (Ed.), *Qualitative psychology: A practical guide to research methods* (pp. 235-251). London: Sage.
- Zeidan, F., Gordon, N. S., Merchant, J., & Goolkasian, P. (2010). The effects of brief mindfulness meditation training on experimentally induced pain. *The Journal of Pain, 11*(3), 199-209.
- Zeidan, F., Johnson, S. K., Gordon, N. S., & Goolkasian, P. (2010). Effects of brief and sham mindfulness meditation on mood and cardiovascular variables. *The Journal of Alternative and Complementary Medicine, 16*(8), 867-873.
- Ziauddeen, H., Farooqi, I. S., & Fletcher, P. C. (2012). Obesity and the brain: how convincing is the addiction model? *Nature Reviews Neuroscience, 13*(4), 279-286.