EXPLORING THE EFFECTS OF MINDFUL EATING, SELF-KINDNESS AND SELF-DISTANCING ON PROMOTING HEALTHIER EATING BEHAVIOURS

By

MISBA HUSSAIN

A thesis submitted to

Birmingham City University

For the degree of

DOCTOR OF PHILOSOPHY

Faculty of Business, Law and Social Sciences

Birmingham City University

September 2020

ABSTRACT

The prevalence of obesity has been on the rise, and using mindfulness and self-compassion based interventions have been suggested to promote healthier eating behaviours. Recently, a mindful eating specific tool, namely Mindful Construal Diary (MCD) was developed, and displayed significant improvements in mindfulness, self-compassion and weight loss. The main aim of the current thesis was to extend on the existing knowledge of mindfulness, mindful eating and self-compassion, and their positive effects on eating behaviours using methods that are easy and practical to implement, as well as explore novel approaches, such as self-kindness and self-distancing that have not yet been explored within food intake and regulation. Chapter 1 described the general background of mindfulness, mindful eating, self-compassion, self-kindness and self-distancing, and evaluated the current literature. Chapter 2 discussed the general methodology of the empirical chapters. Chapter 3 explored the association of mindfulness, mindful eating and self-compassion with maladaptive eating behaviours amongst patients who have clinical obesity. Chapter 4, Chapter 5 and Chapter 6 explored the effect of mindfulness using the MCD on decreasing attentional biases towards food cues, reducing the portion size effect and promoting healthier food choices. Chapter 7 explored the effect of self-kindness in reducing energy intake of high energy dense (HED) foods and promoting the intake of low energy dense (LED) foods. Chapter 8 explored the effect of self-distancing on energy intake through chocolate consumption after a negative state affect. Chapter 9 explored the effect of classical music as a primary environmental tool to eat mindfully, and in effect, reduce the intake of HED foods. The findings from the Chapters suggested mindfulness, mindful eating and self-compassion were associated with eating behaviours, such as grazing and emotional eating, but mindful eating was also associated with other eating behaviours that are often barriers to weight loss success, such as external eating and fat consumption. Moreover, using the MCD appeared to promote a mindful eating experience amongst participants, and in effect, facilitate healthier eating behaviours through reducing the portion size effect and lowering intake of HED food. In addition, the novel concept of self-kindness suggested to increase the intake of LED foods, but this effect was limited. Furthermore, self-distancing appeared to reduce the consumption of chocolate after a negative state affect. Finally, briefly listening to classical music did not appear to enhance a mindful eating experience, but it may

be beneficial in regulating the intake of HED savoury foods. Chapter 10, the final Chapter reviewed the current findings in relation to previous research and reflected on the clinical and non-clinical implications. The present thesis suggests mindfulness, mindful eating, self-compassion, self-kindness and self-distancing may indeed be beneficial in facilitating healthier eating behaviours.

ACKNOWLEDGMENTS

I would first like to say the greatest thank you to my Director of Studies, Dr Michael Mantzios (this time, I made sure I spelt it correctly), who has always been so generous with his time, and very supportive throughout my studies. Michael provided me with the opportunity of studying at a doctoral level, and has always encouraged and believed in me ever since I was completing my undergraduate dissertation. I would not be in the position that I am in today without the opportunities, guidance, wealth of knowledge and support Michael, and my other supervisors, Dr Helen Egan and Dr Rebecca Keyte have provided me with. I am so thankful for such an incredible and kind supervisory team. You are all the best.

I would also like to thank all the participants who contributed to the completion of this thesis. Thank you to Dr Jeffrey Woods for taking out time in providing support and knowledge on eye-tracking. Also, thank you to Dr Pelham Carter for his review of Chapter 5. Thank you to Neale Samways for providing technical support, always opening the labs and being a great friend. I would like to thank my fellow PhD colleagues, work colleagues and friends who have always been so kind and gave me encouragement and advice when I needed it the most. Thank you so much.

Thank you to my parents for always giving me so much love, support and believing in me. Whilst, I may not be a "Brain Doctor", thank you for always telling me how proud you are of me. It always means so much. Lots of love.

Finally, thank you so much to my amazing partner, Theodore, for supporting and believing in me, and always asking if I am okay. You have made this journey easier. I am so thankful for all the times you would just listen to me getting excited about my research, or the times when you would provide me with the encouragement I needed. Thank you for being so kind and understanding every time I would have to cancel our plans because "I *really* need to finish this PhD, Theo". Thank you for being my biggest fan. I am incredibly lucky to have you by my side, and I am so excited for all our trips and movie nights to come. We are finally here.

DISSEMINATION

The contents of Chapter 5 have been presented at The British Feeding and Drinking Group (2019), and Chapter 5 has also been submitted for publication, and is current under review.

Chapter 6 has been accepted for publication in Mindfulness.

Chapter 7 has been published in the Journal of Behavioural Medicine:

Hussain, M., Egan, H., Keyte, R., & Mantzios, M. (2020). Exploring the Role of Self-Kindness in Making Healthier Eating Choices: A Preliminary Study. *International Journal of Behavioural Medicine*, 1-6. https://doi.org/10.1007/s12529-020-09942-0

(See Appendix A1)

Chapter 8 has been published in the Journal of Cognitive Enhancement:

Hussain, M., Egan, H., Keyte, R., & Mantzios, M. (2020). Exploring the effects of mindfulness and self-distancing on chocolate intake after a negative state affect. *Journal of Cognitive Enhancement*, 1-10. https://doi.org/10.1007/s41465-020-00181-5

(See Appendix A2)

Chapter 9 has been published in Psychological Reports:

Hussain, M., Egan, H., Keyte, R., & Mantzios, M. (2020). Exploring the environmental manifestation of types of music on reinforcing mindfulness and concurrent calorie intake. *Psychological Reports*, 1-18. https://doi.org/10.1177/0033294120967276

(See Appendix A3)

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ACT: Acceptance and Commitment Therapy

ANCOVA: Analysis of Covariance

ANOVA: Analysis of Variance

BMI: Body Mass Index

CLT: Construal Level Theory

DBT: Dialectical Behaviour Therapy

DEBQ: Dutch Eating Behaviour Questionnaire

DFS-SQ: Dietary Fat and Free Sugar—Short Questionnaire

EU: European Union

FFMQ-SF: Five-Facet Mindfulness Questionnaire – Short Form

GS: Grazing Scale

HED: High Energy Dense

LED: Low Energy Dense

MB-EAT: Mindfulness-Based Eating Awareness Training

MBCT: Mindfulness-Based Cognitive Therapy

MBI: Mindfulness-Based Intervention

MBSR: Mindfulness-Based Stress Reduction

MCD: Mindful Construal Diary

MEAL: Mindful Eating and Living

MES: Mindfulness Eating Scale

NHS: National Health Service

SBT: Standard Behavioural Treatments for Weight Management

SCS: Self-Compassion Scale

SMS: State Mindfulness Scale

SPSS: Statistical Package for the Social Sciences

SSCS: State Self-Compassion Scale

TFEQ: Three-Factor Eating Questionnaire

UK: United Kingdom

US: United States

WHO: World Health Organization

CHAPTER 1: GENERAL INTRODUCTION

1.1. Obesity

The prevalence of obesity has increased over the past decades, whereby globally 1 in 3 adults are overweight (i.e., BMI > 25) or obese (i.e., BMI > 30) (Artiles et al., 2019; Ng et al., 2014). More specifically, the numbers in the West are startling, with data suggesting that 71.6% of adults in the United States (US) are either overweight or obese (Hales, Margaret, Carroll, Fryar, Cynthia, & Ogden, 2020) and 51.6% of the European Union (EU) population are estimated to be overweight or obese (Eurostat, 2014). Furthermore, in England alone, 28.7% of adults are obese and a further 35.6% are overweight (National Statistics, 2018). The continuance of such trends means that in the next 5 to 28 years, the majority of the population in the US and EU could be overweight or obese (Pinede et al., 2018; Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008). If the "public health war on obesity" (Salas, 2015) is not addressed soon then this could have detrimental effects on the populations' physical and psychological well-being (Dixon, 2010; Wardie & Cooke, 2005). For example, research has shown people who have obesity often experience greater mental health concerns, such as depression, anxiety and low self-esteem than those who do not have obesity (Melnyk et al., 2006; Perrin et al., 2010; Phelen et al., 2015). Obesity is also an important risk factor in many chronic illnesses, such as hypertension, type 2 diabetes, cardiovascular disease, stroke and cancer (e.g., Kopelman, 2007). Alarmingly, high BMI accounted for approximately 4.4 million deaths and 134 million disability-adjusted life-years worldwide in 2015 ("Health Effects of Overweight and Obesity", 2015). More recently, research has emerged suggesting excess weight increases the risk of COVID-19 related illnesses, and such risk grows substantially as BMI increases (Dietz & Santos-Burgoa, 2020; Kassir, 2020). The wide range of health concerns associated with obesity do not only affect quality of life, but also represent a significant economic burden (Tremmel, Gerdtham, Nilson, & Saha, 2017; Wang et al., 2011). For example, the total health care costs attributed to obesity and overweight are estimated to double every decade, suggesting that by 2030 the combined medical costs associated with the treatment of such preventable diseases are expected to increase by $48 to $66 billion every

year in the US and £1.9 to £2 billion every year in the UK (Wang et al., 2011). As such, addressing the epidemic of obesity has become a priority for many governments.

Obesity is suggested to result from an imbalance of energy, specifically between energy intake and energy expenditure (Blomain, Dirhan, Valentino, Kim, & Waldman, 2013; Swinburn et al., 2009). A popular consensus is that changes in the current food environment, such as increased availability, exposure and affordability of foods high in fat and sugar and low in nutritional value (i.e., high energy dense [HED] foods)[1] have resulted in an "obesogenic" environment, leading people to participate in unhealthy eating behaviours, which eventually result in weight gain and obesity (Lowe, 2003; Swinburn et al., 2011). The lack of opportunities for physical activity and the rise of a sedentary lifestyle have also been considered as potential contributors as they lead to a reduction in energy expenditure (Ladabaum, Mannalithara, Myer, & Singh, 2014; Wareham, van Slujis, & Ekelund, 2005). Indeed, improving diet and rectifying calorie intake through means of reducing portion size and encouraging consumption of nutritionally-rich low energy dense (LED) foods[2], such as fruit and vegetables (over HED foods), as well as promoting physical activity have become important components in managing obesity (e.g., World Health Organization [WHO], 2020), and standard behavioural treatments (SBTs) that focus on such elements have been executed (Burgess, Hassmen, Welvaert, & Pumpa, 2017).

1.1.1. Weight Loss Interventions

SBTs for weight loss generally aim to assist people with both weight loss and weight maintenance through means of diet and physical activity. Weight loss diets often involve reducing energy by 500 calories below the standard energy requirement or using set dietary plans consisting of significantly low fat and energy intake (Hall et al., 2011; Jensen et al., 2014; Thomas et al., 2014). Increasing physical activity to 60 to 90 minutes a day is suggested to be required to maintain long term weight loss (Jensen et al., 2014; Slentz, Houmard, & Kraus, 2009). However, usually such diets and physical activities are components of a rather intensive intervention programme (McTiernan et al., 2007; Jakicic, Marcus, Gallagher, Napolitano, & Lang, 2003), and typically involve several

[1] Hereafter, "HED foods" will refer to foods that are low in nutritional value but high in energy.
[2] Hereafter, "LED foods" will refer to foods that are high in nutritional value but low in energy.

sessions over months, often varying on the degree of overweight and obesity (Bray, Fruhbeck, Ryan, & Wilding, 2016). Whilst findings do suggest that weight loss can be achieved through such dietary restrictions and increased physical activity, there is evidence to indicate that this effect is rather moderate, and can take between 6 months to a year to reach (Salas-Salvado et al., 2015). More concerningly, weight loss often only appears to be successful short term, with many individuals often regaining the lost weight within the first 1 to 5 years after completing a SBT programme (Anderson, Konz, Frederich, & Wood, 2001; Greenway, 2015; Jeffery et al., 2000; Maclean, Bergouignan, Cornier, & Jackman, 2011). As the effects of diet and exercise interventions alone do not appear to have substantial effect on maintaining successful weight loss, this could suggest that obesity is rather complex, and changes in the current food environment and reliance on intensive physical activities could contribute towards the inability to adhere to long term weight loss maintenance (Greenway, 2015). As such, there is a need to enhance SBTs for weight loss by incorporating psychological components that promote healthier lifestyle changes (i.e., lifestyle interventions) rather than solely focusing on diet/dietary and physical activity (e.g., O'Reilly, Cook, Sprujit-Metz, 2014; Tapper et al., 2017; Warren, Smith, & Ashwell, 2017).

1.1.2 Eating Behaviours

It is suggested that energy intake and food choices are not only controlled by metabolic needs (Manning and Batterham, 2014), but are also affected by different eating patterns (e.g., French, Epstein, Jeffery, Blundell, & Wardle, 2012). Three common dimensions of eating behaviours are dietary restraint (restrained eating), emotional eating and external eating, all of which to some extent have been associated with overeating, weight gain and obesity (Neumark-Sztainer, Wall, Story, & Standish, 2012; van Strien, Frijters, Bergers, & Defares, 1986; van Strien, Konttinen, Ouwens, van de Laar, & Winkens, 2020). However, such eating behaviours are not typically addressed in weight loss interventions, such as SBTs, and may also contribute towards the lack of long term success (Greenway, 2015). Indeed, understanding their role in food and eating related decisions may provide an opportunity to develop interventions that could promote healthier eating, and thereby support weight loss and weight maintenance (Dochat, Godfrey, Golshan, Cuneo, & Afari, 2019; van Strien, 2018; van Strien et al., 2020).

The term “dietary restraint” implies the cognitive effort that a person makes in order to resist the urge to eat (Bryant, Rehman, Pepper, & Walters, 2019; Herman & Mack, 1975; Herman & Polivy, 1975). Although “dietary restraint” and “dieting” are sometimes interchangeably used, they are in fact distinct (Williamson et al., 2007). For example, tools used to measure “dietary restraint” do not explicitly assess behaviours and motivations for weight loss (e.g., van Strien et al., 1986); whilst, the term “dieting” and dieting measures often refer to an intention to lose weight (Lowe & Thomas, 2009). So, whilst dieters consciously restrict food intake to *lose* weight, restrained eaters are suggested to restrict food intake to *control* for one’s weight and *prevent* weight gain (e.g., Lowe, Doshi, Katterman, & Feig, 2013; Lowe & Levine, 2005). However, dietary restraint is not always applied successfully, and when this happens, it can cause periods of overconsumption (Elfhag & Morey, 2008). For example, Herman and Mack (1975) found participants who were high in dietary restraint consumed significantly more palatable foods in response to high calorie “preloads” compared to those who were low in dietary restraint. This supports the concept that dietary restraint is under *cognitive control*, as opposed to physiological control (Herman & Polivy, 1975; van Strien, Herman, Engels, Larsen, & van Leeuwe, 2007; Polivy & Herman, 1985). Consequently, when cognitive control is undermined it can lead to reduced sensitivity of hunger and satiety cues, and result in disinhibition (i.e., externally and emotionally triggered eating) and overeating (Polivy & Herman, 1985).

The findings from studies exploring the relationship between restrained eating and BMI have often been inconsistent, with reports of positive, negative and null associations (Anderson, Reilly, Schaumberg, Dmochowski, & Anderson, 2016; Cornelis et al., 2014; Hootman, Guertin, & Cassano, 2018; Iceta et al., 2019; Jeanes et al., 2017). One potential explanation is that associations between dietary restraint and BMI may differ between populations, often with normal weight participants displaying positive associations (Bellisle et al., 2004; de Lauzon-Guillain et al., 2006), and those with obesity displaying negative associations (Bellisle et al., 2004; Cappelleri et al., 2009). It could be the case that dietary restraint for those who are normal weight may act as a marker for overeating tendencies, whereas the tendency to overeat is already prominent amongst those with obesity, and as such, restraint will differ between those whose tendency to overeat is attenuated by dietary restraint

and those who do not attempt to regulate their eating (Johnson, Pratt, & Wardle, 2012). Accordingly, dietary restraint may reduce the unhealthy eating behaviours that contribute towards weight gain amongst those with obesity (Johnson et al., 2011). Supporting this, research has shown that when dietary restraint and BMI are explored, and tendencies towards disinhibition and overeating are controlled, dietary restraint appears to weaken the relationship between disinhibition and weight gain (Dykes, Brunner, Martikainen, & Wardle, 2004; Hays & Roberts, 2008). Alternatively, it could also be suggested that those who are overweight/obese or are gaining weight may be more likely to practice restrained eating because of unsuccessful weight management, which could also explain the positive relationship between dietary restraint and BMI amongst both normal weight and overweight/obese populations (e.g., Schaumberg, Anderson, Anderson, Reilly, & Gorrell, 2016). Overall, the outcomes from different studies do imply that dietary restraint has a rather complex relationship with weight trajectory whereby when dietary restraint is followed by disinhibition and overconsumption, it can be a risk for weight gain (Schaumberg et al., 2016). However, when done so successfully (i.e., consistent cognitive and physiological restriction), it may indeed support healthy weight maintenance (Catenacci et al., 2014; Schaumberg, Anderson, Kirschenbaum, & Earleywine, 2015).

Another type of eating behaviour is emotional eating, this originates from the psychosomatic theory, and refers to the tendency to eat in response psychological distress, such as anxiety, sadness, anger and loneliness (Spoor, Bekker, van Strien, & van Heck, 2007; van Strien et al., 1986). In addition to reducing the intensity of one's psychological distress (Macht & Simons, 2010), emotional eating is also suggested to occur in those who experience difficulty in distinguishing hunger and satiety cues from other aversive internal states for reasons such as, lack of interoceptive awareness (Bruch, 1973) or difficulty identifying and describing emotions (i.e., alexithymia; van Strien & Ouwens, 2007). Eating in response to increased psychological distress has been associated with greater consumption of HED foods, and a reduced intake of LED foods in both clinical and non-clinical samples (Cardi, Leppanen, & Treasure, 2015; Mooreville et al., 2014). This suggests that eating influenced by emotional states does not only increase the risk for greater food intake, but also increases the preference for specific foods that lack nutritional value (Yannakolia et al., 2008). If such

eating patterns occur often, they can be problematic with research showing higher levels of emotional eating to be associated with greater BMI, weight gain, obesity and interference with weight loss (Finch & Tomiyama, 2015; Koenders & van Strien, 2011; van Strien, Herman, & Verheijden, 2012). Therefore, exploring the concept of emotional eating and its potential effect on food choice and energy intake may be warranted in developing successful interventions for healthier eating, weight loss and weight maintenance (Levoy, Lazaridou, Brewer, & Fulwiler, 2017; Timmerman & Brown, 2012).

External eating is based on the concept that eating occurs in response to external food-related cues, such as the sight, smell and accessibility of food, regardless of internal states of hunger and satiety (van Strien et al., 1986; van Strien, Herman, & Verheijden, 2009). Both external eating and emotional eating are also suggested to co-occur (van Strien, 2018), whereby emotional eaters shift their attention away from their negative state by directing it to their food environment, resulting in external eating (Wagner, Boswell, Kelley, & Heatherton, 2012). There are findings from various studies that suggest external eating is related to overeating (Kakoschke, Kemps, Tiggermann, 2015; van Strien et al., 2012). For example, external eating has been associated with greater self-reported energy intake from 3 days to 1 month (Anschutz, van Strien, van de van, & Engels, 2009; Lluch, Herbeth, Mejean, & Siest, 2000) and reports from experimental studies have shown external eating patterns to correlate with higher food intake and more unhealthy snack food consumption (Nijs, Muris, Euser, & Franken, 2010). However, the evidence for the association between external eating and BMI has been conflicting. Whilst, some studies have found external eating to be associated with higher BMI (Burton, Smit, & Lightowler, 2007), other research has found no relationship between the two variables (Snoek, Engels, van Strien, & Otten, 2013). Furthermore, research has also suggested that those who are overweight display similar levels of external eating behaviour as normal weight participants (van Strien et al., 2009). Such findings imply that the relationship between external eating and BMI is not clear-cut, and exploring any potential effects of this eating pattern within interventions attempting to promote healthier eating, weight loss and weight maintenance may indeed be beneficial (O'Reilly et al., 2014; Warren et al., 2017).

1.2. Mindfulness

The past decades have witnessed a growing interest in mindfulness and its associated benefits (e.g., Greeson, 2009; Grossman, Niemann, Schmidt, & Walach, 2004; Heeren & Philippot, 2011; Malinowski & Lim, 2015; Zimmermann, Burrell, & Jordan, 2018). Broadly, mindfulness has been associated with psychological and physical well-being, such as reduction in stress and anxiety, and improved emotional regulation, sleep quality and physical activity (Branstrom, Duncan, & Moskowitz, 2011; Howell, Didgon, & Buro, 2010; Prakash, Whitmoyer, Aldao, & Schirda, 2015; Tsafou, De Ridder, van Ee, & Lacroix, 2016). Given the positive associations, researchers have pioneered mindfulness-based interventions (MBIs) in an attempt to promote health behaviours, and findings have been successful (e.g., Cullen, 2011; Olsen & Emery, 2015). For example, several reviews on MBIs have found significant improvements amongst participants in depression, stress, substance use, cancer and chronic pain (Chiesa & Serretti, 2011, 2014; Gotink et al., 2015; Shennan, Payne, & Fenlon, 2011). Researchers have also turned to the possibility of exploring mindfulness in the field of eating disorders, and more recently, facilitating healthier eating behaviours and combating the obesity epidemic with similar positive outcomes (e.g., Kristeller & Hallet, 1999; Dalen et al., 2010; Mantzios & Wilson, 2014).

Mindfulness originates from Buddhist practice, and several researchers have conceptualised what mindfulness entails (Brown & Ryan, 2003; Bishop et al., 2005; Grabovac, Lau, & Willet, 2011; Kabat-Zinn, 1990, 2003; Shapiro, Carlson, Astin, & Freedman, 2006). A common definition that is used within the current literature was initiated by Kabat-Zinn (1990, 2003) who introduced mindfulness as an awareness that emerges through purposefully paying attention to the present with a non-judgmental attitude. Paying attention to the present moment experience is also highlighted amongst other researchers (e.g., Bishop et al., 2005; Brown & Ryan, 2003; Shapiro et al., 2006), and it involves regulating attention by attending to one's breath, disengaging from distractions, and redirecting attention to the original focus (Lutz, Slagter, Dunne, & Davidson, 2008). The present moment experience simply refers to "observing" the present moment without the intention of achieving any particular outcome (e.g., Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). The non-judgemental attitude element involves experiencing and accepting thoughts, feelings and

sensations without judgment (e.g. Alberts, Mulkens, Smeets, & Thewissen, 2010). In other research, it has been suggested that the repeated practice of such components results in another element of mindfulness, namely "decentering" (Bishop et al., 2004; Shapiro et al., 2006), which refers to viewing thoughts and feelings as mental events that are temporary and separate from oneself, thereby imitating a non-judgmental attitude that is presented during present events (e.g., Tapper, 2018). Whilst, the concept of decentering has been specifically identified and used in certain MBIs, much of the current literature applies Kabat-Zinn's (2003) three elements: attention, present moment awareness and non-judgmental attitude (Baer, Smith, & Allen, 2004; Keng, Smoski, & Robins, 2011; Shapiro et al., 2006).

Several interventions focusing on mindfulness-based principles have been developed, such as Mindfulness-Based Stress Reduction programme (MBSR), Mindfulness-Based Cognitive Therapy (MBCT), Dialectical Behaviour Therapy (DBT), Acceptance and Commitment Therapy (ACT) and Decentering (Hayes, Strohsahl, & Wilson, 2009; Kabat-Zinn, 1982; Segal, Williams, & Teasdale, 2002; Tapper, 2018). The interventions aim to cultivate a state of mindfulness, and if the principles are followed thoroughly, it can indeed have the ability to amplify the attribute of mindfulness (i.e., trait; Kiken, Garland, Bluth, Palsson, & Gaylord, 2015). One of the most utilised forms of mindfulness training is the MBSR, an 8 week programme consisting of several mindfulness exercises, such as meditation and yoga (Kabat-Zinn, 1990). The practice of meditation or yoga typically involves focusing on autonomic and dynamic stimuli, such as breathing, eating or walking (Kabat-Zinn, 1990; Zeiden, Johnson, Diamond, David, & Goolkasian, 2010). The approaches of specific MBIs do differ according to their theoretical focus; for example, MBCT focuses on cognitive behavioural processes for mood, whilst DBT, ACT and decentring aim to respond to individual behaviours, such as extreme behavioural reactions, promoting healthier eating behaviours or weight loss (e.g., Lau & McMain, 2005; Lebois et al., 2015).

MBIs have grown in their popularity for the successful treatment of eating disorders, such as bulimia and anorexia (Courbasson, Nishikawa, & Dixon, 2011; Dunn et al., 2018; Wanden-Berghe, Sanz-Valero, Wanden-Berghe, 2010). Particularly, research on binge eating and the positive effects of mindfulness through the Mindfulness-Based Eating Awareness Training (MB-EAT) have been well

documented (Kristeller & Hallet, 1999), and findings have shown reductions in the frequency and severity of binge eating behaviours (Kristeller, Wolever, & Sheets, 2014; O'Reilly et al., 2014). The core principles of MB-EAT are based on MBSR, but with a greater focus placed upon eating exercises, such as eating meditation, mindful tasting, and bringing awareness to hunger and satiety cues (Kristeller et al., 2014).

1.2.1. Mindfulness, Eating Behaviours and Obesity

Unsurprisingly, MBIs have been used to modify eating behaviours and for the treatment of obesity (e.g., Timmerman & Brown; Allirot et al., 2017). Eating is often described as an automatic and overlearned behaviour (Cohen & Farley, 2008). For example, people might eat simply because they are in the presence of food, and not necessarily because they are hungry (e.g., Painter, Wansink, & Hieggelke, 2002), which can contribute towards overeating and weight gain (Blass et al., 2006; Nelson, 2017). Alternatively, "mindful eating" aims to foster awareness on what one is eating, and acknowledge hunger and satiety cues which can assist with weight regulation and healthier eating behaviours (Allirot et al., 2017; Mantzios & Wilson, 2015a; Warren et al, 2017). Impulsivity is another element that is often associated with overeating and obesity, whereby one may make food related decisions in a quick and unintentional reaction towards stimuli without any thought to the negative consequences of that decision (Dohle, Diel, & Hofmann, 2018). Research on impulsive eating has been suggested to relate to difficulties in emotional distress (Hill, 2007), and similar to automatic eating, mindfulness is negatively associated with impulsivity and emotional distress (Greeson et al., 2015; Jordan, Wang, Donatoni, & Meier, 2014). Thereby, training individuals to be mindful can assist them with noticing their distressing thoughts and emotions (Mantzios, 2014; Ouwens, Schiffer, Visser, Raeijmaekers, & Nyklicek, 2015), and in effect, enhance behavioural self-regulation through increased sensitivity towards psychological, physical and environmental cues (Brown & Ryan, 2003). Consequently, allowing a person to tolerate distress without the impulsivity to overeat (Hendrickson & Rasmussen, 2017; Mantzios & Giannou, 2014).

Accordingly, several studies have found MBIs promoted weight loss and weight maintenance (Miller, Kristeller, Headings, Nagaraja, & Miser, 2012; Smith, Shelley, Sloan, Colleran, & Erickson 2017). For example, Dalen et al. (2010) developed Mindful Eating and Living (MEAL), which

involved 6 weekly sessions of 2 hours with classes involving meditation, yoga, eating exercises, and training on awareness of body sensations, emotions and triggers to overeat. The findings indicated significant improvements in cognitive restraint around food, and decreases in weight and maladaptive eating behaviours. Other research has looked at mindful eating interventions based on restaurant eating and weight management, and found participants who attended 6 weekly sessions of 2 hours focusing on mindful eating meditation lost significant weight, increased diet related self-efficacy and experienced fewer barriers to weight management when eating out (Timmerman & Brown, 2012). In another MBI, Alberts et al. (2010) found those who engaged in 10 weekly, 1 hour sessions on mindfulness training for acceptance skills, as well as information on healthy food choices and physical activity, lost significantly more weight than those in a control group. Similarly, those who complied with the principles of ACT and weight loss demonstrated significant reductions in weight loss (Tapper et al., 2009). Mantzios and Wilson (2015b) also found engaging in a mindfulness meditation programme resulted in significant weight loss amongst participants compared to those in a dieting control group.

Furthermore, promoting a direct reduction in the intake of HED foods may also be beneficial for weight loss and the prevention of weight gain and obesity, and research has found that mindfulness can promote healthier eating behaviours within short experimental settings (e.g., Allirot et al., 2017; Dutt, Keyte, Egan, Hussain, & Mantzios, 2019). For example, Allirot et al. (2017) found a brief mindful eating induction subsequently led participants to eat a reduced number of HED foods. Similarly, participants who ate their lunch mindfully by focusing on the sensory characteristics (of the meal), later consumed significantly fewer cookies than those who were in a control condition (Higgs & Donohoe, 2011; Robinson, Kersbergen, & Higgs, 2014). In another study, van de Veer, van Herpen, and van Trijp (2016) found participants who attended to their bodily sensations were more likely to compensate for their previous consumption by consuming fewer cookies. Other research has also found that mindfully eating desired or undesired snacks can significantly increase the enjoyment of those foods (Arch et al., 2016; Hong, Lishner, & Han, 2014; Hong, Lishner, Han, & Huss, 2011). Additionally, Dutt et al. (2019) found that after a stress-inducing task, participants in the mindfulness condition consumed significantly less HED foods and more LED foods than those in a control

condition. Moreover, Mantzios, Egan and Asif (2019) explored chocolate intake, and found those who participated in a mindful raisin exercise consumed significantly less chocolate than those who did not. Similarly, mindfulness training on decentering resulted in participants consuming significantly less chocolate over 5 days than those in a control condition (Jenkins & Tapper, 2014). Furthermore, Forman et al. (2016) found that a 1 hour session on de-automatizing eating reduced consumption of salty snacks over 7 days. Based on such evidence from both longitudinal and brief experiments, it does appear that MBIs may be beneficial in reducing energy intake as well as promoting weight loss.

1.2.2. Contradictory Findings

Although the finding from above do appear to be positive, there is evidence to suggest that not all on MBIs result in successful weight loss or adherence to healthier eating behaviours (e.g., Daubenmier et al., 2011; Kearney et al., 2011). For example, Alberts, Thewissen, and Raes (2012) found participants improved significantly on problematic eating behaviours after an 8 week MBCT eating intervention, but there were no significant improvements in weight loss. Similarly, Daubenmier et al. (2011) explored the effects of a mindfulness programme, combining components of MBSR and MB-EAT for stress-related eating during a 16-week period, and found participants improved on external eating behaviours, but no differences in weight loss or abdominal fat were found. In addition, Kearney et al. (2012) found participation in an 8 week MBSR programme was not associated with any significant changes in emotional eating or uncontrolled eating, nor in the intake of fruit, vegetables, fat and sugar. Furthermore, in a brief experimental setting, engaging in mindfulness exercises did not result in any improvements of external eating behaviours (Cavanagh, Vartanian, Herman, & Polivy, 2014). One potential reason for the lack of success in MBIs for weight loss and improving eating behaviours is suggested to be related to the absence of a direct mindful eating component (Mantzios & Wilson, 2015a). For example, whilst some MBIs for weight loss do include a mindful eating exercise and homework related to one's eating and diet, the primary focus is not on weight loss or eating (Alberts et al., 2012; Marchiori & Papies, 2014). Some interventions do not address any form of eating components, such as taste, satiety, satiation, or emotional and cognitive states associated with eating (e.g., Kearney et al., 2012; Marchiori & Papies, 2014). It is suggested that in order for participants to become familiar with the concept of mindful eating, interventions need

to direct participants towards an intention of improving their eating behaviours (Mantzios & Wilson, 2015a). Thus, standard MBIs, without direct and informative guidance on eating behaviours and weight regulation are not sufficient for weight loss or facilitating healthier eating behaviours (Mantzios & Wilson, 2015a).

A direct solution to this problem would be to adapt mindfulness training to an eating specific focus strategy, such as the raisin meditation exercise which involves the practice of attentive and slow eating to acknowledge the taste, colour and texture of the raisin (Kristeller et al., 2014). However, the requirement of meditation that is often associated with mindfulness training may limit the outcomes for weight loss, weight maintenance and improved eating behaviours (Mantzios & Wilson, 2014, 2015a). For example, the average time spent on mindfulness meditation exercises during a typical intervention is 2.5 hours/weekly, and participants are then required to spend a further 45 to 60 minutes per day practicing the exercises at home (Alberts et al., 2010; Daubenmier, 2011; Kearney et al., 2012). In practicality, many people may not be able to adhere to such requirements due to time or financial constraints. For example, "lack of time" and "busy-ness" are often reported as barriers in both the prevention and treatment of obesity, whereby people claim that a lack of time is what stops them from cooking healthier meals or conducting physical activities (Banwell, Hinde, Dixon, & Sibthorpe, 2005; Hughes, Gooze, Finkelstein & Whitaker, 2010). As such, expecting participants to engage in practices that requires a great amount of time and commitment may be too optimistic, and could create problems in adherence, which is essential to successful long term outcomes (e.g., Tapper et al., 2009). Furthermore, learning and practicing meditation techniques can be difficult, and having an instructor for guidance or being within a group setting may be easier for people to follow (Mantzios & Giannou, 2014). However, the fiscal state of the National Health Service (NHS) makes this difficult to implement (Wang et al., 2011). Additionally, Mantzios and Wilson (2015a) discussed other obstacles to meditation suggested by participants, such as "betrayal to one's religion", "hippy-dippy nonsense" and "boring and mind-numbing practice". Such concerns associated with mindfulness meditation practice can often lead participants to cease their practice or even prevent them from starting (Mantzios 2015a, b). Therefore, exploring alternative methods that are eating

specific and provide the benefits of mindfulness without the requirement of meditation could be beneficial for weight loss, weight maintenance and facilitation of healthier eating behaviours.

1.2.3. Mindful Construal Diary (MCD)

In response to the above, researchers developed a Mindful Construal Diary (MCD; Mantzios & Wilson, 2014), a tool that combines concepts relating to mindfulness, self-compassion and construal level theory (CLT). Mantzios and Wilson (2014) suggested two components that were essential in developing an alternative to mindfulness meditation were: present centred awareness and non-judgemental attitude. Achieving a present centred awareness allows one to monitor their own behaviour, which is particularly relevant in facilitating healthier eating behaviours and weight management (Brown & Ryan, 2003; Kabat-Zinn, 2003; Wing & Phelen, 2005). Additionally, a non-judgmental attitude, similar to lower self-criticism allows failures in self-regulation to be viewed as an essential part in the journey of learning (e.g., Neff, 2009; Short, Mazmanian, Oinonen, & Mushquash, 2016; Terry & Leary, 2011). Such components of mindfulness meditation are also found in CLT (e.g., Liberman & Trope, 1998; Schmeichel, Vohs, & Duke, 2011). CLT suggests concepts can be identified on a close or distant continuum (Liberman & Trope, 1998). Whilst, close objects, events or individuals are represented as *concrete*, distant objects, events and individuals are portrayed as *abstract* (Freitas, Gollwitzer, & Trope, 2004). Abstract construals consider *why* actions are being performed, whereas concrete construals focus people's attention on *how* they carry out behaviour (Freitas et al., 2004). Abstract construals are considered to be unsuitable for developing mindfulness because of their temporal distancing feature (Fujita & Roberts, 2010). For example, when someone sets a future goal for oneself to achieve, they may notice and identify their inadequacies, failures and mistakes, resulting in rumination, isolation and judgment (Fujita, 2008). Research has found when experiencing elevated psychological distress, people report a greater amount of uncertainty, rumination and abstract thinking (Galfin & Waltkin, 2011). In contrast, concrete construals promote attention to the present and near moment, similar to what mindfulness meditation aims to achieve (e.g., Schmeichel et al., 2011). Furthermore, as concrete construals focus on the *how* element of behaviour, they do not require judgment nor do they promote self-critical attitudes – also similar to what mindfulness entails (Brown & Ryan, 2003; Kabat-Zinn, 2003). Research has been conducted in

exploring concrete and abstract construal diaries on weight management, and findings have indicated that concrete construals are significantly more effective in promoting mindfulness, self-compassion and weight loss than abstract construals (Mantzios & Wilson, 2014). Concrete construal diaries (i.e., MCD) simply require participants to read the mindful and self-compassionate questions within the diary, and write out the answers either whilst they are eating or immediately afterwards, a technique that is considered to be much simpler to adhere to than meditation (Mantzios & Wilson, 2014). Research has also explored the effectiveness of MCD as an alternative to mindful meditation, and findings have illustrated that those who use the MCD are able to maintain their weight significantly better than those participating in a mindful self-compassion meditation programme (Mantzios & Wilson, 2014). Therefore suggesting that the MCD may indeed be a practical and beneficial approach in promoting mindfulness, healthier eating behaviours, weight loss and weight maintenance.

1.3. Self-Compassion

Identifying methods to increase the practice of health behaviours, particularly those related to nutrition is important, yet challenging. Whilst the concept of mindfulness has shown to facilitate healthier eating behaviours and promote weight loss (Dalen et al., 2010; Dutt et al., 2019; Jordan et al., 2014; Keesman, Aarts, Hafner, & Papies, 2017; Mantzios et al., 2019), MBIs alone may not be sufficient to achieve this (e.g., Mantzios & Wilson, 2015b). For example, when people start their weight loss journey or simply set a target to change their eating behaviours, their efforts can be hindered by distractions or temptations, which can prevent them from achieving those desired goals (Sirois, 2015). To this end, identifying psychological elements in addition to mindfulness may be beneficial to promote resilience to barriers and adhere to healthier eating regulations (Adams & Leary, 2007; Terry, Leary, Mehta, & Henderson, 2013). Research has highlighted the role of self-compassion in enhancing health outcomes (Neff, Kirkpatrick, & Rude, 2007; Rahimi-Ardabili, Reyonds, Vartanian, McLeod, & Zwar, 2018; Sirois, Kitner, & Hirsch, 2015; van Dam, Sheppard, Forsyth, & Earleywine, 2011), and adding this element into mindful eating interventions may indeed further facilitate healthier eating behaviours (Braun et al., 2012; Mantzios & Wilson, 2014; Mantzios & Wilson, 2015a, b).

Similar to mindfulness, compassion also originates from Buddhism, and in simple terms refers to being able to understand the suffering and distress of another person, and wanting to alleviate such suffering (Gilbert, 2005; Wispe, 1991). Compassion can indeed be extended to the self, whereby one treats themselves with the same understanding and concern when experiencing difficulties as one would treat loved ones with (Neff, 2003a). A definition of self-compassion that is often used in current scientific literature is suggested to involve, taking a kinder approach to oneself with mindful awareness and consideration of personal difficulties as being part of a shared humanity that everyone experiences (Neff, 2003a, b). As the definition implies, self-compassion entails three main components which mutually interact: self-kindness vs self-judgment, feelings of common humanity vs isolation and mindfulness vs over-identification (Neff, 2003a, b). As previously discussed, mindfulness involves purposefully paying attention to the present moment with a non-judgmental attitude, as opposed to fixating with self-relevant thoughts and emotions (Neff, 2003a, b). Secondly, self-kindness refers to being caring and understanding to oneself, and treating personal flaws and inadequacies in a gentle and understanding manner, whilst also using soft and supportive language towards oneself instead of relentlessly criticising or being judgmental (Neff, 2003a, b). Finally, common humanity is the understanding that all people fail and make mistakes and imperfection is part of a shared human condition, instead of feeling and believing that only they make mistakes or have weaknesses (Neff, 2003a, b).

Self-compassion is a personality trait, but it can also be developed as a state (Breines & Chen, 2013; Leary, Tate, Adams, Allen, & Hancock, 2007; Neff & Germer, 2013). An early intervention developed to promote positive feelings of love and kindness was the loving-kindness meditation programme, which involved using phrases that focused on the built-in collective desire to be happy and free from suffering (Salzberg, 1995; Chodron, 1996). The practice of this meditation has led people to develop attitudes of love, compassion and kindness for oneself and others (e.g., Hofmann et al., 2011; Neff & Dahm, 2015; Shapiro, Astin, Bishop & Cordova, 2005). Achieving a self-compassionate approach can be beneficial when dealing with different forms of suffering, such as personal inadequacy and emotional distress (Neff, 2003b, 2009; Neff & McGehee, 2010). Research has shown increased self-compassion is associated with a higher positive affect, better mental health

and greater quality of life (Allen & Leary, 2010; Leary et al., 2007; Neff, 2003b; Neff et al., 2007; van Dam et al., 2011). In addition to psychological well-being, self-compassion may also be beneficial for physiological health (e.g., Dunne, Sheffield, Chilcot, 2016; Homan & Sirois, 2017). For example, self-compassionate people often tend to cope better with stressful events and be less depleted by illness and injury, and are thus able to express self-care to a greater extent (e.g., Allen & Leary, 2010; Brion, Leary, & Drabkin, 2014).

In recent years, self-compassion has been explored within eating behaviours and weight loss. Adams and Leary (2007) explored the effectiveness of self-compassion on restrictive eaters. They investigated whether breaking a diet would lead to an increase in subsequent food intake, as shown in previous research (Herman & Mack, 1975). The findings indicated that participants who were exposed to a self-compassionate induction were able to cope better after breaking their diet, and as a result did not overeat (Adams & Leary, 2007). Since then research has emerged suggesting that self-compassion plays a significant role in weight, eating behaviours and eating disorders (Mantzios & Wilson, 2015b; Rahimi-Ardabili et al., 2018). For example, self-compassion negatively predicted weight gain amongst people in a highly stressful military environment (Mantzios, Wilson, Linnell, & Morris, 2015), and was recently negatively associated with fat and sugar consumption, grazing and motives to eat palatable foods amongst student populations (Mantzios, Egan, Bahia, Hussain, & Keyte, 2018; Mantzios, Egan, Hussain, Keyte, & Bahia, 2018; Mantzios, Egan, Keyte, Bahia, & Hussain, 2018). In addition, greater self-compassion was associated with realistic exercise goals (Magnus, Kowalski, & McHugh, 2010), and less disordered eating behaviours (Webb & Forman, 2013). Self-compassion has also been suggested to be beneficial for body positivity for those with and without eating disorders by breaking the negative cycle of shame, body image dissatisfaction and the drive for thinness (Ferreira, Pinto-Gouveia, Duarte, 2013). Given that such negative factors regarding shame and body dissatisfaction are also often observed amongst those who are dieting, overweight or have obesity (e.g., Chernyak and Lowe, 2010; Conradt et al. 2008; Gavin, Simon, & Ludman, 2010), self-compassion may indeed be beneficial in achieving similar positive outcomes.

Whilst explanations do vary as to how self-compassion can support eating behaviours and weight regulation, the three components of self-compassion (i.e., mindfulness, self-kindness and

common humanity) are suggested to facilitate self-regulatory processes (Neff, 2003a, b; Terry & Leary, 2011). For example, when one breaks a diet, this can lead to feelings of shame and guilt, and result in overconsumption (Adams & Leary, 2007; Polivy, Herman, & Deo, 2010; Herman & Mack, 1975). However, self-compassion can help someone understand that everyone makes mistakes (common humanity), and one should therefore not be too hard on themselves (self-kindness) or be overwhelmed with feelings of guilt and rumination (mindfulness) (Sirois et al., 2015). Furthermore, psychological distress can often lead to unhealthy eating behaviours, eventually affecting weight loss (e.g., Elfhag & Rossner 2005; Lazzeretti et al., 2015). For example, both stress and anxiety can result in the overconsumption of HED foods as a mechanism to cope with unpleasant states (Dallman, 2010); Lazzeretti et al. 2015). Self-compassion, which has been identified as a predictor of coping, is also negatively associated with anxiety and stress (Macbeth & Gumley, 2012; van Dam et al., 2011). As such, self-compassion may act as a successful buffer against some of psychological risk factors associated with obesity, and as obesity also carries a strong social stigma (Puhl & Heuer, 2010), self-compassion may allow a person to cope more proactively (Mantzios & Wilson, 2015a).

1.3.1. Self-Compassion and Mindfulness

Both mindfulness and self-compassion appear to complement one another, and suggest to translate into better outcomes for both mental and physical health (e.g., Braun et al., 2012; Neff & Germer, 2013). For example, previous literature suggested self-compassion amplified the effect of mindfulness training and mediated the relationship between mindfulness and well-being (Birnie, Speca, & Carlson, 2010; Hollis-Walker & Colosimo, 2011; Shapiro et al., 2005). Researchers have also explored the effect of combining the two psychological constructs (i.e., self-compassion and mindfulness) on health outcomes, and findings have been promising (e.g., Mantzios & Wilson, 2015b; Neff & Germer, 2013). For example, Neff and Germer (2013) developed a mindful self-compassion (MSC) programme to improve psychological well-being. The findings suggested that after 8 weekly meetings of participating in mindfulness and self-compassion exercises, participants increased in their life satisfaction, and reduced in their depression, anxiety and stress (Neff & Germer, 2013).

Given that mindfulness and self-compassion appear to amplify the effect of one another in promoting psychological well-being, it would be appropriate to assume that combining the two

constructs could also result in better outcomes for eating behaviours and weight loss. Research conducted by Braun et al. (2012) evaluated the effects of a 5 day yoga programme focusing on mindfulness and self-compassion, and found significant improvements in nutrition behaviours and weight loss up to a 3 month follow-up period. Similarly, other interventions combining self-compassion and mindfulness using psychoeducation in mindful and self-compassion nutrition, as well as practicing mindful exercises and loving kindness meditation found significant improvements in physical fitness measures, unhealthy eating behaviours and BMI after 10 weeks of participation (Horan & Taylor, 2018; Palmeira, Pinto-Gouveia, & Cunha, 2017). In another study, Mantzios and Wilson (2015b) explored the effects of a mindfulness self-compassion programme (i.e., mindfulness and loving-kindness meditation) on weight loss in comparison to a mindfulness meditation group and a control group. The findings showed both mindfulness groups (mindfulness self-compassion vs mindfulness meditation) lost significantly more weight than the control group immediately following the end of the intervention period (i.e., 5 weeks) (Mantzios & Wilson, 2015b). Six months later, the results indicated that the mindfulness self-compassion group continued to lose weight, whilst the mindfulness meditation group displayed no significant differences in weight loss. Finally, at a 1 year follow-up, no significant differences in weight loss were found between all three groups (Mantzios & Wilson, 2015b). However, one potential reason for the non-significant differences in weight loss at a 1 year follow-up could be the result of participants in the mindfulness self-compassion group stopping their practice of meditation after the 6 month follow-up as they may have achieved their weight loss goal (which the authors themselves report in the discussion) or had difficulty adhering to the meditational practice (Mantzios & Wilson, 2015b). As meditation takes time and commitment, it is not uncommon for people to stop their meditation practice or refuse to start (Mantzios & Wilson, 2015b; Miller, Fletcher, & Kabat-Zinn, 1998), bringing us back to the earlier limitations discussed with mindfulness meditation (see 1.2.2. Mindfulness), and in effect, leading to the development of the MCD (Mantzios & Wilson, 2014). Using the MCD, which combines mindfulness, self-compassion and concrete construal messages (without the incorporation of meditation) has shown to promote weight loss and weight maintenance (Mantzios & Wilson, 2014). Such findings suggest that the addition of self-compassion offers more resources to facilitate healthier eating behaviours and weight

loss than mindfulness alone (e.g., Mantzios & Wilson, 2015b). As such, it could be argued that self-kindness and common humanity actively promote mindfulness. Yet, being mindful may also allow a person to notice that they are suffering, which enables them to understand that they are not alone in their suffering, and therefore encourages them to take a kinder approach towards oneself (Mantzios & Wilson, 2014). All in all, including self-compassion within mindfulness interventions does appear to produce an effective means of encouraging healthier eating behaviours and weight loss.

1.3.2. Self-Kindness

One component of self-compassion that has been suggested to be problematic in the self-regulation of eating behaviours is self-kindness (Egan & Mantzios, 2018; Mantzios & Egan, 2017). As previously mentioned, self-kindness is defined as the tendency to be caring and understanding toward oneself instead of being judgmental or critical (Neff, 2003a, b). However, being caring and understanding towards oneself within eating behaviours can be open to interpretation, and may not necessarily be beneficial for promoting physiological health (Mantzios & Egan, 2017). For example, Egan and Mantzios (2017) explored what self-kindness entails amongst a community population, and found wide variations, whereby for some people the act of self-kindness was binge drinking or overindulging on their favourite foods, whilst for others, it involved going for a walk or cooking a nutritious meal. The former group's behaviour reflects self-kindness that only accounts for psychological well-being, whilst the latter group takes into account both psychological and physiological well-being, and reflects a holistic version of self-kindness, and thus, of self-compassion (Neff, 2003a, b, 2010). Synonymizing kindness with compassion in regards to eating behaviours and weight related research can lead to discrepancies, and may not be aligned with Neff's (2003a, b) definition of self-compassion and non-indulgence. Therefore, exploring self-kindness that reflects psychological vs psychological and physiological well-being appears to be warranted in mindfulness and self-compassion interventions for eating behaviour research, and may well be executed through adapting the MCD with simple linguistic changes.

1.4. Self-Distancing

Reflecting on emotions, particularly those that are negative and traumatic has shown to be beneficial for both physical and mental well-being, such as enhanced immune functionality and long

term mood improvements (e.g., Creswell et al., 2007; Frisina, Borod, & Lepore, 2004; King & Miner, 2000; Pennebaker & Chung, 2011; Wilson & Gilbert, 2008). It is suggested that by trying to understand why one might feel certain emotions, it allows people to develop explanations for their negative experiences, which in effect, provides them with emotional relief (Graybeal, Sexton, & Pennebaker, 2002; Gross, 2013; Kross & Ayduk, 2011). However, other researchers have found that re-experiencing negative thoughts and feelings can also lead to a person ruminating and feeling more distressed (Nolen-Hoeksema, 1991; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Smith & Alloy, 2009). Research has since been conducted on exploring the psychological mechanisms between adaptive vs maladaptive forms of self-reflection, and one concept that has shown to successfully address this distinction is psychological distance (e.g., Ayduk & Kross, 2008; Kross, Ayduk, & Mischel, 2005; Mischowski, Kross, & Bushman, 2012).

Distancing refers to the ability of being able to adapt an egocentric point of view, that is being able to think of oneself from the perspective of a distanced observer (or sometimes referred as "fly on the wall") (Ayduk & Kross, 2010a, b). For example, consider Zarah – a university student who is trying to lose weight and had a chocolate cake, she now feels guilt and shame after breaking her diet. To understand her feelings, Zarah might recall and experience the situation from her own perspective, and by doing so, Zarah might think "Why did I eat the chocolate cake?". Here, Zarah is focusing on her feelings from a *self-immersed* perspective - the self who is experiencing the failure and the self who is reasoning are the same (Kross & Ayduk, 2011). However, if Zarah takes a step back when attempting to reason about the past experience, and takes on a distanced point of view (e.g., fly on the wall), she might think "Why did Zarah eat the chocolate cake?". Now, Zarah is focusing on her feelings from a *self-distanced* perspective - the self who is experiencing the argument and the self who is reasoning are psychologically separated (Grossman & Kross, 2014; Kross & Ayduk, 2011). People who are self-immersed (i.e., look at a perspective from their own eyes) whilst analysing distressing memories are predisposed to focus narrowly on *recounting* the intense details of their experience which could perpetuate further negative emotions (e.g., Kross et al., 2005; Kross & Ayduk, 2008; Kross & Ayduk, 2017). Whereas, when people adopt a self-distanced perspective (i.e., look at a perspective from a distant observer), they can understand the broader context of the situation

by being able to step away from the role of a victim and *reconstrue* their experience, which in turn could lead to less distress (e.g., Kross et al., 2005; Kross & Ayduk, 2008; Kross & Ayduk, 2017).

Research has been conducted on how people can achieve a self-distanced perspective, and it has been suggested that patterns of language, specifically the use of non-first pronouns and using one's name can promote self-distancing (Cohn, Mehl, & Pennebaker, 2004; Grossmann & Kross, 2010; Mcisaac & Eich, 2002; Kross & Ayduk, 2017). For example, research on expressive writing has found the fewer first-person pronouns people used when writing about emotional experiences, the more they attempted to distance themselves from those particular experiences (e.g., Cohn et al., 2004). Kross et al. (2014) demonstrated that using non-first person pronouns and one's name instead of first-person pronouns not only enhanced participants' self-distancing, but those participants also performed better on stress tasks and appraised future stressors in more challenging and less threatening terms. Thus, suggesting that simple shifts in speech and language that people use when referring to the self can enhance the notion of self-distancing, and allow a person to think of themselves through the perspective of someone else whose thoughts and feeling they have access to (Kross et al., 2014).

The benefits of self-distancing have indeed been explored in regards to both short term and long term effects (e.g., Abler, Erk, Herwig, & Walter, 2007; Dorfman, Oakes, Santos, & Grossman, 2019; Kross & Ayduk, 2008; Nezlek & Kuppens, 2008; Park, Ayduk, & Kross, 2016). Research has shown that using a self-distanced perspective can enable a person to express self-control when faced with short term temptation or gratification (e.g., Fujita, Trope, Liberman & Levin-Sagi, 2006; Kober et al., 2010). In another study, Kross and Ayduk (2008) found participants who analysed their negative experiences from a self-distanced perspective experienced less emotional distress when thinking about the same experience again up to 1 week later than those who initially self-immersed. More recently, this effect has shown to successfully last up to 6 months (Park et al., 2016). Negative experiences do not only affect feelings, but they also have an impact on a person's physiological health (Kross & Ayduk, 2011; Park et al., 2016). For example, when a person thinks about a negative experience, their blood pressure during this state also rises, and this can increase over time especially if people ruminate, (i.e., usually those who analyse their experience from a self-immersed

perspective) (Brosschot, Gerin, & Thayer, 2006). However, those who adopt a self-distanced perspective display less cardiovascular reactivity and can return to baseline faster than those who self-immerse (Ayduk & Kross, 2008). Additionally, research on neurophysiology and self-distancing has found after adopting a self-distanced strategy when recalling a negative experience (compared to a self-immersed perspective), participants presented reduced activity in a network of cortical midline regions (Kross, Davidson, Weber, & Ochsner, 2009). Increased activity in similar sets of regions is often found amongst people who are clinically depressed (Greicius et al., 2007), and such depressed individuals may indeed reflect on their experiences from a self-immersed perspective, suggesting self-distancing could be beneficial for clinical needs (Kross & Ayduk, 2011).

Furthermore, whilst self-distancing and distraction are suggested to be equally as effective in reducing negative affect in the short term, over time this effect is distinguished (e.g., Kross & Ayduk, 2008), as distraction does not allow people to directly deal with the source of their negative emotions (Gross, 2013). For example, if someone is upset or stressed, as a means of distracting themselves, they may use food (e.g., ordering takeout or going out for a meal), and during this time, they may indeed feel better (Geliebter & Aversa, 2003; Wegner et al., 1987). However, when this meal is over, they are then reminded of their concern, and their negative emotions return (Kross & Ayduk, 2008; Kross & Ayduk, 2011). Attempting to distract oneself from one's negative experience can instead result in the person becoming more preoccupied as they are repeatedly thinking about the situation instead of getting emotional relief (Cribb, Moulds, & Carter, 2006; Moulds, Kandris, Starr, & Wong, 2007). Therefore, the notion of self-distancing appears to derive both immediate and delayed benefits.

1.4.1. Self-Distancing and Mindfulness

Whilst psychological distance from the situation has been considered as not adhering to mindfulness principles (Mantzios & Wilson, 2014; also see 1.2.3. Mindfulness), distancing oneself from the situation may be a means of overcoming any negative affect that arises and disrupts the mindful and self-compassionate engagement within a situation. The concept of self-distancing overlaps with a specific component of mindfulness, namely decentring (Hayes-Skelton & Graham, 2013; Papies, 2017; also see 1.2 Mindfulness), which emphasises the importance of enhancing psychological distance for people to observe and accept both their thoughts and feelings that arise

(e.g., Fresco, Segal, Buis, & Kennedy, 2007; Hayes, Luoma, Bond, Masuda, & Lillis, 2006). CLT suggests psychological distance provides people with the opportunity to embrace a broader perspective, allowing them to see the "bigger picture" of events that help achieve long term goals and promote positive changes in the self (Fujita et al., 2006; Libby, Eibach, & Gilovich, 2005; Liberman & Trope, 2008). For example, body weight is often considered as a long term goal, whereby people aim to either lose or maintain a certain amount of weight over a period of time (e.g., Bray, Look, & Ryan, 2013; Linde, Jeffery, Finch, Ng, & Rothman, 2004), and psychological distance may thereby facilitate in achieving this goal by indirectly encouraging one to eat healthier foods. Research on self-distancing has so far been explored within psychological well-being and some elements of physiological health (e.g., cardiovascular reactivity) (Ayduk & Kross, 2008; Kross et al., 2014). However, research has not yet explored self-distancing and eating behaviours. Manipulating the MCD to create a more self-distanced perspective may well assist the diary to become less judgmental, and more of an accepting tool, and in effect, encourage healthier eating behaviours and sustain long term goals of weight loss and weight maintenance.

1.5. Summary, Aims and Outline

1.5.1. Summary of the Literature Review

The prevalence of obesity has become a "public health war" (Salas, 2015), impacting both psychological and physiological well-being (Kopelman, 2007; Phelen et al., 2015). Unfortunately, SBTs for weight loss have not been met with successful long term outcomes (e.g., Greenway, 2015). As a result, lifestyle interventions that promote positive psychological constructs, such as mindfulness and self-compassion have been suggested as a means to enhance health outcomes (e.g., Neff & Germer, 2013). The findings from both mindful eating and self-compassion interventions have shown to be promising in facilitating healthier eating behaviours and weight loss (Dalen et al., 2010; Mantzios & Wilson, 2014; Mantzios & Wilson, 2015b; Rahimi-Ardabili et al., 2018). However, the requirement of meditation that is involved in such interventions can often be difficult to follow, resulting in people ceasing their meditation practice, and eventually ending their weight loss progress (Mantzios & Wilson, 2015b). As an alternative to meditation, the MCD – a tool consisting of mindful, self-compassionate and concrete construal messages is suggested to perform similarly to a

mindfulness and self-compassion meditation programme in improving eating behaviours and weight loss (Mantzios & Wilson, 2014). However, one element of self-compassion that may be problematic within eating behaviours is self-kindness (Egan & Mantzios, 2018). Research has suggested that being kind to oneself may not necessarily promote behaviours that are considered to be physiologically healthy, and emphasis on holistic self-care may be needed (Mantzios & Egan, 2017). Furthermore, the concept of self-distancing has been identified in past research as a significant contributor towards emotional regulation, and has shown to improve psychological well-being, and to an extent physiological health (Ayduk & Kross, 2008; Kross & Ayduk., 2017; Kross et al., 2014). Given that emotional distress is often associated with maladaptive eating (Dallman, 2010; Lazzeretti et al., 2015), the concept of self-distancing may also assist with promoting healthier eating behaviours.

1.5.2. Aim of the Thesis

Since weight loss is suggested to be brought by reductions in energy intake (relative to energy expenditure), exploring measures, such as consumption of food (i.e., calorie intake and grams consumed) and food choice may be beneficial in preventing weight gain and obesity, as well as contributing towards weight loss, and importantly, weight maintenance. The current thesis presents a series of studies that examine the effects of psychological constructs, such as mindfulness, mindful eating, self-compassion, self-kindness and self-distancing on eating behaviours. The main aim of the thesis is to explore such psychological constructs through means that are easy to implement and practical in facilitating the reduction of energy intake, and ultimately promoting healthier eating behaviours.

1.5.3. Outline of the Thesis

The following Chapter (Chapter 2) will discuss the general methodology of the empirical Chapters. Chapter 3 will explore the association between mindfulness, mindful eating and self-compassion on eating behaviours amongst patients who have clinical obesity. Directly assessing the three psychological constructs with unhealthy and maladaptive eating behaviours will provide a better understanding of developing lifestyle interventions that may eventually assist with weight loss and weight maintenance. Chapter 4 will explore the effect of mindfulness using the MCD on attentional biases towards food cues using eye-tracking. Chapter 5 and Chapter 6 will explore the effect of

mindfulness on directly reducing energy intake. Chapter 5 will specifically investigate whether using the MCD can reduce the portion size effect, and Chapter 6 will examine whether using the MCD can reduce consumption of HED foods and instead promote intake of LED foods. Chapter 7 will explore the effects of self-kindness in reducing energy intake using a similar methodology of HED vs LED foods as Chapter 6. The MCD will be adapted through linguistic changes that reflect kindness to psychological well-being or kindness that reflects psychological and physiological well-being. Chapter 8 will explore self-distancing and the effect on energy intake through chocolate consumption after a negative state affect. Similar to Chapter 7, the MCD will be adapted through linguistic changes that reflect a self-immersed or self-distanced perception. Chapter 9 will explore whether mindfulness can be implemented without the use of any mindfulness interventions or tools, but instead through simple environmental cues, such as music. Exploring music as a primary environmental priming tool may be an effortless and effective way to eat more mindfully, and lead to reduced intake of HED foods. Chapter 10, the final Chapter, will provide an overview of the findings for each Chapter of the current thesis, and discuss the results in light to previous research. The limitations and future directions of the current research will be discussed, and finally, clinical implications will be considered.

CHAPTER 2: GENERAL METHODOLOGY

2.1. Introduction

Chapter 2 will provide an overview of the methods used within the current thesis. Seven research studies were conducted (from Chapter 3 to Chapter 9), and information on sample and recruitment, measures administrated and data analysis are reported. Further detail on the methods of each study can be found in individual research Chapters.

2.2. Ethical Approval

Ethical approval was granted for each of the research studies (Chapter 3 to Chapter 9) from the Business, Law and Social Sciences Ethical Review Committee of Birmingham City University. Furthermore, as the recruitment and data collection for Chapter 3 was conducted within a clinical setting, ethical approval was also provided by the NHS Ethical Review Committee. The ethical approval letters for each research Chapter can be found from Appendix B1 to Appendix B6.

2.3. Overview of Research Chapters

2.3.1. Chapter 3/Study 1: Exploring the association between self-compassion, mindfulness and mindful eating with eating behaviours amongst patients with obesity

2.3.1.1 Sample and Recruitment Procedure

One hundred and one participants with obesity were voluntarily recruited at their first group session appointment at a tier 3 medical weight management service. A power analysis determined that, with alpha set at .05 and power set at .08, 67 participants were required to detect a medium effect size (Cohen, 1992). The participants were approached by the researcher, who provided them with an overview of what the study entails. Participants under the age of 18 years, those who lacked capacity (identified by their consultant), those who had been diagnosed with an eating disorder and non-English speakers were not eligible to participate. Furthermore, those who participated in the study did not receive any compensation for their participation.

2.3.1.2. Measures Used In Chapter 3/Study 1

In Chapter 3/Study 1, participants were asked to provide background information, such as age, gender, height, weight, ethnicity, education and employment status. The self-compassion scale

(SCS), five-facet mindfulness questionnaire-short form (FFMQ-SF), mindful eating scale (MES), Dutch eating behaviour questionnaire (DEBQ), grazing scale (GS) and dietary fat and sugar-short questionnaire (DFS-SQ) were administered to participants. Further information on the measures can be found in section 2.4.

2.3.2. Chapter 4/Study 2: Exploring mindfulness and visual attentional biases towards food cues: preliminary findings

2.3.2.1 Sample and Recruitment Procedure

Fifty participants attending a university in West Midlands, UK were recruited via an online research participation scheme at the institution, and they received course credit for their participation. A power analysis determined that, with alpha set at .05 and power set at .08, 50 participants were required to detect a large effect size (Cohen, 1992). Participants were randomly allocated by the researcher to one of two conditions, mindfulness or control, continuously. For example, if participant one was assigned to the mindfulness condition, participant two was allocated to the control condition, participant three would then be assigned to the mindfulness condition, and participant four was assigned to the control condition, and this cycle would be repeated until recruitment was complete. Participants were not eligible to participate in Study 2 (Chapter 4) if they had been diagnosed with an eating disorder, had any food allergies, intolerances, special dietary requirements or if they participated in other research studies within the thesis.

2.3.2.2. Measures Used In Chapter 4/Study 2

In Chapter 4/Study 2, participants were asked to provide background information, such as age, gender, height, weight and ethnicity. Participants also completed a hunger measure, the state mindfulness scale (SMS) and dietary fat and sugar-short questionnaire (DFS-SQ). The DFS-SF was specifically used to control for any effect that usual consumption of fat and sugar may have on attentional biases towards food cues (Nijs, Franken, & Murris, 2010). Further information on the measures can be found in section 2.4.

2.3.3. Chapter 5/Study 3: Exploring mindfulness and the portion size effect

2.3.3.1 Sample and Recruitment Procedure

One hundred and twenty participants attending a university in West Midlands, UK were recruited via an online research participation scheme at the institution, and they received course credit for their participation. A power analysis determined that, with alpha set at .05 and power set at .08, 111 were needed to achieve a medium to large effect. Randomisation was conducted by the researcher, whereby each participant was assigned to either condition one, two, three or four continuously. For example, if participant one was assigned to condition one, participant two would be allocated to condition 2, participant three would then be selected to condition three, and participant four would be assigned to condition 4, and the same cycle would be repeated for participant five and so on. Participants were not eligible to participate in Study 3 (Chapter 5) if they had been diagnosed with an eating disorder, had any nut allergies or if they participated in other research studies within the thesis.

2.3.3.2. Measures Used In Chapter 5/Study 3

In Chapter 5/Study 3, participants were asked to provide background information, such as age, gender, height, weight and ethnicity. Participants also completed a hunger measure, the five-facet mindfulness questionnaire-short form (FFMQ-SF) and mindful eating scale (MES). The FFMQ-SF and MES were specifically used to control for any effect they may have had on the experimental manipulation, as previous research has suggested that those measures can have an impact on consumption (Jordan et al., 2014). Further information on the measures can be found in section 2.4.

2.3.4. Chapter 6/Study 4: Exploring mindfulness and the promotion of healthier food choices

2.3.4.1 Sample and Recruitment Procedure

Eighty-five participants attending a university in West Midlands, UK were recruited via an online research participation scheme at the institution, and they received course credit for their participation. A power analysis determined that, with alpha set at .05 and power set at .08, 85 participants were required to detect a medium to large effect size (Cohen, 1992). Participants were randomly allocated by the researcher to one of two conditions, mindfulness or control, continuously. For example, if participant one was assigned to the mindfulness condition, participant two was allocated to the control condition, participant three would then be assigned to the mindfulness condition and participant four was assigned to the control condition, and this cycle would be repeated

until recruitment was complete. Participants were not eligible to participate in Study 4 (Chapter 6) if they had been diagnosed with an eating disorder, had any nut allergies or if they participated in other research studies within the thesis.

2.3.4.2. Measures Used In Chapter 6/Study 4

In Chapter 6/Study 4, participants were asked to provide background information, such as age, gender, height, weight and ethnicity. Participants also completed a hunger measure, usual intake of fruit and vegetable, the state mindfulness scale (SMS), five-facet mindfulness questionnaire-short form (FFMQ-SF) mindful eating scale (MES) and three-factor eating questionnaire (TFEQ). The TFEQ was specifically added to control for other eating behaviour patterns (e.g., emotional, external and restrained) that could have an effect on the findings. Further information on the measures can be found in section 2.4.

2.3.5. Chapter 7/Study 5: Exploring the role of self-kindness in making healthier food choices: preliminary findings

2.3.5.1 Sample and Recruitment Procedure

Ninety participants were recruited via opportunity sampling from a university in West Midlands, UK during university open days, a day whereby prospective students come to the campus with their friends and family to explore the university. As such, participants were not compensated with any course credit for their participation as they were in Chapters 4 to 6. A power analysis determined that, with alpha set at .05 and power set at .08, 90 participants were required to detect a medium to large effect size (Cohen, 1992). Participants were randomly allocated by the researcher to one of two conditions, self-kindness to mind or self-kindness to mind and body, continuously. For example, if participant one was assigned to the self-kindness to mind condition, participant two was allocated to the self-kindness to mind and body condition, participant three would then be assigned to the self-kindness to mind condition, and participant four was assigned to the self-kindness to mind and body condition, and this cycle would be repeated until recruitment was complete. As participants were recruited on university open days, it could be determined that they would not have participated in any other studies within the thesis, and as such the only eligible criteria to participate in Study 5

(Chapter 7) was that participants should not be diagnosed with an eating disorder or have any nut allergies.

2.3.5.2. Measures Used In Chapter 7/Study 5

In Chapter 7/Study 5, participants were asked to provide background information, such as age, gender, height, weight and ethnicity. Participants also completed a hunger measure, usual intake of fruit and vegetable, state self-compassion scale (SSCS) and three-factor eating questionnaire (TFEQ). Further information on the measures can be found in section 2.4.

2.3.6. Chapter 8/Study 6: Exploring the effects of mindfulness and self-distancing on chocolate intake after a negative state affect

2.3.6.1 Sample and Recruitment Procedure

One hundred and twenty participants were recruited via opportunity sampling from a university in West Midlands, UK during university open days, a day whereby prospective students come to the campus with their friends and family to explore the university. As such, participants were not compensated with any course credit for their participation as they were in Chapters 4 to 6. A power analysis determined that, with alpha set at .05 and power set at .08, 120 participants were required to detect a medium to large effect size (Cohen, 1992). Participants were randomly allocated by the researcher to one of three conditions, self-immersed, self-distanced or control, continuously. For example, if participant one was assigned to the self-immersed condition, participant two was allocated to the self-distanced condition, participant three would then be assigned to the control condition, and this cycle would be repeated until recruitment was complete. As participants were recruited on university open days, it could be determined that they would not have participated in any other studies within the thesis, and as such the only eligible criteria to participate in Study 6 (Chapter 8) was that participants should not be diagnosed with an eating disorder or have any food allergies.

2.3.6.2. Measures Used In Chapter 8/Study 6

In Chapter 8/Study 6, participants were asked to provide background information, such as age, gender, height, weight and ethnicity. Participants also completed a hunger measure, the state mindfulness scale (SMS) and Dutch eating behaviour questionnaire (DEBQ). As a particular measure of interest was emotional eating, the DEBQ is suggested to provide a more detailed analysis of

emotional eating than the TFEQ (Arnow, Kenardy, & Agras, 1995), and as such it was used to explore any effect it may have had on the findings. Further information on the measures can be found in section 2.4.

2.3.7. Chapter 9/Study 7: Exploring the environmental manifestation of types of music on reinforcing mindfulness and concurrent energy intake

2.3.7.1 Sample and Recruitment Procedure

One hundred participants were recruited via opportunity sampling from a university in West Midlands, UK during university open days, a day whereby prospective students come to the campus with their friends and family to explore the university. As such, participants were not compensated with any course credit for their participation as they were in previous Chapters. A power analysis determined that, with alpha set at .05 and power set at .08, 100 participants were required to detect a medium to large effect size (Cohen, 1992). Participants were randomly allocated by the researcher to one of three conditions, classical music, popular music or control, continuously. For example, if participant one was assigned to the classical music condition, participant two was allocated to the popular music condition, participant three would then be assigned to the control condition, and this cycle would be repeated until recruitment was complete. As participants were recruited on university open days, it could be determined that they would not have participated in any other studies within the thesis, and as such the only eligible criteria to participate in Study 6 (Chapter 8) was that participants should not be diagnosed with an eating disorder or have any food allergies.

2.3.7.2. Measures Used In Chapter 9/Study 7

In Chapter 9/Study 7, participants were asked to provide background information, such as age, gender, height, weight and ethnicity. Participants also completed a hunger measure, the state mindfulness scale (SMS) and three-factor eating questionnaire (TEFQ). Further information on the measures can be found in section 2.4.

2.4. Measures of Mindfulness, Mindful Eating, Self-Compassion, Positive and Negative Affect, and Eating Behaviours

2.4.1. Trait and State Mindfulness

2.4.1.1. Five-Factor Mindfulness Questionnaire-Short Form (FFMQ-SF; Bohlmeijer, Klooster, Fledderus, Veehof, & Baer, 2011)

The FFMQ is a 24 item scale measuring trait mindfulness. It originated from the 39 item FFMQ (Baer, Smith, & Allen, 2004), which was developed by integrating items from previous mindfulness scales, such as the Mindfulness Attention Awareness Scale (Brown & Ryan, 2003), Freiburg Mindfulness Inventory (Buchheld et al. 2001), and Kentucky Inventory of Mindfulness Skills (Baer et al. 2004). The FFMQ-SF measures five main characteristics of mindfulness: observing, describing, non-reactivity, acting with awareness and non-judging. The observing subscale assesses one's ability to observe inner experiences and responses to stimuli (e.g., "when I have distressing thoughts or images, I just notice them and let them go"). The describing subscale measures one's ability to express thoughts and feeling through words (e.g., "Even when I'm feeling terribly upset, I can find a way to put it into words"). The non-reactivity subscale measures one's ability to process emotionally provocative stimuli without reacting (e.g., "When I have distressing thoughts or images, I just notice them and let them go"). The acting with awareness subscale measures one's tendency to make conscious actions rather than functioning automatically without thought or reflection (e.g., "I rush through activities without being really attentive to them"). The non-judging subscale measures the tendency to accept one's inner state instead of judging thoughts and emotions as good or bad (e.g., "I make judgments about whether my thoughts are good or bad"). Each item is scored from 1 (*never or very rarely true*) to 5 (*very often or always true*), with overall scores range from 24 to 120. The FFMQ-SF has been found to be reliable and has been validated cross-culturally and against different populations, such as community, students and clinical (e.g., Asensio-Martinez et al., 2019; Bohlmeijer et al., 2011; Clarkson, Hodgson, & Probst, 2019; Meng, Mao,& Li, 2020; Tran, Gluck, & Nader, 2013). The FFMQ-SF has also been widely explored within mindfulness and eating behaviour research (e.g., Levoy et al., 2017; Tak et al., 2015), and as such it was used as a measure for trait mindfulness within the current thesis. The internal consistency of the FFMQ-SF has been tested and reported in individual research Chapters.

2.4.1.2. State Mindfulness Scale (SMS; Tanay & Bernstein, 2013)

The SMS is a 21 item tool that reflects on traditional and contemporary psychological science models of mindfulness to assess objects (e.g., bodily sensations and mental events) and qualities (e.g., curiosity, intimacy, sensitivity to experience) in different contexts (e.g., daily living, mindfulness meditation, MCD), making it a suitable measure for state mindfulness in the present thesis. Sample items include "I clearly physically felt what was going on in my body" (bodily sensation) and "I noticed pleasant and unpleasant thoughts" (mental events). Responses range from 1 (*not at all*) to 5 (*very well*), with total scores varying from 21 to 105. The SMS has been found to be reliable, and has been validated cross culturally and against different populations as well contexts (e.g., students, community populations, meditation naïve vs experienced meditators, and controlled lab settings in response to mindfulness interventions; Allirot et al., 2017; Bravo, Pearson, Wilson, & Witkiewitz, 2018; Hussein, Egan, & Mantzios, 2017; Koval & Todaman, 2015). Furthermore, previous findings have generally suggested that relative to control conditions, mindfulness training or attention does lead to increased SMS scores (e.g., Luberto & McLeish, 2018; Paz, Zvielli, Goldstein, & Bernstein, 2017). Participants within the thesis completed the SMS before (pre) and after (post) experimental manipulations (e.g., MCD or music). Further detail on this can be found within individual research Chapters, as well as information on internal consistency of the SMS.

2.4.2. Mindful Eating

2.4.2.1 Mindful Eating Scale (MES; Hulbert-Williams, Nicholls, Joy, & Hulbert-Williams, 2014)

The MES is a 28 item scale used to assess mindful eating patterns. The items for the MES were pooled from items in the FFMQ (Baer et al., 2004) and the Philadelphia Mindfulness Scale (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008), and were adapted to eating-specific behaviours to be in line with standard definitions of mindfulness. The MES consists of six subscales: acceptance, awareness, non-reactivity, routine, act with awareness and unstructured eating. Sample items include "I criticise myself for the way I eat" (acceptance), "I notice flavours and textures when I'm eating my food" (awareness), "I can tolerate being hungry for a while" (non-reactivity), "I have a routine for when I eat" (routine), "I eat something without really being aware of it" (act with awareness) and "I multi-task whilst eating" (unstructured eating). Convergent validity for MES has been demonstrated through positive associated with mindfulness, and it has also been widely used

within mindful eating research, displaying high reliability (e.g., Kerin, Webb, Zimmer-Gembeck, 2019) and as such it was used to measure mindful eating patterns within the current thesis. The internal consistency of the MES has been tested and reported in individual research Chapters.

2.4.3. Trait and State Self-Compassion

2.4.3.1. Self-Compassion Scale (SCS; Neff, 2003b)

The SCS is a 26 item tool measuring trait self-compassion. It was developed to represent the thoughts, emotions and behaviours that are associated with the six components of self-compassion: self-kindness vs self-judgment, common humanity vs isolation, and mindfulness vs over-identification. Sample items include "I try to be loving towards myself when I'm feeling emotional pain" (self-kindness), "I'm disapproving and judgmental about my own flaws and inadequacies" (self-judgment), "When things are going badly for me, I see the difficulties as part of life that everyone goes through" (common humanity), "When I think about my inadequacies, it tends to make me feel more separate and cut off from the rest of the world" (isolation), "When I'm feeling down I try to approach my feelings with curiosity and openness" (mindfulness) and "When I fail at something important to me I become consumed by feelings of inadequacy" (over-identification). Scores range from 1 (*almost never*) to 5 (*almost always*), and total scores vary from 26 to 130 (Neff, 2003). The reliability of the SCS has shown to be consistent across several studies (e.g., Neff and Pommier 2013; Werner et al., 2012), and the SCS has also been validated against a wide variety of populations (e.g., student, community and clinical), as well as cross-culturally (Neff, 2003b; Castilho, Pinto-Gouveia, & Duarte, 2015; Lee & Lee, 2010). The SCS has also been widely used within research exploring eating behaviours and obesity, with greater weight loss and healthier eating behaviours often associated with higher levels of self-compassion. Therefore, the SCS was used to measure trait self-compassion within the current thesis. The internal consistency of the SCS has been tested and reported in individual research Chapters.

2.4.3.2. State Self-Compassion Scale (SSCS; Breines & Chen, 2013)

The SSCS is a 16 item tool adapted from the original SCS (Neff, 2003b). The SSCS aims to reflect emotions, behaviours and thoughts that are associated with one's current state of self-compassion. At least two items from each subscale (see above) were included in the adapted SSCS in

order to exhibit a full perspective of the original SCS (Neff, 2003b). Sample items include “Right now, I'm trying to be kind and reassuring to myself” (self-kindness), “Right now, I'm being hard on myself” (self-judgment), “Right now, everyone makes mistakes sometimes” (common humanity), “Right now, I feel like other people have it easier than me” (isolation), “Right now, in the scheme of things, this is not that big of a deal” (mindfulness) and “Right now, I keep thinking about what happened” (over-identification). Responses range from 1 (*strongly disagree*) to 7 (*strongly agree*), with total scores varying from 16 to 112. The SSCS has shown to be positively associated with the trait SCS and have good reliability (Breines & Chen, 2013). Participants in the current study were instructed to complete the SSCS measure before (pre) and after (post) experimental manipulations (e.g., MCD). The internal consistency of the SSCS has been tested and reported in individual research Chapters.

2.4.4. Positive and Negative Affect

2.4.4.1. Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988)

The PANAS is a scale deigned to measure both positive and negative affect. Positive affect reflects the extent to which a person experiences pleasant engagement, whereas, negative affect represents a general dimension of unpleasant engagement. The current thesis administrated the negative affect subscale, and example items include “Distressed” and “Upset”. Responses range from 1 (*very slightly or not at all*) to 5 (*extremely*), with total scores varying from 10 to 50. The PANAS is a widely used tool that has shown high reliability and has been validated against different populations and cultures (DePaoli & Sweeney, 2000; Gaudreau, Sanchez, & Blondin, 2006; Von Humboldt, Monteiro, & Leal, 2017). Participants were instructed to complete the negative affect measure at baseline, pre experimental manipulation and post experimental manipulation. The internal consistency of the PANAS has been tested and reported in individual research Chapters.

2.4.5. Eating Behaviours

2.4.5.1. Three-Factor Eating Questionnaire (TFEQ; Karlsonn, Persson, Sjostrom & Sullivan, 2000)

The TFEQ is an 18 item tool originating from the 51 item scale (Srunkard & Messick, 1985), and consists of three specific measures of eating behaviours: emotional eating, uncontrolled eating and restrained eating. Sample items include “I deliberately take small helpings as a means of

controlling my weight" (emotional eating), "I am always hungry so it is hard for me to stop eating before I finish the food on my plate" (uncontrolled eating) and "When I smell a delicious food, I find it very difficult to keep from eating, even if I have just finished a meal" (restrained eating). Responses range from 1 (*definitely false*) to 4 (*definitely true*), with overall scores ranging from 18 to 76. The TFEQ has shown high reliability, and has been validated in several studies against different populations (e.g., student, community and clinical) and cultures (Angle et al., 2009; Martins, da Silva, Maroco, & Campos, 2020; Mostafavi et al., 2017). The internal consistency of the TFEQ has been tested and reported in individual research Chapters.

2.4.5.2. Dutch eating behaviour questionnaire (DEBQ; van Strien et al., 1986)

The DEBQ is a 33 item scale, and involves three eating style measures: emotional eating, external eating and restrained eating. Sample items include "Do you have a desire to eat when you are feeling lonely?" (emotional eating), "Do you find it hard to resist eating delicious foods?" (external eating) and "Do you deliberately eat less in order to not become heavier?" (restrained eating). Responses range from 1 (*never*) to 5 (*very often*), and overall scores vary from 33 to 165. The DEBQ has been widely administrated, often showing high reliability and validity within different populations (e.g., student, community and clinical) and cross-culturally (Baradda, van Strien, & Cebolla, 2016; Cebolla, Barrada, van Strien, & Banos, 2014; Wu, Cai, & Luo, 2017). The internal consistency of the DEBQ has been tested and reported in individual research Chapters.

2.4.5.3. Hunger Measure

To assess hunger, participants were asked at the start of the experimental sessions "How hungry do you feel right now?" with responses ranging from 1 (*not at all*) to 5 (*extremely hungry*).

2.4.5.4. Usual Intake of Fruit and Vegetable

To assess daily intake of fruit and vegetable, participants were asked "How many portions of fruit and vegetables do you normally eat a day?" in order to get a representative measure of usual fruit and vegetable intake (Robinson, Fleming, & Higgs, 2014).

2.4.5.5. Grazing Scale (GS; Lane& Szabo, 2013)

The GS consists of 8 items measuring behaviours and cognitions specific to grazing. Sample items include "Have you ever felt compelled or driven to eat, even when not hungry?" (grazing

behaviours) and “Do you have a feeling that you have lost control over your eating while ‘grazing’?” (grazing cognitions). Responses range from 1 (*rarely*) to 5 (*all of the time*) and scores range from 8 to 32. The GS has shown to be positively associated with other maladaptive eating behaviours, such as binge eating, as well as displaying good reliability (Lane & Szabo, 2013; Mantzios, Egan, Bahia, et al., 2018). The internal consistency of the GS has been tested and reported in individual research Chapters.

2.4.5.6. Dietary Fat and Free Sugar—Short Questionnaire (DFS-SQ; Francis & Stevenson, 2013)

The DFS-SF is a 26 item scale measuring dietary fat and sugar intake. Twenty-four items of the DFS-SQ require participants to recall the frequency of consumption of food groups eaten in the last 12 months, and the last two items are concerned with the frequency of eating away from home and the added sugar to food and beverages. Sample items include “Fried chicken or chicken burgers” (fat) and “Cakes, cookies” (sugar). Responses range from “1 per month or less” to “5 + per week”, and overall scores range from 26 to 130. The DFS-SQ has displayed good reliability and has been validated against different populations (e.g., clinical and non-clinical; Francis & Stevenson, 2013; Fromm & Horstmann, 2019). The internal consistency of the DFFS-SF has been tested and reported in individual research Chapters.

2.5. Data Analysis

SPSS v24, statistical software, was used to analyse the data. Descriptive statistics were run to determine characteristics/background information, such as gender, age, BMI and ethnicity of the participants in Chapter 3, Chapter 4, Chapter 5, Chapter 6, Chapter 7, Chapter 8 and Chapter 9.

In Chapter 3, Pearson’s bivariate correlations were conducted to assess the associations between self-compassion, mindfulness and mindful eating with eating behaviours, such as emotional, restrained, external, fat and sugar consumption and grazing. Next, external eating and emotional eating were tested as mediators between self-compassion, mindfulness, mindful eating and fat and sugar consumption and grazing. A mediation approach was chosen because it allowed the independent contribution of each mediator as part of an indirect pathway from variable A to variable B to be estimated. A significant indirect pathway is inferred if the lower and upper limit confidence intervals do not cross zero (Hayes, 2017). According to Baron and Kenny (1986), mediation analyses require

the four following steps: (1) Variable A (i.e., self-compassion, mindfulness or mindful eating) is significantly associated with the mediator (i.e., external eating or emotional eating), (2) Variable A (i.e., self-compassion, mindfulness or mindful eating) is significantly associated with the variable B (i.e., fat and sugar consumption or grazing) (3) the mediator (emotional eating or external eating) is significantly associated with variable B (i.e., fat and sugar consumption or grazing) and (4) the relationship between variable A (i.e., self-compassion, mindfulness or mindful eating) and variable B (i.e., fat and sugar consumption or grazing) should be significantly reduced after controlling for the mediator (external eating or emotional eating). The Mediation models were tested using the SPSS PROCESS Macro v3.5 (Hayes, 2017).

In chapter 4, Chi square analysis was used to account for differences in gender between the two conditions, and t-tests were conducted to explore for differences in hunger, BMI, age and fat and sugar consumption. 2 X 2 ANOVAs were conducted to test for differences in state mindfulness, gaze direction bias and gaze duration bias between the two conditions. Participants' hunger and characteristics were also tested as covariates using ANCOVA to assess whether they had any effect on the dependent variables, and if any significant effects were observed, they were followed up with post hoc tests.

In chapter 5, Chi square was used to account for differences in gender across the four conditions, and one way between group ANOVAs were conducted to test for differences in hunger, BMI, age, mindfulness and mindful eating. Furthermore, a 2 X 2 ANOVA was conducted to test the effect of mindfulness and portion size on energy intake, and any significant findings were followed up with Tukey HSD tests. Hunger and participant characteristics were tested as covariates to assess whether they had any effect on energy intake, and if any significant effects were observed, they were followed up with post hoc tests.

In chapter 6, Chi square was used to account for differences in gender and food choice between conditions. T-tests were conducted to test for differences in hunger, BMI, usual intake of fruit and vegetable, age, mindfulness, mindful eating and eating behaviours, such as restrained, uncontrolled and emotional eating. A 2 X 2 ANOVA was planned to test whether an improvement in state mindfulness was observed, and t-tests were conducted to compare mean values of food intake

from M&Ms and grapes consumed between the two conditions. Hunger was used as a priori hypothesis to test any effect it may have had on the dependent variables. Usual intake of fruit and vegetable and participant characteristics were tested as covariates to explore whether they had any effect on any of the dependent variables, and if any significant effects were observed, they were followed up with post hoc tests.

In chapter 7, Chi square was used to account for differences in gender between conditions, and t-tests were conducted to tests for differences in hunger, BMI, age and eating behaviours, such as restrained, uncontrolled and emotional eating. 2 X 2 ANOVAs were conducted to explore improvements in state self-compassion across conditions, as well as energy intake across conditions and usual intake of fruit and vegetable. Any significant findings were followed up with t-tests. Hunger and participant characteristics were tested as covariates to assess whether they had any effect on the dependent variables, and if any significant effects were observed, they were followed up with post hoc tests.

In Chapter 8, Chi square was used to account for differences in gender across the three conditions, and one way ANOVAs were conducted to test for differences in hunger, BMI, age, emotional eating, restrained eating and chocolate intake. 3 X 2 ANOVAs were conducted to test for differences in negative state affect and state mindfulness scores. Hunger and participant characteristics were tested as covariate to explore any effect they may have upon chocolate intake across the three conditions, and if any significant effects were observed, they were followed up with post hoc tests.

In chapter 9, Chi square was used to account for differences in gender across conditions, and one way ANOVAs were carried out to test for differences across conditions in participants' hunger, BMI, age and eating behaviours including restrained, uncontrolled and emotional eating. A 3 X 2 ANOVA was planned to test whether a change was observed in post state mindfulness scores across the three conditions. State mindfulness change was utilised to create a group that increased vs decreased throughout the music manipulations (more information can be found in Chapter 9, section 9.4). Furthermore, 3 X 2 ANOVAs were conducted to explore the effect of state mindfulness change and music on participants' energy intake. Hunger and participant characteristics were tested as

covariates to assess whether they had any effect on the dependent variables, and if any significant effects were observed, they were followed up with post hoc tests.

CHAPTER 3: EXPLORING THE ASSOCIATION BETWEEN SELF-COMPASSION, MINDFULNESS AND MINDFUL EATING WITH EATING BEHAVIOURS AMONGST PATIENTS WITH OBESITY

3.1. Abstract

Background: The prevalence of obesity is on the rise, contributing towards adverse health risks and the financial cost for health care providers. Understanding problematic eating behaviours and their association to self-compassion, mindfulness and mindful eating is important for the development of interventions to promote effective weight regulation targeted at people who have obesity. **Method:** One hundred and one participants attending a clinical weight management treatment group at a hospital in the West Midlands, UK were recruited to complete questionnaires in self-compassion, mindfulness and mindful eating and explore their potential association to eating behaviours, such as, emotional, restrained, external, fat and sugar consumption and grazing. **Results:** The findings suggested that all three constructs, self-compassion, mindfulness and mindful eating were significantly and negatively associated with grazing and emotional eating, but mindful eating was the only construct that also displayed a significant and negative association with other eating behaviours that are often barriers to successful weight regulation, such as external eating and fat consumption. Further investigation suggested external eating mediated the relationship between mindful eating and fat consumption and grazing. **Conclusion:** Mindful eating may be particularly beneficial for interventions promoting healthier eating behaviours amongst patients with clinical obesity, whilst mindfulness and self-compassion appear to be promising for those who display grazing and emotional eating behaviours.

3.2. Background

The increased prevalence of obesity over the past few decades has become one of the most pressing public health issues within the Western world (Agha & Agha, 2017; Inoue, Qin, Poti, Sokol, & Gordan-Larsen, 2018). Such prevalence has put people at a prominent risk of adverse health consequences (e.g., type 2 diabetes, cardiovascular disease, depression, mortality), and substantially contributes to the fiscal deficit of healthcare providers (Hruby et al., 2016; Nortoft, Chubb, &

Borglykke, 2017; Revels, Kumar, & Ben-Assuli, 2017). As the growth of the obesity epidemic has become significant in health outcomes, so has the demand for interventions. Whilst many lifestyle interventions have displayed initial success (Jolly et al., 2011), long term outcomes have frequently been ineffective, with individuals regaining their weight soon after their loss (Montesi et al., 2011), and more problematically exceeding their initial weight (Funk, Lee, Vidoni, & Reininger, 2019). Therefore, establishing interventions that target both weight loss and weight regulation are of absolute necessity, and identifying the associations between intervention variables and eating behaviours that act as barriers to success is an essential step in the process.

People who have obesity often experience problematic eating behaviours, contributing towards their excessive weight gain (Bryant, King, & Blundell, 2008; Carter & Jansen, 2012). Specifically, eating behaviours such as emotional, external and restrained have been associated with weight gain and in the aetiology of obesity (e.g., van Strien et al., 1986). Emotional eating occurs in response to negative emotions, for example, a person may turn to food when experiencing loneliness or sadness (van Strien & Ouwens, 2003). External eating is characterised by eating in response to external cues, such as the sight, smell or taste of food (Srunkard & Messick, 1985; van Strien et al., 2009). Restrained eating is the act of consciously restricting food intake in order to control for one's weight (Herman & Mack, 1975; Herman & Polivy, 1984). Research on the association between restrained eating and obesity has been contradictory, whereby some researchers suggest restrained eating can result in lower body weight and healthier eating patterns (e.g., Boschi, Iorio, Margiotta, D'orsi, & Falconi, 2001), others have suggested when restrained eating is unsuccessful, it could lead to overeating (Herman & Mack, 1975; Stunkard and Messick, 1985). Similarly, studies investigating emotional eating and external eating have found these eating tendencies to be inconsistent in relation to overeating and obesity (e.g., Brogan & Hevey, 2013; Snoek et al., 2013; van Strien et al., 2009). Whilst some literature has highlighted their key role (Burton et al., 2007), other findings suggested a more relevant association to emotional, rather than external eating (van Strien et al., 2009). Thus, exploring such behavioural eating patterns to understand their association with obesity, and addressing them within weight loss interventions may contribute towards effective and long term success.

Grazing, which is the repetitive intake of small amounts of food, is another eating behaviour which has received attention in recent years (e.g., Lane & Szabo, 2013). The tendency to graze is considered problematic and common amongst those who have obesity, and interventions directed towards weight loss may benefit by focusing on grazing (e.g., Colles, Dixon, & O'Brien, 2012). Grazing has been positively associated with external and emotional eating, but not restrained eating (Lane & Szabo, 2013), and in a more recent study, Mantzios, Egan, Keyte et al. (2018) found grazing to also be positively associated with motives to eat palatable foods and fat and sugar consumption. The typical diet within the Western world is often characterised with foods that are high in fat and sugar (e.g., Popkin, 2006), and whilst dietary guidelines do emphasise on limiting the intake of such foods, research indicates that this is normally not the case (e.g., Park, Blanck, Sherry, Brener, & O'Toole, 2012), especially amongst those who have obesity (Te Morenga, Mallard, & Mann, 2012). In fact, despite the WHO recommendation of consuming a minimum of five portions of fruit and vegetables a day (WHO, 2003), studies have suggested that people often consume significantly less (Casagrande, Wang, Anderson, & Gary, 2007; Hall, Moore, Harper, & Lynch, 2009). Focusing on limiting the consumption of foods high in fat and sugar, whilst also encouraging the intake of fruit and vegetables is important for weight regulation and obesity prevention (Akers, Cornett, Salva, Davy, & Davy, 2012; He et al., 2004). Burton et al. (2007) suggested that food cravings, particularly for foods high in fat and sugar, are associated with external eating behaviours. The elements of mindfulness, mindful eating and self-compassion have been suggested to facilitate more adaptive eating behaviours and to promote healthier practices (e.g., Mantzios & Wilson, 2015a). For example, both grazing and fat and sugar consumption behaviours have been negatively associated with traits of mindfulness, mindful eating and self-compassion amongst a student population (Mantzios, Egan, Bahia, et al., 2018; Mantzios, Egan, Hussain, et al., 2018). However, these findings have not yet been replicated amongst patients with clinical obesity, and such trait aspects may be predictive elements of weight loss interventions that can be utilised in future research and inform practical applications of nutritional advice.

Mindfulness has been characterised as purposefully paying attention to the present moment and being aware of all mental states with a non-judgmental attitude (Kabat-Zinn, 1990). Although

mindfulness is often described and discussed as a trait, it can be developed through practicing meditation (Kabat-Zinn, 1979), and other practices, such as mindful yoga, the mindful raisin eating task, and MCD (Carmody & Baer, 2008; Sauer-Zavala, Walsh, Eisenlohr-Moul, & Lykins, 2012; Mantzios & Wilson, 2014). The construct of mindfulness is suggested to elevate a person's observation of their internal state, consequently improving internal regulatory processes (Walach, Buchheld, Buttenmuller, Kleinknecht, & Schmidt, 2006), which assists with distinguishing hunger from emotions, reducing emotional eating and placing less focus on external cues and more on internal cues, such as hunger and satiety, which is vital in overcoming external eating (e.g., Ouwens et al., 2015). Research has reported the positive results of trait mindfulness and MBIs with improved reactions to cravings, impulsivity, emotional and external eating behaviours (Alberts et al., 2010; Dutt et al., 2019; Gouveia, Canavarro, & Moreira, 2019; O'Reilly et al., 2014; Peters, Erisman, Upton, Baer, & Roemer, 2011), which may explain reduced food intake and better weight regulation (Mantzios et al., 2015). However, not all results have found positive changes between mindfulness and healthier eating practices (Kearney et al., 2012). For example, Kearney et al. (2012) found participating in a MBSR programme did not improve emotional eating behaviour, and research on the association between mindfulness and grazing has also been rather inconsistent (Levin, Dalrymple, Himes, & Zimmerman, 2014). In a review by Mantzios and Wilson (2015a), it was suggested that mindfulness interventions relevant to weight regulation should be specific to eating by adapting the fundamental mindfulness elements towards food and eating related experiences. This can assist people to become more accustomed to the concept of mindful eating, which could otherwise take longer to achieve through generic practices of mindfulness (Hong et al., 2011; Mantzios & Wilson, 2014). Research on MBIs specifically aimed at eating behaviours have been found to assist participants with weight loss, increase in cognitive restraint around food, enable healthier food choices through reduced intake of fat and sugar and show improvements in binge eating, grazing and external eating behaviours (Allirot et al., 2018; Dalen et al., 2010; Felske, Williamson, Rash, Telfer, & Campbell, 2019; Kristeller & Wolever, 2010; Mantzios et al., 2019; Mantzios, Skillet, & Egan, 2020; Mason et al., 2016; Miller et al., 2012; Timmerman & Brown, 2012). Exploring both mindfulness and mindful eating constructs with eating behaviours amongst patients who have clinical

obesity may assist in establishing interrelationships that are suggesting healthier and more regulated eating practices.

Recent research has also identified the added value of self-compassion as a pertinent construct within mindfulness in enabling healthier eating behaviours (e.g., Mantzios, Egan, Keyte, et al, 2018; Mantzios, Egan, Hussain, et al, 2018). Self-compassion consists of three main elements, self-kindness, common humanity and mindfulness, and it is defined as taking a kinder approach to oneself with a mindful awareness, and consideration of personal difficulties as being part of a shared humanity that everyone experiences (Neff, 2003a, b). In an earlier study, Adams and Leary (2007) explored the tendency of overeating after breaking a diet (Herman & Mack, 1975), and showed that participants who were exposed to a self-compassionate induction after breaking their diet did not increase their subsequent food intake. Since then, research on self-compassion in the context of eating behaviours and weight loss has been prominent, with findings suggesting self-compassion to be beneficial towards nutritional behaviours, positive body image, emotional eating and weight loss (Gouveia et al., 2019; Rahimi-Ardabili et al., 2018). Furthermore, self-compassion and mindfulness appear to be interrelated, for example, Birnie et al. (2010) found self-compassion to increase the effectiveness of mindfulness training, and Neff and Germer (2013) developed a MBI referred to as the mindful self-compassionate programme to enhance well-being. Later, Mantzios and Wilson (2015b) investigated the effect of a mindfulness and self-compassion centred intervention for weight loss, and findings showed participants continued to successfully lose weight up to 6 months after completing the intervention, suggesting both mindfulness and self-compassion may be promising for weight loss. Their research was with normal weight participants, which is common amongst mindfulness-based constructs and eating behaviours, indicating the need for further research with patients who have clinical obesity.

Previous research has not yet directly explored self-compassion, mindfulness and mindful eating with problematic eating behaviours amongst patients who have clinical obesity. There is a timely imperative to understand the association between such theoretical concepts and eating behaviours to develop lifestyle interventions that can aid patients with weight loss and weight regulation. Therefore, the aim of the present research is to directly explore the associations between

self-compassion, mindfulness and mindful eating with eating behaviours, such as emotional, external, restrained, fat and sugar consumption and grazing amongst patients who have clinical obesity. Another aim is to explore the possibility of emotional and external eating behaviours acting as mediators between relationships observed in the literature between self-compassion, mindfulness and mindful eating with fat and sugar consumption and grazing. Based on theoretical considerations and previous literature on the aforementioned constructs and eating behaviours (e.g., Mantzios, Egan, Bahia et al., 2018; Ouwens et al., 2015), it is hypothesised that mindfulness, mindful eating and self-compassion will be negatively associated with grazing, fat and sugar consumption, emotional eating and external eating, whilst positively associated with dietary restraint. Furthermore, it is predicted that both emotional and external eating will mediate the association between mindfulness, mindful eating and self-compassion with fat and sugar consumption and grazing.

3.3. Method

Participants

One hundred and one participants were voluntarily recruited at their first group session appointment at a tier 3 medical weight management service (see Procedure for further details). Participants did not receive any compensation for their participation. The sample consisted of 82 females, 18 males, and one not-specified. Participants' educational background consisted of a university degree (n = 33), A level or BTEC (n = 21), GCSE (n = 37) and not-specified (n = 10), and they were either employed (n = 60), self-employed (n = 1), unemployed (n = 33), retired (n = 5) and not-specified (n = 2). Participants' self-identified ethnicities were: White or White British (n = 75), Black African or Caribbean (n = 8), South Asian (n = 12), Mixed Ethnicity (n = 2), and not-specified (n = 4).

Eligibility. The exclusion criteria in the current study included any patients under the age of 18 years, those who lacked capacity (identified by their consultant), those who had been diagnosed with an eating disorder and non-English speakers.

Measures

Participant demographics form. Participants were asked to report their age, gender, height, weight, ethnicity, education and employment status in order to assess their background information.

SCS (Neff, 2003b). Please see Chapter 2 for a full description of the SCS. The present study produced an alpha of (α =.87) for the overall score.

FFMQ-SF (Bohlmeijer et al., 2011). Please see Chapter 2 for a full description of the FFMQ. The present study produced an alpha of (α = .80) for the overall score.

MES (Hulbert-Williams et al., 2014). Please see Chapter 2 for a full description of the MES. The present study produced an alpha of (α = .84) for the overall score.

DEBQ (van Strien et al., 1986). Please see Chapter 2 for a full description of the DEBQ. The present study produced alphas of: emotional eating (α = .94), external eating (α = .90) and restrained eating (α = .90).

DFS- SF (Francis & Stevenson, 2013). Please see Chapter 2 for a full description of the DFS-DQ. The fat subscale produced an alpha of (α = .81) and sugar subscale (α = .59) within the present study.

GS (Lane & Szabo, 2013). Please see Chapter 2 for a full description of the GS. The present study produced an alpha of (α = .91) for the overall score.

Procedure

A tier 3 medical weight management service treating patients with a BMI of 35 > was used to approach participants to take part in a study investigating eating behaviours and well-being. After their first group session appointment, patients were approached by the researcher, who provided them with an overview of what the study entails. Those who verbally agreed to participate in the study were provided with an information sheet and consent form. After providing informed consent, participants completed the demographics form and the questionnaires. The study took approximately 20 minutes to complete, and after completion, participants were provided with a debrief form illustrating the purpose and aim of the study, and the researchers' contact details for participants who may have wanted to withdraw or find out about the results at a later date. The study was approved by the NHS ethical committee (see Appendix B1), and informed consent was gained from all participants.

3.4. Data Analysis

Pearson's bivariate correlations were conducted to assess the associations between self-compassion, mindfulness and mindful eating with eating behaviours, such emotional, restrained, external, fat and sugar consumption and grazing. Next, mediational analyses were conducted in order to explore any indirect effects between self-compassion, mindfulness and mindful eating on fat and sugar consumption and grazing through eating behaviours, such as emotional and external eating. All analyses were conducted using SPSS v24 and PROCESS Macro v3.5 (Hayes, 2017).

3.5. Results

3.5.1. Correlations

Inter-correlations between self-compassion, mindfulness, mindful eating, and emotional eating, external eating, restrained eating, fat and sugar consumption and grazing are presented in Table 3.1. Findings suggest a small significant and negative relationship between self-compassion and emotional eating (r = -.227, p = .04) and grazing (r = .222, p = .05). A small significant and negative relationship is presented between mindfulness and grazing (r = -.288, p = .01), and a marginally non-significant and negative relationship with emotional eating (r = -.213, p = .053). There is also a large significant and negative relationship between mindful eating and emotional eating (r = -.592, p < .001) and external eating (r = -.576, p < .001). Furthermore, mindful eating displayed a moderate significant and negative relationship with fat consumption (r = -.466, p < .001) and grazing (r = -.497, p < .001), and a small non-significant and negative relationship with sugar consumption (r = -.213, p = .06).

Table 3.1.

Bivariate Correlations Between Self-Compassion, Mindfulness, Mindful Eating, Emotional, External and Restrained Eating, Fat and Sugar Consumption and Grazing

	1	2	3	4	5	6	7	8	9
1. BMI									
2. SCS	-.105								
3. FFMQ	-.134	.642**							
4. MES	.064	.347**	.409**						
5. Emotional[a]	.116	-.227*	-.213	-.592**					
6. External[a]	.061	-.119	-.117	-.576**	.658**				
7. Restrained[a]	-.002	.053	.078	-.173	.198	.341**			
8. Fat[b]	-.195	-.070	-.089	-.466**	.410**	.480**	-.060		
9. Sugar[b]	-119	-.039	-.176	-.213	.063	.186	-.026	.449**	
10. GS	-.061	-222*	-.288**	-.497**	.314**	.576**	-.115	.588**	.446**

Note. SCS - Self-Compassion Scale; FFMQ – Five-Facet Mindfulness Questionnaire – Short Questionnaire; MES - Mindful Eating Scale; [a] – Subscales of the Dutch Eating Behaviour Questionnaire; [b] – Subscales of Fat and Sugar Scale; GS – Grazing Scale

**Correlation is significant at the .01 level; *Correlation is significant at the .05 level.

3.5.2. Direct and Indirect Effects

The direct and indirect effects of mindful eating on fat consumption and grazing via external eating and emotional eating were examined using mediation analyses (see Table 3.2.). Mindful eating had a significant direct effect on fat consumption (*b* = -.23, *SE* = .09, 95% CI: -.42, -.05) and a significant indirect effect via external eating (*b* = -.14, *SE* = .07, 95% CI: -.28, -.02). Similarly, mindful eating had a significant direct effect on grazing (*b* = -.15, *SE* = .07, 95% CI: -.29, -.01), and a significant indirect effect via external eating (*b* = -.17, *SE* = .05, 95% CI: -.27, -.08). The direct and indirect effects of mindful eating on fat consumption and grazing via emotional eating found mindful eating had a significant direct effect on fat consumption (*b* = -.28, *SE* = .09, 95% CI: -.47, -.09) and a significant direct effect on grazing (*b* = -.30, *SE* = .08, 95% CI: -.46, -.14), but no significant indirect effects via emotional eating were found for either measures.

Furthermore, the direct and indirect effects of mindfulness on grazing via emotional eating were explored (see Table 3.3.). The findings suggested mindfulness had a significant direct effect on grazing (*b* = -.14, *SE* = .07, 95% CI: -.27, -.01), and when exploring this effect via emotional eating, the effect changed to non-significant (*b* = -.04, *SE* = .03, 95% CI: -.09, .00. There was no significant direct effect observed for self-compassion on grazing or via emotional eating (see Table 3.4.). Thus suggesting external eating mediated the association between mindful eating and fat consumption and grazing, whilst, emotional eating resulted in the association between mindfulness and grazing becoming non-significant.

Table 3.2.

Mediation on the Effect of Mindful Eating on Fat Consumption and Grazing through External Eating and Emotional Eating

		External Eating			
		Std. β	*t*	*p*	95% *CI*
Fat Consumption	Total (*c*)	-.37	-4.71	.001	(-.53, -.22)
	Direct (c^1)	-.23	-2.48	.02	(-.42, -.05)
	Indirect (ab^1)	-.14			(-.28, -.02)
Grazing	Total (*c*)	-.32	-5.05	.001	(-.44, -.19)
	Direct (c^1)	-.15	-2.15	.04	(-.29, -.01)
	Indirect (ab^1)	-.17			(-.27, -.08)
		Emotional Eating			
		Std. β	*t*	*p*	95% *CI*
Fat Consumption	Total (*c*)	-.37	-4.71	.001	(-.53, -.22)
	Direct (c^1)	-.28	-2.89	.01	(-.47, -.09)
	Indirect (ab^2)	.09			(-.24, .04)
Grazing	Total (*c*)	-.32	-5.05	.001	(-.44, -.19)
	Direct (c^1)	-.30	-3.8345	.001	(-.46, -.14)
	Indirect (ab^2)	-.02			(-.12, 09)

Note. Total (*c*) = Direct (c^1) + Indirect External Eating (ab^1), Indirect Emotional Eating (ab^2)

Table 3.3.

Mediation on the Effect of Mindfulness on Grazing through Emotional Eating

		Emotional Eating			
		Std. β	*t*	*p*	95% *CI*
Mindfulness	Total (*c*)	-.18	-2.66	.01	(-.31, -.04)
	Direct (c^1)	-.14	-2.12	.04	(-.27, -.01)
	Indirect (ab^2)	-.04			(-.09, .00)

Note. Total (*c*) = Direct (c^1) + Indirect Emotional Eating (ab^2)

Table 3.4.

Mediation on the Effect of Self-Compassion on Grazing through Emotional Eating

		Emotional Eating			
		Std. β	*t*	*p*	95% *CI*
Self-Compassion	Total (*c*)	-.09	-2.01	.05	(-.17, -.00)
	Direct (c^1)	-.06	-1.52	.13	(-.15, 02)
	Indirect (ab^2)	-.0219			(.07, .01)

Note. Total (*c*) = Direct (c^1) + Indirect Emotional Eating (ab^2)

3.6. Discussion

The aim of the current study was to explore the relationship between self-compassion, mindfulness and mindful eating with eating behaviours, such as emotional, external, restrained, fat and sugar consumption and grazing amongst patients who have clinical obesity. The results suggested that self-compassion, mindfulness and mindful eating displayed a negative relationship with grazing and emotional eating, but mindful eating also displayed a negative association with fat consumption and external eating. Further investigation into the mediational effects suggested that self-compassion did not have a direct effect on grazing nor via emotional eating, whereas mindfulness had a direct effect on grazing, but this effect became non-significant when explored via emotional eating. In

addition, mindful eating had a direct effect on fat consumption and grazing and an indirect effect through external eating.

Literature on self-compassion and eating behaviours has been largely underexplored, and findings between general mindfulness and eating behaviours, such as grazing and emotional eating have been mixed (e.g., Kearney et al., 2012; Levin et al., 2014; Mantzios & Wilson, 2015a; Ouwens et al., 2015). Although the present study did display a rather small association of self-compassion and mindfulness with grazing and emotional eating, the two theoretical concepts may indeed be beneficial for patients who have a tendency to graze and emotionally eat (Mantzios, Egan, Bahia et al., 2018; Gouveia et al., 2019). The identification of grazing as a contributing factor towards weight gain was established over a decade ago (Saunders, 2004), but direct attention towards this behaviour within weight loss interventions has been minimal (Parker & Brennan, 2015). If grazing is a common and problematic behaviour amongst those who have obesity, it may explain why mindfulness and/or self-compassion based interventions lead to weight loss (Mantzios & Wilson, 2015b; Rahimi-Ardabili et al., 2018), but it also highlights the demand for contemporary weight loss interventions to directly consider the element of grazing targeted interventions to overcome such problematic eating behaviours. Similarly, little research has been conducted on self-compassion and emotional eating, and previous findings in relation to mindfulness and emotional eating have been inconsistent (Kearney et al., 2012; Ouwens et al., 2015; Gouveia et al., 2019). However, the current findings are aligned with some previous research (Tak et al., 2015; Gouveia et al., 2019), suggesting that both self-compassion and mindfulness may also be beneficial for those who are emotional eaters. Although, self-compassion did display non-significant relationships with other eating behaviours measured within the present study, such as external eating and sugar consumption, as well as a non-significant direct relationship with grazing when explored using mediation, this could potentially be attributed to the SCS not being specific to health behaviours, and that the items may prescribe different behaviour within the context of eating (Mantzios & Egan, 2017; Egan & Mantzios, 2018). Similarly, in the element of mindfulness, questions that explicitly associate mindfulness and eating may be more predictive of eating behaviours than mindfulness alone (Mantzios & Wilson, 2014), which could be one explanation for the non-significant association between mindfulness and other eating behaviours,

such as external eating and sugar consumption. Another explanation could be one that aligns with previous research that suggests general mindfulness is not sufficient enough to improve eating behaviours because the fundamental concepts of mindfulness do not promote any intentions to do so (Mantzios & Wilson, 2015a). Therefore, a more direct solution would be to focus on combining the two concepts and create targeted mindful eating interventions.

The current findings in relation to mindful eating and eating behaviours, such as external, emotional, fat consumption and grazing are consistent with previous research (O'Reilly et al., 2014; Warren et al., 2017). For example, previous literature has suggested that mindful eating may be a prominent factor in promoting healthier eating behaviours, and that weight loss interventions may be enhanced through the inclusion of specific mindful eating elements (Beshara et al., 2013; Pintado-Cucarella & Rodriguez-Salgado, 2016). Mindful eating can assist people to become aware of their internal sensations, particularly hunger and satiety, which are important for healthy adaptive eating behaviours (Dalen et al., 2010; Kristeller & Wolever, 2011). Restrained eating was not associated with mindful eating or mindfulness and self-compassion. Given that previous research and theories have suggested restrained eating may pose as a risk for maladaptive eating behaviours and weight gain (Fairburn, 2008; Schur, Heckbert, & Goldberg, 2010), it may explain the non-association of restrained eating with the three positive psychological constructs, consistent with some previous research (Anderson et al., 2016). Surprisingly, a small and non-significant negative association between mindful eating and sugar consumption was found within the present study. Given that findings from previous research have suggested mindful eating may be a beneficial approach in reducing intake of sweet foods (Mason et al., 2016; Miller et al., 2012), the current findings based on the small and non-significant element are not as consistent. As such, more research specifically focusing on mindful eating and sugar intake may be required to establish a thorough understanding. Overall, identifying and developing mindful eating strategies may be easier for people to adhere to than generic mindfulness practices as they are more relevant to a specific need (i.e., eating) (e.g., Hong et al., 2011; Kristeller & Wolever, 2014; Mantzios & Wilson, 2014), and they often do not require intense training that is typically associated with general MBIs (Kabat-Zinn, 1990; Mantzios & Wilson, 2014).

3.7. Limitations and Future Directions

Three limitations were identified within the present study. The first limitation is that the current study was conducting only using patients who have obesity and are participating in weight management treatment. Participants who have obesity, but are not participating in weight management treatment or participants who are awaiting or have undergone bariatric surgery may present different findings, as well as people with obesity who have not displayed a motivation to regulate their food intake and weight (Gloy et al., 2013). To draw stronger conclusions, future research should replicate current findings amongst wider samples. Considering the association of bariatric patients and grazing, the findings of such a population may enable the embedment of targeted interventions.

Furthermore, the cross-sectional nature of the present study precludes conclusions along causal lines. Future research should utilise experimental and longitudinal designs to explore self-compassion, mindfulness and mindful eating constructs with an intention of altering eating behaviours.

Finally, although self-report measures are often applied within eating and diet related research, they may be problematic, with the possibility of socially desirable responding. Future research should use physiological measurements that can be quantified in the amount of food consumed either through observations or naturalistic experiments.

3.8. Conclusion

The findings from the present study suggest that self-compassion, mindfulness and mindful eating are associated with grazing and emotional eating, but the concept of mindful eating appears to have a particularly significant association with external eating and fat consumption. Understanding the association between the constructs of self-compassion, mindfulness and mindful eating with eating behaviours has important implications for weight loss and weight regulation interventions for patients who have clinical obesity, but the element of mindful eating may be particularly important in developing future eating behaviour programmes that will support the self-regulation of weight.

CHAPTER 4: EXPLORING MINDFULNESS AND VISUAL ATTENTIONAL BIASES TOWARDS FOOD CUES: PRELIMINARY FINDINGS

4.1. Abstract

Background: Constant exposure to HED food related cues is suggested to promote overeating and obesity. The present study explored whether using a mindful eating specific tool, namely MCD could reduce attentional biases towards food cues. **Method:** Forty-four participants were randomly assigned to either the mindfulness or control condition. All participant completed an eye-tracking paradigm, and their eye-movements towards food and non-food images were recorded. **Results:** The findings suggested participants who used the MCD significantly improved on their state mindfulness scores than those in the control condition. However, there were no significant differences in the maintenance of attentional biases towards food cues between the two conditions. **Conclusion:** Future research should explore whether using the MCD can overcome such attentional biases towards food cues by promoting healthier food choices and reducing energy intake.

4.2. Background

The worldwide obesity epidemic is suggested to be the result of the current "obesogenic" environment, which is often characterised with palatable and HED food items that are easily accessible and extensively advertised (Blundell et al., 2005; Swinburn et al., 2011; Werthmann et al., 2011). Exposure to such foods and visual food related cues is proposed to stimulate food cravings, food intake, and in effect, weight gain (Polivy, Herman, & Coelho, 2008). The visualisation of HED foods or food cues are suggested to activate rewards pathways within brain regions (Berridge, 2009; Volkow & Wise, 2005). This concept stems from the incentive sensitization theory (Franken, 2003; Robinson & Berridge, 1993), which suggests that sensitization of the dopaminergic reward system increases the salience of reward related cues in the environment (e.g., HED foods), making them more appealing, thereby promoting cravings and consumption (Nijs & Franken, 2012; Robinson & Berridge, 2003). When translated onto a larger scale, presence of visual food related cues (such as advertisements), accessibility to HED foods, and reward seeking behaviour may lead to habitual overeating and obesity (Lehner, Balsters, Burgler, Hare, & Wenderoth, 2017; Robinson, Fischer,

Ahuja, Lesser, & Maniates, 2015). Therefore, exploring strategies that modify attentional biases towards food cues may be essential to promote healthier eating behaviours.

Attentional biases for food related cues can be directly assessed using eye-tracking technology, and a number of studies have been conducted utilising eye-tracking methods to explore attentional processes around food stimuli (e.g., Baschnagel, 2013; Popien, Frayn, Ranson, & Sears, 2015). For example, researchers have previously explored attentional biases between normal weight and overweight or obese populations, and found participants with obesity exhibited greater initial and maintained attention towards HED food images compared to non-food images than normal weight participants (Castellanos et al., 2009; Doolan, Breslin, Hanna, Murphy, & Gallagher, 2014; Nijs et al., 2010; Werthmann et al., 2011). Similarly, obese participants with binge eating disorder appeared to display increased attentional bias towards food cues than obese participants without binge eating disorder (Deluchi, Costa, Friedman, Goncalves, & Bizarro, 2017). Furthermore, research exploring eating styles and visual attention suggests participants with high restrained eating and external eating traits direct attention faster towards HED food cues than non-food cues (e.g., Brignell, Griffiths, Bradley, & Mogg, 2009; Hollitt, Kemps, Tiggemann, Smeets, & Mills, 2010; Hou et al., 2011).

More specifically, studies have examined the association between attentional biases towards HED foods and unhealthy eating, and findings have indicated a positive correlation between attention bias for HED foods and subsequent consumption of such foods, as well as increased BMI (Calitri, Pothos, Tapper, Brunstrom, & Rogers, 2010; Nijs et al., 2010). Research has suggested that changing attentional biases, particularly decreasing attentional biases for HED foods may assist in reducing consumption of unhealthy foods (Berridge, 2009; Kemp, Tiggemann, Orr, & Grear, 2014). For example, Kakoschke, Tiggemann and Grear (2014) trained participants to direct their attention either towards LED food cues or HED food cues, and found participants who attended to LED food cues increased their attention bias for such cues and consumed more healthy snacks than unhealthy snacks in comparison to those who attended HED food cues. Such findings suggest that inducing attentional bias for LED foods may translate into the consumption of healthier foods (Kemp et al., 2014; Kakoschke et al., 2014), making attentional training an effective method in promoting healthier eating behaviours. Manipulating attentional biases around food is feasible and has been explored in other

behavioural research that explored consumption and memory in attentive and mindful eating experiments (Higgs, 2015; Dutt et al., 2019).

Mindfulness may be a notion that could potentially modify attentional biases towards food cues. The concept of mindfulness has been described as an awareness that emerges through purposefully paying attention to what is taking place in the present moment with a non-judgmental attitude (Kabat-Zinn, 1990). Over recent years, mindfulness has been suggested to be an effective strategy in promoting healthier eating behaviours through increased intake of fruit, reduced consumption of HED foods and control of impulsive reactions towards attractive but unhealthy foods (Dutt et al., 2019; Jenkins & Tapper, 2014; Jordan et al., 2014; Papies, Barsalou, & Custers, 2012). As a result of successfully promoting healthier eating behaviours, MBIs have also led to weight loss (Dalen et al., 2010; Daubenmier et al., 2011; Smith et al., 2017; Warren et al., 2017). However, some research has suggested that generic mindfulness practices, such as mindfulness body-scan may not necessarily achieve regulation around food (Marchiori & Papies, 2014) as they are not eating specific practices (Mantzios & Wilson, 2015a). Furthermore, mindfulness meditation is sometimes viewed as an additional chore that is effortful and time consuming, creating problems in participant engagement, and in turn, effecting eating behaviour and weight regulation (Mantzios & Wilson, 2015a). Research has since focused on brief meditative and non-meditative mindful eating practices, such as mindfulness-based decentring strategy and the MCD (Mantzios & Wilson, 2014; Tapper & Turner, 2018). The MCD combines the concept of mindfulness, self-compassion and CLT (Mantzios & Wilson, 2014), and requires participants to simply consider or write the answers to the MCD items whilst eating (Hussein et al., 2017; Mantzios & Wilson, 2014; Mantzios et al., 2020). CLT describes an identification on a close or distant continuum (Liberman & Trope, 1998). Whilst close objects, events or individuals are represented as concrete; distant objects, events and individuals are portrayed as abstract. Abstract construals consider *why* actions are being performed, whereas concrete construals focuses on the *how* elements of one's behaviour. Concrete construals are suggested to foster present centred awareness and require minimum judgment and rumination - elements that are similar to mindfulness (Brown & Ryan, 2003; Kabat-Zinn, 1990; Mantzios & Wilson, 2014). Furthermore, studies exploring the MCD have shown significant improvements in weight loss,

mindfulness, self-compassion and anxiety (Mantzios & Wilson, 2014; Hussein et al., 2017). However, whether the MCD can reduce attentional biases towards food cues has not yet been explored. In fact, this appears to be the first study exploring the effect of mindfulness training on attentional biases towards food cues.

In an attempt to replicate previous findings, the present study firstly hypothesised that using the MCD would significantly increase state mindfulness when compared to the control condition. Second, it was predicted that all participants will display a greater initial attention towards HED food images than LED food images, but participants using the MCD would exhibit a reduced maintained attentional bias towards food cues than control participants.

4.3. Method

Participants[3]

Participants attending a university in West Midlands, UK were recruited via an online research participation scheme at the institution, and they received course credit for their participation. Six participants were excluded from the final analysis because of missing data (see Data Preparation). The final sample consisted of 44 participants with an average BMI of $M = 24.44$ ($SD = 4.67$) and age of $M = 23.61$ ($SD = 6.87$). The sample size in the present study was based on the number of participants recruited in other similar studies exploring visual attentional biases towards food cues (e.g., Doolan et al., 2014). Participants self-identified ethnicities were: White or White British ($n = 21$), Black African or Caribbean ($n = 5$), South Asian ($n = 10$), Chinese ($n = 3$), Mixed Ethnicity ($n = 4$) and not-specified ($n = 1$). The present study was approved by the University's ethics committee (see Appendix B2), and informed consent was gained from all participants.

Eligibility. Due to the nature of the study (i.e., attentional biases towards food cues), participants were informed via an information sheet and consent form that they were not eligible to participate if they had been diagnosed with an eating disorder, had any food allergies, intolerances or special dietary requirements.

Experiment Conditions

[3] From Chapter 4 to Chapter 6, university students were recruited using an online research participation scheme, and participants were provided with 3 credits for their participation.

Participants were randomly assigned to either the mindfulness condition (n = 22; female = 21, male = 1) or the control condition (n = 22; female = 17, male = 5). Participants in the mindfulness condition received a modified version of the original MCD (Mantzios et al., 2020). The modified MCD was initially developed for chocolate consumption (Mantzios et al., 2020), but for the purpose of this study, "chocolate" was simply rephrased with "raisin" (Appendix C1; see Table 4.1). Participants were asked to simply consider (instead of write) the answers to the questions of the modified MCD (Hussein et al., 2017; Mantzios et al., 2020). In the control condition, participants received a newspaper article concerning carbon emission, and this newspaper article was chosen because of its similarity in length of the modified MCD and its absence of food or eating related matters (Robinson, Kersbergen, & Higgs, 2014).

Measures

Participant demographic form. Participants were asked questions regarding their gender, age, height, weight and ethnicity in order to assess their BMI and background information.

Hunger. To assess hunger, participants were asked at the start of the experimental session "How hungry do you feel right now?" with responses ranging from 1 (*not at all)* to 5 *(extremely hungry*).

SMS (Tanay & Bernstein, 2013). Participants completed the SMS before (pre) and after (post) engaging with the reading materials (i.e., MCD or newspaper article). Please see Chapter 2 for a full description of the SMS. The present study produced an alpha of pre - (α =.93) and post - (α =.93).

DFS-SQ (Francis & Stevenson, 2013). To control for any differences between conditions and any effect that fat and sugar consumption could have on the results, DFS-SQ was administrated. Please see Chapter 2 for a full description of the DFS-SQ. The present study produced an overall alpha of (α = .74).

Table 4.1.

Questions Presented to Participants in the Mindfulness Condition

Mindful Construal Diary - Raisin (MCD - R)
How does it smell?
What is the texture of it?
How does it taste?
How patient am I now that thoughts and feelings are not allowing me to experience the pleasure of eating this raisin?
How important is it for me and all people to experience and eat raisin this way?
How is this snack important right now?

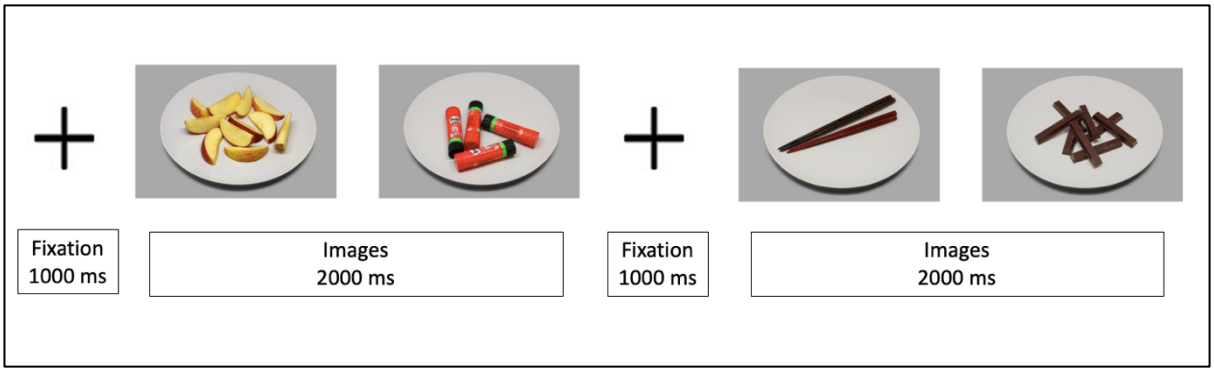
Experimental Task

Visual task: Free exploration paradigm. The pictorial stimuli used in the critical trials consisted of 20 LED food images (e.g., banana, green beans) and 20 HED food images (e.g., doughnuts, burger) (see Appendix D). Each food image was closely matched with a non-food image for colour, size and complexity, and included items, such as tools and stationary (Castellanos et al., 2009; Doolan et al., 2014). An additional 20 images of nature scenes that were unrelated to food were used as filler images, and were randomly paired with both food and non-food images to vary the task and reduce monotony (Castellanos et al., 2009). All images used in the filler trials were different from those used in the critical trials, and each stimulus was presented equally often on the left and right side of the screen. Eye-movement data was collected using a Tobii Pro X3-120 screen based eye-tracker (Tobii Technology, Stockholm, Sweden). Participants were seated in front of the Tobii monitor at a distance of approximately 60 cm, and a 9-point calibration with subsequent validation procedure was conducted for each participant prior to the visual task. After calibration, each trial began with a central fixation cross for 1000 ms, followed by the image pairs for 2000 ms (see Figure 4.1). Participants were instructed to look at the fixation cross at the start of each trial and then freely explore the following stimuli presented (Hummel, Ehret, Zerweck, Winter, & Stroebele-Benschop, 2018; Schag et al., 2013; Schmidt, Luthold, Kittel, Tetzlaff, & Hilbert, 2016). The order of trials was

randomised for each participant. All food and non-food images used in the visual task had a resolution of 600 × 450 pixels, and were taken from a database designed for experimental research on eating and appetite (Blechert, Meule, Busch, & Ohla, 2014).

Figure 4.1.

Example of Trials



Note. A fixation cross is shown in the middle of the screen (for 1000 ms) followed with a LED vs non-food trial (for 2000 ms) and HED vs non-food trial (for 2000 ms).

Procedure

The study was advertised as an experiment investigating the effect of consumption on attention biases towards different images, such as stationary, nature and food, and was deliberately kept vague in order to prevent participants from predicting the true am of the study. Experimental sessions took place between 10am and 3pm, lasting approximately 20 minutes. Upon arrival, participants received an information sheet, and after providing informed consent, their height and weight was measured using a stadiometer and digital scale. Next, participants completed demographic questions, a hunger measure and SMS. Once participants completed those measures, they were asked to either read the modified MCD (mindfulness condition) or a newspaper article (control condition) for 1 minute prior to receiving a raisin in order to familiarise themselves with the reading material. Participants were then provided with a single raisin in a bowl, and continued engaging with either the MCD or newspaper article for another 4 minutes whilst eating their raisin. Next, participants completed another SMS, and were instructed to complete the visual task (as discussed under

Experimental Task). After finishing the visual task, participants completed the DFS-SQ scale, and they were debriefed and thanked for their participation.

Data Preparation – Visual Task

Each participant was shown a total of 60 trials (20 LED food images vs non-food images; 20 HED food vs non-food images; 20 fillers vs food and non-food images). Eye-movement data from filler trials was discarded. No eye-movement data was collected for six participants (mindfulness n = 3; control n = 3) because of calibration difficulties. Two dependent measures were obtained from the eye-movement data: gaze direction bias and gaze duration bias (Castellanos et al., 2009; Doolan et al., 2014; Nijs et al., 2010). Gaze direction bias is the initial attentional orientation, and was calculated using the number of trials in which the first fixation was directed towards a food image as a proportion of all trials in which the first fixation was made to either the food or non-food image (direction bias score: > 0.5 reflects orientating bias towards food images; = 0.5 indicates no bias; < 0.5 represents orientating bias towards non-food images). Gaze duration bias is the maintenance of attention, and was calculated using the average gaze duration towards a food image across all trials as a proportion of the average gaze duration to all food and non-food images (duration bias score: > 0.5 reflects maintained attention towards food images; = 0.5 indicates no bias; < 0.5 represents maintained attention towards non-food images).

4.4. Data Analysis

Chi square analysis was used to account for differences in gender between the two conditions, and t-tests were conducted to explore for differences in hunger, BMI, age and fat and sugar consumption. 2 X 2 ANOVAs were conducted to test for differences in state mindfulness, gaze direction bias and gaze duration bias between the two conditions. Participants' hunger and characteristics were also tested as covariates using ANCOVA to assess whether they had any effect on the dependent variables. All analyses were conducted using SPSS v24.

4.5. Results

Participant Characteristics

Chi square analysis showed that gender did not significantly differ between the mindfulness and control conditions χ^2 (1) = 3.09, p = .08. T-tests found no significant differences in hunger, BMI and fat and sugar consumption between the two conditions: all p > .06 (see Table 4.2). There was a significant difference in age t(27.37) = - 2.17, p = .04, d = .70, whereby age was lower in the mindfulness condition than the control condition. Inclusion of participants' hunger, gender, BMI, age and fat and sugar consumption as covariates in the analyses did not affect the observed results for any of the dependent measures, and are thus not discussed further.

State Mindfulness

A 2 (condition: mindfulness, control) X 2 (time: pre, post) mixed design ANOVA was carried out to explore the effects of the MCD on state mindfulness. There was a significant interaction between condition and time F(1, 42) = 5.40, p = .03, η_p^2 = .11, with mindfulness scores increasing significantly amongst participants within the post mindfulness condition. There was a significant main effect for time F(1, 42) = 7.10, p = .01, η_p^2 = .15, but no significant main effect between conditions F(1, 42) = .10, p = .76 (see Table 4.3).

Table 4.2.

Measures of Participant Hunger and Characteristics Between Mindfulness and Control Conditions

	M, (*SD*) - Mindfulness (*n* = 22)	*M*, (*SD*) - Control (*n* = 22)	*p*
Hunger	1.64, (.79)	2.14, (.89)	.06
BMI	23.82, (4.47)	25.03, (4.89)	.40
Age*	21.45, (3.42)	25.77, (8.67)	.04
Fat and sugar consumption	58.00, (12.11)	59.09, (8.22)	.73

Note. M and *SD* are used to represent mean and standard deviation, respectively. * indicates significant difference between conditions.

Table 4.3.

Pre and Post Measures of SMS Between Mindfulness and Control Conditions

	M, (*SD*) – Mindfulness (*n* = 22)	*M*, (*SD*) – Control (*n* = 22)
Pre	63.14, (17.02)	67.45, (15.39)
Post	75.14, (13.32)	68.27, (17.29)

Note. M and *SD* are used to represent mean and standard deviation, respectively.

Gaze Directional Bias

A 2 (condition: mindfulness, control) X 2 (food image energy density: LED, HED) mixed design ANOVA was carried out, with the condition being a between subjects factor and food image energy density being a repeated measures factor (see Table 4.4). There was a significant main effect for food image energy density $F(1, 42) = 4.83$, $p = .03$, $\eta_p^2 = .10$, with all participants regardless of condition demonstrating greater bias towards HED food images ($M = .52$, $SD = .16$) than LED food images ($M = .46$, $SD = .14$). There was no significant interaction between condition and food image energy density $F(1, 42) = .79$, $p = .38$, and no significant main effect between conditions $F(1, 42) = 1.02$, $p = .32$.

Gaze Duration Bias

A 2 (condition: mindfulness, control) X 2 (food image energy density : LED, HED) mixed design ANOVA was carried out, with the condition being a between subjects factor and food image energy density being a repeated measures factor. There was no significant interaction between condition and food image energy density $F(1, 42) = 2.79$, $p = .10$, no main effect for food image energy density $F(1, 42) = .34$, $p = .56$, and no main effect between conditions $F(1, 42) = 1.81$, $p = .19$ (see Table 4.4).

Table 4.4.

Attention Bias Measures of Participants Between Mindfulness and Control Conditions

	M, (*SD*) - Mindfulness (*n* = 22)	*M*, (*SD*) - Control (*n* = 22)
Gaze direction bias		
LED	.47, (.13)	.46, (.15)
HED	.55, (.17)	.49, (.14)
Gaze duration time (ms)		
LED food	216.37, (80.09)	198.64, (67.35)
HED food	215.00, (91.01)	198.64, (75.86)
LED non-food	198.18, (59.25)	182.73, (67.41)
HED non-food	208.64, (67.77)	175.01, (58.69)
Gaze duration bias		
LED	.52, (.03)	.52, (.04)
HED	.50, (.03)	.53, (.04)

Note. M and *SD* are used to represent mean and standard deviation, respectively. LED – low energy density; HED – high energy density.

4.6. Discussion

The present study was the first to investigate the effect of mindfulness on attentional biases towards food cues using eye-tracking as a direct assessment of visual attention. The findings indicated participants who used the MCD improved significantly on their state mindfulness than those in the control condition. Further in support of the hypotheses, the results from the eye-movement data demonstrated that all participants exhibited a greater initial attentional bias towards HED food images than LED food images. Contrary to the hypotheses, the findings indicated no significant differences in the maintenance of attentional biases towards food cues between participants in the mindfulness condition and those in the control condition. Participants' hunger and other characteristics, such as gender, BMI, age and fat and sugar consumption displayed no significant effect on the findings.

The increase in state mindfulness scores after using the MCD is consistent with previous findings, which found the MCD to successfully induce mindfulness both longitudinally and within experimental settings (Hussein et al., 2017; Mantzios & Wilson, 2014). The components of the MCD follow the concepts of mainstream mindfulness training, but simply without the element of meditational practice, and instead incorporate concrete construals (Freitas et al, 2004). Concrete construals have been suggested to be suitable in elevating mindfulness as they promote attention to the present moment (Schmeichel et al., 2011), and focus on the *how* element of one's behaviour, which often does not require further judgment or rumination, and is thus similar to what mindfulness aims to achieve during contemplative practices (Brown & Ryan, 2003; Kabat-Zinn, 1990).

Participants orientating greater initial attentional bias towards HED food cues over LED food cues is coherent with the previous findings (Castellanos et al., 2009; Nijs et al., 2010) and the theory of incentive sensitisation (Robinson & Berridge, 1993). As HED foods tend to be higher in fat and sugar, they are suggested to activate reward pathways within the brain (Doolan et al., 2014; Volkow & Wise, 2005), and as a result HED food cues become more appealing and receive greater initial attention (Berridge, 2009).

The results indicating that mindfulness did not affect the maintenance of attentional bias towards food cues is surprising given that previous findings have concluded mindfulness to be a prominent factor in promoting healthier eating behaviours (Jordan et al., 2014; Dutt et al., 2019; Mantzios et al., 2019; Mantzios et al., 2020). However, there are factors which need to be considered that may have contributed towards the non-significant findings on the maintenance of attentional bias toward food cues, such as duration of the stimuli presentation and the eating behavioural patterns of participants. The pictorial stimuli in the current study was presented for 2000 ms, and whilst many researchers have indicated that stimuli presented for 1000 ms or longer is suitable to investigate maintained attention (Castellanos et al., 2009; Doolan et al., 2014), others have conflicting interpretations, with suggestions that 500 ms of stimuli presentation is an appropriate measure of maintained attention (Field & Cox, 2008; Koster, De Raedt, Goeleven, Franck, & Crombez, 2005). The difference of interpretation has also led to conflicting conclusions, with some researchers finding significant main effects between weight groups on their attentional biases towards food cues using

stimuli presented for 500 ms (Nijs et al., 2010), and others finding no significant differences between weight groups and their attention biases towards food cues after a stimuli presentation of 2000 ms (Castellanos et al., 2009). Similarly, studies using more comprehensive eye-tracking methodologies by employing a visual probe task (an indirect measure of attention) to explore attentional measures towards food cues found different results despite both methods being used within the same participant pool (e.g., Doolan et al., 2014). Therefore, suggesting that length of stimuli presentation and even the type of methodology used to measure attention towards food cues can affect the results obtained, and future studies are indeed required to identify the most accurate measure of attentional biases towards food cues, or even run two durations of the same paradigm when using mindfulness.

Although hunger, BMI and fat and sugar consumption did not appear to have any impact on the current findings, other eating behaviours could have potentially contributed towards the non-significant differences of maintained attentional biases towards food cues between the mindfulness and control condition. For example, research has suggested mindfulness is an element that can assist with problematic eating behaviours, such as emotional, external and restrained eating (Alberts et al., 2012; Lattimore, Fisher, & Malinowski, 2011; Ouwens et al., 2015). Further evidence on eating behaviours has indicated greater attentional biases towards food cues amongst those who are high emotional and external eaters (Brignell, Griffiths, Bradley, & Mogg, 2009; Hou et al., 2011; Hummel et al., 2018; Nijs, Franken, & Muris, 2009), and mixed findings amongst restrained eaters, with some evidence suggesting a greater attentional bias towards HED foods, and others showing no significant differences (Hollit, Kemps, Tiggemann, Smeets, & Mills, 2010; Werthmann et al., 2013). Therefore, exploring the effects of eating behaviours (i.e., emotional, external and restrained) on brief mindfulness training and attention biases towards food cues may be beneficial for any future research.

A final factor that should be considered when interpreting the present findings is that although the MCD did not reduce attentional biases towards food cues, there is evidence suggesting that the MCD can modify consumption of HED foods and assist with weight regulation (Mantzios & Wilson, 2014; Mantzios et al., 2020). Thus, using the MCD to promote *actual* intake of healthier foods may assist in overcoming the apparent attentional biases towards food cues, and should be investigated in any future research.

4.7. Limitations and Future Directions

There are a number of limitations and potential avenues for future research that need to be considered. First, this study was conducted in a controlled laboratory setting whereby participants were facing a computer with a screen-based eye-tracking device, suggesting a lack of ecological validity. Future research should consider using methodologies that resemble more naturalistic settings. This could potentially be achieved through participants traversing a real-life setting whilst wearing an eye-tracking apparatus (Graham, Orquin, & Visschers, 2012) or even using the concept of virtual reality, whereby participants perform shopping tasks or are simply presented with advertisements of foods whilst measuring their visual attention (Folkvord, Anschutz, Boyland, Kelly, & Buijzen, 2016; van Herpen, van den Broken, van Trijp, & Yu, 2016).

Furthermore, comparing attentional biases towards food cues between a mindful eating practice condition and a control condition which was not exposed to any food related reading material may be another limitation. Although it is common to use non-food related materials as a control stimulus in eating behaviour research (e.g., Dutt et al., 2019; Mantzios et al., 2020; Marchiori & Papies, 2014, Robinson, Fleming, & Higgs, 2014), the difference between reading the MCD and reading materials related to either healthy foods, unhealthy foods or even a neutral food article would have been beneficial in further understanding attentional biases towards food cues. It is suggested that attentional biases are observed through task relevant objects (Beck & Kastner, 2009; Hickey, Chelazzi, & Theeuwes, 2010). For example, Kumar, Higgs, Rutters, and Humphreys (2016) found food related objects deployed increased visual attention towards food cues, whereby merely thinking about food modulated the extent to which attention was captured, and holding specific information caused attention to be automatically drawn towards food stimuli (Higgs, Dolmans, Humphreys, & Rutters, 2015; Higgs, Rutters, Thomas, Naish, & Humphreys, 2012; Rutters, Kumar, Higgs, & Humphreys, 2014). Similarly, Werthmann, Field, Roefs, Nederkoorn, and Jansen (2014) found manipulating attentional bias for food cues increased cravings and food intake, suggesting a link between attention for food and food intake. Such evidence appears to indicate that attentional biases towards food stimuli can be created when one is exposed or primed to food related content (in the case of the present study, the MCD). However, as the findings from the present study suggested no

significant differences in attentional biases towards food cues between the mindfulness and control condition, it could be proposed that exposure to food related content whilst being mindful may be as effective as exposure to non-food stimuli in enabling people to be less biased towards food cues and ultimately consume less. Therefore, future research should also use a control condition exposed to a food related article, and explore any potential effects or differences in attentional biases towards food cues.

Another limitation of the present study is that it focuses predominantly on healthy female undergraduates, minimising the implications of this research to future directions. Research has shown differences in visual attention toward food cues between both male and female healthy weight and overweight or obese participants (Castellanos et al., 2009; Doolan et al., 2014; Nijs et al., 2010). Future research should explore the effectiveness of the MCD and visual attention on food cues in all healthy weight and overweight or obese mixed-gender populations.

Finally, future research could explore the long term effects of using the MCD on attentional biases towards food cues. Previous research has displayed the long terms benefits of using the MCD on mindfulness, weight loss and weight regulation (Mantzios & Wilson, 2014). Thus, priming participants with the MCD over a longer period of time could also potentially improve their attentional biases towards food cues.

4.8. Conclusion

In conclusion, the present study found that participants orientated a greater directional attention bias towards HED food images than LED food images, and the maintenance of attentional bias towards food cues did not appear to be significantly affected by mindfulness, specifically the MCD. Given the abundance of food cues within the contemporary environment, future research should investigate whether the MCD can overcome attentional biases towards food cues by promoting the consumption of healthier food choices and reduced energy intake.

CHAPTER 5: EXPLORING MINDFULNESS AND THE PORTION SIZE EFFECT

5.1. Abstract

Background: Previous research exploring general mindfulness interventions to reduce the portion size effect were found to be limiting in drawing clear conclusions. In this research, it was hypothesised that using a mindful eating specific intervention, namely MCD would reduce the portion size effect on energy intake when compared to control conditions. **Method:** One-hundred and seven participants were randomly assigned to one of four conditions (i.e., small portion – control, small portion - mindfulness, large portion - control, or large portion – mindfulness) and were served peanut M&Ms. **Results:** Participants in the large portion – control condition exhibited greater energy intake than participants in the small portion – control condition, but using the MCD appeared to reduce the portion size effect, with no significant differences in energy intake between those in the small portion and large portion - mindfulness conditions. However, there was a slight (i.e., non-significant) trend apparent for participants in the small portion - mindfulness condition to consume more than those in the large portion - mindfulness condition. Furthermore, there were no significant differences in energy intake between participants in the large portion – mindfulness condition and those in in the large portion – control condition. **Conclusion:** The results from the current study suggest mindful eating interventions may propose as a preliminary effective mean of reducing energy intake. However, more research is warranted using enhanced and controlled experiments in regulating healthier eating practices. Limitations and future research directions are discussed.

5.2. Background

Portion size is a factor that has often been identified as a contributor towards weight gain and obesity (e.g., Barbara & Pourshahidi, 2014; Young & Nestle, 2002). Research has shown that package sizes sold in supermarkets and portions served in restaurants have significantly increased in recent decades (e.g. Vermeer, Steenhuis, & Poleman, 2014). This is problematic, with research demonstrating that when participants are presented with larger portions, they consume 12% to 23% more, and fail to compensate for such excess energy intake in subsequent meals (e.g., Hetherington & Blundell-Birtill, 2018). This phenomenon of increasing energy intake simply based on portion size

has been described as the “portion size effect”, and it has shown to be indiscriminate between people (i.e., gender, BMI) and food types (i.e., pasta, popcorn, chocolate - Zlatevska, Dubelaar, & Holden, 2014). International public health debates on changes in portion sizes have been held, but have not yet been agreed upon, and until there is a consensus in reducing portion sizes across public policy makers and the food industry, it is deemed to be imperative to explore methods that can assist people to recognise and respond to larger portion sizes.

There are suggested to be several mechanisms underlying the portion size effect (English, Lasschujit, & Keller, 2015; Herman, Polivy, Pliner, & Vartanian, 2015). One mechanism behind *why* people overconsume when presented with larger portions is suggested to be appropriateness; that is, participants believe that the portion served to them is an indicator as to how much one should consume regardless of hunger and satiety sensations (Herman & Polivy, 2005). The portion size acts as a consumption norm, so the larger the portion served, the more likely people are to increase their consumption, especially amongst those who do not pay much attention to how much they are eating (Wansink & van Ittersum, 2007). Visual cues are also a mechanism that can result in portion size influencing food intake. For example, participants have shown to rate larger portions of food as more appealing and reported a higher desire to eat them compared to smaller portions of the same foods (Burger, Cornier, Ingebrigtsen, & Johnson, 2011). Other research has suggested that the mere presence of food can trigger desires to eat, suggesting that people may eat simply because it is available and present (Wansink, Painter, & North, 2005).

Several studies have since investigated methods to modifying the food environment to reduce the magnitude of the portion size effect. For example, Stroebele, Ogden, and Hill (2009) proposed that initial exposure to portion controlled packages reduced intake of subsequent larger packages. Other research has suggested the process of anchoring can impact the portion size effect and subsequently reduce peoples’ intake (Marchiori, Papies. & Klein, 2014). Furthermore, research led by Spanos, Kenda, and Vartanian (2015) found serving size label reduced the portion size effect, but this effect was only present when servings were labelled as larger opposed to smaller. In another study, Marchiori and Papies (2014) proposed that the mechanisms underlying the portion size effect indicated the presence of mindless eating behaviours. As a result, an alternative strategy that has been

suggested in reducing the portion size effect is to place a greater focus on internal cues, such as hunger and satiety, which may assist in increasing peoples' awareness regarding their experience with food. Thus, this might reduce the influence of external cues, such as attractiveness, which may in turn diminish the effects of unhealthy eating (Dalen et al., 2010).

One method that has been widely used in increasing awareness is mindfulness (Kabat-Zinn, 1990). Mindfulness has been described as purposely paying attention to one's present moment experience with an open, non-judgmental and accepting attitude (e.g., Bishop et al., 2004; Brown & Ryan, 2003; Kabat-Zinn, 1990). More specifically, research on mindful eating appears promising, with mindful interventions demonstrating significant changes in weight loss and increases in mindfulness and cognitive restraint around food (Dalen et al., 2010; Mantzios & Wilson, 2014; Timmerman & Brown, 2012). Some research has focused specifically on the impact of mindfulness in regulating portion size effect (Marchiori & Papies, 2014; Cavanagh et al., 2014). For example, Cavanagh et al. (2014) compared a brief education on internal and external influences on food intake and a brief mindfulness raisin exercise, in addition to reading a brochure about mindfulness. The results demonstrated that there were no significant reductions in portion size consumption. Similarly, Marchiori and Papies (2014) used a brief MBI, namely the body-scan meditation, an exercise which involves gaining awareness of one's body in the present moment. The findings showed that the MBI had no significant impact on the portion size effect, but did reduce the effects of hunger for eating unhealthily (Marchiori & Papier, 2014). Such results could suggest that perhaps generic mindful exercises are not effective in reducing the portion size effect because they are not specific to eating behaviours (Mantzios & Wilson, 2015a), leading researchers to explore more targeted eating specific mindfulness interventions (Kristeller et al., 2014).

Mantzios and Wilson (2014) combined mindfulness and self-compassion with CLT to develop a tool that was specifically related to mindful eating, namely MCD. CLT describes an identification on a close or distant continuum (Liberman & Trope, 1998). Whilst close objects, events or individuals are represented as concrete; distant objects, events and individuals are portrayed as abstract. Abstract construals consider *why* actions are being performed, whereas concrete construals focus on *how* they carry out behaviour (Freitas et al., 2004). Mantzios and Wilson (2014) suggest that

concrete construals are suitable in promoting mindfulness because of two main factors. Firstly, concrete construals promote attention to the present moment (Schmeichel et al., 2011), similarly to what mindfulness aims to achieve (e.g., Brown & Ryan, 2003). Secondly, by focusing on the *how* aspect of one's behaviour, concrete construals do not often require further judgment or rumination, which is also an element similarly associated with mindfulness (Brown & Ryan, 2003; Kabat-Zinn, 1990). Furthermore, research has found that interacting with the MCD through either writing out the answers or by simply considering the answers to the mindful construal questions whilst eating has improved with both state and trait mindfulness, lower energy intake and weight regulation (Hussein et al., 2017; Mantzios et al., 2020; Mantzios & Wilson, 2014). However, research has not yet explored the impact of the MCD on portion size effect. Engaging with the MCD by simply considering questions related to mindfulness, hunger, taste, and healthiness of a HED snack presented may be sufficient to overcome the mechanisms underlying the portion size effect, and promote relying and placing a greater focus upon internal cues of hunger and satiety.

Therefore, the present study will explore whether using the MCD could directly influence the portion size effect. It was hypothesised, participants who are served a larger portion of M&Ms will exhibit a greater energy intake than those who are served a smaller portion, but engaging with the MCD will significantly reduce the portion size effect.

5.3. Method

Participants

Participants attending a university in West Midlands, UK were recruited via an online research participation scheme at the institution, and they received course credit for their participation. Thirteen participants were excluded from the final analysis as they did not follow all the instructions provided by the researcher. The final sample consisted of 107 participants with an average BMI of M = 24.89 (SD = 5.96) and an age of M = 20.80 (SD = 4.47). The sample size was based on the number of participants recruited in other similar studies (e.g., Marchiori & Papies, 2014; Marchiori, Corneille, & Klein, 2012). Participants in the current study were of different ethnicities: White British (n = 59), South Asian (n = 26), Black African or Caribbean (n = 11), Mixed Ethnicity (n = 6), Chinese (n = 1),

Middle Eastern (n = 2) and not specified (n = 2). The present study was approved by the University's ethics committee (see Appendix B3), and informed consent was gained from all participants.

Eligibility. Due to the nature of the study (i.e., presence of food), participants were informed via an information sheet and consent form that they were not eligible to participate if they had been diagnosed with an eating disorder, or if they had any nut allergies.

Experimental Conditions

Participants were randomly assigned to one of the four conditions: small portion – control condition (n = 28; female = 24, male = 4; condition 1), small portion – mindfulness condition (n = 27; female = 17, male = 10; condition 2), large portion – control condition (n = 24; female = 18, male = 6; condition 3) and large portion – mindfulness condition (n = 28; female = 24, male = 4; condition 4). Participants in the mindfulness conditions received the original MCD (as opposed to the modified version used in Chapter 4), consisting of questions surrounding mindfulness awareness and concrete construals (see Appendix C2; see Table 5.1). The modified version of the MCD used in Chapter 4 was designed to promote a mindful eating experience during the intake of a single raisin, as opposed to the original MCD designed to enhance a mindful eating experience during usual intake (Mantzios & Wilson, 2014). Participants were required to simply consider (instead of write) their answers to all questions of the MCD (Hussein et al., 2017; Mantzios et al., 2020; see Chapter 4). Participants in the control conditions were provided with a newspaper article (concerning diesel cars), and the newspaper article was chosen because it matched the length of the MCD but avoided any discussion of food or eating related matters.

Table 5.1.

Questions Presented to Participants in the Mindfulness Condition

Mindful Construal Diary (MCD)
How does this snack taste?
How does this snack smell?
What are the colours and texture of it?
How could this snack be better right now?
How could this snack be healthier right now?
How do you feel and what passes through your mind now that you are eating this snack?
How important is it for me and all people to eat healthy?
How kind are you to yourself now that you eat this snack?
How understanding and kind are my thoughts and feelings now that I am eating this snack?
How understanding and patient am I now that thoughts and feelings are intruding this pleasurable experience?
How understanding and patient am I now that this snack is not a satisfying experience?
How do I show kindness to myself now that I am eating healthily?
How important is this snack right now?

Food and Portion Size

Participants were provided with Peanut M&Ms, and they were served as one of two portion sizes. Participants in the small portion conditions were served 300g (1,500kCal) and participants in the large portion conditions were served 600g (3,000kCal). Such portion sizes were provided in order to prevent artificially limited intake and to avoid participants from noticing the amount of M&Ms eaten from the bowl (Adam & Leary, 2007). Both small and large portions of M&Ms were provided in a clear plastic bowl with the size amounting to: length 30.48cm x width 30.48cm x depth 11.43 cm.

Measures

Participant demographic form. Participants were asked questions regarding their age, height, weight, gender and ethnicity in order to assess their BMI and background information.

Hunger. To assess hunger, participants were asked at the start of the experimental session "How hungry do you feel right now?" with responses ranging from 1 (*not at all)* to 5 *(extremely hungry*).

FFMQ-SF (Bohlmeijer, et al., 2011). To control for any differences between conditions and any effect that trait mindfulness could have on the results, FFMQ-SF was administrated. Please see Chapter 2 for a full description of the FFMQ-SF. The present study produced an overall alpha of (α = .71).

MES (Hulbert-Williams et al., 2014). To control for any differences between conditions and any effect that mindful eating could have on the results, MES was administrated. Please see Chapter 2 for a full description of the MES. The present study produced an overall alpha of (α = .85).

Procedure

The study was advertised as an experiment regarding food and personality, and was deliberately kept vague in order to prevent participants from predicting the true aim of the study. Experimental sessions took place between 2pm and 4pm and lasted approximately 25 minutes. Upon arrival, participants received an information sheet, and after providing informed consent, they were seated in individual cubicles. Participant's height and weight was measured in cm and kg using a stadiometer and a digital scale, and they were then instructed to complete a participant demographic form and a hunger measure. Next, depending on the conditions participants were asked to either read the MCD (mindfulness conditions) or a newspaper article (control conditions) for 2 minutes prior to receiving the M&Ms in order to familiarise themselves with the reading materials. All participants were then provided with M&Ms, amounting 300g or 600g, depending on the portion size condition, and they were asked to continue engaging with the reading materials whilst eating for another 5 minutes. A total 7 minutes framework to read and engage with the MCD was deemed to be appropriate based on previous research that has shown a similar time frame to result in significant improvements in state mindfulness (Hussein et al., 2017; also see Chapter 4). Participants were told they could eat as much M&Ms as they like. After 5 minutes, the experimenter asked participants to finish eating, and they were asked to respond to questionnaires regarding mindfulness (i.e., FFMQ-SF) and mindful eating (i.e., MES). Once participants had completed the questionnaires, they were debriefed and thanked for their participation.

5.4. Data Analysis

The consumption of M&Ms was initially measured in grams, and this was determined by calculating the difference in weight of each bowl between the start and end of each experimental session. The grams consumed were then multiplied by 5.12 (obtained from manufacturers package information) in order to get a measure of total calories (kCal) consumed. Chi square was used to account for differences in gender across the four conditions, and one way between group ANOVAs were conducted to test for differences in hunger, BMI, age, mindfulness and mindful eating. Furthermore, a 2 X 2 ANOVA was planned to test the effect of mindfulness and portion size on energy intake, and any significant findings were followed up with Tukey HSD tests. Hunger and participant characteristics were tested as covariates to assess whether they had any effect on energy intake, and any effects observed were followed up with subsequent analyses. All analyses were conducted using SPSS v24.

5.5. Results

Participant Characteristics

Chi Square analysis showed that gender did not significantly differ across all conditions, X^2 (3) = 5.54, p = .14. One way between group ANOVAs found no significant differences across conditions in participants' hunger, BMI, age, mindfulness and mindful eating: all $p > .27$ (see Table 5.2). Hunger, BMI, age and mindfulness were tested as covariates, and were found to have no significant effect on participants' energy intake across the conditions, and are therefore not discussed any further.

Energy Intake[4]

A 2 (condition: mindfulness, control) X 2 (portion size: small, large) between subjects' ANOVA was conducted to explore the effects of mindfulness and portion size on energy intake. There was a significant interaction between condition and portion size on energy intake $F(1, 103) = 5.55$, $p = .02$, $\eta_p^2 = .05$. There was no significant main effect between conditions $F(1, 103) = .17$, $p =$

[4] From Chapter 5 to Chapter 8, "Energy Intake", "Food Intake", "Chocolate Intake", "Intake" and "Consumption" refers to both grams and calories consumed.

.68, and there was no significant main effect between portion size $F(1, 103) = 1.87$, $p = .18$ (see Table 5.3).

A post hoc comparison using Tukey HSD was conducted to explore participants' energy intake across the four conditions: small portion – control, small portion – mindfulness, large portion – control, and large portion – mindfulness conditions. As Figure 5.1 shows, the findings suggested participants in the large portion – control condition exhibited greater energy intake than those in the small portion – control condition ($p = .05$), but no significant differences in energy intake were found between participants in the small portion – mindfulness condition and those in the large portion – mindfulness condition ($p = .89$). There were also no significant differences in energy intake between participants in the small portion – control condition and small portion – mindfulness condition ($p = .51$), or between those in the large portion – control condition and large portion – mindfulness condition ($p = .23$). Therefore, suggesting that energy intake differences were only significantly apparent between participants in the small and large portion control conditions.

Table 5.2.

Measures of Participant Hunger and Characteristics Across Small and Large Portions – Control and Mindfulness Conditions

	M, (*SD*) – (C1) - Small Portion Control (*n* = 28)	*M*, (*SD*) – (C2) - Small Portion Mindfulness (*n* = 27)	*M*, (*SD*) – (C3) - Large Portion Control (*n* = 24)	*M*, (*SD*) – (C4) - Large Portion Mindfulness (*n* = 28)	*p*
Hunger	2.57, (.96)	2.44, (1.09)	2.13, (.74)	2.21, (1.17)	.36
BMI	24.61, (5.61)	23.75, (4.82)	25.22, (5.75)	26.01, (7.38)	.55
Age	20.04, (1.80)	21.37, (4.63)	20.04, (2.66)	21.68, (6.79)	.39
Mindfulness [a]	55.46, (9.61)	55.81, (7.99)	51.91, (6.59)	53.89, (8.59)	.33
Mindful eating [b]	70.50, (12.59)	74.33, (12.62)	72.83, (10.73)	70.43, (12.58)	.58

Note. M and *SD* are used to represent mean and standard deviation, respectively. [a] = FFMQ-SF, [b] = MES.

Table 5.3.

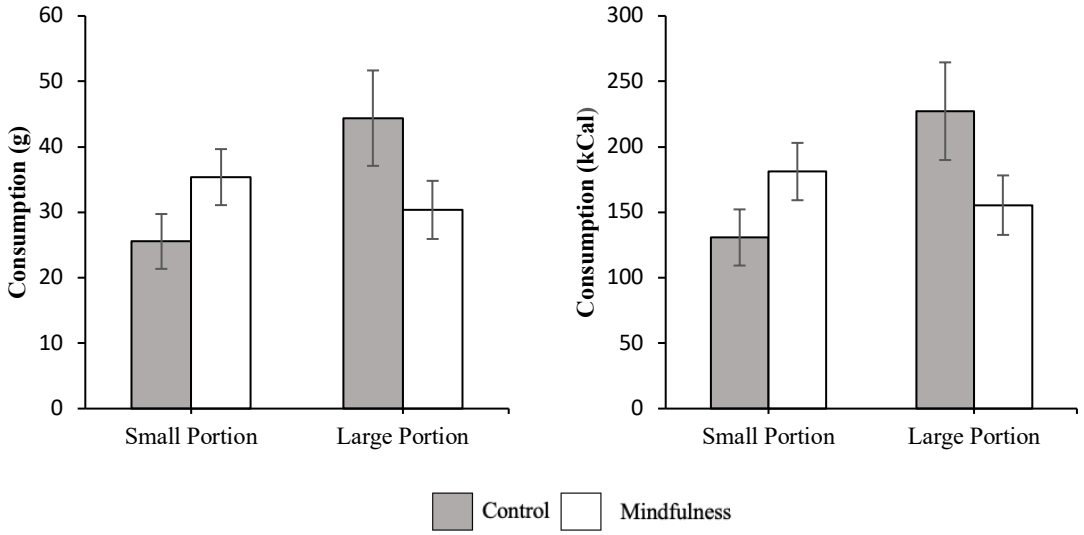
Participants' Energy Intake Across Small and Large Portions – Control and Mindfulness Conditions

	(C1) - Small Portion Control (*n* = 28)	(C2) - Small Portion Mindfulness (*n* = 27)	(C3) - Large Portion Control (*n* = 24)	(C4) - Large Portion Mindfulness (*n* = 28)
M, (*SD*) - g	25.54, (22.17)	35.37, (22.23)	44.38, (35.70)	30.36, (23.49)
M, (*SD*) - kCal	130.74, (113.49)	181.10, (113.81)	227.20, (182.79)	155.43, (120.26)

Note. M and *SD* are used to represent mean and standard deviation of consumption of M&Ms in grams and calories.

Figure 5.1.

Participants' M&Ms Energy Intake



Note. Consumption of M&Ms across conditions (Control vs Mindfulness) and portion sizes (300g vs 600g - 1,500kCal vs 3,000kCal). Error bars refer to the standard error of the mean. Left panel represents consumption in grams, and right panel represents consumption in calories.

Post Hoc Exploration: Effects of Mindful Eating on Energy Intake

Mindful eating as a covariate had a significant effect on participants' energy intake $F(1, 102) = 5.70$, $p = .02$, $\eta_p^2 = .05$. Low mindful eaters were associated with slightly higher energy intake ($M = 191.74$, $SD = 145.77$) than high mindful eaters ($M = 154.48$, $SD = 126.87$). Post hoc Tukey HSD test showed that only the difference between low mindful eaters in the small portion – control condition and low mindful eaters in the large portion – control condition was significant ($p = .03$). Chi square analyses showed that low and high mindful eaters were equally represented in intervention conditions $X^2 (1) = .10$, $p = .75$ and portion sizes $X^2 (1) = 1.53$, $p = .22$. Additionally, mindful eating did not interact with the conditions or portion sizes: all $p > .40$. Furthermore, the significant interaction between condition and portion size on energy intake was present when controlling for the effect of mindful eating $F (1, 102) = 7.27$, $p = .01$, $\eta_p^2 = .07$. Therefore, mindful eating does not appear to explain the interactional effect of the experimental manipulations.

5.6. Discussion

The present study explored whether the use of the MCD could diminish the portion size effect. Consistent with previous research, it was found that participants in the large portion - control condition displayed a greater intake of M&Ms than participants in the small portion - control condition. However, in line with our hypothesis, the use of the MCD reduced the effect of portion size on participants' energy intake, with results showing that there were no significant differences in the intake of M&Ms between those in the small portion and large portion mindfulness conditions. As the primary mechanisms of the MCD are based upon the elements of mindful eating, these findings are in accordance with previous studies demonstrating that eating specific MBIs are successful in regulating healthier eating behaviours (Dalen et al., 2010; Kristeller et al., 2014; Mantzios & Wilson, 2014). However, it should be noted that whilst no significant differences were found between the small and large portion mindfulness conditions, participants in the small portion - mindfulness condition did eat slightly (i.e., non-significant) more than those in the large portion - mindfulness condition. Therefore, the MCD may not necessarily regulate average portion sizes, which is one potential avenue for future research.

Explaining the findings could be through Adaptation Level Theory (ALT; Helson, 1964), whereby the judgment of the small condition depended on how its magnitude compared to a single reference point, which would be a typical and average pack of M&Ms. An adaptation in decision-making and through consideration of relevant information may have been an aspect that poses a novel method of exploring mindful eating interventions in future research. Still, allowing participants in the mindfulness condition to read and consider the questions of the MCD proved helpful in regulating consumption. Engaging in this mindful approach may have led participants to place a greater focus upon their internal cues – such as hunger and satiety – and refrain from re-acting to the external cue of portion size (Mantzios & Wilson, 2014; Dalen et al., 2010).

Furthermore, although participants in the large portion – mindfulness condition did display a lower energy intake than participants in the large portion – control condition, these differences were not significant. The present study did not assess state mindfulness measures pre and post intervention, and it could be the case that participants state mindfulness levels between the two conditions varied

significantly prior to the intervention. As such, participants in the large portion - mindfulness condition may have indeed significantly increased their state mindfulness post intervention, but they may not have necessarily significantly differed from those in the large portion - control condition, which could in effect, serve as a potential explanation for the non-significant differences in energy intake between the two conditions. Another element that should be considered is that only using the MCD for 5 minutes whilst eating (plus 2 minutes prior to consumption) may have interfered with the mindful eating experience. Some researchers have used a slightly longer time-frame, such as 14 minutes to assist participants in developing a mindfulness state (e.g., Marchiori & Papies, 2014), and as such a 7 minute total duration in the current study may not have been a sufficient amount of time to engage with the MCD. However, previous research using the MCD has found a similar time-frame to improve state mindfulness (Hussein et al., 2017; see Chapter 4). There are also several other brief mindfulness strategies that have applied a similar time-frame used in the current study, and have successfully promoted healthier eating behaviours (e.g., Allirot et al., 2018; Tapper & Turner, 2018). Therefore, any future research conducted should explore measures of state mindfulness as a means of controlling the experiment more tightly.

Additionally, the reduced portion size effect between the small portion – mindfulness condition and large portion – mindfulness condition could be explained through the use of an eating specific mindful exercise and not a generic mindful exercise (Mantzios & Wilson, 2015a). Whilst there is some evidence that general mindfulness interventions are successful in reducing food intake (e.g., van de Veer et al., 2016), there are mixed findings in using general mindfulness techniques in reducing portion size effect. For example, two studies have previously looked at the portion size effect and generic brief mindful exercises, and neither have found a success in reducing the portion size effect (Cavanagh et al., 2014; Marchiori & Papies, 2014). On the other hand, Timmerman and Brown (2012) found that participants who took part in a mindful eating intervention showed a reduction in their daily calorie intake. Therefore, it is likely that the specific focus on eating, rather than typical and generic mindful exercises resulted in the reduction of the portion size effect by allowing participants to endure eating related specific thoughts, and attune themselves better to their hunger and cravings.

Finally, the use of priming (or nudging), which is a dynamic undercurrent of the MCD has shown to be successful in reducing intake of tempting snacks (Buckland, Finlayson, Edge, & Hetherington, 2014). For example, Versluis and Papies (2015) found that the use of diet-goal priming, such as the cover of a dieting magazine or diet related commercial significantly reduced the portion size effect. The act of considering questions within the MCD may have equally acted as a mindful-priming technique, and in turn, aided in the reduction of the portion size effect by centring on internal cues of satiety and hunger, and respond in a mindful way, whether or not we are considering the portion-size effect. Writing the answers out to the questions in the MCD would have required more conscious effort and may have been a distracting factor, and in turn, taken the focus away from the actual MCD (Foerde, Knowlton, & Poldrack, 2006). The feature of priming may have allowed participants to be consciously aware of their food intake instead of mindlessly consuming the M&Ms or cognitively engage with writing their responses. Hence, using the diary as a priming tool may have promoted lower levels of consumption based on prior reference points of average portions, without distractions and heightened attention.

5.7. Limitations and Future Directions

There are some limitations within the present study that require further discussion. Firstly, the present study used a highly controlled laboratory setting, which is quite different to home, restaurants and social food environments, where there is an added level of complexity. For example, watching television, eating with friends and families, and the element of "value for money" (i.e., larger portions offered at a proportionally low cost) are all factors that are present in real-life settings, and can contribute towards peoples' energy intake (Belisle, Dalix, & Slama, 2004; De Castro & Brewer, 1992; Kaisari & Higgs, 2015; Young & Nestle, 2007; Steenhuis & Poelman, 2017). Thus, future research should attempt to integrate the MCD into daily eating behaviours, and explore the effect it may have upon both internal and external cues.

Moreover, the present study consisted predominantly of lean female university students, making it difficult to generalize the results amongst other populations. Future research should explore both the community and clinically obese populations to gain an overall understanding of how effective the MCD is in reducing the portion size effect.

Third, serving a large portion of 600g of M&Ms challenges the ecological validity of the present study. For example, a standard UK portion of M&Ms is 48g (240kCal); the results in the current study suggest that on average the largest portion eaten was approximately equivalent to one standard bag. Future research should use portion sizes that reflect a variety of amounts, both smaller portions and perhaps even larger portions as there are M&Ms that are sold in 1kg bags to consumers in the UK, and other low-budget supermarkets that are selling their own branded products in larger portions.

Finally, only M&Ms were used as a snacking option; future research should examine other types of snacks, and explore whether the MCD can assist with overcoming the portion size effect amongst different foods, as it would imitate a more realistic, contemporary, and potentially competing food environment.

5.8. Conclusion

The findings from the present study preliminary indicate that the MCD may potentially eliminate the portion size effect. However, this does not necessarily mean that people collectively eat less; those with smaller portions may eat slightly more. Whilst there are many different methodologies available when putting mindfulness forward as an intervention in promoting healthier eating behaviours, the MCD is a tool that is easily accessible, and could indeed protect the fiscal health of public services. Exploring how the MCD could regulate intake from larger portion was an initial step, further research is warranted using enhanced and controlled experiments to explore the extent to which the MCD can aid in healthier eating practices, especially amongst portions that are considered to be of a small or average size.

CHAPTER 6: EXPLORING MINDFULNESS AND THE PROMOTION OF HEALTHIER FOOD CHOICES

6.1. Abstract

Background: Regularly choosing HED foods can have negative health consequences. The present study tested whether a mindful eating specific tool, namely MCD would promote healthier eating behaviours. **Method:** Eighty-five university students were randomly assigned to either a mindfulness or control condition, and were served M&Ms and grapes as an unhealthy and healthy option, respectively. **Results:** Participants in the mindfulness condition consumed significantly less M&Ms than participants allocated to the control condition, but no significant differences were found in the consumption of grapes between the two conditions. When exploring hunger within the conditions, control participants ate significantly more M&Ms when hungry, whilst the same was not true for participants in the mindfulness condition. **Conclusion:** Together, these result suggest that the MCD may be effective in reducing consumption of foods high in fat and sugar. However, future research is warranted in developing the MCD to encourage consumption of healthier food options.

6.2. Background

Transition to university is a time of change, and on campus living has been associated with poorer eating habits (Sprake et al., 2017; Tanton, Dodd, Woodfield, & Mabhala, 2015). Students often cite a lack of time, limited knowledge on how to prepare healthy foods, and easy access to unhealthy foods as barriers to healthy eating (Ashton, Hutchesson, Rollo, Morgan & Collins, 2016; Escoto, Laska, Larson, Neumark-Sztainer, & Hannan, 2012). Higher consumption of convenience and HED foods has been associated with a lower intake of fruit and vegetables, and university students have been reported to consume well below the public health agency recommended five portions of fruit and vegetables per day (Small, Bailey-Davis, Morgan, & Maggs, 2013). Such unhealthy eating behaviours have shown to result in significant weight gain (Vadebonceour, Townsend, & Foster, 2015), which usually continues throughout adulthood. Therefore, interventions for healthy eating amongst student populations may be important and timely.

Typically, consumers make an average of over 200 food related choices per day (Wansink & Sobal, 2007), and such choices can be significantly affected by the "obesogenic environment" (Chaput, Klingenberg, Astrup, & Sjoden, 2011). For example, research has shown that supermarkets package sizing and restaurants and fast-foods portions have all increased in recent years (Steenhuis & Poelman, 2017; Wansink, Just & Payne, 2009). However, eating habits are not only concerned with the amount that people eat, but also the type of foods consumed. Indeed, the ubiquitous availability of high-energy foods can make healthy and low-caloric choices difficult (Hartmann, Siegrist & van der Horst, 2012). To improve eating behaviours, changes need to be made in dietary intake. For example, increasing fruit and vegetable intake and reducing the consumption of HED foods can significantly aid in weight regulation (Hill, Wyatt, Reed & Peters, 2003). Investigating effective methods that encourage people to make healthier food choices is essential.

Several studies have identified different methods in influencing the choice towards healthier eating habits, including the role of visual fields, social influences and priming (Burger et al, 2010; Anschutz, van Strien, & Engels, 2008). Romero and Biswas (2016) found that healthier food options are significantly more likely to be selected when they are placed on the left visual field compared to the right visual field. The influence of descriptive social norms has been investigated, and findings suggest that exposure to descriptive information of social norms leads participants to increasingly choose healthier eating options, such as increasing vegetable intake (Mollen, Rimal, Ruiter & Kok, 2013; Robinson, Fleming, & Higgs, 2014). Simple health primes have also shown to stimulate healthier eating behaviours, whereby diet cues in a TV commercial reduced unhealthy snack consumption amongst dieters (Anschutz, van Strien & Engels, 2008). Similarly, exposing dieters to the cover of a health and diet magazine led participants to fewer hedonic food choices (Versluis & Papies, 2015). Field findings also found that simple health primes reduced the purchase of HED snacks by up to 75% amongst overweight and obese individuals (Papies, Potjes Keesman, Schwinghammer, & Koningsbruggen, 2014). Such findings suggest that health primes can shift attention away from attractive, high-caloric foods, and instead towards choosing healthier eating options, making priming a highly viable intervention tool for the facilitation of healthy food choices. However, enacting the elements of priming of one's own accord is not a clear-cut process. An

intervention tool that actively enables people towards the act of priming may be required in order to maintain healthy eating behaviours (Mantzios & Wilson, 2014).

Over recent years, mindfulness has been used as a successful intervention strategy in promoting healthier eating practices, such as reduced food cravings, weight loss and increased diet self-efficacy (Alberts et al., 2010; Jenkins & Tapper, 2014, Jordan et al, 2014; Timmerman & Brown, 2012). Hunger can impact our attitudes towards food choices – typically boosting the attractiveness of HED foods (Amin & Mercer, 2016; Siep et al., 2009), and triggering automatic eating-orientated reactions (Papies, Stroebe & Aarts, 2008). However, research has shown that mindful attention can help diminish the attractiveness towards such foods by viewing simulations of eating attractive but unhealthy foods as mere mental events, subsequently resulting in reduced unhealthy snacking (Marchiori & Papies, 2014).

Mindfulness has been described as an awareness that emerges through purposefully paying attention to what is taking place in the present moment with a non-judgmental attitude (Kabat-Zinn, 1990). Experimental studies have shown the practice of mindfulness to successfully encourage healthier eating behaviours (Papies, Barsalou & Custers, 2012; Papies, Pronk, Keesman, & Barsalou, 2015) and display significant changes in weight loss (Hamilton, Fawn, May, Andrade & Kavanagh, 2013; Mantzios & Wilson, 2014). Findings from cross-sectional studies suggest that this positive impact occurs by assisting in the gradual change of external to internal eating, and improving the ability to monitor and regulate dietary intake (Mantzios & Giannou, 2014; Mantzios & Wilson, 2014). In a number of studies participants who reported higher levels of mindful eating reported increased intake of fruit and vegetables, a reduction in fat and sugar consumption, grazing and reduced motivations to eat palatable foods (e.g., Gilbert & Waltz, 2010; Mantzios, Egan, Hussain, et al., 2018). Taken together, these findings provide strong evidence that mindfulness can encourage healthier eating behaviours, and on a practical level gives guidance as to how consumers can enhance their responsiveness to hunger and satiety cues (Jordan et al., 2014).

The majority of experimental studies on eating behaviours use body scan exercises or short audio recording of mindful instructions. However, current evidence within literature suggests that eating specific mindful exercises may be more effective in promoting healthier eating behaviours and

weight loss than generic mindfulness practises as they are more behavioural relevant (Mantzios & Wilson, 2015a). Mantzios and Wilson (2014) developed the MCD which combined the theoretical concepts of mindfulness, self-compassion and CLT. CLT describes an identification on a close or distant continuum (Liberman & Trope, 1998). Whilst close objects, events or individuals are represented as concrete, distant objects, events and individuals are portrayed as abstract. Abstract construals consider *why* actions are being performed, whereas concrete construals focus on *how* they carry out behaviour (Freitas et al., 2004). As abstract construals are described using a temporal distancing technique, this makes them unsuitable in the development of mindfulness for two main reasons (Mantzios & Wilson, 2014). Firstly, abstract mindsets involve ruminative, judgmental and uncertain thinking, and these are mechanisms that are often involved in psychological distress (Galfin & Waltkin, 2011). Secondly, by focusing on the *why* elements of a given situation, one's' concern of the present moment would be periodical (Fujita, 2008). Contrary, concrete construals promote present focused orientation and rarely require judgment or rumination, elements primarily descriptive of mindfulness (Kabat-Zinn, 1990; Schmeichel et al., 2011). Previous research has indeed found that interacting with the MCD has assisted with the development of mindfulness, lower energy intake and reduced the portion size effect (Hussein et al., 2017; Mantzios et al., 2020; see Chapter 5). However, whether the MCD can promote healthier food choices when presented with LED and HED foods has not yet been explored.

Therefore, the present study will investigate the effect of the MCD on promoting healthier food choices. Firstly, it was hypothesised that participants who engage with the MCD by simply reading and reflecting on the questions will be less likely to consume HED (i.e., unhealthier) foods, and more likely to consume LED (i.e., healthier foods) than participants in the control condition. Secondly, it was predicted that the consumption of HED foods will be greater for participants who are hungry compared to those who are not, but using the MCD whilst hungry will significantly reduce the intake of HED foods.

6.3. Method

Participants

Eighty-five participants attending a university in the West Midlands, UK were recruited through an online research participation website, and participants received course credit for their participation. The sample size in the present study was based on the number of participants recruited in other similar studies exploring food choices (e.g., Dutt et al., 2019; Robinson, Fleming, & Higgs, 2014). The average BMI of the sample was $M = 24.54$ ($SD = 7.23$) and age was $M = 20.11$ years ($SD = 3.51$). Participants self-identified ethnicities were: White or White British ($n = 39$), Black African or Caribbean ($n = 12$), South Asian ($n = 26$), Mixed Ethnicity ($n = 6$) and Arab ($n = 2$). The present study was approved by the University's ethics committee (see Appendix B4), and informed consent was gained from all participants.

Eligibility. Due to the nature of the study (i.e., presence of food), participants were informed via an information sheet and consent form that they were not eligible to participate if they had been diagnosed with an eating disorder or if they had any nut allergies.

Experimental Conditions

Participants were randomly assigned to either the mindfulness condition ($n = 43$: female = 36, male = 7) or control condition ($n = 42$; female = 36, male = 6). Participants in the mindfulness conditions received the MCD, which consisted of questions surrounding mindful awareness and concrete construal (see Appendix C2; see Table 5.1). Participants were required to simply consider (instead of write) their answers to all questions of the MCD (Hussein et al., 2017, Mantzios et al., 2020; see Chapter 4, 5). Participants in the control conditions were provided with a newspaper article (concerning diesel cars), and the newspaper article was chosen because it matched the length of the MCD but avoided any discussion of food or eating related matters.

Food

Participants in both the mindfulness and control conditions were provided with peanut M&Ms (512 kCal/100g) and green and red grapes (72kCal/100g). Although a typical serving size in the UK is approximately 45g (230kCal and 32kCal), a serving of 100g was provided in this experiment in order to avoid artificially limited intake. Whilst both M&Ms and grapes do contain sugar (Sutterlin & Siegrist, 2015), grapes can be determined to be the healthier (i.e., LED) option due to their nutritiously sufficient qualities, such as being lower in calories, sodium, carbohydrates and sugar in

comparison to peanut M&Ms (i.e., HED). The M&Ms and grapes were served in two separate white bowls (15cm x 15cm x 8cm) presented to participants in front of them. All foods were brought from UK Tesco stores.

Measures

Participant demographic form. Participants were asked questions relating to their gender, age, height, weight and ethnicity in order to assess their BMI and background.

Hunger. In order to assess hunger, participants were asked at the start of the experimental session *"*How hungry are you right now?" with responses ranging from 1 (*not at all hungry*) to 5 (*extremely hungry*).

Usual intake of fruit and vegetable. To assess daily fruit and vegetable consumptions, participants were asked "How many portions of fruit and vegetables do you normally eat a day?" in order to get a representative measure of usual fruit and vegetable intake (Robinson et al., 2014).

SMS (Tanay & Bernstein, 2013). Participants in the current study were instructed to complete the SMS measure before (pre) and after (post) being presented with the MCD and food. Please see Chapter 2 for a full description of the SMS. The present study produced alpha of pre (α =.94) and post (α =.94).

FFMQ-SF (Bohlmeijer et al., 2011). To control for any differences between conditions and any effect that trait mindfulness could have on the results, FFMQ-SF was administrated. Please see Chapter 2 for a full description of the FFMQ-SF. The present study produced an overall alpha of (α = .83).

MES (Hulbert-Williams et al., 2014). To control for any differences between conditions and any effect that mindful eating could have on the results, MES was administrated. Please see Chapter 2 for a full description of the MES. The present study produced an overall alpha of (α = .80).

TFEQ (Karlsonn et al., 2000). To control for any differences between conditions and any effect that eating behaviours could have on the results, TFEQ was administrated. Please see Chapter 2 for a full description of the TFEQ. The present study produced an alpha of: restrained eating - (α = .75), uncontrolled eating - (α = .87), emotional eating - (α = .79) and overall score (α = .82).

Procedure

The present study was advertised as an experiment regarding affective responses to food tasting, and was deliberately kept vague in order to prevent people from predicting the true aim of the study. Experimental sessions took place between 12pm and 4pm and lasted approximately 25 minutes. Upon arrival, participants were randomly assigned to either the mindfulness or control condition. Participants received an information sheet, and after providing informed consent, they were seated in individual cubicles. Participants' height and weight was measured in cm and kg using a stadiometer and a digital scale, and they were then instructed to complete a participant demographic form, usual fruit and vegetable intake and a SMS measure. Next, depending on the condition, participants were asked to read the MCD or a newspaper article (concerning diesel cars) for two minutes prior to receiving the M&Ms and grapes in order to familiarise themselves with the reading materials. Participants were then provided with both M&Ms and grapes, and asked to continue engaging in the reading whilst eating for another five minutes. Participants were told they could choose any option of food they wanted (or both), and eat as much as they like. After 5 minutes, the experimenter asked participants to finish eating and they were asked to complete another SMS, as well as questionnaires regarding mindfulness (i.e., FFMQ-SF), mindful eating (i.e., MES) and eating behaviours (i.e., TFEQ). Once participants had finished answering the questionnaires, they were debriefed and thanked for their participation.

6.4. Data Analysis

Consumption of each food was measured in grams, and it was calculated using the difference in weight of each bowl before and after each experimental session. Calories consumed were calculated by multiplying the weight of the fruit by 0.72, and multiplying the weight of the chocolate by 5.12 (obtained from manufacturers package information). Chi square was also used to account for differences in gender and food choice between conditions. T-tests were conducted to test for differences in hunger, BMI, usual intake of fruit and vegetable, age, mindfulness, mindful eating and eating behaviours (including restrained, uncontrolled and emotional eating). A 2 X 2 ANOVA was planned to test whether an improvement in state mindfulness was observed and t-tests were conducted to compare mean values of food intake from M&Ms and grapes consumed between the two conditions. Hunger and participant characteristics were tested as covariates to explore whether they

had any effect on any of the dependent variables. The hunger scale used as a covariate was initially run as a continuous variable, and a median split on the hunger scale was then conducted gaining a dichotomous variable. Participants who scored below 2 (*not at all hungry*) were categorised as having low levels of hunger, and those who scored 2 or above (*slightly hungry or more*) were categorised as having high levels of hunger. Any significant covariates were followed up with subsequent analyses. All analyses were conducted using SPSS V24.

6.5. Results

Participant Characteristics

Eighteen participants were labelled as having low levels of hunger ($M = 1.57$, $SD = .50$), and 67 participants were identified as having high levels of hunger ($M = 2.91$, $SD = .72$). Chi Square analysis showed that gender did not significantly differ between the mindfulness and control conditions, X^2 (1) = .07, $p = .80$. T-tests were also conducted to test for differences in participants' hunger and characteristics, such as: BMI, usual fruit/vegetable consumption, age, mindfulness, mindful eating and eating behaviours. As Table 6.1 shows, there were no significant differences found between the two conditions regarding such characteristics: all $p > .20$. Participants' BMI, usual fruit and vegetable intake, age, mindfulness, mindful eating and eating behaviours were tested as covariates, and they showed to have no significant effect on the observed results for any of the dependent variables, and are therefore not discussed any further.

State Mindfulness

A 2 (condition: mindfulness, control) X 2 (time: pre, post) mixed design ANOVA was carried out to explore the effects of the MCD on state mindfulness. There was a significant interaction between the condition and time $F(1, 83) = 4.40$, $p = .04$, $\eta_p^2 = .05$, with state mindfulness scores increasing significantly within the post mindfulness condition. There was also a significant main effect of time $F(1, 83) = 4.15$, $p = .05$, $\eta_p^2 = .05$, but no significant main effect between conditions $F(1, 83) = .80$, $p = .38$ (see Table 6.2).

Table 6.1.

Measures of Participant Hunger and Characteristics Between Mindfulness and Control Conditions

	M, (*SD*) - Mindfulness (*n* = 43)	*M*, (*SD*) - Control (*n* = 42)	*p*
Hunger	2.37, (.95)	2.12, (.86)	.20
BMI	24.07, (7.60)	25.02, (6.88)	.55
Fruit/Vegetable Intake	2.56, (1.25)	2.56, (1.98)	1.00
Age	19.93, (1.58)	20.29, (4.75)	.64
Mindfulness [a]	56.79, (9.95)	57.71, (10.35)	.68
Mindful Eating [b]	75.44, (10.32)	76.19, (10.10)	.74
Eating Behaviours [c]	40.63, (10.09)	40.17, (8.15)	.82
Restrained Eating [d]	11.98, (3.82)	12.67, (3,92)	.41
Uncontrolled Eating [d]	21.37, (6.55)	20.67, (6.48)	.62
Emotional Eating [d]	7.28, (2.87)	6.83, (2.37)	.44

Note. M and *SD* are used to represent mean and standard deviation, respectively. [a] = FFMQ-SF, [b] = MES, [c] = TFEQ, [d] = Subscales of TFEQ.

Table 6.2.

Pre and Post Measures of SMS Between Mindfulness and Control Conditions

	M, (*SD*) – Pre	*M*, (*SD*) – Post
Mindfulness (n = 43)	64.86, (16.53)	73.23, (17.37)
Control (n = 42)	66.50, (16.39)	66.38, (15.14)

Note. M and *SD* are used to represent mean and standard deviation, respectively.

Food Choice

There was no significant difference found in the choice of food selected by participants between the mindfulness and control conditions, X^2 (3) = .18, p = .98 (see Table 6.3).

Food Intake

An independent-samples t-test was conducted to compare M&Ms consumed between the mindfulness and control condition. There was a significant difference in the consumption of M&Ms between the two conditions, with the mindfulness condition consuming significantly less M&Ms than the control condition t(70.5) = - 2.44, p = .02, d = .53 (see Table 6.4 and Figure 6.1).

An independent-samples t-test was conducted to compare grapes consumed between the mindfulness and control condition. There was no significant difference found in the consumption of grapes between the mindfulness condition and control condition t(83) = 1.24, p = .22 (see Table 6.4 and Figure 6.1).

Table 6.3.

Food Selected By Percentage of Participants in Mindfulness and Control Conditions

	M&Ms	Grapes	Both	None
Mindfulness (n = 43)	14%	41.9%	41.9%	2.2%
Control (n = 42)	16.7%	38.1%	42.9%	2.3%

Table 6.4.

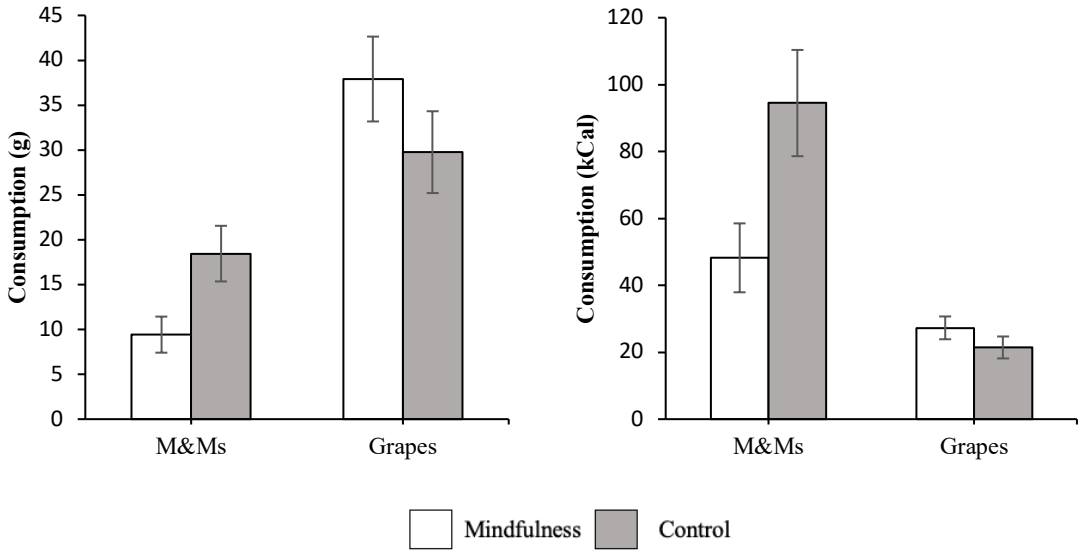
Participants' Food Intake Between Mindfulness and Control Conditions

	Mindfulness (n = 43)	Control (n = 42)
M, (SD) - g		
M&Ms	9.42, (13.19)	18.45, (20.11)
Grapes	37.91, (31.01)	29.76, (29.53)
M, (SD) - kCal		
M&Ms	48.22, (67.55)	94.48, (102.95)
Grapes	27.29, (22.33)	21.43, (21.26)

Note. M and *SD* are used to represent mean and standard deviation of intake of M&Ms and grapes in grams and calories, respectively.

Figure 6.1.

Participants' Food Intake



Note. Consumption of M&Ms and grapes between mindfulness and control conditions. Error bars refer to the standard error of the mean. Left panel represents consumption in grams, and right panel represents consumption in calories.

Effects of Hunger

Hunger was used as a covariate to test the effect that it may have had upon participants' consumption of M&Ms and grapes. A between subjects ANCOVA revealed that hunger had a significant effect upon the amount of M&Ms consumed $F(1, 82) = 4.04$, $p = .05$, $\eta_p^2 = .05$, but had no significant effect on the amount of grapes consumed $F(1, 82) = 1.12$, $p = .29$. The significant effect of hunger on the amount of M&Ms consumed was followed up with t-tests.

Low levels of hunger and M&Ms consumption. An independent-samples t-test was conducted to compare M&Ms consumed between the mindfulness and control conditions in participants with low levels of hunger. There was no significant difference found in the consumption of M&Ms between the mindfulness condition and control condition $t(16) = -.66$, $p = .52$ (see Table 6.5).

High levels of hunger and M&Ms consumption. An independent samples t-test was conducted to compare M&Ms consumed between the mindfulness and control condition in participants with high levels of hunger. There was a significant difference found in M&Ms consumed between the two conditions, with the mindfulness condition consuming significantly less M&Ms than the control condition $t(52.84) = 2.57$, $p = .01$, $d = .64$ (see Table 6.5).

Table 6.5.

Intake of M&Ms in Low and High Hunger Participants' Between Mindfulness and Control Conditions

	M, (SD) - M&Ms (g)	*M, (SD)* - M&Ms (kCal)
Low Hunger		
Mindfulness ($n = 8$)	4.38, (7.29)	22.40, (37.32)
Control ($n = 10$)	7.00, (9.19)	35.84, (47.05)
High Hunger		
Mindfulness ($n = 35$)	10.57, (14.03)	54.13, (71.81)
Control ($n = 32$)	22.03, (21.32)	112.81, (109.17)

Note. M and *SD* are used to represent mean and standard deviation of intake of M&Ms and grapes in grams and calories, respectively.

6.6. Discussion

The present study explored whether the MCD could be an effective tool in promoting healthier food choices. The findings suggest participants in the mindfulness condition consumed significantly less M&Ms than participants in the control condition, but no significant differences were found in consumption of grapes between the two conditions. Furthermore, control participants ate significantly more M&Ms when hungry than when not hungry, whilst participants in the mindfulness condition did not. Other characteristics, such as BMI, daily and weekly fruit/vegetable consumption, age, trait mindfulness, trait mindful eating and eating behaviours were tested as covariates, and they

had no significant effect on the findings. Collectively results suggest that utilising the MCD may pose as an effective method in reducing unhealthy eating.

Results are explained through three potential avenues. First, the procedure of reading and reflecting on the MCD may have led participants to consume less M&Ms because they may have placed a greater focus upon their internal cues of hunger, and considered the nutritious elements of the food instead of simply focusing on the attractiveness of the food. The engagement of the MCD and considering questions related to their hunger, taste and healthiness of the snack may have been sufficient to overcome the initial temptation of selecting the M&Ms; thus, resulting in a reduced consumption of M&Ms. This is supported by research that has suggested that encouraging participants to be aware of and rely on internal signals of hunger and satiety might reduce the influence of external cues, such as attractiveness, which may in turn diminish the effects of unhealthy eating (Dalen et al., 2010).

Furthermore, the mindful intervention used in this study was an eating specific exercise, and the focus of the intervention was to be mindfully aware of the taste, texture, likability and healthiness of the food being consumed. Jordan et al. (2014) suggested that even without mindful eating specific instructions, mindfulness can encourage healthier eating. However, this study suggests that engaging with the MCD is perhaps more effective for healthier eating than generic mindfulness techniques or other eating specific mindful methods (Kabat-Zinn, 2006; Mantzios & Wilson, 2015a). The MCD is suggested to enable participants to adopt a mindful eating attitude; that is, being aware of what they are eating, and placing a focus on its nutritious benefits which then enables healthier food choices. This method may also offer a more accessible, sustainable technique to be applied at each meal or snack than a body-scan exercise, which is not eating specific, and whilst there is evidence for accessibility and efficacy of the body-scan exercise (Al-Chalabi et al., 2008), for some people it may be seen as more effortful. Furthermore, even in the case of an eating specific method, such as the mindful eating-raisin exercise (Kabat-Zinn, 2006), there is clear evidence for promoting healthier eating behaviours (e.g., Hong et al., 2014; Hong et al., 2011). However, the original recording is 17 minutes long (Kabat-Zinn, 2006), and although other researchers have used a shorter version of 10

minutes (Hong et al., 2011; Hong et al., 2014), this may still be too long to practice before every meal, and thus may not be feasible.

Finally, participants may have found it easier to engage with the MCD as it was used as a priming tool. Previous research on priming has shown its success in promoting healthier eating behaviours (e.g., Hussain et al., 2017; Papies et al., 2014). The act of allowing participants to simply read and consider the answers to the questions rather than writing out answers could act as a more mindful and less distracting approach towards eating (Ogden et al., 2013), thus consciously leading towards healthier eating behaviours.

6.7. Limitations and Future Directions

There are some potential limitations to the present study that require further attention. Firstly, whilst consumption of M&Ms was reduced in the mindfulness condition, consumption of grapes did not increase; this could suggest that the MCD may be beneficial for reducing unhealthy eating (i.e., foods high in fat and sugar), but may not necessarily encourage consumption of healthier food options (i.e., fruit). Further research should investigate methods that can be applied within the MCD that encourage the consumption of fruit (or other healthier food options, such as vegetables).

Moreover, the present study was conducted on relatively lean and highly educated female students. Previous studies have indicated that people who are overweight or obese are more likely to engage in HED snacking (Hartmann et al., 2012). In order to better understand the potential of this intervention, future research should specifically focus on populations at risk and in need for such interventions, as the engagement and acceptability in such populations is of primary importance.

Furthermore, this study was conducted in a highly controlled laboratory, and real-life situations may not be so clear-cut when it comes to choosing between healthy and unhealthy foods. However, the long term application of using MCD within home and personal settings did find significant improvements in weight loss, suggesting people are able to implement it within their daily life (Mantzios & Wilson, 2014). The MCD in essence requires less time, commitment and effort, and adopting a lifestyle change of making heathier food choices may come through this short and accessible mindfulness practice (Mantzios & Giannou, 2018). However, further long term follow ups via longitudinal studies are essential in concretely determining the impact of the MCD upon peoples'

eating behaviours and weight loss, as often weight maintenance appears to be a difficult notion for people to control, thus requiring further attention (Mantzios & Wilson, 2015a).

Finally, the MCD has previously demonstrated an ability in increasing people's self-compassion (Hussain et al., 2017; Mantzios & Wilson, 2014). Self-compassion is described as taking a kinder approach to oneself with a mindful awareness and consideration of personal difficulties as being part of a shared humanity that everyone experiences (Neff, 2003b). Both mindfulness and self-compassion appear to be inter-related, with literature suggesting that the combination of both theories tend to improve psychological well-being and weight loss (e.g., Neff & Germer, 2013; Mantzios & Wilson, 2015a). Recent research has looked into the component of self-kindness within self-compassion, and found wide variations in behaviours (Egan & Mantzios, 2018). In their research, Egan and Mantzios (2018) found that the act of self-kindness for some people involved binge drinking or overindulging on their favourite foods, for others it consisted of taking a warm bath or eating a healthy meal. They explained that the former group displays behaviour that may lead to negative health consequences, and only refers to a perceived sense being "kind" to the mind (i.e., one's thoughts, feelings and emotions), whilst the latter group displays behaviours that relate to self-kindness of both the mind and body (i.e. psychological and physiological self-kindness) (Egan & Mantzios, 2018), and therefore, is perhaps a truer model of self-compassion (Neff, 2003b, 2009) and the golden standard of self-care. Future research should investigate how the state of self-kindness combined with mindfulness could influence food choices and behaviours via experimental settings.

6.8. Conclusion

The findings from the present study indicate that utilising and engaging with the MCD may be an effective method in encouraging healthier eating behaviours by reducing consumption of foods high in fat and sugar. However, future research should investigate the use of the MCD amongst varied populations as well as apply strategies that encourage consumption of healthier food options.

CHAPTER 7: EXPLORING THE ROLE OF SELF-KINDNESS IN MAKING HEALTHIER FOOD CHOICES: PRELIMINARY FINDINGS

7.1. Abstract

Background: Food selection is an important factor in the prevalence of obesity, and regularly choosing HED foods can have negative health consequences. The present study tested whether using the MCD combined with self-kindness could promote healthier food choices. **Method:** Ninety participants were randomly assigned to either a self-kindness to the mind condition or self-kindness to the mind and body condition, and were served M&Ms and grapes as an unhealthy and healthy option, respectively. **Results:** The results suggested that a difference in consumption was found between the two conditions, with participants in the self-kindness to the mind condition consuming significantly more grapes than those in the self-kindness to the mind and body condition. However, this difference was restricted to those who are usually low consumers of fruit and vegetable. **Conclusions:** The effect of self-kindness towards promoting heathier eating whilst considering the body thus appears to require further investigation. Limitations and recommendations for future research are discussed.

7.2. Background

The increasing consumption of foods that are HED has contributed to the obesity epidemic worldwide (Arroyo-Johnson & Mincey, 2016; Romieu et al., 2017), tasking policy makers and public health with enabling preventions and solutions to address escalating health concerns and health economics (Finer, 2015; Tremmel, Gerdtham, Nilsson, & Saha, 2017). One approach to tackle the prevalence of obesity is to promote healthier food choices by encouraging the consumption of LED foods, such as fruit and vegetables over foods that are HED, such as high in fat and sugar (Deshpande, Basil, & Basil, 2009; Robinson, Fleming, & Higgs, 2014; Rolls, Drewnowski, & Ledikwe, 2005; Rolls, Roe, & Meengs, 2010). Whilst guidelines and benefits of consuming fruits and vegetables are apparent, the intake levels for members of the public in the UK are below recommended guidelines (Bates et al., 2014). This is problematic as research has suggested consuming HED foods is directly associated with an increased BMI (e.g., Mendoza, Drewnowski, & Chritakis, 2007; Stelmach-Mardas

et al., 2016). Therefore, finding means of encouraging healthier food choices appears to be crucial in improving weight management and addressing the current obesity epidemic.

One factor that has shown to positively influence healthier eating behaviours is mindfulness (O'Reilly et al., 2014). Mindfulness has been described as purposely paying attention to the present moment with a non-judgmental attitude (Kabat-Zinn, 1990). More specifically, research on mindful eating has shown significant changes in weight loss (Dalen et al., 2010; Kristeller et al., 2014; Mantzios & Wilson, 2014). Findings from experimental and cross-sectional data have suggested participants who reported higher levels of mindful eating reported increased intake of fruit and vegetables, a reduction in fat and sugar consumption, grazing and reduced motivations to eat palatable foods, (Gilbert & Waltz, 2010; Mantzios & Egan, 2017; Mantzios, Egan, Hussain, et al., 2018; Mantzios, Egan, Bahia, et al., 2018). In an attempt to induce a state of mindful eating, a MCD was developed, which was to be used at every meal (Mantzios & Wilson, 2014). The diary emphasised mindfulness, construal theory and self-compassion, and created a tool for participants to observe in the present moment whilst being kind and non-judgmental to thoughts and feelings that arose during each meal. The MCD has shown improvements both longitudinally and via brief experimental settings in both mindfulness and eating behaviours (Mantzios & Wilson, 2014; Hussein et al., 2017; see Chapter 4, 5, 6). The element of self-compassion within the MCD may also be beneficial in promoting healthier eating behaviours as previous literature has found self-compassion to be useful in weight regulation (Mantzios & Wilson, 2015b; Rahimi-Ardabili et al., 2018).

Mindfulness has clear and strong associations with self-compassion, which has indeed been found to be helpful in reinforcing the non-judgmental attitude of people who practice mindfulness, and it consists of three elements: self-kindness, common humanity and mindfulness. Self-compassion is described as taking a kinder approach to oneself with a mindful awareness and consideration of personal difficulties as being part of a shared humanity that everyone experiences (Neff, 2003a, b). Literature suggests that the combination of both mindfulness and self-compassion have shown positive effects in improving eating behaviours, well-being and weight management (Birnie et al., 2010; Hollis-Walker & Colosimo, 2011; Mantzios et al., 2015; Shapiro et al., 2005). For example, a mindfulness and self-compassion based programme has shown to assist people in enhancing self-

compassion, mindfulness and well-being (Neff & Germer, 2013). Furthermore, other research found that interventions utilising both mindfulness and self-compassion were more effective in assisting people with weight management than mindfulness alone or a control group (Mantzios & Wilson, 2015b). Mindfulness and self-compassion are therefore suggested to amplify the effects of one another, whereby more self-kindness and common humanity may promote mindfulness, or being mindful may enable someone to notice that they are suffering, and in effect, take a kinder approach to oneself (Mantzios & Wilson, 2014). Whilst self-compassion does appear to be an essential aspect in mindfulness, eating behaviours and weight management, it still requires further research as it is uncertain as to what elements of self-compassion improve healthier behaviours around food.

One area that appears to be problematic within the concept of self-compassion is self-kindness (Mantzios & Egan, 2017). Recent research has suggested self-kindness to be a significant contributor towards engaging in health promoting actions and wellness (Gedik, 2019), and more specifically nutritional behaviours (Holden, Rollins, Gonzalez, 2020). Whilst it is commonly believed that being kind to oneself is beneficial when trying to lose weight, the influence that self-kindness may have upon physiological health is not so clear-cut (Egan & Mantzios, 2018; Mantzios & Egan, 2017). It has been proposed that self-kindness is a different element to that of self-compassion, this does not mean that self-kindness does not promote health, but that it may moderate positive relationships (Mantzios & Egan, 2017). For example, recent research found wide separations in behaviours regarding self-kindness, whereby, for some people self-kindness involved binge drinking or overindulging on their favourite foods, and for others it consisted of taking a warm bath or eating a healthy meal (Egan & Mantzios, 2018). Whilst the former groups behaviour may lead to negative health consequences, and only refers to perceived kindness to the mind, the latter groups behaviour relates to self-kindness of both the mind and body, and therefore, is perhaps a truer model of self-compassion (Neff, 2003b, 2009) and the golden standard of self-care. Furthermore, Sirois, Kitner and Jameson (2014) found a positive association between self-compassion and intake of fruit and vegetables, and based on the findings from Egan and Mantzios (2018) it could be suggested that those who do not participate in the holistic care of self-compassion (i.e., displaying kindness to both the mind and body) could also potentially be less likely to consume healthier foods (e.g., fruits and

vegetables). Priming participants who are usually low consumers of fruit and vegetable to be kind to both their mind and body may lead to a greater intake of healthier food choices.

Whilst self-kindness may be a positive method of alleviating psychological distress, in principle being kind to oneself does not necessarily mean that both physical and psychological health are attained simultaneously. In practise, psychological health is often prioritised over physiological health, for example, someone who is on a weight loss diet and has had a stressful day may want to treat themselves by eating a chocolate cake instead of a portion of fruit because "they deserve it" (Taylor, Webb, & Sheeran, 2013). By doing so, they are only showing perceived kindness to their mind, and if such behaviour is sustained continuously, it can make adhering to healthy eating difficult. Self-kindness has so far been considered as a positive method of alleviating psychological distress, but it seems that specific eating behaviours comfort the mind, and when in excess, can lead to damaging the body. Therefore, exploring the state of self-kindness and the affect that it has upon eating behaviours is an avenue that merits investigation.

The present study will explore whether the MCD combined with self-kindness could promote healthier food choices. In a novel hypothesis, it is predicted that participants who simply consider the answers to the MCD combined with self-kindness to both the mind and body will be more likely to choose healthier food options than participants who consider the answers to the MCD combined with self-kindness solely to the mind. However, it is predicted that this effect will only occur in participants who are usually low consumers of fruit and vegetable, as they may be less likely to practise the holistic act of self-kindness on a daily basis (e.g., Egan & Mantzios, 2018).

7.3. Method

Participants[5]

Ninety participants were recruited via opportunity sampling from a university in West Midlands, UK, and participants were not compensated for their participation. The sample size in the present study was based on the number of participants recruited in other similar studies exploring

[5] From Chapter 7 to Chapter 9, participants were recruited on university open days – a day whereby prospective students come to the campus with their friends and family to explore the university. On those occasions, opportunity sampling was used and participants were not compensated with any course credit for their participation as they were in previous Chapters.

food choices (Dutt et al., 2019; Robinson, Fleming, & Higgs, 2014; see Chapter 6). The average BMI of the sample was $M = 24.32$ ($SD = 9.13$) and age was $M = 24.54$ ($SD = 10.83$). Participants self-identified ethnicities were: White or White British ($n = 55$), Black African or Caribbean ($n = 12$), South Asian ($n = 19$), Chinese ($n = 2$), Arab ($n = 1$), and not specified ($n = 1$). The present study was approved by the University's ethics committee (see Appendix B4), and informed consent was gained from all participants.

Eligibility. Due to the nature of the study (i.e., presence of food), participants were informed via an information sheet and consent form that they were not eligible to participate if they had been diagnosed with an eating disorder or if they had any nut allergies.

Experimental Conditions

Participants were randomly assigned to either the self-kindness to the mind condition ($n = 45$: female = 34, male = 9, not-specified = 2) or self-kindness to the mind and body condition ($n = 45$: female = 37, male = 8). Participants in the self-kindness to the mind condition received a MCD that was adapted with questions regarding kindness to one's mind and thoughts (see Appendix C3; see Table 7.1) and participants in the self-kindness to both the mind and body received a MCD incorporated with questions regarding kindness to body the mind and body (see Appendix C4; see Table 7.1). Participants in both the conditions were asked to simply consider the answers to the adapted versions of the MCD (Hussein et al., 2017; Mantzios et al, 2020; see Chapters 4, 5, 6).

Food

The food served to participants in the present study was the same as discussed in Chapter 6. Please see Chapter 6 for a full description. Participants in both the self-kindness to the mind condition and self-kindness to the mind and body condition were provided with peanut M&Ms (512 kCal/100g) and green and red grapes (72kCal/100g).

Table 7.1.

Questions Presented to Participants in Self-Kindness Conditions

Self-Kindness Mind - MCD	Self-Kindness Mind and Body - MCD
How does this snack taste?	How does this snack taste?
How does this snack smell?	How does this snack smell?
What are the colours and texture of it?	What are the colours and texture of it?
How do you feel and what passes through your mind now that you are eating this snack?	How do you feel and what passes through your mind now that you are eating this snack?
How could this snack be an act of self-care for your thoughts right now?	How could this snack be better at taking care of your thoughts and physiological health right now?
How could this snack become an act of self-caring to your feelings and emotions right now?	How could this snack be an act of self-care towards your thoughts and feelings, as well as your physical health right now?
How caring are your thoughts and feelings now that you are eating this snack?	How caring are you towards your thoughts and emotions as well as your physical health now that you are eating this snack?
How are you showing kindness to your emotions and feelings now that you are eating?	How are you taking care of your emotions and your physical health now that you are eating this snack?
How important is this snack for taking care of your thoughts and feelings right now?	How important is this snack for your thoughts/emotions and your physical-self right now?

Measures

Participant demographic form. Participants were asked questions regarding their gender, age, height, weight and ethnicity in order to assess their BMI and background information.

Hunger. To assess hunger, participants were asked at the start of the experimental session "How hungry do you feel right now?" with responses ranging from 1 (*not at all)* to 5 *(extremely hungry*).

Usual intake of fruit and vegetable. To assess daily fruit and vegetable consumptions, participants were asked "How many portions of fruit and vegetables do you normally eat a day?" in order to get a representative measure of usual fruit and vegetable intake (Robinson, Fleming, & Higgs, 2014; see Chapter 6).

SSCS (Breines & Chen, 2013). Participants in the current study were instructed to complete the SSCS measure before (pre) and after (post) being presented with the self-kindness MCD and food. Please see Chapter 2 for a full description of the SSCS. The present study produced alpha of pre (α =.84) and post (α =.87).

TFEQ (Karlsonn et al., 2000). To control for any differences between conditions and any effect that eating behaviours could have on the results, TFEQ was administrated. Please see Chapter 2 for a full description of the TFEQ. The present study produced an alpha of: restrained eating - (α = .78), uncontrolled eating - (α = .88), emotional eating - (α = .82) and overall score (α = .84).

Procedure

The procedure for the current study was the same as Chapter 6, except for some of the measures provided. The original MCD used in Chapter 6 was replaced with either self-kindness to the mind MCD or self-kindness to the mind and body MCD (depending on the two condition), and state mindfulness measures were replaced with state self-compassion measures, and there were no measures administrated for mindfulness and mindful eating for the current study. Please see Chapter 6 for a full description of the procedure.

7.4. Data Analysis

Consumption of each food was initially measured in grams, and it was calculated using the difference in weight of each bowl before and after each experimental session. Calories consumed were calculated by multiplying the weight of the fruit by 0.72, and multiplying the weight of the chocolate by 5.12 (obtained from manufacturers package information). A median split on the usual fruit and vegetable intake measure resulted in low consumers being categorised as participants consuming 2 or less portions of fruit and vegetables a day, and high consumers being labelled as participants consuming 2.5 or more portions of fruits and vegetables a day. Chi square was used to account for differences in gender between conditions, and t-tests were conducted to tests for

differences in hunger, BMI, age and eating behaviours (including restrained, uncontrolled and emotional). 2 X 2 ANOVAs were conducted to explore improvements in state self-compassion across conditions, as well as energy intake across conditions and usual intake of fruit and vegetable. Any significant findings were followed up with t-tests. Hunger and participant characteristics were tested as covariates to assess whether they had any effect on the dependent variables. All analyses were conducted using SPSS V24.

7.5. Results

Participants Characteristics

Fifty participants were labelled as low consumers of fruit and vegetables (daily portion: M = 1.51, SD = .63), whilst the remaining forty participants were identified as high consumers (daily portion: M = 3.98, SD = 1.30). Chi square analysis revealed that gender was equal across the self-kindness to the mind condition and self-kindness to the mind and body condition X^2 (2) = .2.19, p = .34 and t-tests also found no significant difference in participants' hunger, BMI, age and eating behaviours (including restrained, external and emotional): all $p > .10$ (see Table 7.2). Inclusion of hunger, BMI, age and gender as covariates in the analyses did not affect the observed results for any of the dependent measures, and are therefore not discussed further.

Table 7.2.

Measures of Participant Hunger and Characteristics Between Self-Kindness Mind and Self-Kindness Mind and Body Conditions

	M, (*SD*) – Self-Kindness Mind (*n* = 45)	*M*, (*SD*) – Self-Kindness Mind and Body (*n* = 45)	*p*
Hunger	2.13, (1.16)	1.80, (.81)	.12
BMI	23.96, (9.87)	24.68, (8.42)	.71
Age	23.24, (9.99)	25.84, (11.58)	.28
Eating Behaviours [a]	45.47, (9.86)	44.22, (11.01)	.32
Restrained Eating [b]	13.38, (4.56)	14.07, (4.13)	.46
Uncontrolled Eating [b]	23.51, (6.63)	21.36, (7.52)	.12
Emotional Eating [b]	7.98, (2.80)	6.91, (3.22)	.10

Note. M and *SD* are used to represent mean and standard deviation, respectively. [a] = TFEQ, [b] = Subscales of TFEQ.

State Self-Compassion

A 2 (condition: self-kindness to the mind, self-kindness to the mind and body) X 2 (time: pre, post) mixed design ANOVA was carried out to explore the effects of self-kindness to the mind and self-kindness to the mind and body on state self-compassion. There was a significant main effect of time $F(1, 88) = 137.50$, $p < .001$, $\eta_p^2 = .61$, with state self-compassion scores being significantly higher within the post conditions. There was no significant interaction between the condition and time $F(1, 88) = .004$, $p = .95$, and no significant main effect between conditions $F(1, 88) = .80$, $p = .38$ (see Table 7.3).

Food Choice

There were no significant differences found in the choices of food selected by participants between the self-kindness to the mind condition and self-kindness to the mind and body condition, X^2 (3) = 3.45, p = .33 (see Table 7.4).

Table 7.3.

Pre and Post Measures of SSCS Between Self-Kindness Mind and Self-Kindness Mind and Body Conditions

	M, (*SD*) – Pre	*M*, (*SD*) – Post
Self-Kindness Mind (n = 45)	64.91, (11.68)	77.51, (13.18)
Self-Kindness Mind and Body (n = 45)	67.47, (13.95)	79.93, (17.27)

Note. M and *SD* are used to represent mean and standard deviation, respectively.

Table 7.4.

Food Selected By Percentage of Participants in Self-Kindness Mind and Self-Kindness Mind and Body Conditions

	M&Ms	Grapes	Both	None
Self-Kindness Mind (n = 43)	13.3%	33.3%	53.3%	0%
Self-Kindness Mind and Body (n = 42)	11.1%	26.7%	55.6%	6.7%

Food Intake

A 2 (condition: self-kindness to the mind, self-kindness to the mind and body) X 2 (usual fruit and vegetable intake: low, high) ANOVA was conducted to explore the effect of self-kindness and usual fruit and vegetable intake on M&Ms consumption. There was no significant main effect between conditions $F(1, 86) = .95$, $p = .33$, no significant main effect of usual fruit and vegetable intake $F(1, 86) = 2.12$, $p = .15$, and no significant interaction between condition and usual fruit and vegetable intake $F(1, 86) = 11$, $p = .75$. Therefore, suggesting self-kindness to either the mind or mind and body and usual fruit and vegetable intake had no effect on participants' M&M intake (see Table 7.5).

A 2 (condition: self-kindness to the mind, self-kindness to the mind and body) X 2 (usual fruit and vegetable intake: low, high) ANOVA was conducted to explore the effect of self-kindness and usual fruit and vegetable intake on grape consumption. There was a significant interaction between condition and usual fruit and vegetable intake $F(1, 86) = 7.68$, $p = .01$, $\eta_p^2 = .08$. There was no significant main effect of conditions $F(1, 86) = .85$, $p = .36$, and no significant main effect of usual fruit and vegetable intake $F(1, 86) = 2.22$, $p = .14$ (see Table 7.6.). Therefore, t-tests were conducted to explore the effect of self-kindness on grape intake between low and high consumers of fruit and vegetable.

Table 7.5.

Intake of M&Ms in Low and High Consumers of Fruit and Vegetable Between Self-Kindness Mind and Self-Kindness Mind and Body Conditions

	M, (SD) - M&Ms (g)	*M, (SD)* - M&Ms (kCal)
Low Consumers		
Self-Kindness Mind (n = 26)	16.45, (23.05)	83.69, (118.00)
Self-Kindness Mind and Body (n = 24)	12.71, (22.16)	65.07, (113.48)
High Consumers		
Self-Kindness Mind (n = 19)	26.32, (31.22)	132.74, (159.84)
Self-Kindness Mind and Body (n = 21)	19.05, (29.82)	97.52, (152.66)

Note. M and *SD* are used to represent mean and standard deviation of intake of M&Ms in grams and calories, respectively.

Low consumers – Grape consumption

For low consumers, there was a significant effect of self-kindness on participants' intake of grapes $t(43.33) = 2.75$, $p = .01$, whereby participants in the self-kindness to the mind condition consumed significantly more grapes than participants in the self-kindness to the mind and body condition (see Figure 7.1).

High consumers – Grape consumption

For high consumers, there was no significant difference between the self-kindness to the mind condition and self-kindness to the mind and body condition in participants' intake of grapes $t(38) = 1.26$, $p = .21$ (see Figure 7.1).

Table 7.6.

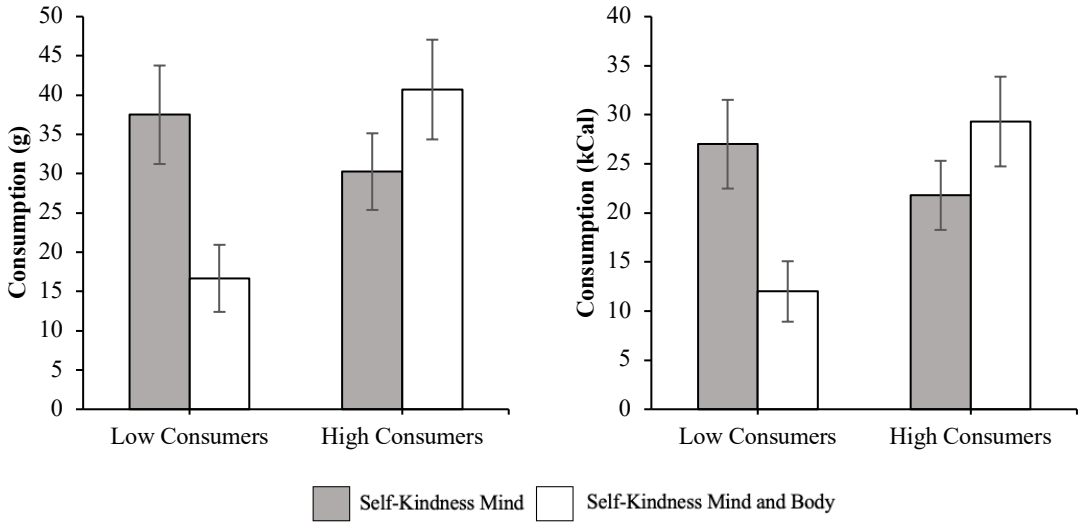
Intake of Grapes in Low and High Consumers of Fruit and Vegetable Between Self-Kindness Mind and Self-Kindness Mind and Body Conditions

	M, (SD) - Grapes (g)	*M, (SD)* - Grapes (kCal)
Low Consumers		
Self-Kindness Mind (*n* = 26)	37.50, (31.98)	27.00, (23.02)
Self-Kindness Mind and Body (*n* = 24)	16.67, (20.94)	12.00, (15.08)
High Consumers		
Self-Kindness Mind (*n* = 19)	30.26, (21.31)	21.79, (15.34)
Self-Kindness Mind and Body (*n* = 21)	40.71, (29.08)	29.31, (20.94)

Note. M and *SD* are used to represent mean and standard deviation of intake of grapes in grams and calories, respectively.

Figure 7.1.

Participants' Grape Intake



Note. Consumption of grapes in low and high consumers of fruit and vegetable between self-kindness mind and self-kindness mind and body conditions. Error bars refer to the standard error of the mean. Left panel represents consumption in grams, and right panel represents consumption in calories.

7.6. Discussion

The present study investigated whether or not the MCD combined with self-kindness could promote healthier food choices. Whilst a difference in intake was found between the self-kindness to the mind condition and self-kindness to the mind and body condition, it was limited and not consistent with the aforementioned hypotheses. The data suggested that there were no significant differences in the consumption of M&Ms or grapes between self-kindness to the mind condition and self-kindness to the mind and body condition. However, participants who were typically low consumers of fruit and vegetable consumed significantly more grapes in the self-kindness to the mind condition compared to those in the self-kindness to the mind and body condition. Therefore, suggesting that the concept of self-kindness may not be so apparent when promoting healthier food choices, especially for those who are usually low consumers of fruit and vegetable.

One possible interpretation of the results is that participants' who were low consumers of fruit and vegetable may have altered their behaviour and consumed more grapes in the self-kindness to the mind condition because the element of mindfulness may have subdued the effect of self-kindness to the mind, and led to an increased influence towards their food choices (e.g., Mantzios, Egan, Hussain et al., 2018). For example, whilst the questions within the MCD were priming participants to be kinder to their mind, the diary was also encouraging participants to be more mindful. Previous research that has investigated the original MCD has found the diary to be significantly effective in promoting healthier eating behaviours (Mantzios & Wilson, 2014; Mantzios et al., 2020; also see Chapters 5, 6). Furthermore, mindfulness has shown to reduce the influence of external cues (e.g., Alberts et al., 2012; Allirot et al., 2017; Marchiori & Papies, 2014; see Chapter 5, 6), and in this case, the attractiveness of the M&Ms, and therefore participants who were low consumers of fruit and vegetables were perhaps led to a higher consumption of grapes.

Alternatively, the discomfort that people felt during the process of thinking about being kind to oneself may have induced more self-consciousness, and in effect, promoted healthier eating behaviours. For example, commercials on limiting sugar intake often highlight the negative associations that sugar does to the body, this could potentially lead people to consciously think about their food choices, and adjust their eating behaviours accordingly in order to avoid any detrimental repercussions towards their physiological health. The notion of promoting physical health may thus require a greater focus on mind elements, which could in effect, result in better decision making around food.

7.7. Limitations and Future Directions

There are some potential limitations to the present study that require further discussion and investigation. First, the present study did not include a control group that was exposed to a non-self-kindness condition, and therefore did not allow an assessment on whether self-kindness had any significant direct effect. Future studies should include such a condition to allow a direct assessment on the effect of self-kindness in comparison to a conventional version of the intervention.

As mindfulness may have potentially reduced the effect of self-kindness, any future research should explore self-kindness as a sole intervention. Whilst the improvements in self-compassion

scores post intervention within the current study do suggest that self-kindness was promoted, the concept of self-kindness within eating behaviours is still a novel and rather complex concept (Egan & Mantzios, 2018; Mantzios & Egan, 2017). The present work makes a primary contribution to our understanding of the specific role of self-kindness in eating behaviours, laying the foundation for future investigations that focus on this element of self-compassion. This should include the long term impact of self-kindness and the development of effective interventions for eating behaviours and weight regulation.

Finally, there was little variability in the BMI of the sample used, people who are overweight or obese may have responded differently. For example, such populations may more often choose psychological health over physiological health (Hartmann et al., 2012), and including these populations may provide different results.

7.8. Conclusion

The present study suggests that mindfulness combined with self-kindness to the mind can encourage healthier eating, but this effect is limited, and restricted to lower consumers of fruit and vegetable. The concept of self-kindness requires further research to understand further its impact on eating behaviours and weight regulation.

CHAPTER 8: EXPLORING THE EFFECTS OF MINDFULNESS AND SELF-DISTANCING ON CHOCOLATE INTAKE AFTER A NEGATIVE STATE AFFECT

8.1. Abstract

Background: Foods high in fat and sugar can often act as emotional regulators during negative emotional states, and regularly engaging in such behaviour can contribute towards weight gain. The present study investigated whether using MCD adapted with the element of self-distancing could improve state mindfulness, attenuate negative affect and reduce chocolate intake. **Method:** One hundred and twenty participants were randomly assigned to one of three conditions, self-immersed, self-distanced and control, and after evoking a negative state affect through a film excerpt, participants were served chocolate. **Results:** The findings suggested there were no significant differences in improving state mindfulness or state negative affect across the three conditions. However, participants in the control condition did consume significantly more chocolate than those in the self-immersed and self-distanced conditions. Whilst there were no significant differences in chocolate intake between the two experimental conditions, those in the self-distanced condition did consume the least amount of chocolate. **Conclusion:** The concept of self-distancing may be beneficial in improving emotional eating behaviours further in mindful eating interventions. Limitations and recommendations for future research are discussed.

8.2. Background

Research suggests that emotion regulation can derive from some foods, which are often high in fat and sugar, and may be understood as "comfort foods" (Macht & Mueller, 2007), temporarily diminishing negative mood and evoking a state of pleasure (e.g., Scholey & Owen, 2013; Wansink, Cheney, & Chan, 2003). For example, Macht and Dettmer (2006) found participants reported a positive mood after eating chocolate in comparison to those eating an apple or nothing. Similarly, other experimental research found eating chocolate vs drinking water significantly reduced negative state mood (Macht & Mueller, 2007). Frequently engaging in eating to improve affect can lead to excessive energy intake, and may contribute towards weight gain and obesity (e.g., van Strien, 2018; Konttinen; van Strien; Mannisto; Jousilahti; Haukkala, 2019).

Literature on trait eating styles, such as emotional and restrained eating, and their influence upon negative mood that leads to consumption is inconsistent. Some studies suggest high emotional eaters increase their food intake after a negative mood induction, and consume more sweet and high fat foods than non-emotional eaters (Loxton, Dawe, & Cahill, 2011; Yeomans & Coughlan, 2009). Others report that emotional eating traits do not have an influence on food intake (e.g., Evers, Marijn Stok & de Ridder, 2010). Furthermore, findings on restrained eating and negative affect also appear to be conflicting. Whilst some researchers argue negative affects prompt overconsumption in people attempting to restrict their caloric intake (Schotte, Cools, & McNally, 1990; Wallis & Hetherington, 2004), others have reported that the relationship between restrained eaters and overeating in response to negative moods is not so direct (e.g. Herman, Polivy, Lank, & Heatherton, 1987; Yeomans & Coughlan, 2009). Such findings suggest emotional and restrained eating behaviours may not necessarily lead to overconsumption, but rather the experimental induction in replicating natural states of negative emotion may promote increased energy intake. Therefore, it is important to find means that moderate the consumption of calorie dense foods during episodes of negative affect to prevent overeating and risk of weight gain (Canetti et al., 2002; Lazarevich, Irigoyen, Velazquez, & Zepeda, 2016; Macht, 2008).

Mindfulness may be a variable that could moderate the association between negative affect and overconsumption (Meier, Noll, & Molowku, 2017). Mindfulness is an awareness that emerges through purposefully paying attention to what is taking place in the present moment with a non-judgmental attitude (Kabat-Zinn, 1990). Over recent years, there has been an extensive amount of research associating mindfulness with healthier eating behaviours, such as promoting healthier food choices, reducing fat and sugar consumption, as well as susceptibility to hunger cues (Dutt et al., 2019; Marchiori & Papies, 2014). In a study more specifically related to affect and consumption, Meier et al. (2017) found participants who were instructed to mindfully eat chocolate had a greater increase in positive mood compared to participants who were instructed to eat chocolate non-mindfully or crackers either mindfully or non-mindfully. Mindfulness may then enhance pleasure, and enable people to regulate their consumption of calorie dense foods whilst also self-regulating mood (Meier et al., 2017).

In an attempt to induce mindful eating, Mantzios and Wilson (2014) developed a non-meditative mindful eating tool referred to as the MCD promoting mindfulness and self-compassion through construal level methods. The tool is used during each meal and individuals are encouraged to be present in the moment, whilst also being kind and non-judgmental to their thoughts and feelings that may arise whilst eating (Mantzios & Wilson, 2014). CLT describes an identification on a close or distant continuum (Lieberman & Trope, 1998). Distant objects, events and individuals are portrayed as abstract construals as they consider *why* actions are being performed, whilst, close objects, events or individuals are represented as concrete construals as they focus on *how* they carry out behaviour (Freitas et al., 2004). For example, whilst eating, a person thinking concretely will consider how their food tastes *right now*, and *how* healthy they perceived it to be, whereas, abstract thinking will focus on *why* this meal is healthy. The MCD has shown improvements in promoting healthier behaviours, such as reducing portion size effect, encouraging fruit consumption, improving weight loss and psychological well-being (Hussein et al., 2017; Mantzios & Wilson, 2014, Mantzios et al., 2019; see Chapter 5, 6). The current research proposes another element that has not yet been explored in relation to eating behaviours, but has been found to successfully reduce emotional distress and enable people to cope with negative emotions, namely, self-distancing (e.g., Ayduk & Kross, 2010a, b).

The act of expressive writing, whereby people explore emotional trauma, has demonstrated physical and psychological health benefits (Frisina et al., 2004; King & Miner, 2000). However, such benefits are only apparent when people reflect on these events through a self-distanced perspective (Mischowski et al., 2012; Nolen- Hoeksema, 1991). Research illustrates when people are self-immersed (i.e., look at a perspective from their own point of view) whilst analysing distressing memories, they are predisposed to focus narrowly on *recounting* the intense details of their experience, which could perpetuate further negative emotions. Contrary, when people adopt a self-distanced perspective (i.e., look at a perspective from a distanced viewpoint), they are able to understand the broader context of the situation by being able to step away from the role of a victim and *reconstrue* their experience, which in effect, can lead to less distress (e.g., Kross & Ayduk, 2011). Adopting a self-distanced role has shown to lower blood pressure reactivity, reduce depression and affect, and improve coping with social anxiety and stress (Kross et al., 2014).

The MCD has previously been adjusted through simple linguistic adaptations to create a connotation of self-compassion and mindfulness through concrete construals (see Chapter 7). To form a self-distanced perspective of the MCD, linguistic adaptations were specifically implemented for the present study. For example, the MCD typically encourages people to reflect on their eating behaviour through a self-immersed perspective, such as "How kind are you to yourself whilst you are eating this meal?" (Mantzios & Wilson, 2014), and by doing so, the self who conducts the behaviour, and the self who is reasoning the behaviour are the same. Divergently, using a self-distanced perspective, such as "How kind is Zarah being to herself whilst she is eating this meal?", the person can take a step back and view their behaviour from a distanced perspective, potentially allowing them to manage their eating behaviour with more acceptance and non-judgment. Research on CLT suggests that psychological distance allows people to adopt broader perspectives on events, helping people to see the bigger picture rather than focusing on concrete details (Fujita et al., 2006; Liberman & Trope, 2008), which was achieved through mindfulness and self-compassion in the MCD, whilst maintaining concrete perspectives on the present meal and eating experience.

Psychological distance from the situation has been considered in previous literature as not adhering to mindfulness principles (e.g., considering past and future behaviours – Mantzios & Wilson, 2014); however, distancing oneself from the situation may be a means of overcoming affect that arises and disrupts the mindful and self-compassionate engagement within the situation. Literature has repeatedly identified how people find it easier to be kind to loved ones, but rather more difficult to express kindness towards oneself (Egan & Mantzios, 2018; Mantzios & Wilson, 2015b). Therefore, the addition of a self-distanced perspective within the MCD may amplify the effect of regulating consumption when negative mood is further regulated.

The present study will explore whether a self-distanced MCD could improve state mindfulness and state negative affect, and consequently lead to a reduced intake of calorie dense foods. It was hypothesised participants in a self-distanced MCD condition would be significantly more likely to improve their state mindfulness, attenuate their negative mood, and consume less chocolate than participants who receive a self-immersed MCD and the control condition. However,

this may be effected by eating behaviours, such as emotional eating and restrained eating, which were controlled for in subsequent analyses.

8.3. Method

Participants

One hundred and twenty participants were recruited via opportunity sampling from a university in the West Midlands, UK, and participants did not receive any compensation for their participation. The sample size was based on the number of participants recruited in other similar studies (e.g., Macht & Mueller, 2007; Mantzios et al., 2019; Mantzios et al., 2020). The average BMI of the sample was $M = 22.30$ ($SD = 8.48$) and age was $M = 24.23$ ($SD = 9.49$), and their self-identified ethnicities were: White or White British ($n = 43$), Black African or Caribbean ($n = 18$), South Asian ($n = 43$), Middle Eastern ($n = 5$), Chinese ($n = 5$), Mixed Ethnicity ($n = 5$), and not-specified ($n = 1$). The present study was approved by the University's ethics committee (see Appendix B5), and informed consent was gained from all participants.

Eligibility. Due to the nature of the study (presence of food), participants were informed via an information sheet and consent form that they were not eligible to participate if they had been diagnosed with an eating disorder or if they had any had any food allergies or intolerances (e.g., dairy).

Experimental Conditions

Participants were randomly assigned to one of three conditions, self-immersed ($n = 40$; female = 33, male = 5, not-specified = 2), self-distanced ($n = 40$; female = 35, male = 4, not-specified = 1) and control ($n = 40$; female = 23, male = 11, not-specified = 6). Participants in both experimental conditions received an adapted version of the original MCD (Mantzios & Wilson, 2014). Participants in the self-immersed condition received a MCD that was adapted with questions presented in the first person (see Table 8.1; see Appendix C5), and participants in the self-distanced condition received a MCD formatted in the third person (see Appendix C6; see Table 8.1). Participants in both conditions were asked to simply consider the answers to the questions of the adapted MCD versions (Hussein et al., 2017; Mantzios et al., 2020), and in order to represent a real living condition as much as possible, participants in the control condition did not receive a MCD or any reading task.

Mood Induction

To induce a negative state affect, an excerpt from a popular movie, “The Champ” was presented, showing a young boy crying at the death of his father (duration: 2 min 51sec). The use of this film clip has shown to successfully induce negative emotions amongst different populations (Gross & Levenson, 1995; Hagemann et al., 1999; Macht & Mueller, 2007; Macht, Roth, & Ellgring, 2002).

Food

Participants in all three conditions were provided with Galaxy chocolate minstrels (500kCal/100g). Although a typical serving size in the UK is approximately 45g (225kCal), a serving of 100g was provided in order to avoid artificially limited intake. The chocolate was sourced from UK Tesco stores, and served in a white bowl with the size amounting to: width 15cm x length 15cm x height 8cm.

Table 8.1.

Questions Presented to Participants in the Mindfulness Conditions

Self-Immersed MCD	Self-Distanced MCD
How do I think this snack tastes?	How does Zarah think this snack tastes?
How do I think this snack smells?	How does Zarah think this snack smells?
What do I think of the colours and texture of it?	What does Zarah think of the colours and texture of it?
How could this snack be better right now for me?	How could this snack be better right now for Zarah?
How could this snack be healthier right now for me?	How could this snack be healthier right now for Zarah?
How do I feel and what passes through my mind now that I am eating this snack?	How does Zarah feel and what passes through Zarah's mind now that Zarah is eating this snack?
How important do I think it is for me and all people to eat healthy?	How important does Zarah think it is for her and all people to eat healthy?
How kind am I to myself now that I am eat this snack?	How kind is Zarah being to herself now that she is eating this snack?
How understanding and kind are my thoughts and feelings now that I am eating this snack?	How understanding and kind are Zarah's thoughts and feelings now that she is eating this snack?
How understanding and patient am I now that thoughts and feelings are intruding this pleasurable experience?	How understanding and patient is Zarah now that thoughts and feelings are intruding this pleasurable experience?
How understanding and patient am I now that this snack is not a satisfying experience for myself?	How understanding and patient is Zarah now that this snack is not a satisfying experience for herself?
How do I show kindness to myself now that I am eating healthily?	How does Zarah show kindness to herself now that she is eating healthily?
How important is this snack to me right now?	How important is this snack right now for Zarah?

Measures

Participant demographic form. Participants were asked questions regarding their gender, age, height, weight and ethnicity in order to assess their BMI and background information.

Hunger. To assess hunger, participants were asked at the start of the experimental session "How hungry do you feel right now?" with responses ranging from 1 (*not at all)* to 5 *(extremely hungry*).

Taste test. In a bogus taste test, participants were asked to rate the likeability of the chocolate after consumption (e.g., "How much did you like the taste of the chocolate minstrels?"), with responses ranging from 1 (*not at all*) to 7 (*extremely*).

SMS (Tanay & Bernstein, 2013). Participants in the current study were instructed to complete the SMS after the mood induction (pre), and again after consumption (post). Please see Chapter 2 for a full description of the SMS. In the present study, the alpha was pre - (α =.94) and post - (α =.95).

PANAS (Watson et al., 1988). Participants were instructed to complete the negative affect measure at baseline, again after mood induction (pre), and finally after consumption (post). Please see Chapter 2 for a full description of the PANAS. In the present study, the alpha was baselines - (α =.76), pre - (α =.89) and post - (α =.85).

DEBQ (van Strien et al., 1986). To control for any differences between conditions and any effect that emotional eating and restrained eating could have on the results, subscales from DEBQ were administrated. Please see Chapter 2 for a full description of the DEBQ. In the present study, the alpha was emotional eating - (α =.90) and restrained eating - (α =.91).

Procedure

The study was advertised as an experiment regarding mood and taste perception, and was deliberately kept vague in order to prevent participants from predicting the true aim of the study. Experimental sessions took place between 12pm and 4pm, lasting approximately 20 minutes. Upon arrival, participants received an information sheet, and after providing informed consent, they were seated in individual cubicles. Participants height and weight was measured in cm and kg using a stadiometer and a digital scale, and they were then instructed to complete a participant demographic

form and the negative affect subscale. The excerpt from the movie "The Champ" was then played, and immediately after watching the clip, participants were instructed to complete the SMS scale and another negative affect subscale. Next, participants in the self-immersed condition and self-distanced condition were instructed to read the adapted MCD for 2 minutes prior to receiving the chocolate. Once participants had finished reading their adapted versions of the MCD, they were provided with the chocolate, and asked to continue engaging with the MCD by considering the answers to the questions. Participants in the control condition were simply asked to taste the chocolate. All participants were informed they could eat as much or as little chocolate as they like, and should at least try to taste one chocolate from the bowl provided. After 5 minutes of being presented with the chocolate, the experimenter asked all participants to finish eating, and administrated a likeability question, SMS, negative affect subscale, emotional eating subscale and restrained eating subscale. Once participants had completed the questionnaires, they were debriefed and thanked for their participation.

8.4. Data Analysis

Consumption of chocolate was initially measured in grams, using the difference in weight of the bowl before and after each experimental session. The grams consumed were multiplied by 5 (obtained from manufacturers package information) in order to get a measure of total calories (kCal) consumed. Chi square was used to account for differences in gender across the three conditions, and one way ANOVAs were conducted to test for differences in hunger, BMI, age, emotional eating, restrained eating and chocolate intake. 3 X 2 ANOVAs were conducted to test for differences in negative state affect and state mindfulness scores. Participant hunger and characteristics (including emotional and restrained eating) were used tested as covariate to explore any effect they may have upon chocolate intake across the three conditions. All analyses were conducted using SPSS v24.

8.5. Results

Participant Characteristics

One way between group ANOVAs found no significant differences across conditions in participants' hunger, BMI and restrained eating: all $p > .07$ (see Table 8.2). Chi square analysis

indicated gender was not equal across the three conditions X^2 (4) = 11.69, p = .02, with significantly less females present in the control condition than the self-distanced condition (p = .01).There was a significant difference in age F(2, 119) = 6.01, p = .01, ηp^2 = .09, whereby age was lower amongst participants in the self-immersed condition than those in the control condition (p = .01). There was also a significant difference in emotion eating F(2, 119) = 3.03, p = .05, ηp^2 = .05, whereby participants in the self-distanced condition displayed a greater emotional eating style than those in the self-immersed condition (p = .04). Inclusion of hunger, BMI, age and gender as covariates in the analyses did not affect the observed results for any of the dependent measures, and are therefore not discussed further. Emotional eating and restrained eating are discussed further below.

Mood Manipulation

A 3 (condition: self-immersed, self-distanced, control) X 2 (time: baseline, pre) mixed design ANOVA was conducted in order to ensure that the movie excerpt presented induced a negative state affect amongst participants. The analysis revealed a significant main effect for time F(1, 117) = 74.72, p < .001, ηp^2 = .39, no significant main effect across conditions F(2, 117) = 1.69, p = .19, and no significant interaction between time and condition F(2, 117) = .63, p = .54. Therefore, mood manipulation appeared to be successful in all three conditions (see Table 8.3).

Table 8.2.

Measures of Participants' Hunger, BMI and Age Across Self-Immersed, Self-Distanced and Control Conditions

	M, (*SD*) - Self-Immersed (*n* = 40)	*M*, (*SD*) - Self-Distanced (*n* = 40)	*M*, (*SD*) - Control (*n* = 40)	*p*
Hunger	1.70, (.79)	2.00, (.93)	2.14, (.95)	.08
BMI	21.03, (9.34)	24.18, (7.77)	21.71, (8.13)	.22
Age[*]	21.08, (3.47)	23.56, (7.47)	28.05, (13.46)	.01
Emotional Eating[*a]	26.98, (9.15)	32.25, (9.90)	29.78, (9.71)	.05
Restrained Eating [a]	24.15, (8.88)	28.03, (7.15)	24.75, (8.02)	.07

Note. M and *SD* are used to represent mean and standard deviation, respectively [*] = significant difference across conditions, [a] = subscales of DEBQ.

Table 8.3.

Baseline, Pre and Post Measures of Negative Affect Subscale Across Self-Immersed, Self-Distanced and Control Conditions

	M, (*SD*) - Baseline	*M*, (*SD*) - Pre	*M*, (*SD*) - Post
Self-Immersed (*n* = 40)	12.52, (3.47)	16.07, (5.19)	12.60, (3.97)
Self-Distanced (*n* = 40)	13.78, (4.21)	18.35, (7.42)	14.58, (4.62)
Control (*n* = 40)	13.50, (3.69)	18.35, (7.51)	13.03, (4.95)

Note. M and *SD* are used to represent mean and standard deviation, respectively.

State Mindfulness

A 3 (condition: self-immersed, self-distanced, control) X 2 (time: pre, post) mixed design ANOVA was carried out to explore the effects of self-immersed MCD and self-distanced MCD on state mindfulness. There was a significant main effect across conditions $F(2, 117) = 5.36$, $p = .01$, $\eta p^2 = .08$, no significant main effect for time $F(1, 117) = 3.11$, $p = .08$, and no significant interaction between condition and time $F(2, 117) = .89$, $p = .42$. A post hoc comparison using the Tukey HSD test suggested participants in the self-distanced condition scored significantly higher in pre state mindfulness than those in the control condition ($p = .03$). However, no significant differences were found between participants in self-immersed condition and self-distanced condition ($p = .46$), or between those in the self-immersed condition and control condition ($p = .33$). Therefore, suggesting post state mindfulness scores did not significantly increase (or decrease) across the three conditions (see Table 8.4).

Negative State Affect

A 3 (condition: self-immersed, self-distanced, control) X 2 (time: pre, post) mixed design ANOVA was carried out to explore the effects of self-immersed MCD and self-distanced MCD on negative state affect. There was a significant main effect for time, $F(1, 117) = 67.37$, $p = .001$, $\eta p^2 = .37$. There was no significant main effect across condition, $F(2, 117) = 1.81$, $p = .17$, and there was no significant interaction between condition and time, $F(2, 117) = 1.26$, $p = .29$. Thus, suggesting self-immersed MCD or self-distanced MCD had no significant effect in improving negative state affect when compared to the control condition (see Table 8.3).

Table 8.4.

Pre and Post Measures of SMS Across Self-Immersed, Self-Distanced and Control Conditions

	M, (*SD*) - Pre	*M*, (*SD*) - Post
Self-Immersed (n = 40)	64.30, (16.30)	59.88, (17.62)
Self-Distanced (n = 40)	68.63, (13.41)	68.70, (15.38)
Control (n = 40)	59.10, (18.60)	55.90, (20.90)

Note. M and *SD* are used to represent mean and standard deviation, respectively.

Chocolate Intake

A one way between group ANOVA was conducted to explore participants' intake of chocolate across the self-immersed condition, self-distanced condition, and control condition. There was a significant difference in chocolate intake across the three conditions $F(2, 119) = 8.74$, $p = .001$, $\eta p^2 = .13$ (see Table 8.5). A post hoc comparison using the Tukey HSD test found participants in the control condition consumed significantly more chocolate than those in the self-immersed condition ($p = .01$) and in the self-distanced condition ($p < .001$). However, participants in the self-immersed and self-distanced conditions did not significantly differ in their intake of chocolate ($p = .63$) (see Figure 8.1).

Effects of Eating Behaviours

As Table 8.2 displays, emotional eating style significantly differed between conditions, and to explore for any effect it may have had upon participants' intake of chocolate, an ANCOVA was conducted. A between group ANCOVA indicated emotional eating had no significant effect on the amount of chocolate participants' consumed across the three conditions $F(1, 116) = .35$, $p = .55$. Restrained eating was also explored to control for any effect it may have upon chocolate intake, and similarly no effect was found $F(1, 116) = 2.03$, $p = .16$. Therefore, suggesting the difference in

participants' intake of chocolate across the three conditions was not because of emotional or restrained eating behaviours.

Table 8.5.

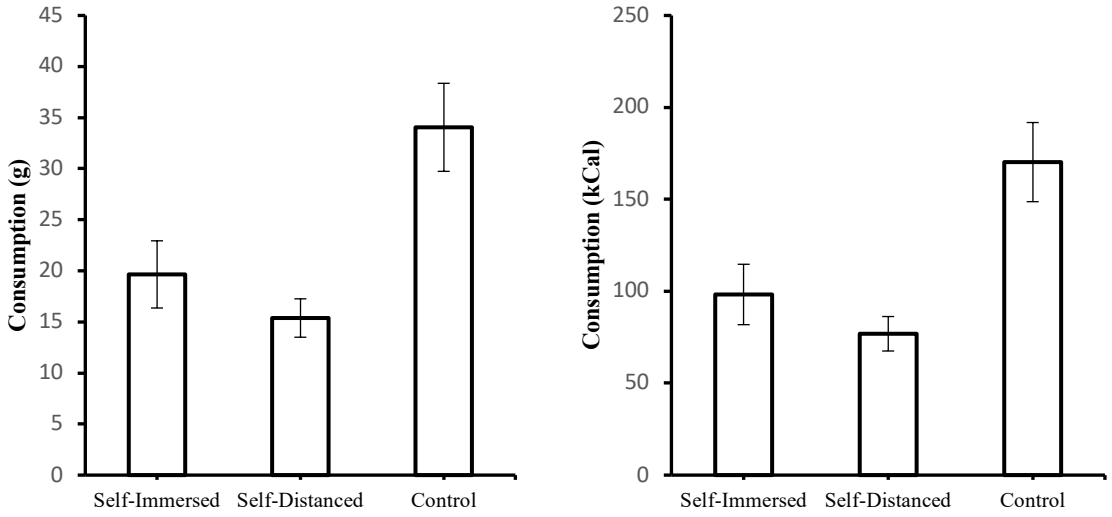
Participants' Chocolate Intake Across Self-Immersed, Self-Distanced and Control Conditions

	Self-Immersed (n = 40)	Self-Distanced (n = 40)	Control (n = 40)
M, (*SD*) - g	19.65, (20.71)	15.37, (11.86)	34.05, (27.24)
M, (*SD*) - kCal	98.25, (103.92)	76.88, (59.34)	170.25, (136.19)

Note. M and *SD* are used to represent mean and standard deviation of consumption of chocolate in grams and calories.

Figure 8.1.

Participants' Chocolate Intake



Note. Consumption of chocolate in self-immersed, self-distanced and control conditions. Error bars refer to the standard error of the mean. Left panel represents consumption in grams, and right panel represents consumption in calories.

8.6. Discussion

The present study investigated whether a self-distanced MCD could improve participants' state mindfulness whilst also attenuating their negative state affect and regulating their chocolate intake. The findings suggest that participants using the self-immersed MCD or self-distanced MCD did not improve their state mindfulness or state negative affect any more (or less) than those in the control condition. However, participants in the self-immersed condition and self-distanced condition did consume significantly less chocolate than those in the control condition, and contrary to the hypothesis, there were no significant differences in participants' chocolate intake between the two experimental conditions (i.e., self-immersed and self-distanced). Emotional eating and restrained eating behaviour patterns, as well as other characteristics, such as hunger, BMI, age and gender had no significant effect on the findings. Overall, it appears that both self-immersed MCD and self-distanced MCD may be beneficial in reducing the overconsumption of chocolate.

Mindful eating strategies indirectly promote a moderation of consumption of unhealthy foods by encouraging people to focus on their satiety and emotional states, which in effect, could lead them to eat less without affecting their mood (Kristeller & Wolever, 2010). Participants using the self-immersed MCD and self-distanced MCD did consume the least amount of chocolate (compared to those in the control condition), but their state mindfulness scores did not improve. Participants in the current study engaged with the adapted versions of the MCD for a total of 7 minutes (2 minutes reading the MCD before being presented with chocolate, and 5 minutes spent engaging with the MCD whilst being presented with chocolate). Whilst previous research has found that a 7 minute framework of using the MCD is effective in improving state mindfulness (Hussein et al., 2017; see Chapter 4, 6), participants in those settings were not experimentally induced to develop a negative affect. It is possible that participants may have needed a longer period of time engaging with the MCD to overcome their induced negative state affect and develop a state of mindfulness. In fact, the findings suggest that participants in the self-immersed and control conditions did slightly decrease in their state mindfulness scores after the experimental task; whereas in the self-distanced condition, participants state mindfulness scores remained similar across measurements, which could potentially explain why

participants in the self-distanced condition consumed significantly less chocolate than the control condition, and slightly less chocolate than those in self-immersed condition.

Participants negative state affect appeared to improve in all three conditions, suggesting that perhaps using a self-immersed MCD or self-distanced MCD is not any more (or less) beneficial in improving negative mood when compared to a control condition. One potential reason for improvement in mood across all three conditions may be the presence and intake of chocolate, as past research has indicated that chocolate consumption alone can improve negative mood states (e.g., Macht & Mueller, 2007; Parker, Parker, & Brotchie, 2006). However, it also appears that in order to improve negative state affect, participants in the control condition needed to consume significantly more chocolate than those in the self-immersed and self-distanced conditions, suggesting both the self-immersed MCD and self-distanced MCD may be promising. Although non-significant (when compared to the self-immersed condition), participants in the self-distanced condition did consume the least amount of chocolate whilst also improving their negative affect. Previous studies have found when participants adopt a self-distanced perspective, they are able to reflect on negative experiences adaptively, and the shift in thought content helps them reduce dwelling on sources of distress (Ayduk & Kross, 2010a). In the present study, engaging with the self-distanced MCD may have led participant to *reconstrue* their experience of watching the movie fragment and focus on the broader context of the situation, i.e., the movie was fictional, and therefore resulted in a prompt attenuation of negative mood without overindulging on chocolate. Therefore, the concept of self-distancing may inform interventions for reduced emotional eating with or without the MCD.

Emotional eating and restrained eating behaviours did not appear to significantly impact participants' chocolate intake across the three conditions, and this appears to be aligned with some previous research. For example, whilst emotional eating may be a common behaviour, the amount of food that people consume to improve their mood differs greatly, and this could be based on a number of reasons, such as early childhood, cultural differences and biological factors (e.g., Macht & Simons, 2010). Furthermore, researchers have suggested that restrained eating alone does not lead to overconsumption during negative emotional states, but it is rather a combination of different factors, such as a tendency to overeat or initial hunger (e.g. Herman et al., 1987; Yeomans & Coughlan,

2009). These findings suggest that eating behaviours, such as emotional and restrained may not directly lead to overconsumption, and their effect can vary upon negative affect induced eating.

8.7. Limitations and Future Directions

There are some potential limitations to the present study which require further attention. Firstly, this study was conducted in a highly controlled laboratory setting, and a film extract was used to induce negative affect. However, situations in real-life may not be so clear-cut, for example, in reality there may be many reasons for people to experience negative mood, such as a breakdown of a relationship or bereavement, and the emotions evoked in such situations may be longer and more detrimental. Future research investigating the role of self-distancing and eating should look to elicit negative emotions in a more authentic manner, for example, public speaking is often a method that induces anxiety and stress (Kross et al., 2014), and may be a more accurate method of negative mood induction. Another concern regarding the ecological validity of this study is the element of reading and engaging with the MCD, as this may be challenging for people in times of difficulty (e.g., low mood). Future research should investigate appropriate methods in training people to take on a more self-distanced perspective potentially through other methods of priming or nudging, and potentially utilise an audio file or simplify the instructions and usage for more effective emotion regulation.

Furthermore, the control condition was not provided with a reading or engagement task, and it could be the case that paying attention to anything whilst eating chocolate could have resulted in a reduced chocolate intake and improved mood. Therefore, future studies should include attention-grabbing or mindless control conditions, or perhaps use the original MCD to thoroughly investigate the effects of self-distancing in improving negative state affect and regulating chocolate consumption.

Finally, the current study was conducted on a relative lean population, and people who are underweight or overweight may have had different reactions towards negative mood and chocolate intake. For example, Geliebter and Aversa (2003) found people who are underweight consumed significantly less than normal weight and overweight individuals during negative emotional states. These differences could potentially lead to distinctions in the effect of self-distancing and eating behaviours amongst underweight, normal weight and overweight individuals. Future research should

explore populations with varied BMIs in order to gain an understanding on the effects of self-distancing towards negative emotional states and eating behaviours.

8.8. Conclusion

The present study suggests that self-distancing may be beneficial in reducing the overconsumption of chocolate during a negative emotional state, and exploring this concept as a means of improving emotional eating behaviours with or without the element of mindfulness could assist in moderating weight regulation. More realistic experimental settings and populations with a varied BMI categorisations may offer more insights as to how self-distancing can enable better eating behaviours and experiences in future research.

CHAPTER 9: EXPLORING THE ENVIRONMENTAL MANIFESTATION OF TYPES OF MUSIC ON REINFORCING MINDFULNESS AND CONCURRENT ENERGY INTAKE

9.1. Abstract

Background: The role of music on energy intake is conflicting, and recent research has suggested a positive association between classical music listening and mindfulness. The present study aimed to investigate the effect of music, specifically classical music on state mindfulness and calorie intake of HED foods. **Method:** One hundred participants were randomly assigned to either a classical, popular or no music condition, and were served a variety of sweet (i.e., chocolate and cookies) and savoury (i.e., crisps) HED foods. **Results:** The results found no significant differences in state mindfulness, overall calorie intake or intake of sweet foods across the three conditions. However, participants in the classical music condition did consume significantly less savoury food than those in the no music condition. **Conclusion.** Playing classical music may be beneficial in reducing intake of savoury foods, but not through the association to changes in state mindfulness. Future research should explore extended sessions of music listening on state mindfulness and other experiential evaluations of mindfulness to conclude on the direct and indirect effects of music on sweet and savoury foods.

9.2. Background

Eating behaviours in general can be influenced by external factors, such as the environmental stimuli (Wansink, 2004). For example, television viewing, presence of other people and ambience are all suggested to act as food intake regulators as they affect food choice, motivation to eat and meal duration (Braude & Stevenson, 2014; Robinson & Higgs, 2013; Wansink & van Ittersum, 2012). The construct of mindfulness has also been proposed to affect eating behaviours with research suggesting mindfulness is associated with lower caloric intake, reduced fat and sugar consumption, and smaller serving sizes (Arch et al., 2016; Beshara et al., 2013; Mantzios, Egan, Hussain, et al., 2018). Exploring strategies to promote healthier eating behaviours within the eating context of one's environment is becoming increasingly important when observing the sustainability of interventions and the worldwide prevalence of obesity (Arroyo-Johnson & Mincey, 2016). Simply putting some

music on may propose an effortless way of healthier and well-regulated eating, and is worth exploring to propose additional methods of support.

Music is an element that is present in many public and private eating places, and the presence of music has been suggested to be associated with increased energy intake (Lock, Brindal, Hendrie, & Cox, 2016; Stroebele & Castro, 2006). Specifically, different features of music are suggested to distinctively affect eating behaviours (e.g., Karapetsa, Karapetsa, Maria, & Lasaraski, 2015). For example, research within music genre indicates that classical music leads to a greater enjoyment in food (Novak, La-Lopa, & Novak, 2010), and research on music tempo suggests increased music speed leads to higher energy intake (e.g., Milliman, 1986; Roballey et al., 1985; Wansink & van Ittersum, 2012). However, at the same time, other researchers have not been able to replicate such findings, and have instead found no influence of music on energy intake (e.g., Mamalaki, Zachari, Karfopoulou, Zervas, & Yannakoulia, 2017; Peneu et al., 2009). The mechanisms behind such conflicting findings are not apparent, and appear to need exploring.

Research has found that certain elements of music can have a calming or stimulating effect depending on the tempo or genre (Koelsch & Siebel, 2005; Patel, 2003), which could explain the inconsistent findings observed in eating literature. For example, recent research has found a positive association between listening to classical music on a regular basis and mindfulness (Bell, McIntyre, & Hadley, 2016). Mindfulness is characterised as an awareness that emerges through purposefully paying attention to what is taking place in the present moment with a non-judgmental attitude (Kabat-Zinn, 1990). Specifically, those who practice mindfulness through meditational exercises on average increase their predisposition to be mindful in daily life, which in effect, has shown to contribute towards healthier eating behaviours across time (Dalen et al., 2010; Jordan et al., 2014; Kristeller et al., 2014). In general, there seems to be little research conducted on music and its effect on mindfulness; however, previous studies that have been conducted do suggest a possible association between the two, specifically regarding classical music (Bell et al., 2016). For example, similar to classical music, mindfulness practices are also suggested to have a calming effect amongst participants (e.g., Lauricella, 2013), and similar neurophysiology amongst those who regularly engage in mindfulness meditation and those who listen to classical music on a daily basis has also been found

(Aoun, Jones, Shaw and Bodner, 2005; Holzel et al., 2011; Vuilleumier, 2005). Furthermore, those who actively participate in music activities develop enhanced awareness of self and others, as well as improved listening and attention skills, components that are key in mindfulness practices (Auerbach & Delport, 2018), and mindful eating practices (Dalen et al., 2010; Kristeller et al., 2014). Therefore, elements of mindfulness could potentially be developed through centring on music, specifically classical music.

It could be suggested mindfulness (or the lack of mindfulness) may be a contributing factor towards the conflicting findings on music and energy intake. Over recent years, mindfulness has been used as a intervention strategy in promoting healthier eating practices, such as reduced food cravings, resisting HED foods and choosing healthier food options (e.g., Dutt et al, 2019; Jenkins & Tapper, 2014; Mantzios et al., 2020). Furthermore, similar to classical music, mindfulness has shown to enhance the enjoyment of foods consumed (Arch et al., 2016; Hong et al., 2014). Research indicates that mindful attention can help reduce the temptations of consuming attractive, but unhealthy foods by viewing such simulations as mere mental events, and as a result assist in the gradual change of external to internal eating (Mantzios et al., 2019; Mantzios & Giannou, 2014; Marchiori & Papies, 2014). The majority of experimental studies that use mindfulness as a strategy in promoting healthier eating behaviours use body scan exercises or short audio recordings of mindful instructions (e.g., Jordan et al., 2014; Jenkins & Tapper, 2014). Mantzios and Giannou (2018) proposed how mindfulness could be utilised to become short and effortless practices, and some research has focused on introducing brief and effortless interventions to enable adherence and embedment within one's lifestyle (Mantzios & Wilson, 2014; Mantzios & Wilson, 2015a; Hussain et al., 2017). However, this study poses the question whether state mindfulness can be induced via a simple environmental change and the complete disengagement from any active interventions. Since previous studies have concluded that listening to classical music on a regular basis can promote mindfulness (e.g., Bell et al., 2016), and mindfulness has shown to be successful in encouraging healthier eating behaviours (e.g., Alberts et al., 2010; Dutt et al., 2019), exploring exposure to classical music whilst being exposed to food is an initial pilot of exploring associations and proposals for future research.

The present study aims to explore whether music could be a primary environmental tool to eat more mindfully, and investigate whether briefly listening to music could induce a mindfulness state, and in effect, lead to a reduced consumption of HED foods. It was hypothesised that state mindfulness would increase and intake from HED foods would be lower when listening to classical music in comparison to popular music and no music, and correspondingly significantly differ in food consumption.

9.3. Method

Participants

One hundred participants were recruited via opportunity sampling from a university in West Midlands, UK, and participants did not receive any compensation for their involvement in the study. The sample size was based on the number of participants recruited in other similar studies (e.g., Mamalaki et al., 2017; Stroebele & Castro, 2006). Participants had an average BMI of $M = 21.72$ ($SD = 10.77$) and an age of $M = 26.18$ ($SD = 13.02$), and their self-identified ethnicities were: White or White British ($n = 65$), Black African or Caribbean ($n = 7$), South Asian ($n = 20$), Mixed Ethnicity ($n = 6$) and Middle Eastern ($n = 2$). The present study was approved by the University's ethics committee (see Appendix B6), and informed consent was gained from all participants.

Eligibility. Due to the nature of the study (i.e., presence of food), participants were informed via an information sheet and consent form that they were not eligible to participate if they had been diagnosed with an eating disorder or if they had any food allergies or intolerances.

Experimental Conditions

Participants were randomly assigned to one of three conditions: classical music ($n = 33$; female = 24, male = 7, not-specified = 2), popular music ($n = 33$; female = 29, male = 4), and no music ($n = 34$; female = 23, male = 10, not-specified = 1). The music tempo in the two conditions was estimated to be similarly slow, and the music in the classical condition was chosen from the "50 Greatest Pieces of Classic Music" playlist because of its genre, and lasted a total of 7 minutes. The choice of songs used for the popular music condition were based on their popularity, and were therefore chosen from the "Official UK Top 40 Singles Chart" during the period of Spring 2018, and lasted a total of 7 mins 28s.

Food

Participants were served with both sweet and savoury HED foods in order to cater for differences in food preferences and ensure food variety. Participants were presented with Walkers salted crisps (132 kCal/25g), Galaxy chocolate minstrels (225 kCal/45g) and Oreo cookies (212 kCal/45.2g), and they were able to eat as much or as little as they preferred. Participants were not required to try all three snacks, but were given the option to do so. All portions served were based on standard UK portion sizes, and all food products were sourced from UK Tesco stores and were presented on individual bowls (15cm x 15cm x 8cm).

Measures

Participant demographics form. Participants were asked questions regarding their gender, age, height, weight and ethnicity in order to assess their BMI and background information.

Hunger. To assess hunger, participants were asked as the start of the experimental session "How hungry do you feel right now?" with responses ranging from 1 (*not at all*) to 5 (*extremely hungry*).

Taste test. In a bogus taste test, participants were asked to rate the foods in front of them (e.g., "How much did you like the taste of the chocolate minstrels?") with responses ranging from 1 (*not at all*) to 5 (*extremely*). The results of the bogus taste test were also used to assess participants' likeability of the foods.

SMS (Tanay & Bernstein, 2013). Participants in the current study were instructed to complete the SMS measure before (pre) and after (post) the introduction of music (or no music) and food. Please see Chapter 2 for a full description of the SMS. The present study produced an alpha of pre (α =.95) and post (α =.95).

TFEQ (Karlsonn et al., 2000). To control for any differences between conditions and any effect that eating behaviours could have on the results, TFEQ was administrated. Please see Chapter 2 for a full description of the TFEQ. The present study produced an alpha of restrained eating - (α = .83), uncontrolled eating - (α = .89), emotional eating (α = .88) and overall score - (α = .86).

Procedure

The study was advertised as an experiment investigating the effect of environmental stimuli on taste perception, and was deliberately kept vague in order to prevent participants from predicting the true aim of the study. Experimental sessions took place between 12 and 4pm lasting approximately 25 minutes. Upon entering the lab, participants received an information sheet, and after providing informed consent, they were seated in individual cubicles. Participants height and weight was measured using a stadiometer and a digital scale, and they were asked to complete a participant demographic form, a hunger measure and a SMS. Next, the experimenter provided participants with three bowls of food containing crisps, chocolates, and cookies. Participants in both the classic and popular music conditions were instructed to listen to music on their computer media player using their headphones, and consume as much or as little of the food they wanted in order to judge the taste of the food products. Whilst participants in the no music condition were simply instructed to eat as much or as little food as they wanted in order to judge the taste of the food. After either listening to classical music, popular music, or having no music, participants filled out a bogus taste test, those who did not eat any one of the snacks could simply select "Did Not Eat X" and they then completed another measure of the SMS and the TFEQ. Finally, participants were debriefed and thanked for their participation.

9.4. Data Analysis

Calorie intake was determined for food products by calculating the difference in weight of each bowl between the start and end of experimental sessions, and multiplying the weight consumed by the calorie density of each food product (obtained from manufacturers package information). Chi square was used to account for differences in gender across conditions, and one way ANOVAs were carried out to test for differences across conditions in participants' hunger, food likeability (i.e., crisps, chocolate and cookies), BMI, age and eating behaviours including restrained, uncontrolled and emotional eating. A 3 X 2 ANOVA was planned to test whether a difference was observed in post state mindfulness scores across the three conditions. State mindfulness change was utilised to create a group that increased vs decreased throughout the music manipulations, and this was conducted by subtracting post state mindfulness scores with pre state mindfulness scores which created one score (i.e., "change score"), and those who decreased or increased on the change score were grouped in

decrease and increase groups, respectively. 3 X 2 ANOVAs were conducted to explore the effect of state mindfulness change and music on participants' energy intake. Hunger, food likeability (i.e., crisps, chocolate and cookies) and participant characteristics were tested as covariates to assess whether they had any effect on the dependent variables. All analyses were conducted using SPSS v24.

9.5. Results

Participant Characteristics

Chi Square analysis displayed that there were no significant differences in gender across the classical music, popular music and no music conditions X^2 (6) = 6.37, p = .38. One way ANOVAs found no significant differences across conditions in participants' hunger, food likeability (i.e., crisps, chocolate and cookies), BMI and eating behaviours including restrained, uncontrolled and emotional eating: all $p > .12$. There was a significant difference in age $F(2, 97) = 4.99$, $p = .001$, $\eta_p^2 = .09$, whereby age was lower in the popular music condition than the classical music condition (p = .02) and the no music condition (p = .02) (see Table 9.1). Participants' hunger, food likeability (i.e., chocolate and cookies), BMI, age and eating behaviours including restrained, uncontrolled and emotional eating were tested as covariates, and were found to have no significant effect on any of the dependent variables, and are thus not discussed further.

Table 9.1.

Measures of Participant Hunger, Food Likeability and Characteristics Across Classic Music, Popular Music and No Music Conditions

	M, (*SD*) - Classical Music (*n* = 33)	*M,* (*SD*) - Popular Music (*n* = 33)	*M,* (*SD*) - No Music (*n* = 34)	*p*
Hunger	1.81, (.68)	1.97, (1.02)	2.01, (.86)	.18
Crisps Likeability	2.79, (2.25)	2.33, (2.15)	3.06, (2.07)	.38
Chocolate Likeability	3.18, (2.05)	3.12, (2.09)	4.03, (1.83)	.12
Cookie Likeability	1.58, (1.84)	1.45, (1.97)	1.71, (2.13)	.87
BMI	25.79, (5.42)	22.72, (9.00)	24.84, (8.89)	.32
Eating Behaviours [a]	41.45, (11.29)	41.24, (9.77)	42.32, (7.80)	.89
Restrained Eating [b]	13.06, (4.86)	12.70, (4.23)	12.44, (3.70)	.84
Uncontrolled Eating [b]	21.45, (6.77)	20.73, (6.58)	22.12, (4.96)	.65
Emotional Eating [b]	6.94, (3.15)	7.81, (3.14)	7.76, (2.81)	.42
Age[*]	29.06, (14.24)	20.56, (7.37)	28.85, (14.55)	.01

Note. M and *SD* are used to represent mean and standard deviation, respectively. [a] = TFEQ, [b] = Subscales of TFEQ, Age[*] = Significant difference across conditions.

State Mindfulness

A 3 (condition: classical music, popular music, no music) X 2 (time: pre, post) mixed design ANOVA was carried out to explore the effect of music on state mindfulness across the three

conditions. There was no significant main effect of conditions $F(2, 97) = 1.89$, $p = .16$, no significant main effect of time $F(1, 97) = .98$, $p = .32$, and no significant interaction between conditions and time $F(2, 97) = .50$, $p = .60$. Therefore, suggesting that exposure to classical music, popular music and no music had no significant effect on increasing (or decreasing) participants state mindfulness (see Table 9.2).

Overall Intake[6]

A 3 (condition: classical music, popular music, no music) X 2 (state mindfulness: decrease, increase) between group ANOVA was conducted to explore the effects of music and state mindfulness on participants overall energy intake (i.e., crisps, chocolate, and cookies). There was no significant main effect of conditions $F(2, 94) = 1.33$, $p = .27$, no significant main effect of state mindfulness $F(1, 94) = 1.75$, $p = .19$, and no significant interaction between conditions and state mindfulness $F(2, 94) = .20$, $p = .82$. Therefore, suggesting both music and state mindfulness had no significant effect on participants' overall energy intake (see Table 9.3).

Table 9.2.

Pre and Post Measures of SMS Across Classical Music, Popular Music and No Music Conditions

	M, (*SD*) - Pre	*M,* (*SD*) - Post
Classical Music (*n* = 33)	64.73, (17.27)	61.64, (21.21)
Popular Music (*n* = 33)	68.33, (18.68)	69.12, (17.94)
No Music (*n* = 34)	63.21, (17.18)	59.94, (17.39)

Note. M and *SD* are used to represent mean and standard deviation, respectively.

[6] In Chapter 9, "Energy intake", "Food Intake", "Intake" and "Consumption" only refers to calories consumed, as opposed to both grams and calories described in previous Chapters.

Table 9.3.

Participants' Overall Intake of Sweet and Savoury Foods Across Classical, Popular and No Music Conditions

	M, (*SD*) - Classical Music (*n* = 33)	*M,* (*SD*) - Popular Music (*n* = 33)	*M,* (*SD*), - No Music (*n* = 34)
Decrease State Mindfulness	158.38, (80.71)	168.08, (132.46)	202.17, (145.52)
Increase State Mindfulness	208.93, (109.55)	179.63, (122.20)	240.00, (142.38)
Total	183.41, (97.54)	173.68, (125.72)	218.86, (143.23)

Note. M and *SD* are used to represent mean and standard deviation of calorie intake, respectively.

Sweet Food Intake

A 3 (condition: classical music, popular music, no music) X 2 (state mindfulness: decrease, increase) between group ANOVA was conducted to explore the effect of music and state mindfulness on participants energy intake of sweet foods (i.e., chocolate and cookies). There was no significant main effect of conditions $F(2, 94) = .52$, $p = .60$, no significant main effect of state mindfulness $F(1, 94) = 1.87$, $p = .17$, and no significant interaction between conditions and state mindfulness scores $F(2, 94) = .01$, $p = .99$. Therefore, suggesting both music and state mindfulness had no significant effect on participants' intake of sweet foods (see Table 9.4).

Table 9.4.

Participants' Intake of Sweet Foods Across Classical, Popular and No Music Conditions

	M, (*SD*) - Classical Music (*n* = 33)	*M,* (*SD*) - Popular Music (*n* = 33)	*M,* (*SD*) - No Music (*n* = 34)
Decrease State Mindfulness	141.06, (69.79)	119.94, (94.78)	139.37, (140.76)
Increase State Mindfulness	171.31, (82.43)	145.32, (115.72)	172.07, (82.43)
Total	155.73, (76.53)	132.24, (104.57)	153.79, (131.00)

Note. M and *SD* are used to represent mean and standard deviation of calorie intake, respectively.

Savoury Food Intake

A 3 (condition: classical music, popular music, no music) X 2 (state mindfulness: decrease, increase) between group ANOVA was conducted to explore the effect of music and state mindfulness on participants energy intake of savoury food (i.e., crisps).There was a significant main effect of condition $F(2, 94) = 5.13$, $p = .01$, $\eta_p^2 = .10$. There was no main effect of state mindfulness $F(1, 94) = .13$, $p = .72$, and no significant interaction between conditions and state mindfulness $F(2, 94) = .97$, $p = .38$.

The covariate, likeability of crisps, had a significant effect on participants consumption of crisps $F(1, 96) = 11.41$, $p = .001$, $\eta_p^2 = .11$. There was also a significant effect of music on participants consumption of crisps after controlling for the effect of likeability of crisps $F(2, 96) = 5.02$, $p = .01$, $\eta_p^2 = .10$.

A Bonferroni pairwise comparison indicated that participants in the classical music condition consumed significantly less crisps than those in the no music condition ($p = .01$). There was no significant difference found in the consumption of crisps between participants in the classical music condition and popular music condition ($p = .40$), or between participants in the no music condition and popular music condition ($p = .32$) (see Table 9.5).

Table 9.5.

Participants' Intake of Savoury Foods Across Classical, Popular and No Music Conditions

	Classical Music (n = 33)	Popular Music (n = 33)	No Music (n = 34)
M, (*SD*)			
Decrease State Mindfulness	18.32, (33.76)	48.14, (50.02)	62.80, (50.67)
Increase State Mindfulness	37.62, (52.12)	34.32, (46.55)	67.94, (54.65)
Total	27.68, (44.04)	41.44, (48.12)	65.07, (51.71)
M_{adj}, (*SE*)			
Total	27.26, (7.96)	44.32, (8.00)	62.68, (7.87)

Note. M and *SD* are used to represent mean and standard deviation of calorie intake, respectively. M_{adj} and *SE* are used to represent adjusted mean and standard error of calorie intake by controlling likeability of crisps, respectively.

9.6. Discussion

The present study investigated whether briefly listening to classical music could induce an increase in state mindfulness, and in effect, result in a reduced intake of HED foods. Contrary to our hypotheses, the data showed that there were no significant differences in state mindfulness across classical music, popular music and no music conditions. There were also no significant differences found in the overall intake of foods, or in the intake of sweets foods (i.e., chocolate and cookies) across the three conditions; however, participants in the classical music condition did consume significant less savoury food (i.e., crisps) than those in the no music condition, even after controlling for the likeability of crisps. Thus, suggesting background music does not affect state mindfulness or intake of sweet foods, but playing classical music may be beneficial in reducing intake of savoury foods.

Prior research has suggested similarities in the mechanisms underlying mindful meditation and classical music listening (Angelucci et al., 2007; Holzel et al., 2011), and whilst the findings from the current study do not align with such literature, previous research has solely explored the long term effects of classical music listening on mindfulness (Bell et al., 2016). The music in the current study was played for 7 minutes (classical music condition) which may not have been a sufficient amount of time to induce a state of mindfulness, and perhaps a slightly longer period of music listening may have led to a greater change in state mindfulness (Auerbach & Delport, 2018; Bell et al., 2016). That being said, state mindfulness did in fact slightly decrease in the classic music condition, and moderately increase in the popular music condition. A potential reason for this could be that participants in the popular music condition may have liked the music more than participants in the classical music condition, which in effect, may have led to other elements that may have influenced state mindfulness. For example, nostalgia (Sedikides & Skowronski, 2020) and familiarity of the song (Barrett et al., 2010) may serve as a way of increasing mindfulness. When listening to a song that reminds someone of a positive (or negative) experience, their mind may wonder away for a moment, and they then return their attention back to the music that is playing; an element that replicated the notion of the self-regulation of attention that is described in mindfulness literature (Baer et al., 2004). However, the present did study did not conduct any assessments on music likeability, which could have indeed had an effect on the current results (Kantono Hamid, Shepherd, Yoo, Carr, et al., 2016; Kantono, Hamid, Shepherd, Yoo, Grazioli, et al., 2016; Kantono et al., 2018). Future research exploring likeability, nostalgia and familiarity, as well as memories associated to the song may serve an enhanced and more tightly controlled experiment.

The non-significant differences in participants overall energy intake across the classical music, popular music and no music conditions could be explained by the non-significant changes in state mindfulness scores. Although in the present study, it did appear that participants who increased in their state mindfulness after the music manipulations did exhibit a slightly (i.e., non-significant) greater intake of HED foods than those who scored lower in state mindfulness; previous research has suggested mindfulness to be a key factor in promoting healthier eating behaviours. For example, findings from both experimental and cross-sectional data have suggested participants who reported

high levels of mindfulness are suggested to increase their intake of fruit and vegetables and reduce their calorie consumption, impulsive eating and grazing (Dutt et al., 2019; Jordan et al., 2014; Mantzios, Egan, Bahia, et al., 2018; Mantzios & Wilson, 2014). Research suggests mindfulness can minimise automatic and inattentive reactions around food, and bring back the focus to what one is eating (Mantzios & Wilson, 2015a). On the other hand, Mantzios and Wilson (2015a) proposed that mindfulness interventions may need to be specific to the eating experience, and it may be the case that mindfulness induction may need to co-occur with the eating experience, and not one being subsequent to the other. For now, we can conclude that the non-significant changes in state mindfulness influence any interpretations on eating and overall energy intake across conditions.

Despite state mindfulness not significantly increasing, participants in the classical music condition did consume significantly less savoury food than those in the no music condition. Previous research has found that different elements of music, such as genre, volume, tempos, pitches and likeability can have an effect on the perception (i.e., pleasantness and enjoyments) of foods, specifically sweet foods (Fiegel, Meullenet, Harrington, Humble, & Seo, 2014; Fiegel, Childress, Beekman, Seo, 2019; Kantono Hamid, Shepherd, Yoo, Carr, et al., 2016; Kantono, Hamid, Shepherd, Yoo, Grazioli, et al., 2016; Kantono et al., 2018), which could offer another level of explanation of present findings. However, research has not yet directly explored the effect of music on savoury vs sweet foods, which could be another avenue for future research. For example, the majority of other research conducted on music and eating behaviours has explored variables such as meal duration and overall amount of food consumed, (e.g., Kaiser, Silberberger, Hilzendegen, Stroebele-Benschop, 2016; Woods et al., 2011; Milliman, 1986). The possibility that the effect of music, specifically classical music may differ between savoury and sweet foods could provide a possible explanation for the conflicting findings on music and energy intake, the association to mindfulness, and the potential differences between meals and snacks.

Recent research has found a difference in peoples' perception and consumption between foods that are "meals" and "snacks". For example, in an explorative study, Banna, Richards, and Browns (2017) found participants perceived "real meals" to be nutritious and healthy, compared to "meals". Other research has found participants ate significantly more during a taste test when the

preload had been labelled or presented as a snack compared to a meal (Ogden, Wood, Payne, Fouracre, & Lammyman, 2018). Majority of previous studies looking at music and energy intake have used foods that are labelled as meals (e.g., Kaiser et al., 2016; Wansink & van Ittersum, 2012), whilst the current study presented foods considered to be snacks. Therefore, music could have a different effect on energy intake when exploring divergent perceptions and consumption of snacks compared to meals.

9.7. Limitations and Future Directions

There are some limitations within the current study that require further discussion. Firstly, the current study was conducted in a controlled laboratory setting, suggesting a lack of ecological validity. Future studies should conduct similar research in field settings to investigate whether any differences are apparent in mindfulness and energy intake.

Furthermore, there was no assessment conducted on any chewing sounds that participants may have experienced whilst eating with their headphones. Previous studies have suggested that listening to oneself chew could affect eating behaviours in regards to enjoyment and energy intake (Amos et al., 2006; Endo, Ino, & Fujisaki, 2016; Elder & Mohr, 2016). Any future research should therefore control for this measure as a means of enhancing the development of this research.

Additionally, the current study did not investigate the effects of different tempos and noise levels of music on state mindfulness or on energy intake of HED foods, and the presence of different tempos and noise levels may have led to contrasting findings. For example, listening to music of increased tempo and noise level may have led participants to be less mindful, and in effect, increase their intake (McCarron & Tierney, 1989); whilst the presence of reduced tempo and noise level may have led participants to be more mindful, and in effect, potentially reduce their intake (McElrea & Standing, 1992). The present study did use music with similar estimations of tempos between the two music conditions; future research should investigate the effects of different tempos and noise levels, as well as pleasant and unpleasant music on participants state mindfulness and energy intake of HED foods.

Finally, the sample within the current study was small, and consisted predominantly of healthy females. Future research should use a larger and diverse sample representing both genders and varied BMI.

9.8. Conclusion

The findings from the present pilot study suggest that listening to classical music or popular music does not affect mindfulness any differently. Similarly, overall energy intake of HED foods in the presence of music types or no music did not suggest any significant differences. However, playing classical music may be beneficial in reducing intake of savoury foods. Protecting the fiscal health of public services whilst also enhancing health behaviours may be achieved through detailing the relationship between mindfulness and music as this can be achieved through minimal interventions with high adherence, and added to existing clinical practices without additional costs to the NHS.

CHAPTER 10: GENERAL DISCUSSION

10.1. Overview of the Current Thesis and Aims

The current thesis aimed to explore psychological constructs, such as mindfulness, mindful eating and self-compassion that have previously demonstrated their positive effect towards healthier eating behaviours (e.g., Braun et al., 2012; Dalen et al., 2010; Horan & Taylor, 2018; Mantzios & Wilson, 2014), as well as novel approaches, such as self-kindness and self-distancing that have not yet been explored within eating behaviours. The main aim of the current thesis was to explore these constructs using methods that are easy and practical to implement in an attempt to facilitate energy intake reduction, and ultimately promote healthier eating behaviours. The broad aims of the current thesis include: (1) exploring the association between mindfulness, mindful eating and self-compassion on eating behaviours amongst patients who have clinical obesity; (2) investigating the effect of mindfulness using the MCD on decreasing attentional biases towards food cues, reducing portion size effect and promoting healthier food choices; (3) examining the effect of self-kindness using the MCD on promoting healthier food choices; (4) exploring the effect of self-distancing using the MCD on decreasing consumption of HED food after a negative state affect; (5) investigating the effect of environment cues, such as music as a simpler and more effortless method to eat mindfully, and consequently reduce intake of HED foods.

In the following sections, the findings from each Chapter will be briefly reviewed, focusing on how each Chapter contributes towards the main aims of the current thesis, and how the findings are associated with previous research. The limitations and future directions of the current research will be discussed, and the potential clinical and non-clinical implications will also be considered.

10.2. Key Findings

Chapter 3 explored the association between mindfulness, mindful eating and self-compassion with eating behaviours, such as emotional, restrained, external, fat and sugar consumption and grazing amongst patients with clinical obesity. The findings from the research suggest all three constructs, mindfulness, mindful eating and self-compassion were significant and negatively associated with grazing and emotional eating, but mindful eating was the only construct that also displayed a

significant and negative association with other eating behaviours, such as external eating and fat consumption. Furthermore, external eating appeared to mediate the association between mindful eating and fat consumption and grazing, whilst, emotional eating resulted in the association between mindfulness and grazing becoming non-significant. The findings on mindful eating are consistent with previous research, for example, literature has suggested mindful eating can facilitate healthier eating behaviours, such as reduced consumption of HED foods, smaller serving sizes and weight loss (Allirot et al., 2017; Beshara et al., 2013; Dalen et al., 2010; Timmerman & Brown, 2013). Research on mindfulness and eating behaviours has been mixed, with some researchers claiming mindfulness is associated with reduced emotional eating (Ouwen et al., 2015; Tak et al., 2015), others have concluded general mindfulness is not sufficient in improving eating behaviours as it is not behavioural relevant (i.e., mindful eating) (Beshera et al., 2013; Kearney et al., 2012; Mantzios & Wilson, 2015b). Moreover, previous research has found self-compassion to be negatively associated with fat and sugar consumption (Mantzios, Egan, Hussain et al., 2018). One explanation for some of the inconsistent findings within Chapter 3 could be attributed to the clinically obese population used as opposed to student populations in previous research (Mantzios, Egan, Hussain et al., 2018; Mantzios, Egan, Bahia et al., 2018). Furthermore, as the SCS is not specific to health behaviours, the items present in the SCS may prescribe different behaviour within the context of eating for those who have clinical obesity (Mantzios & Egan, 2017; Egan & Mantzios, 2018). Chapter 3 was the first study to explore all three constructs of mindfulness, mindful eating and self-compassion with eating behaviours, such as emotional, restrained, external, fat and sugar consumption and grazing amongst patients with clinical obesity. Overall, this Chapter has contributed towards the understanding of psychological constructs that are associated with different eating behaviours. The following Chapters explored how such constructs can effect different eating related behaviours, such as visual attentional biases, energy intake and food choices.

Chapter 4 explored the effects of mindfulness using the MCD on visual attentional biases towards food cues. The findings from the research suggested participants using the MCD significantly improved on their state mindfulness compared to those in the control condition. However, no significant differences in attentional biases towards food cues between the two conditions were found.

Whilst, the finding for improved state mindfulness after using the MCD are consistent with previous research (Hussein et al., 2017; Mantzios & Wilson, 2014), the non-significant differences in attentional biases towards food cues are contradictory. For example, although Chapter 4 was the first study to explore the effect of mindfulness on attentional biases towards food cues, previous research has generally suggested that mindful eating can facilitate healthier eating behaviours (e.g., Artiles et al., 2019; O'Reilly et al., 2014; Warren et al., 2017). However, one element that could explain the contradictory findings within Chapter 4 is the exposure to food/eating related cues for participants using the MCD in comparison to the non-food exposure cues amongst those in the control condition. For example, literature has suggested that when someone is exposed to food related content (i.e., the MCD), and another is not, the attentional biases towards food stimuli may be more intense for the person originally exposed to food related content (Hickey et al., 2010; Higgs et al., 2015; Kumar et al., 2016). Thus, it could be suggested that being exposed to food related content whilst being mindful may be as effective as exposure to non-food stimuli in enabling people to be less biased towards food cues and ultimately consume less. As such, the following Chapter explored the effect of the MCD on actual energy intake.

Chapter 5 examined the effects of mindfulness using the MCD on fostering healthier eating, specifically through preventing the portion size effect. The findings indicated participants in the large portion - control condition displayed a greater intake of M&Ms than those in the small portion - control condition. However, no significant differences in energy intake were found between those in the small and large portion mindfulness conditions. Previous research exploring mindfulness and portion size has found limited success (Cavanaugh et al., 2014; Marchiori & Papies, 2014). One potential explanation for the successful outcome in Chapter 5 is suggested to be the result of the mindful eating specific element that is generated using the MCD, as opposed to generic mindful exercises that are not behaviour (i.e., eating) exclusive (Cavanaugh et al., 2014; Mantzios & Wilson, 2014; Mantzios & Wilson, 2015a; Marchiori & Papies, 2014). Whilst the findings in Chapter 5 do point towards the positive benefits of using the MCD in surpassing external eating cues, and in effect, reducing energy intake, there were other elements within the results that required further attention. For example, although non-significant, participants in the small portion - mindfulness condition did

eat slightly more than those in the large portion - mindfulness condition. This could be suggested to be the result of ALT, whereby the judgment of the small condition depended on how its magnitude compared to a single reference point (Helson, 1964), which would be a typical and average pack of M&Ms. The results also indicated no significant differences in energy intake between the large portion, control and mindfulness conditions. The absence of a pre and post intervention state mindfulness measure could explain such findings. For example, participants state mindfulness levels between the two large portion conditions may have varied prior to the intervention, and as a result participants in the large portion - mindfulness condition may have significantly increased on their state mindfulness post intervention, but they may not have necessarily significantly differed from those in the large portion - control condition, resulting in non-significant energy intake differences. Another element that should also be considered is the M&M portion sizes. Chapter 5 provided participants with 300g vs 600g of M&Ms, and there is concern that both portions are rather a sizeable amount. For example, a standard portion of M&Ms in the UK is 48g, and findings from Chapter 5 do suggest that on average the largest portion eaten was approximately equivalent to one standard bag. Although some studies have used similar portion sizes as Chapter 5 (e.g., Cavanagh et al., 2014), and there are M&Ms that are sold in 1kg bags to consumers in the UK, as well as other low-budget supermarkets that are selling their own branded products in larger portions, it may have still been beneficial to present participants with portions that are smaller and clearly distinct in size (Marchiori & Papies, 2014). The portion sizes in chapter 5 may in fact reflect medium vs large or even large vs very large amounts (Marchiori, Corneille, & Klein, 2012), which could explain some of the unexpected findings. Therefore, although Chapter 5 did display some positive effects in reducing the portion size effect, it was rather limited. The next Chapter further explored the effect of mindfulness using the MCD in promoting healthier eating behaviours.

Chapter 6 explored the effects of mindfulness using the MCD in promoting healthier food choices between HED (M&Ms) and LED (grapes) foods. The results suggested participants who used the MCD significantly improved on their state mindfulness and were significantly less likely to consume M&Ms than those in the control condition. However, no significant differences in the intake of grapes were found between the two conditions. Furthermore, control participants ate significantly

more M&Ms when hungry than when not hungry, whilst participants in the mindfulness condition did not. The findings in Chapter 6 are consistent with previous research (e.g., Allirot et al., 2017; Higgs & Donohoe, 2011; Marchiori & Papies, 2014; Papies et al., 2015). For example, Papies et al. (2015) concluded that after mindfulness training, participants were less likely to select an unhealthy snack and more likely to select a salad, and suggested greater hunger was also associated with the selection of caloric-dense meals amongst participants in the control condition, but not in the mindfulness condition. Similarly, Marchiori and Papies (2014) found mindfulness reduced the effects of hunger on unhealthy eating. However, the findings from Chapter 6 suggest that whilst the MCD may be beneficial in reducing the intake of HED foods, it may not necessarily be sufficient in promoting the consumption of LED foods that are nutritionally dense. As such, exploring the notion of another psychological construct, such as self-kindness may result in the increased intake of LED food, and was thus explored in the following chapter.

Chapter 7 explored the effects of self-kindness towards psychological well-being (i.e., self-kindness to the mind) and self-kindness towards psychological and physiological well-being (i.e., self-kindness to the mind and body) in promoting healthier food choices between HED (M&Ms) and LED (grapes) foods. The findings suggested no significant differences in the consumption of M&Ms or grapes between self-kindness to the mind condition and self-kindness to the mind and body condition. However, participants who were typically low consumers of fruit and vegetable consumed significantly more grapes in the self-kindness to the mind condition compared to those in the self-kindness to the mind and body condition. Chapter 7 was the first study to explore the direct effect of self-kindness on eating behaviours, and as the findings imply, the concept of self-kindness appears to be complex, especially amongst low consumers of fruit and vegetables. One potential explanation for such findings is suggested to be the result of combining the concept of self-kindness with the MCD. For example, whilst the questions within the MCD were priming participants to be kinder to their mind or kinder to their mind and body, the diary was also encouraging participants to be mindful. As such, the presence of mindfulness may have subdued the effect of self-kindness to the mind, and resulted in greater consumption of grapes amongst low consumers of fruit and vegetables (e.g., Dalen et al., 2010; Timmerman & Brown, 2012). Given the novelty of self-kindness in relation to eating

behaviours, it may have been beneficial to explore self-kindness as a sole concept instead of combining other psychological constructs together (Egan & Mantzios, 2018; Mantzios & Egan, 2017). The following Chapter explored another novel concept involving eating behaviours, namely self-distancing.

Chapter 8 explored the concept of self-distancing using the MCD in reducing the intake of HED food (chocolate) after a negative state affect. The findings suggested participants in the self-distanced condition consumed significantly less chocolate than those in the control condition, and whilst no differences in chocolate intake were present between the self-immersed and self-distanced condition, those in the self-distanced condition did consume the least amount of chocolate. Moreover, all participants appeared to similarly improve on their state negative affect after the chocolate intake. Whilst, previous research has found chocolate consumption can improve mood (Macht & Dettmer, 2006; Macht & Mueller, 2007; Parker et al., 2006.), the findings from Chapter 8 suggest using a self-distanced perspective may be the most beneficial approach in improving negative state affect without overindulging on chocolate. Furthermore, literature on self-distancing has been found to attenuate negative affect, as well as promote psychological and physiological well-being (e.g., Ayduk & Kross, 2008; Kross et al., 2014). Whilst Chapter 8 was the first study to investigate the effect of self-distancing on eating behaviours, the findings are relatively consistent when exploring self-distancing and health related behaviours (Dorfman et al., 2019; Park et al., 2016). The research Chapters have so far suggested that using the MCD is beneficial in fostering healthier eating behaviours, and whilst the MCD is a rather simple and easy tool to use, exploring other effortless strategies in promoting mindful eating may be beneficial. Therefore, the final research Chapter explored other means to implement mindful eating without using any particular mindful tools.

Chapter 9 explored the effect of music, specifically classical music as a primary environmental tool to eat mindfully, and in effect, reduce the intake of HED foods. The findings suggested that briefly listening to classical music had no significant effect on improving state mindfulness any more (or less) than listening to popular music or no music. Furthermore, although no significant differences were found in the overall intake of HED foods across the three conditions, participants in the classical music condition did consume significant less savoury food (crisps) than

those in the no music condition, even after controlling for the likeability of crisps. Whilst, the non-significant effect of classical music listening and mindfulness is inconsistent with previous findings (Bell et al., 2016), a potential explanation for this could be attributed to the length of time (i.e., 7 minutes) classical music was played in Chapter 9. For example, previous research has found regularly listening to classical music over a prolonged period can improve one's ability to be mindful (Auerbach & Delport, 2018; Bell et al., 2016). Therefore, 7 minutes of classical music listening within Chapter 9 may not have been a sufficient amount of time to promote a state of mindfulness, and a slightly longer period of time may have been needed to enhance a mindful state. The non-significant differences in the overall energy intake of HED foods could be explained by the non-significant changes in state mindfulness across the three conditions. For example, research on mindful eating has been suggested to promote healthier eating and reduce intake of HED foods (e.g., Artiles et al., 2019), and the lack of mindful eating in Chapter 9 amongst participants could potentially explain the absence of overall reduced energy intake. Furthermore, previous literature has suggested different elements of music, such as genre, volume, tempos, pitches and likeability can have an effect on the perception of sweet foods (e.g., Fiegel et al., 2014; Fiegel et al., 2019). Whilst research has not yet explored the effect of such elements on savoury foods, the genre of classic music could be a possible explanation for the reduced intake of savoury foods amongst participants. Therefore, whilst the findings from Chapter 9 are not directly related to mindfulness, listening to classical music may be another beneficial approach to promote the reduction of HED savoury foods.

In summary, the findings from the research Chapters suggest that mindfulness, mindful eating and self-compassion are associated with eating behaviours, such as grazing and emotional eating, but mindful eating is also associated with other eating behaviours, such as external eating and fat consumption (Chapter 3). The MCD appears to promote a mindful eating experience, and in effect, facilitate healthier eating behaviours within brief experimental settings (Chapter 4, 5, 6). The novel concept of self-kindness does suggest an increase in the intake of LED foods, but this effect is limited (Chapter 7). Furthermore, self-distancing appears to be beneficial in reducing consumption of HED foods after a negative state affect (Chapter 8). Finally, briefly listening to classical music does not enhance a mindful eating experience, but it may be beneficial in regulating the intake of HED savoury

foods (Chapter 9). Therefore, using a MCD that is combined with elements of self-kindness and self-distancing, whilst also listening to classical music may be an additional element of support in facilitating healthier eating behaviours, which may in effect, prevent weight gain and obesity, and potentially contribute towards weight loss and weight maintenance.

10.3. Limitations and Future Directions

The studies conducted in the current thesis provide knowledge and understanding of psychological constructs, such as mindfulness, mindful eating, self-compassion, self-kindness and self-distancing in facilitating healthier eating behaviours. However, there are a number of limitations within the current thesis that require attention, and may warrant further investigation. Firstly, whilst there are several benefits of removing formal meditation within the context of mindful eating, such as greater convenience and adherence, there are also concerns in relation to other behaviours that may impede a healthier lifestyle or mindful living approach. For example, the MCD solely focuses on food and eating related behaviours, and whilst this may facilitate healthier eating, it might not be sufficient to promote other health related behaviours, such as alcohol consumption (Mantzios & Wilson, 2015a). Research has suggested that alcohol intake is associated with a higher BMI, and is considered to be a risk factor for weight gain and obesity (Nies, Sun, Kazemi, Carriker, & Dmochowski, 2012; Traversy & Chaput, 2015), especially amongst university students (Smarendescu, Walker, & Wansink, 2014). Furthermore, when excess drinking does occur, it can also lead to overeating and making unhealthy food choices (Richardson, Lucero, DiBello, Jacobson, & Wing, 2008). Yet, using the MCD may not necessarily prevent mindless drinking, and this may in effect, preclude reduction in energy intake, weight loss and weight maintenance. Therefore, it is suggested that future research should consider elements of both eating and drinking to further facilitate health behaviours.

Moreover, the current thesis used proxy measures of weight regulation, such as energy intake and food choices. Although, there is evidence that such behaviours can lead to weight loss (Grafenauer et al., 2013, Huseinovic et al., 2014), it is also possible that reduced energy intake and healthier food choices displayed within the brief laboratory settings were later compensated, and as a result did not lead to reductions in overall energy intake (Bellisle & Dalix, 2001; Tapper & Seguias, 2020). Whilst the original MCD has shown to facilitate weight loss and weight maintenance amongst

overweight students (Mantzios & Wilson, 2014), it has not yet been determined how effective the MCD incorporated with elements of self-kindness and self-distancing may be in directly promoting weight loss, weight maintenance and prevention of weight gain. As such, additional research is warranted to explore whether the findings in the current research are applicable long term and can translate into direct weight loss measures.

Furthermore, the present research was conducted predominately on healthy weight female students. Research has suggested students are often at an increased risk of weight gain (e.g., Vadebonceour et al., 2015), and applying the constructs of mindful eating, self-kindness and self-distancing may indeed be beneficial in facilitating healthier eating behaviours amongst this population. However, gender and BMI differences in mindful eating, self-compassion and eating behaviours have been displayed within previous literature (e.g., Hartmann et al., 201; Doolan et al., 2014). For example, female participants have shown to be more sensitive to food intake, less likely to overeat, and make healthier food choices than males (Cornier, Salzburg, Endly, Bessesen, & Tregellas, 2010; Hartmann et al., 2011). Meanwhile, males have reported higher levels of self-compassion than females (Yarnell et al., 2015). Moreover, greater fat intake and increased attentional biases towards HED food cues are found amongst those who are overweight or have obesity compared to those who are normal weight (e.g., Hendrikse et al., 2015; Jeon, Lee, Kim, & Han, 2011). Consequently, mindful eating, reduced energy intake and healthier food choices may be more effective amongst healthy weight females, and elements of self-compassion and self-kindness may be more successful for males. Therefore, future research should include both genders and use participants who are overweight and obese to concretely establish the effectiveness of such constructs on eating behaviours, weight loss and weight maintenance.

Additionally, the current thesis explored the effects of mindful eating, self-kindness and self-distancing on energy intake using foods that are considered to be snacks (Riaz, 2016). Yet, people's perception of snacks and meals could determine how effective such constructs may be in reducing energy intake. For example, research has indicated differences in a meal or snack can influence both immediate and subsequent consumption (Gatenby, 1997, Longnecker et al., 1997, Oltersdorf et al., 1999; Pliner & Zec, 2007), with participants consuming significantly more when food is presented as

a snack compared to a meal (Ogden et al., 2018). In contrast, mindful eating has shown to facilitate reductions in unhealthy snacking (e.g., Mantzios et al., 2019, 2020; Seguias & Tapper, 2018; van de Veer et al., 2016), and may explain the successful outcomes in the present research. However, whether the current findings in mindful eating, self-kindness and self-distancing can be applied to promote healthier eating behaviours for meals cannot yet be determined, and future research should attempt to explore such findings further. For example, portion size effect can be investigated using foods, such as pasta instead of M&Ms, and healthy vs unhealthy food choices can be explored using buffet style foods, such as sandwiches and roasted vegetables vs pizzas and fries instead of grapes vs M&Ms (Cavanaugh et al., 2014; Robinson, Fleming, & Higgs, 2014). Using a variety of foods including those that are considered as meals will contribute towards a greater understanding of mindful eating, self-kindness and self-distancing and their effect on facilitating healthier eating behaviours.

It is also possible that certain unmeasured individual differences between participants completing the research studies could have contributed towards the findings, particularly regarding two concepts, interoceptive awareness and alexithymia (e.g., Casagrande, Boncompagni, Forte, Guarino, & Favieri, 2020; Garfinkel, Seth, Barrett, Suzuki, & Critchley, 2013). Interoceptive awareness involves awareness of the body's physiological condition and the mental interpretations arising with such awareness (Mehling, 2016). Deficits in interoceptive awareness are associated with the confusion and difficulties in recognising and accepting internal bodily signals, such as being unable to distinguish hunger from emotions (Cameron, 2001), which may potentially contribute towards overeating and obesity (Willem et al., 2019). The inability to regulate internal states may put some individuals using the MCD at a disadvantage as they may be unable to recognise the physical and mental sensation that are associated with the MCD. Furthermore, some individuals also have difficulties in identifying feelings and distinguishing these feelings from bodily sensations, this is commonly known as alexithymia (Lesser, 1981; Sifneos, 1973), a trait that is similar to low interoceptive awareness (Zamariola, Vlemincx, Luminet, & Corneille, 2018). Alexithymia can also contribute towards maladaptive eating behaviours, such as emotional eating (Pink, Lee, Price, & Williams, 2019). For example, research has found that difficulty in identifying and describing feelings

influences emotional eating via emotional dysregulation and poor coping expectancies (McAtamney, Mantzios, Egan, & Wallis, 2021). Recently, mindfulness and alexithymia have also shown to be related (Norman, Marzona, Coulson, & Oskis, 2019), with low levels of mindfulness associated with higher alexithymia (Teixeira & Pereira, 2015). Given that the items in the MCD attempt to promote participants to identify their feelings whilst eating (e.g., "How understanding and kind are my thoughts and feelings now that I am eating this snack?"), those with alexithymia may find it difficult to engage with the diary. Thus, future research should explore measures of interoceptive awareness and alexithymia to control for any effect they may have on eating behaviour outcomes when using the MCD.

Moreover, there are some elements of the MCD itself that also need to be critically considered. Firstly, the positive impact of the MCD that was displayed through reduced energy intake could be the result of a priming effect rather than mindfulness or the MCD itself. Priming refers to the psychological effect in which exposure to subtle external cues or stimulus (e.g., words or pictures) can activate mental representations of a goal or other meaningful constructs (Shalev & Bargh, 2011). There is some evidence to suggest that simple health primes can guide people towards making healthier food choices and eating decisions. For example, Boland, Connell and Vallen (2013) found participants who were exposed to healthy food ads significantly reduced their consumption of M&Ms compared to those exposed to indulgent foods or non-food items. Field findings also found that simple health primes using phrases, such as "good for your figure", reduced the purchase of HED snacks by up to 75% amongst overweight and obese individuals (Papies et al., 2014). Other findings have suggested that presenting images of negative health outcomes (e.g., pictures of obesity and heart surgery) led to healthier food choices compared to control images (Hollands and Marteau, 2016). Similarly, Versluis and Papies (2015) found that the use of diet-goal priming, such as the cover of a dieting magazine or diet related commercial significantly reduced the portion size effect. Such findings suggest that health primes can shift attention away from attractive, high-caloric foods, and instead towards healthier food choices (Papies et al., 2014). The use of priming within the research studies could have indeed resulted from the phrases and terminologies that were used in the MCD, such as "How could this snack be *healthier* right now" and "How important is it for me and all people

to eat *healthy*". The words "healthier" and "healthy" may have primed participants to reduce their consumption of HED foods or increase their intake of LED foods, and as such the findings may not be necessarily because the result of mindfulness, self-kindness or self-distancing but rather due to effects of priming.

Another point of consideration should be the possibility of the impact of guilt induction on the reduced consumption of HED foods that are suggested to be the result of the MCD. For example, food and eating are often associated with mixed feelings, such as pleasure and enjoyment, as well as worry and concern often regarding one's weight, appearance and health effects (e.g., Rozin, Bauer, & Catanese, 2003). Whilst, restrained eating measure was controlled in most of the research studies within the thesis, and it showed to have no effect on energy intake; the foods that were presented to participants (e.g., high fat, sugar and energy content) can often lead to experiences of guilt (e.g., Macht and Dettmer, 2006, Rodgers, Wener, Stritzke, Bui, Franko, & Chabrol, 2011; Rogers and Smit, 2000). Feelings of guilt are unpleasant, but they may motivate self-control behaviour (e.g., Tangney et al., 2007), and as a result shift attention away from tempting foods, such as chocolate and cookies. As such, reduced intake of HED foods may be a result of experiences with guilt rather than mindfulness, self-kindness or self-distancing. Therefore, future work should also explore guilt and shame related tendencies (Conradt et al., 2007), when investigating the effects of the MCD on energy intake.

Furthermore, the different versions of the MCD used within the current thesis (e.g., mindfulness, self-kindness and self-distancing) were only administrated to college and university students. Given the reading and engagement requirements of the MCD, it is clear that there is a level of education and reading comprehension that is required in order to engage with the MCD items (Mantzios & Wilson, 2014). Furthermore, all previous research on the effectiveness of the MCD towards well-being and healthier eating behaviours has only been conducted amongst those who are highly educated, such as college and university students (e.g., Hussein et al., 2017; Mantzios & Wilson, 2014; Mantzios et al., 2020). Some research on health interventions has suggested that a greater impact of healthier food choices is more apparent amongst highly educated individuals than less (Fordwood, Ahern, Hollands, Ng, & Marteau, 2015). As such, it may be the case that the positive outcomes demonstrated within the current thesis only apply to such individuals. Therefore, future

research should explore the effect of the MCD, including elements of self-kindness and self-distancing on community populations with varied levels of education in order to thoroughly explore the effect of the MCD on eating behaviours.

Given the reading and comprehension requirements, it is also possible that some participants may have experienced difficulty in clearly understanding what the questions are asking, and as a result some may have lost focus and attention. One potential way to address this concern, as well as those relating to the potential effects of priming and guilt induction is through the "think aloud method" (Ericsson & Simon, 1993). The think aloud method requires participants to think out aloud whilst performing a task or recall thoughts immediately following the completion of a task (Ericsson & Simon, 1993). Previous research using the think aloud method has been found to establish the validity of psychological constructs (Gadermann, Guhn, & Zumbo, 2011; Oort et al., 2011). When using the think aloud method for the MCD, it may allow the researchers to gain a better understanding of participants interpretation and comprehension of the MCD items, and potentially follow up with areas that may be unclear or of concern.

Finally, the SMS, SCS and SSCS used within the current research were developed to represent general levels of either state mindfulness, self-compassion or state self-compassion. However, mindful eating and self-compassion skills relevant to eating may not be adequately reflected using such scales (Neff, 2003a; Tanay & Bernstein, 2013). For example, a person who is mindfully eating within the current state may respond "very well" to the item "I noticed the smell, taste and texture of the food I was eating", but may respond differently to the item "I noticed many small details of my experience" as this represents overall mindfulness levels, and is not relevant to eating. Similarly, someone who is compassionate towards their eating behaviours may respond "not at all" to the item "When times are really difficult, I tend to overeat and overindulge on my favourite foods", whilst their response to the item "When times are really difficult, I tend to be tough on myself" may differ based on the general elements of self-compassion that affect one's life. Therefore, given the growing research interest within brief mindful eating interventions and the role of self-compassion within eating behaviours, it would be appropriate to conceptualise and validate scales that are exclusive to eating behaviours, and in effect, allow the direct assessment of eating outcomes.

10.4. Practical Implications

The current thesis provides practical implications for both clinical and non-clinical settings. Overall, the evidence obtained from the research Chapters suggests positive psychological constructs, such as mindfulness, mindful eating, self-compassion, self-kindness and self-distancing play a significant role within eating behaviours. Specifically, elements of mindful eating, self-kindness and self-distancing that were implemented via the MCD appeared to facilitate healthier eating behaviours. As such, administrating the MCD amongst patients who have clinical obesity may be a beneficial approach in improving dietary change and weight loss. Given the time and cost effective methods of the MCD, as well the simple and effortless features, the MCD may indeed qualify for long term adherence (Mantzios & Wilson, 2014), and in effect, promote weight maintenance. The improvements in healthier eating behaviours, weight loss and weight maintenance may also benefit other physiological health concerns associated with obesity, such as type 2 diabetes, cardiovascular disease, hypertension and COVID-19 related illnesses (Dietz & Santos-Burgoa, 2020; Kassir, 2020; Kopelman, 2007; Lighter, 2020; Manna & Jain, 2015). Furthermore, given the unhealthy eating behaviours and increased risk of weight gain amongst university students (e.g., Sprake et al., 2017), using the MCD adapted with elements of self-kindness and self-distancing may be beneficial in the prevention of weight gain.

Additionally, adapting the MCD into a digital app may further enhance healthier eating behaviours, weight loss and weight maintenance. For example, mindful eating apps have shown successful outcomes for increased mindful states, greater adherence, improved psychological well-being and eating behaviours, as well as weight loss (Lyzwinski, Edirippulige, Caffery, & Bambling, 2019; Mason, Jhaveri, Cohn, & Brewer, 2018; Turner & Hingle, 2018). Research has suggested effortless, easily accessible and simple to use apps are beneficial in supporting health behaviour change (Dennison, Morrison, Conway, & Yardley, 2013; Peng, Kanthawala, Yuan, & Hussain, 2016; Papadaki, Thanasoulias, Pound, Sebire, & Jago, 2016). Given the already effortless and simple features of the MCD, the digital app format may result in greater adherence and faster progression. For example, having the app on a device may encourage a person to use the MCD more often as it is easily available and accessible, and the ability to track one's progress, as well as receive reminders

may further reinforce engagement (Dennison et al., 2013). Furthermore, including a forum page within the digital app may allow users to share their stories and progress with others (Papadaki et al., 2016), which is an additional benefit often witnessed within group interventions but without the costly and timely constraints (Mantzios & Giannou, 2014). Therefore, a digital app for the MCD may indeed be beneficial in improving dietary behaviours, weight loss and weight maintenance.

Finally, playing classical music as opposed to popular music or no music may be another effortless method to reduce consumption of HED savoury foods as displayed within the current research. As such, encouraging the widespread use of classical music within restaurants settings and food halls may promote healthier eating behaviours.

10.5. Conclusion

The current research explored the role of mindfulness, mindful eating, self-compassion, self-kindness and self-distancing on eating behaviours. More specifically, the current thesis aimed to implement such positive psychological constructs using methods that are simple and effortless to employ in an attempt to reduce energy intake and promote healthier eating behaviours. The findings suggest mindfulness, mindful eating and self-compassion are associated with grazing and emotional eating, but overall, mindful eating is associated with other eating behaviours that are often barriers to successful weight regulation, such as external eating and fat consumption. Using the MCD can enhance a mindful eating experience, and encourage reduced energy intake and healthier eating behaviours, without the requirement of meditation or mindfulness training that is typically associated with MBIs. The concept of self-kindness within eating behaviours is still a rather novel approach, and whilst the current research did display positive findings, they were rather limited. Furthermore, self-distancing appeared to reduce energy intake after a negative state affect, and although music did not appear to affect mindfulness or promote a mindful eating experience, playing classical music whilst eating may be another simple method that can be administrated to reduce intake of HED foods. Future research should attempt to apply the MCD, as well as the concepts of self-kindness and self-distancing amongst patients who have clinical obesity, and explore long term effects of such methods on weight loss and weight maintenance, as well as the prevention of weight gain amongst university

students. Overall, the findings from the current thesis appear to be positive in reducing energy intake and facilitating healthier eating behaviours.

REFERENCES

Abler, B., Erk, S., Herwig, U., & Walter, H. (2007). Anticipation of aversive stimuli activates extended amygdala in unipolar depression. *Journal of Psychiatric Research*, *41*(6), 511-522. https://doi.org/10.1016/j.jpsychires.2006.07.020

Adams, C. E., & Leary, M. R. (2007). Promoting self–compassionate attitudes toward eating among restrictive and guilty eaters. *Journal of Social and Clinical psychology*, *26*(10), 1120-1144. https://doi.org/10.1521/jscp.2007.26.10.1120

Adult and child overweight and obesity. Retrieved from http://healthsurvey.hscic.gov.uk/media/78619/HSE17-Adult-Child-BMI-rep.pdf

Agha, M., & Agha, R. (2017). The rising prevalence of obesity: part A: impact on public health. *International Journal of Surgery. Oncology*, *2*(7), 17. http://dx.doi.org/10.1097/IJ9.0000000000000017

Akers, J. D., Cornett, R. A., Savla, J. S., Davy, K. P., & Davy, B. M. (2012). Daily self-monitoring of body weight, step count, fruit/vegetable intake, and water consumption: A feasible and effective long-term weight loss maintenance approach. *Journal of the Academy of Nutrition and Dietetics*, *112*(5), 685-692. https://doi.org/10.1016/j.jand.2012.01.022

Al-Chalabi, L., Prasad, N., Steed, L., Stenner, S., Aveyard, P., Beach, J., & Ussher, M. (2008). A pilot randomised controlled trial of the feasibility of using body scan and isometric exercises for reducing urge to smoke in a smoking cessation clinic. *BioMed Central Public Health*, *8*(1). https://doi.org/ 10.1186/1471-2458-8-349.

Alberts, H. J., Mulkens, S., Smeets, M., & Thewissen, R. (2010). Coping with food cravings. Investigating the potential of a mindfulness-based intervention. *Appetite, 55*(1), 160-163. https://doi.org/10.1016/j.appet.2010.05.044

Allen, A. B., & Leary, M. R. (2010). Self-Compassion, stress, and coping. *Social and Personality Psychology Compass*, *4*(2), 107-118. https://doi.org/10.1111/j.1751-9004.2009.00246.x

Allirot, X., Miragall, M., Perdices, I., Baños, R. M., Urdaneta, E., & Cebolla, A. (2018). Effects of a brief mindful eating induction on food choices and energy intake: external eating and

mindfulness state as moderators. *Mindfulness*, *9*(3), 750-760. https://doi.org/10.1007/s12671-017-0812-0

Amin, T., & Mercer, J. (2016). Hunger and satiety mechanisms and their potential exploitation in the regulation of food intake. *Current Obesity Reports*, *5*(1), 106-112. https://doi.org/ 10.1007/s13679-015-0184-5

Anderson, J. W., Konz, E. C., Frederich, R. C., & Wood, C. L. (2001). Long-term weight-loss maintenance: a meta-analysis of US studies. *The American Journal of clinical nutrition, 74*(5), 579-584. https://doi.org/10.1093/ajcn/74.5.579

Anderson, L. M., Reilly, E. E., Schaumberg, K., Dmochowski, S., & Anderson, D. A. (2016). Contributions of mindful eating, intuitive eating, and restraint to BMI, disordered eating, and meal consumption in college students. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, *21*(1), 83-90. https://doi.org/10.1007/s40519-015-0210-3

Angelucci, F., Fiore, M., Ricci, E., Padua, L., Sabino, A., & Tonali, P. (2007). Investigating the neurobiology of music: Brain-derived neurotrophic factor modulation in the hippocampus of young adult mice. *Behavioural Pharmacology*, *18*(5-6), 491-496. https://doi.org/10.1097/fbp.0b013e3282d28f50

Anglé, S., Engblom, J., Eriksson, T., Kautiainen, S., Saha, M. T., Lindfors, P., ... & Rimpelä, A. (2009). Three factor eating questionnaire-R18 as a measure of cognitive restraint, uncontrolled eating and emotional eating in a sample of young Finnish females. *International Journal of Behavioral Nutrition and Physical Activity, 6*(1), 1-7. https://doi.org/10.1186/1479-5868-6-41

Anschutz, D. J., Van Strien, T., Van De Ven, M. O., & Engels, R. C. (2009). Eating styles and energy intake in young women. *Appetite, 53*(1), 119-122. https://doi.org/10.1016/j.appet.2009.03.016

Anschutz, D., Van Strien, T., & Engels, R. (2008). Exposure to slim images in mass media: Television commercials as reminders of restriction in restrained eaters. *Psychology of Popular Media Culture*, *1*, 48-59. https://doi.org/ 10.1037/0278-6133.27.4.401

Aoun, P., Jones, T., Shaw, G., & Bodner, M. (2005). Long-term enhancement of maze learning in mice via a generalized Mozart effect. *Neurological Research*, *27*(8), 791-796. https://doi.org/10.1179/016164105x63647

Arch, J. J., Brown, K. W., Goodman, R. J., Della Porta, M. D., Kiken, L. G., & Tillman, S. (2016). Enjoying food without caloric cost: The impact of brief mindfulness on laboratory eating outcomes. *Behaviour Research and Therapy*, *79*, 23-34. https://doi.org/10.1016/j.brat.2016.02.002

Arnow, B., Kenardy, J., & Agras, W. S. (1995). The Emotional Eating Scale: The development of a measure to assess coping with negative affect by eating. I*nternational Journal of Eating Disorders, 18*(1), 79-90. https://doi.10.1002/1098-108x(199507)18:1<79::aid-eat2260180109

Arroyo-Johnson, C., & Mincey, K. (2016). Obesity epidemiology worldwide. *Gastroenterology clinics of North America, 45*(4), 571-579. https://doi.org/10.1016/j.gtc.2016.07.012

Artiles, R., Staub, K., Aldakak, L., Eppenberger, P., Rühli, F., & Bender, N. (2019). Mindful eating and common diet programs lower body weight similarly: Systematic review and meta-analysis. *Obesity Reviews*, *20*(11), 1619-1627. https://doi.org/10.1111/obr.12918

Asensio-Martínez, Á., Masluk, B., Montero-Marin, J., Olivan-Blázquez, B., Navarro-Gil, M. T., García-Campayo, J., & Magallón-Botaya, R. (2019). Validation of five facets mindfulness questionnaire–Short form, in Spanish, general health care services patients sample: Prediction of depression through mindfulness scale. *Plos One*, *14*(4), 0214503. https://doi.org/10.1371/journal.pone.0214503

Ashton, L., Hutchesson, M., Rollo, M., Morgan, P., & Collins, C. (2016). Motivators and barriers to engaging in healthy eating and physical activity. *American Journal of Men's Health, 11*(2), 330-343. https://doi.org/10.1177/1557988316680936

Auerbach, C., & Delport, A. (2018). Developing mindfulness in children through participation in music activities. *South African Journal of Childhood Education*, *8*(1). https://doi.org/10.4102/sajce.v8i1.519

Ayduk, O., & Kross, E. (2008). Enhancing the pace of recovery: Self-distanced analysis of negative experiences reduces blood pressure reactivity. *Psychological Science*, *19*(3), 229-231. https://doi.org/10.1111/j.1467-9280.2008.02073.x

Ayduk, O., & Kross, E. (2010a). From a distance: Implications of spontaneous self-distancing for adaptive self-reflection. *Journal of Personality and Social Psychology, 98*(5), 809–829. https://doi.org/10.1037/a0019205

Ayduk, O., & Kross, E. (2010b). Analyzing negative experiences without ruminating: The role of self-distancing in enabling adaptive self-reflection. *Social and Personality Psychology Compass*, *4*(10), 841-854. https://doi.org/10.1111/j.1751-9004.2010.00301.x

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. *Assessment*, *11*(3), 191-206. https://doi.org/10.1177/1073191104268029

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*(1), 27-45. https://doi.org/10.1177/1073191105283504

Banna, J., Richards, R., & Brown, L. (2017). College students' perceived differences between the terms real meal, meal, and snack. *Journal of Nutrition Education and Behaviour*, *49*(3), 228-235.e1. https://doi.org/10.1016/j.jneb.2016.11.001

Banwell, C., Hinde, S., Dixon, J., & Sibthorpe, B. (2005). Reflections on expert consensus: a case study of the social trends contributing to obesity. *The European Journal of Public Health*, *15*(6), 564-568. https://doi.org/10.1093/eurpub/cki034

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

Barrada, J. R., Van Strien, T., & Cebolla, A. (2016). Internal structure and measurement invariance of the Dutch eating behavior questionnaire (DEBQ) in a (nearly) representative Dutch community sample. *European Eating Disorders Review, 24*(6), 503-509. https://doi.org/10.1002/erv.2448

Barrett, F., Grimm, K., Robins, R., Wildschut, T., Sedikides, C., & Janata, P. (2010). Music-evoked nostalgia: Affect, memory, and personality. *Emotion*, *10*(3), 390-403. https://doi.org/10.1037/a0019006

Baschnagel, J. S. (2013). Using mobile eye-tracking to assess attention to smoking cues in a naturalized environment. *Addictive Behaviors*, *38*(12), 2837-2840. https://doi.org/10.1016/j.addbeh.2013.08.005

Beck, D. M., & Kastner, S. (2009). Top-down and bottom-up mechanisms in biasing competition in the human brain. *Vision Research*, *49*(10), 1154-1165. https://doi.org/10.1016/j.visres.2008.07.012

Bell, T., McIntyre, K., & Hadley, R. (2016). Listening to classical music results in a positive correlation between spatial reasoning and mindfulness. *Psychomusicology: Music, Mind, and Brain*, *26*(3), 226-235. https://doi.org/10.1037/pmu0000139

Bellisle, F., & Dalix, A. M. (2001). Cognitive restraint can be offset by distraction, leading to increased meal intake in women. *The American Journal of Clinical Nutrition*, *74*(2), 197-200. https://doi.org/10.1093/ajcn/74.2.197

Bellisle, F., Clément, K., Le Barzic, M., Le Gall, A., Guy-Grand, B., & Basdevant, A. (2004). The Eating Inventory and body adiposity from leanness to massive obesity: a study of 2509 adults. *Obesity Research, 12*(12), 2023-2030. https://doi.org/10.1038/oby.2004.253

Bellisle, F., Dalix, A.M., & Slama, G. (2004). Non-food-related environmental stimuli induce increased meal intake in healthy women: comparison of television viewing versus listening to a recorded story in laboratory settings. *Appetite*, *43*(2), 175-180. https://doi.org/ 10.1016/j.appet.2004.04.004

Berridge, K. C. (2009). 'Liking' and 'wanting' food rewards: Brain substrates and roles in eating disorders. *Physiology & Behavior*, *97*(5), 537-550. https://doi.org/10.1016/j.physbeh.2009.02.044

Beshara, M., Hutchinson, A., & 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. https://doi.org/10.1016/j.appet.2013.03.012

Birnie, K., Speca, M., & Carlson, L. E. (2010). Exploring self-compassion and empathy in the context of mindfulness-based stress reduction (MBSR). *Stress and Health*, *26*(5), 359-371. https://doi.org/10.1002/smi.1305

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., ... & Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical psychology: Science and practice*, *11*(3), 230-241. https://doi.org/10.1093/clipsy.bph077

Blass, E. M., Anderson, D. R., Kirkorian, H. L., Pempek, T. A., Price, I., & Koleini, M. F. (2006). On the road to obesity: Television viewing increases intake of high-density foods. *Physiology & Behavior*, *88*(4-5), 597-604. https://doi.org/10.1016/j.physbeh.2006.05.035

Blechert, J., Meule, A., Busch, N. A., & Ohla, K. (2014). Food-pics: An image database for experimental research on eating and appetite. *Frontiers in Psychology*, *5*, 617. https://doi.org/10.3389/fpsyg.2014.00617

Blomain, E. S., Dirhan, D. A., Valentino, M. A., Kim, G. W., & Waldman, S. A. (2013). Mechanisms of weight regain following weight loss. *International Scholarly Research Notices - Obesity*. https://doi.org/10.1155/2013/210524

Blundell, J. E., Stubbs, R. J., Golding, C., Croden, F., Alam, R., Whybrow, S., ... & Lawton, C. L. (2005). Resistance and susceptibility to weight gain: individual variability in response to a high-fat diet. *Physiology & Behavior*, *86*(5), 614-622. https://doi.org/10.1016/j.physbeh.2005.08.052

Bohlmeijer, E., Klooster, P., Fledderus, M., Veehof, M., & Baer, R. (2011). Psychometric Properties of the five facet mindfulness questionnaire in depressed adults and development of a short form. *Assessment*, *18*(3), 308-320. https://doi.org/10.1177/1073191111408231

Boland, W. A., Connell, P. M., & Vallen, B. (2013). Time of day effects on the regulation of food consumption after activation of health goals. *Appetite, 70*, 47-52. https://doi.org/10.1016/j.appet.2013.06.085

Boschi, V., Iorio, D., Margiotta, N., D'Orsi, P., & Falconi, C. (2001). The three-factor eating questionnaire in the evaluation of eating behaviour in subjects seeking participation in a

dietotherapy programme. *Annals of Nutrition and Metabolism*, *45*(2), 72-77. https://doi.org/10.1159/000046709

Branstrom, R., Duncan, L. G., & Moskowitz, J. T. (2011). The association between dispositional mindfulness, psychological well-being, and perceived health in a Swedish population-based sample. *British Journal of Health psychology*, *16*(2), 300-316. https://doi.org/10.1348/135910710X501683

Braude, L., & Stevenson, R. (2014). Watching television while eating increases energy intake. Examining the mechanisms in female participants. *Appetite, 76*, 9-16. https://doi.org/10.1016/j.appet.2014.01.005

Braun, T., Park, C., & Conboy, L. A. (2012). Psychological well-being, health behaviors, and weight loss among participants in a residential, Kripalu yoga-based weight loss program. *International Journal of Yoga Therapy*, *22*(1), 9-22. https://doi.org/10.17761/ijyt.22.1.y47k2658674t1212

Bravo, A. J., Pearson, M. R., Wilson, A. D., & Witkiewitz, K. (2018). When traits match states: Examining the associations between self-report trait and state mindfulness following a state mindfulness induction. *Mindfulness, 9*(1), 199-211. https://doi.org/10.1007/s12671-017-0763-5

Bray, G. A., Frühbeck, G., Ryan, D. H., & Wilding, J. P. (2016). Management of obesity. *The Lancet, 387*(10031), 1947-1956. https://doi.org/10.1016/S0140-6736(16)00271-3

Bray, G., Look, M., & Ryan, D. (2013). Treatment of the obese patient in primary care: Targeting and meeting goals and expectations. *Postgraduate Medicine*, *125*(5), 67-77. https://doi.org/10.3810/pgm.2013.09.2692

Breines, J. G., & Chen, S. (2013). Activating the inner caregiver: The role of support-giving schemas in increasing state self-compassion. *Journal of Experimental Social Psychology*, *49*(1), 58-64. https://doi.org/10.1016/j.jesp.2012.07.015

Brignell, C., Griffiths, T., Bradley, B. P., & Mogg, K. (2009). Attentional and approach biases for pictorial food cues. Influence of external eating. *Appetite*, *52*(2), 299-306. https://doi.org/10.1016/j.appet.2008.10.007

Brion, J. M., Leary, M. R., & Drabkin, A. S. (2014). Self-compassion and reactions to serious illness: The case of HIV. *Journal of Health Psychology*, *19*(2), 218-229. https://doi.org/10.1177/1359105312467391

Brogan, A., & Hevey, D. (2013). Eating styles in the morbidly obese: restraint eating, but not emotional and external eating, predicts dietary behaviour. *Psychology & Health*, *28*(6), 714-725. https://doi.org/10.1080/08870446.2012.760033

Brosschot, J. F., Gerin, W., & Thayer, J. F. (2006). The perseverative cognition hypothesis: A review of worry, prolonged stress-related physiological activation, and health. *Journal of Psychosomatic Research*, *60*(2), 113-124. https://doi.org/10.1016/j.jpsychores.2005.06.074

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*(4), 822. https://doi.org/10.1037/0022-3514.84.4.822

Bruch, H. (1973). *Eating disorders. Obesity, anorexia nervosa and the person within.* Basic Books, New York

Bryant, E. J., King, N. A., & Blundell, J. E. (2008). Disinhibition: Its effects on appetite and weight regulation. *Obesity Reviews*, *9*(5), 409-419. https://doi.org/10.1111/j.1467-789X.2007.00426.x

Bryant, E. J., Rehman, J., Pepper, L. B., & Walters, E. R. (2019). Obesity and eating disturbance: The role of TFEQ restraint and disinhibition. *Current Obesity Reports, 8*(4), 363-372. https://doi.org/10.1007/s13679-019-00365-x

Buchheld, N., Grossman, P., & Walach, H. (2001). Measuring mindfulness in insight meditation (Vipassana) and meditation-based psychotherapy: The development of the Freiburg Mindfulness Inventory (FMI). *Journal for Meditation and Meditation Research*, *1*(1), 11-34. https://doi.org/10/2307/1411318

Buckland, N., Finlayson, G., Edge, R., & Hetherington, M. (2014). Resistance reminders: Dieters reduce energy intake after exposure to diet-congruent food images compared to control non-food images. *Appetite*, *73*, 189-196. https://doi.org/10.1016/j.appet.2013.10.022

Burger, J., Bell, H., Harvey, K., Johnson, J., Stewart, C., Dorian, K., & Swedroe, M. (2010). Nutritious or delicious? The effect of descriptive norm information on food choice. *Journal of Social and Clinical Psychology*, *29*(2), 228-242. https://doi.org/ 10.1521/jscp.2010.29.2.228

Burger, K., Cornier, M., Ingebrigtsen, J., & Johnson, S. (2011). Assessing food appeal and desire to eat: the effects of portion size & energy density. International Journal Of *Behavioral Nutrition And Physical Activity, 8*(1), 101. https://doii.org/10.1186/1479-5868-8-101

Burgess, E., Hassmén, P., Welvaert, M., & Pumpa, K. (2017). Behavioural treatment strategies improve adherence to lifestyle intervention programmes in adults with obesity: A systematic review and meta-analysis. *Clinical Obesity*, *7*(2), 105-114. https://doi.org/10.1111/cob.12180

Burton, P., Smit, H. J., & Lightowler, H. J. (2007). The influence of restrained and external eating patterns on overeating. *Appetite*, *49*(1), 191-197. https://doi.org/10.1016/j.appet.2007.01.007

Calitri, R., Pothos, E. M., Tapper, K., Brunstrom, J. M., & Rogers, P. J. (2010). Cognitive biases to healthy and unhealthy food words predict change in BMI. *Obesity*, *18*(12), 2282-2287. https://doi.org/10.1038/oby.2010.78

Cameron, O. G. (2001). Interoception: the inside story—a model for psychosomatic processes. Psychosomatic medicine, 63(5), 697-710. https://doi.org/10.1097/00006842-200109000-00001

Canetti, L., Bachar, E., & Berry, E. (2002). Food and emotion. *Behavioural Processes*, *60*(2), 157-164. https://doi.org/10.1016/s0376-6357(02)00082-7

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 sample of obese and non-obese participants. *International Journal of Obesity, 33*(6), 611-620. https://doi.org/10.1038/ijo.2009.74

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. https://doi.org/10.1177/1073191107311467

Cardi, V., Leppanen, J., & Treasure, J. (2015). The effects of negative and positive mood induction on eating behaviour: A meta-analysis of laboratory studies in the healthy population and eating

and weight disorders. *Neuroscience & Biobehavioral Reviews, 57*, 299-309. https://doi.org/10.1016/j.neubiorev.2015.08.011

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. https://doi.org/10.1007/s10865-007-9130-7

Carter, F. A., & Jansen, A. (2012). Improving psychological treatment for obesity. Which eating behaviours should we target?. *Appetite*, *58*(3), 1063-1069. https://doi.org/10.1016/j.appet.2012.01.016

Casagrande, M., Boncompagni, I., Forte, G., Guarino, A., & Favieri, F. (2020). Emotion and overeating behavior: effects of alexithymia and emotional regulation on overweight and obesity. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity, 25*(5), 1333-1345. https://doi.org/10.1007/s40519-019-00767-9

Casagrande, S. S., Wang, Y., Anderson, C., & Gary, T. L. (2007). Have Americans increased their fruit and vegetable intake?: The trends between 1988 and 2002. *American Journal of Preventive Medicine*, *32*(4), 257-263. https://doi.org/10.1016/j.amepre.2006.12.002

Castellanos, E. H., Charboneau, E., Dietrich, M. S., Park, S., Bradley, B. P., Mogg, K., & Cowan, R. L. (2009). Obese adults have visual attention bias for food cue images: Evidence for altered reward system function. *International Journal of Obesity*, *33*(9), 1063-1073. https://doi.org/10.1038/ijo.2009.138

Castilho, P., Pinto-Gouveia, J., & Duarte, J. (2015). Evaluating the multifactor structure of the long and short versions of the self-compassion scale in a clinical sample. *Journal of Clinical Psychology, 71*(9), 856-870. https://doi.org/10.1002/jclp.22187

Catenacci, V. A., Odgen, L., Phelan, S., Thomas, J. G., Hill, J., Wing, R. R., & Wyatt, H. (2014). Dietary habits and weight maintenance success in high versus low exercisers in the National Weight Control Registry. *Journal of Physical Activity and Health, 11*(8), 1540-1548. https://doi.org/10.1123/jpah.2012-0250

Cavanagh, K., Vartanian, L. R., Herman, C. P., & Polivy, J. (2014). The effect of portion size on food intake is robust to brief education and mindfulness exercises. *Journal of Health Psychology*, *19*(6), 730-739. https://doi.org/10.1177/1359105313478645

Cebolla, A., Barrada, J. R., Van Strien, T., Oliver, E., & Baños, R. (2014). Validation of the Dutch eating behavior questionnaire (DEBQ) in a sample of Spanish women. *Appetite, 73*, 58-64. https://doi.org/10.1016/j.appet.2013.10.014

Chaput, J., Klingenberg, L., Astrup, A., & Sjödin, A. (2011). Modern sedentary activities promote overconsumption of food in our current obesogenic environment. *Obesity Reviews*, *12*(5), 12-20. https://doi.org/10.1111/j.1467-789X.2010.00772.x

Chernyak, Y., & Lowe, M. R. (2010). Motivations for dieting: Drive for thinness is different from drive for objective thinness. *Journal of Abnormal Psychology*, *119*(2), 276. https://doi.org/10.1037/a0018398

Chiesa, A., & Serretti, A. (2011). Mindfulness-based interventions for chronic pain: a systematic review of the evidence. *The journal of Alternative and Complementary Medicine, 17*(1), 83-93. https://doi.org/10.1089/acm.2009.0546

Chiesa, A., & Serretti, A. (2014). Are mindfulness-based interventions effective for substance use disorders? A systematic review of the evidence. *Substance Use & Misuse*, *49*(5), 492-512. https://doi.org/10.3109/10826084.2013.770027

Chodron, P. (1996). *Awakening loving-kindness*. Shambhala Publications.

Clarkson, M., Heads, G., Hodgson, D., & Probst, H. (2019). Does the intervention of mindfulness reduce levels of burnout and compassion fatigue and increase resilience in pre-registration students? A pilot study. *Radiography, 25*(1), 4-9. https://doi.org/10.1016/j.radi.2018.08.003

Cohen, D., & Farley, T. A. (2008). Peer reviewed: eating as an automatic behavior. *Preventing Chronic Disease*, *5*(1). http://www.cdc.gov/pcd/issues/2008/jan/ 07_0046.htm.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155. https://doi.org/10.1037/0033-2909.112.1.155

Cohen, J. (2013). *Statistical power analysis for the behavioral sciences*. Academic press.

Cohn, M. A., Mehl, M. R., & Pennebaker, J. W. (2004). Linguistic markers of psychological change surrounding September 11, 2001. *Psychological Science*, *15*(10), 687-693. https://doi.org/10.1111/j.0956-7976.2004.00741.x

Colles, S. L., Dixon, J. B., & O'Brien, P. E. (2007). Night eating syndrome and nocturnal snacking: Association with obesity, binge eating and psychological distress. *International Journal of Obesity*, *31*(11), 1722-1730. https://doi.org/10.1038/sj.ijo.0803664

Conradt, M., Dierk, J. M., Schlumberger, P., Rauh, E., Hebebrand, J., & Rief, W. (2008). Who copes well? Obesity-related coping and its associations with shame, guilt, and weight loss. *Journal of Clinical Psychology*, *64*(10), 1129-1144. https://doi.org/10.1002/jclp.20501

Conradt, M., Dierk, J. M., Schlumberger, P., Rauh, E., Hebebrand, J., & Rief, W. (2007). Development of the weight-and body-related shame and guilt scale (WEB–SG) in a nonclinical sample of obese individuals. *Journal of Personality Assessment, 88*(3), 317-327. https://doi.org/10.1080/00223890701331856

Cornelis, M. C., Rimm, E. B., Curhan, G. C., Kraft, P., Hunter, D. J., Hu, F. B., & Van Dam, R. M. (2014). Obesity susceptibility loci and uncontrolled eating, emotional eating and cognitive restraint behaviors in men and women. *Obesity, 22*(5), 135-141. https://doi.org/10.1002/oby.20592

Cornier, M. A., Salzberg, A. K., Endly, D. C., Bessesen, D. H., & Tregellas, J. R. (2010). Sex-based differences in the behavioral and neuronal responses to food. *Physiology & Behavior*, *99*(4), 538-543. https://doi.org/10.1016/j.physbeh.2010.01.008

Courbasson, C., Nishikawa, Y., & Dixon, L. (2012). Outcome of dialectical behaviour therapy for concurrent eating and substance use disorders. *Clinical Psychology & Psychotherapy*, *19*(5), 434-449. https://doi.org/10.1002/cpp.748

Creswell, J. D., Way, B. M., Eisenberger, N. I., & Lieberman, M. D. (2007). Neural correlates of dispositional mindfulness during affect labelling. *Psychosomatic Medicine*, *69*(6), 560-565. https://doi.org/10.1097/PSY.0b013e3180f6171f

Cribb, G., Moulds, M. L., & Carter, S. (2006). Rumination and experiential avoidance in depression. *Behaviour Change*, *23*(3), 165. https://doi.org/10.1375/bech.23.3.165

Cross, A. T., Babicz, D., & Cushman, L. F. (1994). Snacking patterns among 1,800 adults and children. *Journal of the American Dietetic Association, 94*(12), 1398-1403.

Cullen, M. (2011). Mindfulness-based interventions: An emerging phenomenon. *Mindfulness*, *2*(3), 186-193. https://doi.org/10.1007/s12671-011-0058-1

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. https://doi.org/10.1016/j.ctim.2010.09.008

Dallman, M. F. (2010). Stress-induced obesity and the emotional nervous system. Trends in Endocrinology & Metabolism, 21(3), 159-165. https://doi.org/10.1016/j.tem.2009.10.004

Daubenmier, J., Kristeller, J., 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*, 2011, 1-13. https://doi.org/10.1155/2011/651936

De Castro, J., & Brewer, E. (1992). The amount eaten in meals by humans is a power function of the number of people present. *Physiology & Behavior*, *51*(1), 121-125. https://doi.org/10.1016/0031-9384(92)90212-k

De La Cruz, O., & Rodríguez-Carvajal, R. (2014). Mindfulness and music: A promising subject of an unmapped field. *International Journal of Behavioral Research & Psychology*, 27-35. https://doi.org/10.19070/2332-3000-140006

de Lauzon-Guillain, B., Basdevant, A., Romon, M., Karlsson, J., Borys, J. M., Charles, M. A., & FLVS Study Group. (2006). Is restrained eating a risk factor for weight gain in a general population?. *The American Journal of Clinical Nutrition, 83*(1), 132-138. https://doi.org/10.1093/ajcn/83.1.132

Deluchi, M., Costa, F. S., Friedman, R., Gonçalves, R., & Bizarro, L. (2017). Attentional bias to unhealthy food in individuals with severe obesity and binge eating. *Appetite*, *108*, 471-476. https://doi.org/10.1016/j.appet.2016.11.012

Dennison, L., Morrison, L., Conway, G., & Yardley, L. (2013). Opportunities and challenges for smartphone applications in supporting health behavior change: qualitative study. *Journal of Medical Internet Research*, *15*(4), e86. https://doi.org/10.2196/jmir.2583

DePaoli, L. C., & Sweeney, D. C. (2000). Further validation of the positive and negative affect schedule. *Journal of Social Behavior and Personality, 15*(4), 561-568.

Dietz, W., & Santos-Burgoa, C. (2020). Obesity and its Implications for COVID-19 Mortality. *Obesity, 28*(6), 1005-1005. https://doi.org/10.1002/oby.22818

Dixon, J. B. (2010). The effect of obesity on health outcomes. *Molecular and Cellular Endocrinology, 316*(2), 104-108. https://doi.org/10.1016/j.mce.2009.07.008

Dochat, C., Godfrey, K. M., Golshan, S., Cuneo, J. G., & Afari, N. (2019). Dietary restraint and weight loss in relation to disinhibited eating in obese Veterans following a behavioral weight loss intervention. *Appetite, 140*, 98-104. https://doi.org/10.1016/j.appet.2019.05.013

Dohle, S., Diel, K., & Hofmann, W. (2018). Executive functions and the self-regulation of eating behavior: A review. *Appetite*, *124*, 4-9. https://doi.org/10.1016/j.appet.2017.05.041

Doolan, K. J., Breslin, G., Hanna, D., Murphy, K., & Gallagher, A. M. (2014). Visual attention to food cues in obesity: An eye-tracking study. *Obesity*, *22*(12), 2501-2507. https://doi.org/10.1002/oby.20884

Dorfman, A., Oakes, H., Santos, H. C., & Grossmann, I. (2019). Self-distancing promotes positive emotional change after adversity: Evidence from a micro-longitudinal field experiment. *Journal of Personality*. https://doi.org/10.1111/jopy.12534

Dunn, C., Haubenreiser, M., Johnson, M., Nordby, K., Aggarwal, S., Myer, S., & Thomas, C. (2018). Mindfulness approaches and weight loss, weight maintenance, and weight regain. *Current Obesity Reports*, *7*(1), 37-49. https://doi.org/10.1007/s13679-018-0299-6

Dunne, S., Sheffield, D., & Chilcot, J. (2016). Self-compassion, physical health and the mediating role of health-promoting behaviours. *Journal of Health Psychology, Advance Online Publication.* https://doi/10.1177/1359105316643377

Dutt, S., Keyte, R., Egan, H., Hussain, M., & Mantzios, M. (2019). Healthy and unhealthy eating amongst stressed students: Considering the influence of mindfulness on eating choices and

consumption. *Health Psychology Report*, *7*(2), 113-120. https://doi.org/10.5114/hpr.2019.77913

Dykes, J., Brunner, E. J., Martikainen, P. T., & Wardle, J. (2004). 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. https://doi.org/10.1038/sj.ijo.0802523

Egan, H., & Mantzios, M. (2018). A qualitative exploration of self-kindness and "treating oneself" in contexts of eating, weight regulation and other health behaviors: implications for mindfulness-based eating programs. *Frontiers in Psychology*, *9*, 880. https://doi.org/10.3389/fpsyg.2018.00880

Elder, R., & Mohr, G. (2016). The crunch effect: Food sound salience as a consumption monitoring cue. *Food Quality and Preference*, *51*, 39-46. https://doi.org/10.1016/j.foodqual.2016.02.015

Elfhag, K., & Morey, L. C. (2008). Personality traits and eating behavior in the obese: poor self-control in emotional and external eating but personality assets in restrained eating. *Eating Behaviors, 9*(3), 285-293. https://doi.org/10.1016/j.eatbeh.2007.10.003

Elfhag, K., & Rössner, S. (2005). Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. *Obesity Reviews*, *6*(1), 67-85. https://doi.org/10.1111/j.1467-789X.2005.00170.x

English, L., Lasschuijt, M., & Keller, K. (2015). Mechanisms of the portion size effect. What is known and where do we go from here? *Appetite, 88,* 39-49. https://doi.org/10.1016/j.appet.2014.11.004

Ericsson, K. A., & Simon, H. A. (1998). How to study thinking in everyday life: Contrasting think-aloud protocols with descriptions and explanations of thinking. *Mind, Culture, and Activity, 5*(3), 178-186. https://doi.org/10.1207/s15327884mca0503_3

Escoto, K., Laska, M., Larson, N., Neumark-Sztainer, D., & Hannan, P. (2012). Work hours and perceived time barriers to healthful eating among young adults. American *Journal of Health Behavior, 36*(6), 786-796. https://doi.org/10.5993/AJHB.36.6.6

Eurostat (2014). *Overweight and obesity - BMI statistics.* Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php/Overweight_and_obesity_-_BMI_statistics

Evers, C., Marijn Stok, F., & de Ridder, D. (2010). Feeding your feelings: Emotion regulation strategies and emotional eating. *Personality and Social Psychology Bulletin*, *36*(6), 792-804. https://doi.org/10.1177/0146167210371383

Fairburn, C. G. (2008). *Cognitive behavior therapy and eating disorders*. Guilford Press.

Felske, A. N., Williamson, T. M., Rash, J. A., Telfer, J. A., & Campbell, T. (2019). A brief mindfulness-based intervention reduces eating disorder symptoms and improves eating self-efficacy and emotion regulation among adults seeking bariatric surgery. *Alberta Academic Review*, *2*(3), 13-13. Retrieved from https://www.albertaacademicreview.com/index.php/aar/article/view/104

Ferreira, C., Pinto-Gouveia, J., & Duarte, C. (2013). Self-compassion in the face of shame and body image dissatisfaction: Implications for eating disorders. *Eating Behaviors*, *14*(2), 207-210. https://doi.org/10.1016/j.eatbeh.2013.01.005

Fiegel, A., Childress, A., Beekman, T., & Seo, H. (2019). Variations in food acceptability with respect to pitch, tempo, and volume levels of background music. *Multisensory Research*, *32*(4-5), 319-346. https://doi.org/10.1163/22134808-20191429

Fiegel, A., Meullenet, J., Harrington, R., Humble, R., & Seo, H. (2014). Background music genre can modulate flavor pleasantness and overall impression of food stimuli. *Appetite*, *76*, 144-152. https://doi.org/10.1016/j.appet.2014.01.079

Field, M., & Cox, W. M. (2008). Attentional bias in addictive behaviors: a review of its development, causes, and consequences. *Drug and Alcohol Dependence*, *97*(1-2), 1-20. https://doi.org/10.1016/j.drugalcdep.2008.03.030

Finch, L. E., & Tomiyama, A. J. (2015). Comfort eating, psychological stress, and depressive symptoms in young adult women. *Appetite, 95,* 239-244. https://doi.org/10.1016/j.appet.2015.07.017

Foerde, K., Knowlton, B., & Poldrack, R. (2006). Modulation of competing memory systems by distraction. *Proceedings of the National Academy of Sciences, 103*(31), 11778-11783. Doi: 10.1073/pnas.0602659103

Folkvord, F., Anschütz, D. J., Boyland, E., Kelly, B., & Buijzen, M. (2016). Food advertising and eating behavior in children. *Current Opinion in Behavioral Sciences*, *9*, 26-31. https://doi.org/10.1016/j.cobeha.2015.11.016

Forman, E. M., Shaw, J. A., Goldstein, S. P., Butryn, M. L., Martin, L. M., Meiran, N., ... & Manasse, S. M. (2016). Mindful decision making and inhibitory control training as complementary means to decrease snack consumption. *Appetite*, *103*, 176-183. https://doi.org/10.1016/j.appet.2016.04.014

Forwood, S. E., Ahern, A. L., Hollands, G. J., Ng, Y. L., & Marteau, T. M. (2015). Priming healthy eating. You can't prime all the people all of the time. *Appetite, 89*, 93-102. https://doi.org/10.1016/j.appet.2015.01.018

Francis, H., & Stevenson, R. (2013). Validity and test–retest reliability of a short dietary questionnaire to assess intake of saturated fat and free sugars: A preliminary study. *Journal of Human Nutrition and Dietetics*, *26*(3), 234-242. https://doi.org/10.1111/jhn.12008

Franken, I. H. (2003). Drug craving and addiction: integrating psychological and neuropsychopharmacology approaches. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *27*(4), 563-579. https://doi.org/10.1016/S0278-5846(03)00081-2

Freitas, A. L., Gollwitzer, P., & Trope, Y. (2004). The influence of abstract and concrete mindsets on anticipating and guiding others' self-regulatory efforts. *Journal of Experimental Social Psychology, 40*(6), 739-752. https://doi.org/10.1016/j.jesp.2004.04.003

French, S. A., Epstein, L. H., Jeffery, R. W., Blundell, J. E., & Wardle, J. (2012). Eating behavior dimensions. Associations with energy intake and body weight. A review. *Appetite, 59*(2), 541-549. https://doi.org/10.1016/j.appet.2012.07.001

Fresco, D. M., 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*(3), 447–455. https://doi.org/10.1037/0022-006X.75.3.447

Frisina, P.G., Borod, J., & Lepore, S. (2004). A meta-analysis of the effects of written emotional disclosure on the health outcomes of clinical Populations. *The Journal of Nervous and Mental Disease, 192*(9), 629- 634. http://dx.doi.org/10.1097/01.nmd.0000138317.30764.63

Fromm, S. P., & Horstmann, A. (2019). Psychometric evaluation of the German version of the dietary fat and free sugar-short questionnaire. *Obesity Facts, 12*(5), 518-528. https://doi.org/10.1159/000501969

Fujita, K. (2008). Seeing the forest beyond the trees: A construal-level approach to self-control. *Social and Personality Psychology Compass*, *2*(3), 1475-1496. https://doi.org/10.1111/j.1751-9004.2008.00118.x

Fujita, K., & Roberts, J. C. (2010). Promoting prospective self-control through abstraction. *Journal of Experimental Social Psychology*, *46*(6), 1049-1054. https://doi.org/10.1016/j.jesp.2010.05.013

Fujita, K., Trope, Y., Liberman, N., & Levin-Sagi, M. (2006). Construal levels and self-control. *Journal of Personality and Social Psychology, 90*(3), 351-367. http://dx.doi.org/10.1037/0022-3514.90.3.351

Funk, M. D., Lee, M., Vidoni, M. L., & Reininger, B. M. (2019). Weight loss and weight gain among participants in a community-based weight loss Challenge. *Bio-Med Central Obesity*, *6*(1), 2. https://doi.org/10.1186/s40608-018-0225-1

Gadermann, A. M., Guhn, M., & Zumbo, B. D. (2011). Investigating the substantive aspect of construct validity for the satisfaction with life scale adapted for children: A focus on cognitive processes. *Social Indicators Research, 100*(1), 37-60. https://doi.org10.1007/s11205-010-9603-x

Galfin, J. M., & Watkins, E. R. (2011). Construal level, rumination, and psychological distress in palliative care. *Psycho-Oncology*, *21*(6), 680-683. https://doi.org/10.1002/pon.1948

Garfinkel, S. N., Seth, A. K., Barrett, A. B., Suzuki, K., & Critchley, H. D. (2015). Knowing your own heart: distinguishing interoceptive accuracy from interoceptive awareness. *Biological Psychology, 104*, 65-74. https://doi.org/10.1016/j.neuropsychologia.2013.08.014

Gatenby, S. J. (1997). Eating frequency: methodological and dietary aspects. *British Journal of Nutrition*, *77*(1), 7-20. https://doi.org/10.1079/BJN19970100

Gaudreau, P., Sanchez, X., & Blondin, J. P. (2006). Positive and negative affective states in a performance-related setting: Testing the factorial structure of the PANAS across two samples of French-Canadian participants. *European Journal of Psychological Assessment, 22*(4), 240-249. https://doi.org/10.1027/1015-5759.22.4.240

Gavin, A. R., Simon, G. E., & Ludman, E. J. (2010). The association between obesity, depression, and educational attainment in women: the mediating role of body image dissatisfaction. *Journal of Psychosomatic Research*, *69*(6), 573-581. https://doi.org/10.1016/j.jpsychores.2010.05.001

GBD 2015 Obesity Collaborators. (2017). Health effects of overweight and obesity in 195 countries over 25 years. *New England Journal of Medicine, 377*(1), 13-27. https://doi.org/10.1056/NEJMoa1614362

Geliebter, A., & Aversa, A. (2003). Emotional eating in overweight, normal weight, and underweight individuals. *Eating Behaviours*, *3*(4), 341-347. https://doi.org/10.1016/S1471-0153(02)00100-9

Gilbert, D., & Waltz, J. (2010). Mindfulness and health behaviors. *Mindfulness, 1*(4), 227-234.

Gilbert, P. (Ed.). (2005). *Compassion: Conceptualisations, research and use in psychotherapy*. Routledge.

Gloy, V. L., Briel, M., Bhatt, D. L., Kashyap, S. R., Schauer, P. R., Mingrone, G., ... & Nordmann, A. J. (2013). Bariatric surgery versus non-surgical treatment for obesity: a systematic review and meta-analysis of randomised controlled trials. *The BMJ*, *347*, 5934. https://doi.org/10.1136/bmj.f5934

Gotink, R. A., Chu, P., Busschbach, J. J., Benson, H., Fricchione, G. L., & Hunink, M. M. (2015). Standardised mindfulness-based interventions in healthcare: an overview of systematic reviews and meta-analyses of RCTs. *Public Library of Science One, 10*(4), e0124344. https://doi.org/10.1371/journal.pone.0124344

Gouveia, M. J., Canavarro, M. C., & Moreira, H. (2019). Associations between mindfulness, self-compassion, difficulties in emotion regulation, and emotional eating among adolescents with

overweight/obesity. *Journal of Child and Family Studies*, *28*(1), 273-285. https://doi.org/10.1007/s10826-018-1239-5

Grabovac, A. D., Lau, M. A., & Willett, B. R. (2011). Mechanisms of mindfulness: A Buddhist psychological model. *Mindfulness*, *2*(3), 154-166. https://doi.org/10.1007/s12671-011-0054-5

Grafenauer, S. J., Tapsell, L. C., Beck, E. J., & Batterham, M. J. (2013). Baseline dietary patterns are a significant consideration in correcting dietary exposure for weight loss. *European Journal of Clinical Nutrition*, *67*(4), 330-336. https://doi.org/10.1038/ejcn.2013.26

Graham, D. J., Orquin, J. L., & Visschers, V. H. (2012). Eye tracking and nutrition label use: A review of the literature and recommendations for label enhancement. *Food Policy*, *37*(4), 378-382. https://doi.org/10.1016/j.foodpol.2012.03.004

Graybeal, A., Sexton, J. D., & Pennebaker, J. W. (2002). The role of story-making in disclosure writing: The psychometrics of narrative. *Psychology and Health*, *17*(5), 571-581. https://doi.org/10.1080/08870440290025786

Greenway, F. L. (2015). Physiological adaptations to weight loss and factors favouring weight regain. *International Journal of Obesity, 39*(8), 1188-1196. https://doi.org/10.1038/ijo.2015.59

Greeson, J. M., Smoski, M. J., Suarez, E. C., Brantley, J. G., Ekblad, A. G., Lynch, T. R., & Wolever, R. Q. (2015). Decreased symptoms of depression after mindfulness-based stress reduction: potential moderating effects of religiosity, spirituality, trait mindfulness, sex, and age. *The Journal of Alternative and Complementary Medicine*, *21*(3), 166-174. https://doi.org/10.1089/acm.2014.0285

Greicius, M. D., Flores, B. H., Menon, V., Glover, G. H., Solvason, H. B., Kenna, H., … & Schatzberg, A. F. (2007). Resting-state functional connectivity in major depression: abnormally increased contributions from subgenual cingulate cortex and thalamus. *Biological Psychiatry*, *62*(5), 429-437. https://doi.org/10.1016/j.biopsych.2006.09.020

Gross, J.J. (2013). Emotion regulation: Taking stock and moving forward. *Emotion, 13*(3), 359–365. https://doi.org/10.1037/a0032135

Gross, J.J., & Levenson, R. (1995). Emotion elicitation using films. *Cognition & Emotion*, *9*(1), 87-108. https://doi.org/10.1080/02699939508408966

Grossmann, I., & Kross, E. (2010). The impact of culture on adaptive versus maladaptive self-reflection. *Psychological science*, *21*(8), 1150-1157. https://doi.org/10.1177/0956797610376655

Hagemann, D., Naumann, E., Maier, S., Becker, G., Lürken, A., & Bartussek, D. (1999). The assessment of affective reactivity using films: Validity, reliability and sex differences. *Personality and Individual Differences*, *26*(4), 627-639. https://doi.org/10.1016/s0191-8869(98)00159-7

Hales, C., Carroll, M., Fryar, C., & Ogden, C. (2020). *Prevalence of Obesity and Severe Obesity Among Adults: United States, 2017–2018*. Cdc.gov. Retrieved from https://www.cdc.gov/nchs/products/databriefs/db360.htm.

Hall, J. N., Moore, S., Harper, S. B., & Lynch, J. W. (2009). Global variability in fruit and vegetable consumption. *American Journal of Preventive Medicine*, *36*(5), 402-409. https://doi.org/10.1016/j.amepre.2009.01.029

Hall, K. D., Sacks, G., Chandramohan, D., Chow, C. C., Wang, Y. C., Gortmaker, S. L., & Swinburn, B. A. (2011). Quantification of the effect of energy imbalance on bodyweight. *The Lancet, 378*(9793), 826-837. https://doi.org/10.1016/S0140-6736(11)60812-X

Hamilton, J., Fawson, S., May, J., Andrade, J., & Kavanagh, D. (2013). Brief guided imagery and body scanning interventions reduce food cravings. *Appetite*, *71*, 158-162. https://doi.org/10.1016/j.appet.2013.08.005

Hartmann, C., Siegrist, M., & van der Horst, K. (2012). Snack frequency: associations with healthy and unhealthy food choices. *Public Health Nutrition*, *16*(08), 1487-1496. https://doi.org/10.1017/S1368980012003771

Hayes-Skelton, S.A., & Graham, J. R. (2013). Decentering as a common link among mindfulness, cognitive reappraisal, and social anxiety. *Behavioural and Cognitive Psychotherapy*, *41*(3), 317. https://doi.org/10.1017/S1352465812000902.

Hayes, A. F. (2017). *Introduction to Mediation, Moderation, and Conditional Process Analysis* (Second). Guilford Publications.

Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, *44*(1), 1-25. https://doi.org/10.1016/j.brat.2005.06.006

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2009). *Acceptance and commitment therapy*. Washington, DC: American Psychological Association.

Hays, N. P., & Roberts, S. B. (2008). Aspects of eating behaviors "disinhibition" and "restraint" are related to weight gain and BMI in women. *Obesity, 16*(1), 52-58. https://doi.org/10.1038/oby.2007.12

He, K., Hu, F. B., Colditz, G. A., Manson, J. E., Willett, W. C., & Liu, S. (2004). Changes in intake of fruits and vegetables in relation to risk of obesity and weight gain among middle-aged women. *International Journal of Obesity*, *28*(12), 1569-1574. https://doi.org/10.1038/sj.ijo.0802795

Heeren, A., & Philippot, P. (2011). Changes in ruminative thinking mediate the clinical benefits of mindfulness: Preliminary findings. *Mindfulness*, *2*(1), 8-13. https://doi.org/10.1007/s12671-010-0037-y

Helson, H. (1964). *Adaptation-level theory: an experimental and systematic approach to behavior*. Harper and Row: New York.

Hendrickson, K. L., & Rasmussen, E. B. (2017). Mindful eating reduces impulsive food choice in adolescents and adults. *Health Psychology*, *36*(3), 226-235. https://doi.org/10.1037/hea0000440

Hendrickson, K.L., & Rasmussen, E.B. (2013). Effects of mindful eating training on delay and probability discounting for food and money in obese and healthy-weight individuals. *Behaviour Research and Therapy*, *51*(7), 399-409. https://doi.org/10.1016/j.brat.2013.04.002

Hendrikse, J. J., Cachia, R. L., Kothe, E. J., McPhie, S., Skouteris, H., & Hayden, M. J. (2015). Attentional biases for food cues in overweight and individuals with obesity: a systematic review of the literature. *Obesity reviews*, *16*(5), 424-432. https://doi.org/10.1111/obr.12265

Herman, C. P., & Polivy, J. (1975). Anxiety, restraint, and eating behavior. *Journal of Abnormal Psychology, 84*(6), 666. https://doi.org/10.1037/0021-843X.84.6.666

Herman, C., & Mack, D. (1975). Restrained and unrestrained eating. *Journal of Personality*. https://doi.org/10.1111/j.1467-6494.1975.tb00727.x

Herman, C., & Polivy, J. (1984). A boundary model for the regulation of eating. *Research Publications-Association for Research in Nervous and Mental Disease*, *62*, 141. https://doi.org/10.3928/0048-5713-19831201-03

Herman, C., & Polivy, J. (2005). Normative influences on food intake. *Physiology & Behavior, 86*(5), 762-772. Doi: 10.1016/j.physbeh.2005.08.064

Herman, C., Polivy, J., Lank, C., & Heatherton, T. (1987). Anxiety, hunger, and eating behaviour. *Journal of Abnormal Psychology*, *96*(3), 264-269. https://doi.org/10.1037/0021-843x.96.3.264

Herman, C., Polivy, J., Pliner, P., & Vartanian, L. (2015). Mechanisms underlying the portion-size effect. *Physiology & Behavior, 144*, 129-136. https://doi.org/10.1016/j.physbeh.2015.03.025

Herman, C., Polivy, J., Vartanian, L., & Pliner, P. (2016). Are large portions responsible for the obesity epidemic? *Physiology & Behavior, 156*, 177-181. https://doi.org/10.1016/j.physbeh.2016.01.024

Hetherington, M., & Blundell-Birtill, P. (2018). The portion size effect and overconsumption - towards downsizing solutions for children and adolescents. *Nutrition Bulletin, 43*(1), 61-68. https://doi.org/10.1111/nbu.12307

Hickey, C., Chelazzi, L., & Theeuwes, J. (2010). Reward guides vision when it's your thing: Trait reward-seeking in reward-mediated visual priming. *Public Library of Science One*, *5*(11), e14087. https://doi.org/10.1371/journal.pone.0014087

Higgs, S. (2015). Manipulations of attention during eating and their effects on later snack intake. *Appetite*, *92*, 287-294. https://doi.org/10.1016/j.appet.2015.05.033

Higgs, S., & Donohoe, J. E. (2011). Focusing on food during lunch enhances lunch memory and decreases later snack intake. *Appetite*, *57*(1), 202-206. https://doi.org/10.1016/j.appet.2011.04.016

Higgs, S., Dolmans, D., Humphreys, G. W., & Rutters, F. (2015). Dietary self-control influences top–down guidance of attention to food cues. *Frontiers in Psychology*, *6*, 427. https://doi.org/10.3389/fpsyg.2015.00427

Higgs, S., Rutters, F., Thomas, J. M., Naish, K., & Humphreys, G. W. (2012). Top down modulation of attention to food cues via working memory. *Appetite*, *59*(1), 71-75. https://doi.org/10.1016/j.appet.2012.03.018

Hill, A. J. (2007). The psychology of food craving*: Symposium on 'Molecular mechanisms and psychology of food intake'. *Proceedings of the Nutrition Society*, *66*(2), 277-285. https://doi.org/10.1017/S0029665107005502

Hill, J.O., Wyatt, H., Reed, G., & Peters, J. (2003). Obesity and the environment: Where do we go from here?. *Science*, *299*(5608), 853-855. https://doi.org/ 10.1126/science.1079857

Hofmann, S. G., Grossman, P., & Hinton, D. E. (2011). Loving-kindness and compassion meditation: Potential for psychological interventions. *Clinical Psychology Review*, *31*(7), 1126-1132. https://doi.org/10.1016/j.cpr.2011.07.003

Hollis-Walker, L., & Colosimo, K. (2011). Mindfulness, self-compassion, and happiness in non-meditators: A theoretical and empirical examination. *Personality and Individual Differences*, *50*(2), 222-227. https://doi.org/10.1016/j.paid.2010.09.033

Hollitt, S., Kemps, E., Tiggemann, M., Smeets, E., & Mills, J. S. (2010). Components of attentional bias for food cues among restrained eaters. *Appetite*, *54*(2), 309-313. https://doi.org/10.1016/j.appet.2009.12.005

Holzel, B., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S., Gard, T., & Lazar, S. (2011). Mindfulness practice leads to increases in regional brain gray matter density. *Psychiatry Research: Neuroimaging*, *191*(1), 36-43. https://doi.org/10.1016/j.pscychresns.2010.08.006

Homan, K. J., & Sirois, F. M. (2017). Self-compassion and physical health: Exploring the roles of perceived stress and health-promoting behaviors. *Health Psychology Open*, *4*(2), 2055102917729542. https://doi.org/10.1177/2055102917729542

Hong, P. Y., Lishner, D. A., & Han, K. H. (2014). Mindfulness and eating: An experiment examining the effect of mindful raisin eating on the enjoyment of sampled food. *Mindfulness*, *5*(1), 80-87. http://doi.org/10.1007/s12671-012-0154-x

Hong, P. Y., Lishner, D. A., Han, K. H., & Huss, E. A. (2011). The positive impact of mindful eating on expectations of food liking. *Mindfulness*, *2*(2), 103-113. http://doi.org/10.1007/s12671-011-0048-3

Hootman, K. C., Guertin, K. A., & Cassano, P. A. (2018). Stress and psychological constructs related to eating behavior are associated with anthropometry and body composition in young adults. *Appetite, 125*, 287-294. https://doi.org/10.1016/j.appet.2018.01.003

Horan, K. A., & Taylor, M. B. (2018). Mindfulness and self-compassion as tools in health behavior change: An evaluation of a workplace intervention pilot study. *Journal of Contextual Behavioral Science*, *8*, 8-16. https://doi.org/10.1016/j.jcbs.2018.02.003

Hou, R., Mogg, K., Bradley, B. P., Moss-Morris, R., Peveler, R., & Roefs, A. (2011). External eating, impulsivity and attentional bias to food cues. *Appetite*, *56*(2), 424-427. https://doi.org/10.1016/j.appet.2011.01.019

Howell, A. J., Digdon, N. L., & Buro, K. (2010). Mindfulness predicts sleep-related self-regulation and well-being. *Personality and Individual Differences*, *48*(4), 419-424. https://doi.org/10.1016/j.paid.2009.11.009

Hruby, A., Manson, J. E., Qi, L., Malik, V. S., Rimm, E. B., Sun, Q., ... & Hu, F. B. (2016). Determinants and consequences of obesity. *American Journal of Public Health*, *106*(9), 1656-1662. https://doi.org/10.2105/AJPH.2016.303326

Hughes, C. C., Gooze, R. A., Finkelstein, D. M., & Whitaker, R. C. (2010). Barriers to obesity prevention in Head Start. *Health Affairs*, *29*(3), 454-462. https://doi.org/10.1377/hlthaff.2009.0499

Hulbert-Williams, L., Nicholls, W., Joy, J., & Hulbert-Williams, N. (2014). Initial validation of the mindful eating scale. *Mindfulness*, *5*(6), 719-729. https://doi.org/10.1007/s12671-013-0227-5

Hummel, G., Ehret, J., Zerweck, I., Winter, S. S., & Stroebele-Benschop, N. (2018). How eating behavior, food stimuli and gender may affect visual attention–An eye tracking study. *Eating Behaviors*, *31*, 60-67. https://doi.org/10.1016/j.eatbeh.2018.08.002

Huseinovic, E., Winkvist, A., Bertz, F., & Brekke, H. K. (2014). Changes in food choice during a successful weight loss trial in overweight and obese postpartum women. *Obesity*, *22*(12), 2517-2523. https://doi.org/10.1002/oby.20895

Hussein, M., Egan, H., & Mantzios, M. (2017). Mindful construal diaries: a less anxious, more mindful, and more self-compassionate method of eating. *Sage Open*, *7*(2), 2158244017704685. https://doi.org/10.1177/2158244017704685

Iceta, S., Julien, B., Seyssel, K., Lambert-Porcheron, S., Segrestin, B., Blond, E., ... & Disse, E. (2019). Ghrelin concentration as an indicator of eating-disorder risk in obese women. *Diabetes & Metabolism, 45*(2), 160-166. https://doi.org/10.1016/j.diabet.2018.01.006

Inoue, Y., Qin, B., Poti, J., Sokol, R., & Gordon-Larsen, P. (2018). Epidemiology of obesity in adults: latest trends. *Current Obesity Reports*, *7*(4), 276-288. https://doi.org/10.1007/s13679-018-0317-8

Jakicic, J. M., Marcus, B. H., Gallagher, K. I., Napolitano, M., & Lang, W. (2003). Effect of exercise duration and intensity on weight loss in overweight, sedentary women: a randomized trial. *Journal of American Medical Association, 290*(10), 1323-1330. http://doi.org/10.1001/jama.290.10.1323

Jeanes, Y. M., Reeves, S., Gibson, E. L., Piggott, C., May, V. A., & Hart, K. H. (2017). Binge eating behaviours and food cravings in women with polycystic ovary syndrome. *Appetite, 109*, 24-32. https://doi.org/10.1016/j.appet.2016.11.010

Jeffery, R. W., Epstein, L. H., Wilson, G. T., Drewnowski, A., Stunkard, A. J., & Wing, R. R. (2000). Long-term maintenance of weight loss: current status. *Health psychology, 19*, 5. https://doi.org/10.1037/0278-6133.19.Suppl1.5

Jenkins, K. T., & Tapper, K. (2014). Resisting chocolate temptation using a brief mindfulness strategy. *British Journal of Health Psychology*, *19*(3), 509-522. https://doi.org/10.1111/bjhp.12050

Jensen, P., Zachariae, C., Christensen, R., Geiker, N. R., Schaadt, B. K., Stender, S., ... & Skov, L. (2014). Effect of weight loss on the cardiovascular risk profile of obese patients with psoriasis. *Acta Dermato-Venereologica, 94*(6), 691-694. https://doi.org/10.2340/00015555-1824

Jeon, K. J., Lee, O., Kim, H. K., & Han, S. N. (2011). Comparison of the dietary intake and clinical characteristics of obese and normal weight adults. *Nutrition Research and Practice*, *5*(4), 329-336. http://dx.doi.org/10.4162/nrp.2011.5.4.329

Johnson, F., Pratt, M., & Wardle, J. (2012). Dietary restraint and self-regulation in eating behavior. *International Journal of Obesity, 36*(5), 665-674. https://doi.org/10.1038/ijo.2011.156

Jolly, K., Lewis, A., Beach, J., Denley, J., Adab, P., Deeks, J. J., ... & Aveyard, P. (2011). Comparison of range of commercial or primary care led weight reduction programmes with minimal intervention control for weight loss in obesity: Lighten Up randomised controlled trial. The *BMJ*, *343*, d6500. https://doi.org/10.1136/bmj.d6500

Jordan, C. H., Wang, W., Donatoni, L., & Meier, B. P. (2014). Mindful eating: Trait and state mindfulness predict healthier eating behavior. *Personality and Individual differences*, 68, 107-111. https://doi.org/10.1016/j.paid.2014.04.013

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*(1), 33-47. https://doi.org/10.1016/0163-8343(82)90026-3

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness.* New York: Delacourt.

Kabat-Zinn, J. (2006). *Eating meditation. On mindfulness for beginners [CD].* Louisville: Sounds True, Inc.

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: past, present, and future. *Clinical Psychology: Science and Practice*, *10*(2), 144-156. http://doi.org/10.1093/clipsy/bpg016

Kaisari, P., & Higgs, S. (2015). Social modelling of food intake. The role of familiarity of the dining partners and food type. *Appetite*, *86*, 19-24. https://doi.org/10.1016/j.appet.2014.09.020

Kaiser, D., Silberberger, S., Hilzendegen, C., & Stroebele-Benschop, N. (2016). The influence of music type and transmission mode on food intake and meal duration: An experimental study. *Psychology of Music*, *44*(6), 1419-1430. https://doi.org/10.1177/0305735616636207

Kakoschke, N., Kemps, E., & Tiggemann, M. (2014). Attentional bias modification encourages healthy eating. *Eating Behaviors*, *15*(1), 120-124. https://doi.org/10.1016/j.eatbeh.2013.11.001

Kakoschke, N., Kemps, E., & Tiggemann, M. (2015). External eating mediates the relationship between impulsivity and unhealthy food intake. *Physiology & Behavior, 147*, 117-121. https://doi.org/10.1016/j.physbeh.2015.04.030

Kantono, K., Hamid, N., Shepherd, D., Lin, Y., Brard, C., Grazioli, G., & Thomas Carr, B. (2018). The effect of music on gelato perception in different eating contexts. *Food Research International*, *113*, 43-56. https://doi.org/10.1016/j.foodres.2018.06.030

Kantono, K., Hamid, N., Shepherd, D., Yoo, M., Carr, B., & Grazioli, G. (2016). The effect of background music on food pleasantness ratings. *Psychology of Music*, *44*(5), 1111-1125. https://doi.org/10.1177/0305735615613149

Karapetsa, A. A., Karapetsas, A. V., Maria, B., & Laskaraki, I. R. M. (2015). The role of music on eating behavior. *Encephalos*, *52*, 59-63. https//doi.org/ 46909703

Karlsson, J., Persson, L., Sjöström, 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*(12), 1715-1725. https://doi.org/10.1038/sj.ijo.0801442

Kassir, R. (2020). Risk of COVID-19 for patients with obesity. *Obesity Reviews, 21*(6). http://doi.org/10.1111/dth.13361

Kearney, D. J., Milton, M. L., Malte, C. A., McDermott, K. A., Martinez, M., & Simpson, T. L. (2012). Participation in mindfulness-based stress reduction is not associated with reductions in emotional eating or uncontrolled eating. *Nutrition Research*, *32*(6), 413-420. https://doi.org/10.1016/j.nutres.2012.05.008

Keesman, M., Aarts, H., Hafner, M., & Papies, E. K. (2017). Mindfulness reduces reactivity to food cues: underlying mechanisms and applications in daily life. *Current Addiction Reports*, *4*(2), 151-157. https://doi.org/10.1007/s40429-017-0134-2

Kemps, E., Tiggemann, M., Orr, J., & Grear, J. (2014). Attentional retraining can reduce chocolate consumption. *Journal of Experimental Psychology: Applied*, *20*(1), 94. https://doi.org/10.1037/xap0000005

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. https://doi.org/10.1016/j.cpr.2011.04.006

Kerin, J. L., Webb, H. J., & Zimmer-Gembeck, M. J. (2019). Intuitive, mindful, emotional, external and regulatory eating behaviours and beliefs: *An investigation of the core components. Appetite*, 132, 139-146. https://doi.org/10.1016/j.appet.2018.10.011

Kiken, L. G., Garland, E. L., Bluth, K., Palsson, O. S., & Gaylord, S. A. (2015). From a state to a trait: Trajectories of state mindfulness in meditation during intervention predict changes in trait mindfulness. *Personality and Individual differences*, *81*, 41-46. https://doi.org/10.1016/j.paid.2014.12.044

King, L. A., & Miner, K. N. (2000). Writing about the perceived benefits of traumatic events: Implications for physical health. *Personality and Social Psychology Bulletin*, *26*(2), 220-230. https://doi.org/10.1177/0146167200264008

Kober, H., Mende-Siedlecki, P., Kross, E. F., Weber, J., Mischel, W., Hart, C. L., & Ochsner, K. N. (2010). Prefrontal–striatal pathway underlies cognitive regulation of craving. *Proceedings of the National Academy of Sciences*, *107*(33), 14811-14816. https://doi.org/10.1073/pnas.1007779107

Koelsch, S., & Siebel, W. (2005). Towards a neural basis of music perception. *Trends in Cognitive Sciences, 9*(12), 578-584. https://doi.org/10.1016/j.tics.2005.10.001

Koenders, P. G., & van Strien, T. (2011). Emotional eating, rather than lifestyle behavior, drives weight gain in a prospective study in 1562 employees. *Journal of Occupational and Environmental Medicine, 53*(11), 1287-1293. https://doi.org/10.1097/jom.0b013e31823078a2

Konttinen, H., van Strien, T., Männistö, S., Jousilahti, P., & Haukkala, A. (2019). Depression, emotional eating and long-term weight changes: A population-based prospective study. *International Journal of Behavioural Nutrition And Physical Activity*, *16*(1). https://doi.org/10.1186/s12966-019-0791-8

Koster, E. H., De Raedt, R., Goeleven, E., Franck, E., & Crombez, G. (2005). Mood-congruent attentional bias in dysphoria: maintained attention to and impaired disengagement from negative information. *Emotion*, *5*(4), 446. https://doi.org/10.1037/1528-3542.5.4.446

Koval, S. R., & Todman, M. (2015). Induced boredom constrains mindfulness: An online demonstration. *Psychology and Cognitive Science Open Journal, 1*(1), 1-9. http://dx.doi.org/10.17140/PCSOJ-1-101

Kristeller, J., & Hallett, C. B. (1999). An exploratory study of a meditation-based intervention for binge eating disorder. *Journal of health psychology*, *4*(3), 357-363. https://doi.org/10.1177/135910539900400305

Kristeller, J., & Wolever, R. (2010). Mindfulness-based eating awareness training for treating binge eating disorder: The conceptual foundation. *Eating Disorders*, *19*(1), 49-61. https://doi.org/10.1080/10640266.2011.533605

Kristeller, J., Wolever, R., & Sheets, V. (2014). Mindfulness-based eating awareness training (MB-EAT) for binge eating: A randomized clinical trial. *Mindfulness*, *5*(3), 282-297. https://doi.org/10.1007/s12671-012-0179-1

Kross, E., & Ayduk, O. (2008). Facilitating adaptive emotional analysis: Distinguishing distanced-analysis of depressive experiences from immersed-analysis and distraction. *Personality and Social Psychology Bulletin*, *34*(7), 924-938. https://doi.org/10.1177/0146167208315938

Kross, E., & Ayduk, O. (2011). Making meaning out of negative experiences by self-distancing. *Current Directions in Psychological Science, 20*(3), 187–191. http://dx.doi.10.1177/0963721411408883

Kross, E., & Ayduk, O. (2017). Self-Distancing. *Advances In Experimental Social Psychology*, 81-136. https://doi.org/10.1016/bs.aesp.2016.10.002

Kross, E., Ayduk, O., & Mischel, W. (2005). When asking “why” does not hurt distinguishing rumination from reflective processing of negative emotions. *Psychological science*, *16*(9), 709-715. https://doi.org/10.1111/j.1467-9280.2005.01600.x

Kross, E., Bruehlman-Senecal, E., Park, J., Burson, A., Dougherty, A., Shablack, H., Bremner, R., Moser, J., & Ayduk, O. (2014). Self-talk as a regulatory mechanism: How you do it matters. *Journal of Personality and Social Psychology, 106*(2), 304–324. https://doi.org/10.1037/a0035173

Kross, E., Bruehlman-Senecal, E., Park, J., Burson, A., Dougherty, A., & Shablack, H. et al. (2014). Self-talk as a regulatory mechanism: How you do it matters. *Journal of Personality and Social Psychology, 106*(2), 304-324. http://dx.doi.org/10.1037/a0035173

Kross, E., Davidson, M., Weber, J., & Ochsner, K. (2009). Coping with emotions past: the neural bases of regulating affect associated with negative autobiographical memories. *Biological Psychiatry*, *65*(5), 361-366. https://doi.org/10.1016/j.biopsych.2008.10.019

Kumar, S., Higgs, S., Rutters, F., & Humphreys, G. W. (2016). Biased towards food: Electrophysiological evidence for biased attention to food stimuli. *Brain and Cognition*, *110*, 85-93. https://doi.org/10.1016/j.bandc.2016.04.007

Ladabaum, U., Mannalithara, A., Myer, P. A., & Singh, G. (2014). Obesity, abdominal obesity, physical activity, and caloric intake in US adults: 1988 to 2010. *The American Journal of Medicine, 127*(8), 717-727.https://doi.org/10.1016/j.amjmed.2014.02.026

Lane, B., & Szabo, M. (2013). Uncontrolled, repetitive eating of small amounts of food or 'grazing': development and evaluation of a new measure of atypical eating. *Behaviour Change*, *30*(2), 57. https://doi.org/10.1017/bec.2013.6

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. https://doi.org/10.1016/j.appet.2010.12.007

Lau, M. A., & McMain, S. F. (2005). Integrating mindfulness meditation with cognitive and behavioural therapies: The challenge of combining acceptance-and change-based

strategies. *The Canadian Journal of Psychiatry*, *50*(13), 863-869. https://doi.org/10.1177/070674370505001310

Lazarevich, I., Irigoyen Camacho, M., Velázquez-Alva, M., & Zepeda, M. (2016). Relationship among obesity, depression, and emotional eating in young adults. *Appetite*, *107*, 639-644. https://doi.org/10.1016/j.appet.2016.09.011

Lazzeretti, L., Rotella, F., Pala, L., & Rotella, C. M. (2015). Assessment of psychological predictors of weight loss: how and what for?. *World Journal of Psychiatry*, *5*(1), 56. https://doi.org/10.5498/wjp.v5.i1.56

Leary, M. R., Tate, E. B., Adams, C. E., Batts Allen, A., & Hancock, J. (2007). Self-compassion and reactions to unpleasant self-relevant events: the implications of treating oneself kindly. *Journal of Personality and Social Psychology*, *92*(5), 887. https://doi.org/10.1037/0022-3514.92.5.887

Lebois, L. A., Papies, E. K., Gopinath, K., Cabanban, R., Quigley, K. S., Krishnamurthy, V., ... & Barsalou, L. W. (2015). A shift in perspective: Decentering through mindful attention to imagined stressful events. *Neuropsychological*, 75, 505-524. https://doi.org/10.1016/j.neuropsychologia.2015.05.030

Lee, W. K., & Lee, K. (2010). The validation study of the Korean version of Self-Compassion Scale with adult women in community. *Journal of Korean Neuropsychiatric Association, 49*(2), 193-200. https://doi.org/ 10.17315/kjhp.2008.13.4.012

Lehner, R., Balsters, J. H., Bürgler, A., Hare, T. A., & Wenderoth, N. (2017). Food-predicting stimuli differentially influence eye movements and goal-directed behavior in normal-weight, overweight, and obese individuals. *Frontiers in Psychiatry*, *8*, 230. https://doi.org/10.3389/fpsyt.2017.00230

Lesser, I. M. (1981). A review of the alexithymia concept. *Psychosomatic Medicine, 43*(6), 531–543. https://doi.org/10.1097/00006842-198112000-00009

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. https://doi.org/10.1016/j.eatbeh.2014.03.012

Levoy, E., Lazaridou, A., Brewer, J., & Fulwiler, C. (2017). An exploratory study of Mindfulness Based Stress Reduction for emotional eating. *Appetite, 109*, 124-130. https://doi.org/10.1016/j.appet.2016.11.029

Libby, L. K., Eibach, R. P., & Gilovich, T. (2005). Here's Looking at Me: The Effect of Memory Perspective on Assessments of Personal Change. *Journal of Personality and Social Psychology, 88*(1), 50–62. https://doi.org/10.1037/0022-3514.88.1.50

Liberman, N., & Trope, Y. (1998). The role of feasibility and desirability considerations in near and distant future decisions: A test of temporal construal theory. *Journal of Personality and Social Psychology, 75*(1), 5–18. https://doi.org/10.1037/0022-3514.75.1.5

Liberman, N., & Trope, Y. (2008). The psychology of transcending the here and now. *Science*, *322*(5905), 1201-1205. https://doi.org/10.1126/science.1161958

Lighter, J., Phillips, M., Hochman, S., Sterling, S., Johnson, D., Francois, F., & Stachel, A. (2020). Obesity in patients younger than 60 years is a risk factor for Covid-19 hospital admission. *Clinical Infectious Diseases*. https://doi.org/10.1093/cid/ciaa415

Linde, J. A., Jeffery, R. W., Finch, E. A., Ng, D. M., & Rothman, A. J. (2004). Are unrealistic weight loss goals associated with outcomes for overweight women?. *Obesity Research*, *12*(3), 569-576. https://doi.org/10.1038/oby.2004.65

Livingstone, M., & Pourshahidi, L. (2014). Portion Size and Obesity. *Advances in Nutrition*, *5*(6), 829-834. https://doi.org/10.3945/an.114.007104

Lloyd-Richardson, E. E., Lucero, M. L., DiBello, J. R., Jacobson, A. E., & Wing, R. R. (2008). The relationship between alcohol use, eating habits and weight change in college freshmen. *Eating Behaviors*, *9*(4), 504-508. https://doi.org/10.1016/j.eatbeh.2008.06.005

Lluch, A., Herbeth, B., Mejean, L., & Siest, G. (2000). Dietary intakes, eating style and overweight in the Stanislas Family Study. *International Journal of Obesity, 24*(11), 1493-1499. https://doi.org/10.1038/sj.ijo.0801425

Lock, C., Brindal, E., Hendrie, G., & Cox, D. (2016). Contextual and environmental influences on reported dietary energy intake at evening eating occasions. *Eating Behaviours, 21*, 155-160. https://doi.org/10.1016/j.eatbeh.2016.03.012

Longnecker, M. P., Harper, J. M., & Kim, S. (1997). Eating frequency in the nationwide food consumption survey (USA), 1987–1988. *Appetite*, *29*(1), 55-59. https://doi.org/10.1006/appe.1997.0094

Lowe, M. R. (2003). Self-regulation of energy intake in the prevention and treatment of obesity: is it feasible?. *Obesity Research, 11*(10), 44S-59S. https://doi.org/10.1038/oby.2003.223

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. https://doi.org/10.1038/oby.2005.90

Lowe, M. R., and Thomas, J. G. (2009). "Measures of restrained eating: Conceptual evolution and psychometric update," in *Handbook of assessment methods for obesity and eating behaviors*, eds D. Allison, and M. L. Baskin (New York, NY: Sage), 137–185.

Lowe, M. R., Doshi, S. D., Katterman, S. N., & Feig, E. H. (2013). Dieting and restrained eating as prospective predictors of weight gain. *Frontiers in Psychology, 4*, 577. https://doi.org/10.3389/fpsyg.2013.00577

Loxton, N., Dawe, S., & Cahill, A. (2011). Does negative mood drive the urge to eat? The contribution of negative mood, exposure to food cues and eating style. *Appetite*, *56*(2), 368-374. https://doi.org/10.1016/j.appet.2011.01.011

Luberto, C. M., & McLeish, A. C. (2018). The effects of a brief mindfulness exercise on state mindfulness and affective outcomes among adult daily smokers. *Addictive Behaviors, 77*, 73-80. https://doi.org/10.1016/j.addbeh.2017.09.013

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. https://doi.org/10.1016/j.tics.2008.01.005

Lyzwinski, L. N., Edirippulige, S., Caffery, L., & Bambling, M. (2019). Mindful eating mobile health apps: review and appraisal. *Journal of Medical Internet Research Mental Health*, *6*(8), e12820. https://doi.org/10.2196/12820

MacBeth, A., & Gumley, A. (2012). Exploring compassion: A meta-analysis of the association between self-compassion and psychopathology. *Clinical Psychology Review*, *32*(6), 545-552. https://doi.org/10.1016/j.cpr.2012.06.003

Macht M., & Simons, G. (2011) Emotional Eating. In: Nyklíček I., Vingerhoets A., Zeelenberg M. (eds) *Emotion Regulation and Well-Being*. Springer, New York, NY

Macht, M. (2008). How emotions affect eating: A five-way model. *Appetite*, *50*(1), 1-11. https://doi.org/10.1016/j.appet.2007.07.002

Macht, M., & Dettmer, D. (2006). Everyday mood and emotions after eating a chocolate bar or an apple. *Appetite*, *46*(3), 332-336. https://doi.org/10.1016/j.appet.2006.01.014

Macht, M., & Mueller, J. (2007). Immediate effects of chocolate on experimentally induced mood states. *Appetite*, *49*(3), 667-674. https://doi.org/10.1016/j.appet.2007.05.004

Macht, M., Roth, S., & Ellgring, H. (2002). Chocolate eating in healthy men during experimentally induced sadness and joy. *Appetite*, *39*(2), 147-158. https://doi.org/10.1006/appe.2002.0499

MacLean, P. S., Bergouignan, A., Cornier, M. A., & Jackman, M. R. (2011). Biology's response to dieting: the impetus for weight regain. American Journal of Physiology-Regulatory, *Integrative and Comparative Physiology*. https://doi.org/10.1152/ajpregu.00755.2010

Magnus, C. M., Kowalski, K. C., & Mchugh, T. L. F. (2010). The role of self-compassion in women's self-determined motives to exercise and exercise-related outcomes. *Self and Identity*, *9*(4), 363-382. https://doi.org/10.1080/15298860903135073

Malinowski, P., & Lim, H. J. (2015). Mindfulness at work: Positive affect, hope, and optimism mediate the relationship between dispositional mindfulness, work engagement, and well-being. *Mindfulness*, *6*(6), 1250-1262. https://doi.org/10.1007/s12671-015-0388-5

Mamalaki, E., Zachari, K., Karfopoulou, E., Zervas, E., & Yannakoulia, M. (2017). Presence of music while eating: Effects on energy intake, eating rate and appetite sensations. *Physiology & Behaviour, 168*, 31-33. https://doi.org/10.1016/j.physbeh.2016.10.019

Manna, P., & Jain, S. K. (2015). Obesity, oxidative stress, adipose tissue dysfunction, and the associated health risks: causes and therapeutic strategies. *Metabolic Syndrome and Related Disorders*, *13*(10), 423-444. https://doi.org/10.1089/met.2015.0095

Manning, S., & Batterham, R. L. (2014). The role of gut hormone peptide YY in energy and glucose homeostasis: twelve years on. *Annual Review of Physiology, 76*, 585-608. https://doi.org/10.1146/annurev-physiol-021113-170404

Mantzios, M. (2014). Exploring the relationship between worry and impulsivity in military recruits: The role of mindfulness and self-compassion as potential mediators. *Stress and Health*, *30*(5), 397-404. https://doi.org/10.1002/smi.2617

Mantzios, M., & Egan, H. (2017). On the role of self-compassion and self-kindness in weight regulation and health behavior change. *Frontiers in Psychology*, 8,229. https://doi.org/10.3389/fpsyg.2018.00880

Mantzios, M., & Giannou, K. (2014). Group vs. single mindfulness meditation: exploring avoidance, impulsivity, and weight management in two separate mindfulness meditation settings. *Applied Psychology: Health and Well-Being*, *6*(2), 173-191. https://doi.org/10.1111/aphw.12023

Mantzios, M., & Giannou, K. (2018). A real-world application of short mindfulness-based practices: A review and reflection of the literature and a practical proposition for an effortless mindful lifestyle. *American Journal of Lifestyle Medicine*, 1559-8276. https://doi.org/10.1177/1559827618772036

Mantzios, M., & Wilson, J. C. (2014). Making concrete construals mindful: A novel approach for developing mindfulness and self-compassion to assist weight loss. *Psychology & Health, 29*(4), 422-441. https://doi.org/10.1080/08870446.2013.863883

Mantzios, M., & Wilson, J. C. (2015a). Mindfulness, eating behaviours, and obesity: A review and reflection on current findings. *Current obesity reports*, *4*(1), 141-146. https://doi.org/10.1007/s13679-014-0131-x

Mantzios, M., & Wilson, J. C. (2015b). Exploring mindfulness and mindfulness with self-compassion-centered interventions to assist weight loss: theoretical considerations and preliminary results of a randomized pilot study. *Mindfulness*, *6*(4), 824-835. https://doi.org/10.1007/s12671-014-0325-z

Mantzios, M., Egan, H., & Asif, T. (2019). A randomised experiment evaluating the Mindful Raisin Practice as a method of reducing chocolate consumption during and after a mindless activity. *Journal of Cognitive Enhancement*, 1-8. https://doi.org/10.1007/s41465-019-00159-y

Mantzios, M., Egan, H., Bahia, H., Hussain, M., & Keyte, R. (2018). How does grazing relate to body mass index, self-compassion, mindfulness and mindful eating in a student population?. *Health Psychology Open*, *5*(1), 2055102918762701. https://doi.org/10.1177/2055102918762701

Mantzios, M., Egan, H., Hussain, M., Keyte, R., & Bahia, H. (2018). Mindfulness, self-compassion, and mindful eating in relation to fat and sugar consumption: an exploratory investigation. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity, 23*(6), 833-840. https://doi.org/10.1007/s40519-018-0548-4

Mantzios, M., Egan, H., Keyte, R., Bahia, H., & Hussain, M. (2019). Grazing, motives to eat palatable foods, and fat and sugar consumption: an exploratory investigation. *Journal of Public Health*, *27*(2), 143-149. https://doi.org/10.1007/s10389-018-0944-2

Mantzios, M., Skillet, K., & Egan, H. (2020). Examining the Effects of Two Mindful Eating Exercises on Chocolate Consumption. *European Journal of Health Psychology, 26*, 120 – 128. https://doi.org/10.1027/2512-8442/a000040

Mantzios, M., Wilson, J. C., Linnell, M., & Morris, P. (2015). The role of negative cognition, intolerance of uncertainty, mindfulness, and self-compassion in weight regulation among male army recruits. *Mindfulness, 6*(3), 545-552. https://doi.org/10.1007/s12671-014-0286-2

Marchiori, D., & Papies, E. (2014). A brief mindfulness intervention reduces unhealthy eating when hungry, but not the portion size effect. *Appetite, 75*, 40-45. https://doi.org/10.1016/j.appet.2013.12.009

Marchiori, D., Corneille, O., & Klein, O. (2012). Container size influences snack food intake independently of portion size. *Appetite*, *58*(3), 814-817. https://doi.org/10.1016/j.appet.2012.01.015

Marchiori, D., Papies, E., & Klein, O. (2014). The portion size effect on food intake. An anchoring and adjustment process?. *Appetite*, *81*, 108-115. https://doi.org/10.1016/j.appet.2014.06.018

Martins, B. G., da Silva, W. R., Maroco, J., & Campos, J. A. D. B. (2020). Psychometric characteristics of the Three-Factor Eating Questionnaire-18 and eating behavior in undergraduate students. Eating and Weight Disorders-Studies on *Anorexia, Bulimia and Obesity*, 1-12. https://doi.org/10.1007/s40519-020-00885-9

Mason, A. E., Epel, E. S., Kristeller, J., Moran, P. J., Dallman, M., Lustig, R. H., ... & Daubenmier, J. (2016). Effects of a mindfulness-based intervention on mindful eating, sweets consumption, and fasting glucose levels in obese adults: data from the SHINE randomized controlled trial. *Journal of Behavioral Medicine*, *39*(2), 201-213. https://doi.org/10.1007/s10865-015-9692-8

Mason, A. E., Jhaveri, K., Cohn, M., & Brewer, J. A. (2018). Testing a mobile mindful eating intervention targeting craving-related eating: feasibility and proof of concept. *Journal of Behavioral Medicine*, *41*(2), 160-173. https://doi.org/10.1007/s10865-017-9884-5

McAtamney, K., Mantzios, M., Egan, H., & Wallis, D. J. (2021). Emotional eating during COVID-19 in the United Kingdom: Exploring the roles of alexithymia and emotion dysregulation. *Appetite, 161*, 105-120. https://doi.org/10.1016/j.appet.2021.105120

McCarron, A., & Tierney, K. (1989). The effect of auditory stimulation on the consumption of soft drinks. *Appetite*, *13*(2), 155-159. https://doi.org/10.1016/0195-6663(89)90112-8

McElrea, H., & Standing, L. (1992). Fast Music Causes Fast Drinking. *Perceptual and Motor Skills*, *75*(2), 362-362. https://doi.org/10.2466/pms.1992.75.2.362

McIsaac, H. K., & Eich, E. (2002). Vantage point in episodic memory. *Psychonomic Bulletin & Review*, *9*(1), 146-150. https://doi.org/10.3758/BF03196271

McTiernan, A., Sorensen, B., Irwin, M. L., Morgan, A., Yasui, Y., Rudolph, R. E., ... & Potter, J. D. (2007). Exercise effect on weight and body fat in men and women. *Obesity, 15*(6), 1496-1512. https://doi.org/10.1038/oby.2007.178

Mehling, W. (2016). Differentiating attention styles and regulatory aspects of self-reported interoceptive sensibility. *Philosophical Transactions of the Royal Society B: Biological Sciences,* 371(1708), 20160013. https://doi.org/10.1098/rstb.2016.0013

Meier, B., Noll, S., & Molokwu, O. (2017). The sweet life: The effect of mindful chocolate consumption on mood. *Appetite*, *108*, 21-27. https://doi.org/10.1016/j.appet.2016.09.018

Melnyk, B. M., Small, L., Morrison-Beedy, D., Strasser, A., Spath, L., Kreipe, R., ... & Van Blankenstein, S. (2006). Mental health correlates of healthy lifestyle attitudes, beliefs, choices, and behaviors in overweight adolescents. *Journal of Pediatric Health Care, 20*(6), 401-406. https://doi.org/10.1016/j.pedhc.2006.03.004

Meng, Y., Mao, K., & Li, C. (2020). Validation of a short-form five facet mindfulness questionnaire instrument in china. *Frontiers in psychology, 10*, 3031. https://doi.org/10.3389/fpsyg.2019.03031

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. https://doi.org/10.1016/j.jand.2012.07.036

Miller, J., Fletcher, K., & Kabat-Zinn, J. (1998). Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders. *International Journal of Yoga Therapy*, *8*(1), 45-53. https://doi.org/10.17761/ijyt.8.1.f5654n6515513127

Milliman, R. (1986). The influence of background music on the behavior of restaurant patrons. *Journal of Consumer Research, 13*(2), 286. https://doi.org/10.1086/209068

Mischkowski, D., Kross, E., & Bushman, B. (2012). Flies on the wall are less aggressive: Self-distancing "in the heat of the moment" reduces aggressive thoughts, angry feelings and aggressive behaviour. *Journal of Experimental Social Psychology, 48(*5), 1187-1191. http://dx.doi.org/10.1016/j.jesp.2012.03.012

Mollen, S., Rimal, R., Ruiter, R., & Kok, G. (2013). Healthy and unhealthy social norms and food selection. Findings from a field-experiment. *Appetite*, *65*, 83-89. https://doi.org/10.1016/j.appet.2013.01.020

Montesi, L., El Ghoch, M., Brodosi, L., Calugi, S., Marchesini, G., & Dalle Grave, R. (2016). Long-term weight loss maintenance for obesity: A multidisciplinary approach. *Diabetes, Metabolic Syndrome and Obesity: targets and therapy*, *9*, 37. http://dx.doi.org/10.2147/DMSO.S89836

Mooreville, M., Shomaker, L. B., Reina, S. A., Hannallah, L. M., Cohen, L. A., Courville, A. B., ... & Yanovski, J. A. (2014). Depressive symptoms and observed eating in youth. *Appetite, 75,* 141-149. https://doi.org/10.1016/j.appet.2013.12.024

Mostafavi, S. A., Akhondzadeh, S., Mohammadi, M. R., Eshraghian, M. R., Hosseini, S., Chamari, M., & Keshavarz, S. A. (2017). The reliability and validity of the persian version of three-factor eating questionnaire-R18 (TFEQ-R18) in overweight and obese females. *Iranian Journal of Psychiatry, 12*(2), 100.

Moulds, M. L., Kandris, E., Starr, S., & Wong, A. C. (2007). The relationship between rumination, avoidance and depression in a non-clinical sample. *Behaviour Research and Therapy*, *45*(2), 251-261. https://doi.org/10.1016/j.brat.2006.03.003

National Statistics (2018). *Health Survey for England 2017 Adult and child overweight and obesity.* Retrieved from http://healthsurvey.hscic.gov.uk/media/78619/HSE17-Adult-Child-BMI-rep.pdf

Neff, K. D. (2003a). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity, 2*(2), 85-101. https://doi.org/10.1080/15298860309032

Neff, K. D. (2003b). The development and validation of a scale to measure self-compassion. *Self and identity*, *2*(3), 223-250. https://doi.org/10.1080/15298860309027

Neff, K. D. (2009). The role of self-compassion in development: A healthier way to relate to oneself. *Human development*, *52*(4), 211-214. https://doi.org/10.1159/000215071

Neff, K. D., & Dahm, K. A. (2015). Self-compassion: What it is, what it does, and how it relates to mindfulness. In *Handbook of mindfulness and self-regulation* (121-137). Springer, New York, NY.

Neff, K. D., & McGehee, P. (2010). Self-compassion and psychological resilience among adolescents and young adults. *Self and Identity*, *9*(3), 225-240. https://doi.org/10.1080/15298860902979307

Neff, K. D., & Pommier, E. (2013). The relationship between self-compassion and other-focused concern among college undergraduates, community adults, and practicing meditators. *Self and Identity, 12*(2), 160-176. https://doi.org/10.1080/15298868.2011.649546

Neff, K. D., Kirkpatrick, K. L., & Rude, S. S. (2007). Self-compassion and adaptive psychological functioning. *Journal of Research in Personality*, *41*(1), 139-154. https://doi.org/10.1016/j.jrp.2006.03.004

Neff, K.D, & Germer, C. (2013). A pilot study and randomized controlled trial of the mindful self-compassion program. *Journal of Clinical Psychology*, *69*(1), 28-44. https://doi.org/10.1002/jclp.22021

Nelson, J. B. (2017). Mindful eating: the art of presence while you eat. *Diabetes Spectrum*, *30*(3), 171-174. *https://doi.org/10.2337/ds17-0015*

Neumark-Sztainer D, Wall M, Story M, & Standish A.R. Dieting and unhealthy weight control behaviors during adolescence: Associations with 10-year changes in body mass index. *Journal of Adolescence Health, 50*(1), 80-86. https://doi.org/10.1016/j.jadohealth.2011.05.01

Nezlek, J. B., & Kuppens, P. (2008). Regulating positive and negative emotions in daily life. *Journal of Personality*, *76*(3), 561-580. https://doi.org/10.1111/j.1467-6494.2008.00496.x

Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., ... & Abraham, J. P. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, *384*(9945), 766-781. https://doi.org/10.1016/S0140-6736(14)60460-8

Nies, M. A., Sun, L., Kazemi, D., Carriker, A., & Dmochowski, J. (2012). Relationship of body mass index to alcohol consumption in college freshmen. *The Scientific World Journal*, *2012.* https://doi.org/10.1100/2012/849018

Nijs, I. M., & Franken, I. H. (2012). Attentional processing of food cues in overweight and obese individuals. *Current Obesity Reports*, *1*(2), 106-113. https://doi.org/10.1007/s13679-012-0011-1

Nijs, I. M., Franken, I. H., & Muris, P. (2009). Enhanced processing of food-related pictures in female external eaters. *Appetite*, *53*(3), 376-383. https://doi.org/10.1016/j.appet.2009.07.022

Nijs, I. M., Franken, I. H., & Muris, P. (2010). Food-related Stroop interference in obese and normal-weight individuals: Behavioral and electrophysiological indices. *Eating Behaviors*, *11*(4), 258-265. https://do.org/10.1007/s13679-012-0011-1

Nijs, I. M., Muris, P., Euser, A. S., & Franken, I. H. (2010). Differences in attention to food and food intake between overweight/obese and normal-weight females under conditions of hunger and satiety. *Appetite*, *54*(2), 243-254. https://doi.org/10.1016/j.appet.2009.11.004

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, *100*(4), 569. 10.1037//0021-843x.100.4.569

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, *3*(5), 400-424. https://doi.org/10.1111/j.1745-6924.2008.00088.x

Norman, H., Marzano, L., Coulson, M., & Oskis, A. (2019). Effects of mindfulness-based interventions on alexithymia: a systematic review. *Evidence-Based Mental Health, 22*(1), 36-43. http://dx.doi.org/10.1136/ebmental-2018-300029

Nortoft, E., Chubb, B., & Borglykke, A. (2018). Obesity and healthcare resource utilization: comparative results from the UK and the USA. *Obesity Science & Practice*, *4*(1), 41-45. https://doi.org/10.1002/osp4.148

Novak, C., La Lopa, J., & Novak, R. (2010). Effects of sound pressure levels and sensitivity to noise on mood and behavioral intent in a controlled fine dining restaurant environment. *Journal of Culinary Science & Technology, 8*(4), 191-218. https://doi.org/10.1080/15428052.2010.535756

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. https://doi.org/10.1111/obr.12156

Ogden, J., Wood, C., Payne, E., Fouracre, H., & Lammyman, F. (2018). 'Snack' versus 'meal': The impact of label and place on food intake. *Appetite*, *120*, 666-672. https://doi.org/10.1016/j.appet.2017.10.026

Olson, K., & Emery, C. (2015). Mindfulness and weight loss. *Psychosomatic Medicine, 77*(1), 59-67. https://doi.org/10.1097/psy.0000000000000127

Oltersdorf, U., Schlettwein-Gsell, D., & Winkler, G. (1999). Assessing eating patterns—an emerging research topic in nutritional sciences: introduction to the symposium. *Appetite*, *32*(1), 1-7. https://doi.org/10.1006/appe.1998.0189

Ouwens, M. A., Schiffer, A. A., Visser, L. I., Raeijmaekers, N. J. C., & Nyklíček, I. (2015). Mindfulness and eating behaviour styles in morbidly obese males and females. *Appetite, 87*, 62–67. https://doi.org/10.1016/j.appet.2014.11.030

Painter, J., & Wansink, B. (2002). How visibility and convenience influence candy consumption. *Appetite*, *38*(3), 237-238. https://doi.org/10.1006/appe.2002.0485

Palmeira, L., Pinto-Gouveia, J., & Cunha, M. (2017). Exploring the efficacy of an acceptance, mindfulness & compassionate-based group intervention for women struggling with their weight (Kg-Free): A randomized controlled trial. *Appetite, 112*, 107-116. https://doi.org/10.1016/j.appet.2017.01.027

Papadaki, A., Thanasoulias, A., Pound, R., Sebire, S. J., & Jago, R. (2016). Employees' Expectations of Internet-Based, Workplace Interventions Promoting the Mediterranean Diet: A Qualitative Study. *Journal of Nutrition Education and Behavior*, *48*(10), 706-715. https://doi.org/10.1016/j.jneb.2016.08.003

Papies, E, Potjes, I., Keesman, M., Schwinghammer, S., & van Koningsbruggen, G. (2014). Using health primes to reduce unhealthy snack purchases among overweight consumers in a grocery store. *International Journal of Obesity*, *38*(4), 597-602. https://doi.org/10.1038/ijo.2013.136

Papies, E. (2017). Mindfulness and health behavior: Examining the roles of attention regulation and decentering. *In Current Issues in Social Psychology. Mindfulness in Social Psychology* (94–108). Routledge.

Papies, E., & Hamstra, P. (2010). Goal priming and eating behavior: Enhancing self-regulation by environmental cues. *Health Psychology, 29*(4), 384. https://doi.org/ 10.1037/a0019877

Papies, E., Barsalou, L. W., & Custers, R. (2012). Mindful attention prevents mindless impulses. *Social Psychological and Personality Science*, *3*(3), 291-299. https://doi.org/10.1177/1948550611419031

Papies, E., Pronk, T., Keesman, M., & Barsalou, L. (2015). The benefits of simply observing: Mindful attention modulates the link between motivation and behavior. *Journal of Personality and Social Psychology*, *108*(1), 148-170. https://doi.org/10.1037/a0038032

Papies, E., Stroebe, W., & Aarts, H. (2008). Healthy Cognition: Processes of self-regulatory success in restrained eating. *Personality and Social Psychology Bulletin*, *34*(9), 1290-1300. https://doi.org/10.1177/0146167208320063

Park, J., Ayduk, O., & Kross, E. (2016). Stepping back to move forward: Expressive writing promotes self-distancing. *Emotion, 16*(3), 349–364. https://doi.org/10.1037/emo0000121

Park, S., Blanck, H. M., Sherry, B., Brener, N., & O'Toole, T. (2012). Factors associated with sugar-sweetened beverage intake among United States high school students. *The Journal of Nutrition*, *142*(2), 306-312. https://doi.org/10.3945/jn.111.148536

Parker, G., Parker, I., & Brotchie, H. (2006). Mood state effects of chocolate. *Journal of Affective Disorders*, *92*(2-3), 149-159. https://doi.org/10.1016/j.jad.2006.02.007

Parker, K., & Brennan, L. (2015). Measurement of disordered eating in bariatric surgery candidates: a systematic review of the literature. *Obesity Research & Clinical Practice*, *9*(1), 12-25. https://doi.org/10.1016/j.orcp.2014.01.005

Patel, A. (2003). Language, music, syntax and the brain. *Nature Neuroscience*, *6*(7), 674-681. https://doi.org/10.1038/nn1082

Paz, R., Zvielli, A., Goldstein, P., & Bernstein, A. (2017). Brief mindfulness training de-couples the anxiogenic effects of distress intolerance on reactivity to and recovery from stress among deprived smokers. *Behaviour Research and Therapy, 95*, 117-127. https://doi.org/10.1016/j.brat.2017.05.017

Péneau, S., Mekhmoukh, A., Chapelot, D., Dalix, A., Airinei, G., Hercberg, S., & Bellisle, F. (2009). Influence of environmental factors on food intake and choice of beverage during meals in teenagers: a laboratory study. *British Journal of Nutrition, 102*(12), 1854-1859. https://doi.org/10.1017/s0007114509991280

Peng, W., Kanthawala, S., Yuan, S., & Hussain, S. A. (2016). A qualitative study of user perceptions of mobile health apps. *BioMed Central Public Health*, *16*(1), 1-11. https://doi.org/10.1186/s12889-016-3808-0

Pennebaker, J. W., & Chung, C. K. (2011). *Expressive writing: Connections to physical and mental health.* In H. S. Friedman (Ed.), *Oxford library of psychology. The Oxford handbook of health psychology* (p. 417–437). Oxford University Press.

Perrin, E. M., Boone-Heinonen, J., Field, A. E., Coyne-Beasley, T., & Gordon-Larsen, P. (2010). Perception of overweight and self-esteem during adolescence. *International Journal of Eating Disorders, 43*(5), 447-454. https://doi.org/10.1002/eat.20710

Peters, J. R., Erisman, S. M., Upton, B. T., Baer, R. A., & Roemer, L. (2011). A preliminary investigation of the relationships between dispositional mindfulness and impulsivity. *Mindfulness*, *2*(4), 228-235. https://doi.org/10.1007/s12671-011-0065-2

Phelan, S. M., Burgess, D. J., Puhl, R., Dyrbye, L. N., Dovidio, J. F., Yeazel, M., ... & Burke, S. E. (2015). The adverse effect of weight stigma on the well-being of medical students with overweight or obesity: Findings from a national survey. *Journal of General Internal Medicine, 30*(9), 1251-1258. https://doi.org/10.1007/s11606-015-3266-x

Pineda, E., Sanchez-Romero, L. M., Brown, M., Jaccard, A., Jewell, J., Galea, G., ... & Breda, J. (2018). Forecasting future trends in obesity across Europe: the value of improving surveillance. *Obesity Facts, 11*(5), 360-371. https://doi.org/10.1159/000492115

Pink, A. E., Lee, M., Price, M., & Williams, C. (2019). A serial mediation model of the relationship between alexithymia and BMI: The role of negative affect, negative urgency and emotional eating. *Appetite, 133*, 270-278. https://doi.org/10.1016/j.appet.2018.11.014

Pintado-Cucarella, S., & Rodríguez-Salgado, P. (2016). Mindful eating and its relationship with body mass index, binge eating, anxiety and negative affect. *Journal of Behavior, Health & Social Issues*, *8*(2), 19-24. https://doi.org/10.1016/j.jbhsi.2016.11.003

Pliner, P., & Zec, D. (2007). Meal schemas during a preload decrease subsequent eating. *Appetite*, *48*(3), 278-288. https://doi.org/10.1016/j.appet.2006.04.009

Polivy, J., & Herman, C. P. (1985). Dieting and binging: A causal analysis. *American Psychologist, 40*(2), 193. https://doi.org/10.1037/0003-066X.40.2.193

Polivy, J., Herman, C. P., & Coelho, J. S. (2008). Caloric restriction in the presence of attractive food cues: external cues, eating, and weight. *Physiology & Behavior*, *94*(5), 729-733. https://doi.org/10.1016/j.physbeh.2008.04.010

Polivy, J., Herman, C. P., & Deo, R. (2010). Getting a bigger slice of the pie. Effects on eating and emotion in restrained and unrestrained eaters. *Appetite*, *55*(3), 426-430. https://doi.org/10.1016/j.appet.2010.07.015

Popien, A., Frayn, M., von Ranson, K. M., & Sears, C. R. (2015). Eye gaze tracking reveals heightened attention to food in adults with binge eating when viewing images of real-world scenes. *Appetite*, *91*, 233-240. https://doi.org/10.1016/j.appet.2015.04.046

Popkin, B. M. (2006). Global nutrition dynamics: the world is shifting rapidly toward a diet linked with noncommunicable diseases–. *The American Journal of Clinical Nutrition*, *84*(2), 289-298. https://doi.org/10.1093/ajcn/84.2.289

Prakash, R. S., Whitmoyer, P., Aldao, A., & Schirda, B. (2017). Mindfulness and emotion regulation in older and young adults. *Aging & Mental Health*, *21*(1), 77-87. https://doi.org/10.1080/13607863.2015.1100158

Prazak, M., Critelli, J., Martin, L., Miranda, V., Purdum, M., & Powers, C. (2011). Mindfulness and its role in physical and psychological Health. *Applied Psychology: Health and Well-Being*, *4*(1), 91-105. https://doi.org/10.1111/j.1758-0854.2011.01063.x

Puhl, R. M., & Heuer, C. A. (2010). Obesity stigma: important considerations for public health. *American Journal of Public Health*, *100*(6), 1019-1028. https://doi.org/10.2105/AJPH.2009.159491

Rahimi-Ardabili, H., Reynolds, R., Vartanian, L. R., McLeod, L. V. D., & Zwar, N. (2018). A systematic review of the efficacy of interventions that aim to increase self-compassion on nutrition habits, eating behaviours, body weight and body image. *Mindfulness*, *9*(2), 388-400. https://doi.org/10.1007/s12671-017-0804-0

Riaz, M. (2016). Snack Foods: Processing. *Encyclopaedia Of Food Grains*, 414-422. https://doi.org/10.1016/b978-0-12-394437-5.00160-1

Roballey, T. C., McGreevy, C., Rongo, R. R., Schwantes, M. L., Steger, P. J., Wininger, M. A., & Gardner, E. B. (1985). The effect of music on eating behavior. *Bulletin of the Psychonomic Society*, *23*(3), 221-222. https://doi.org/10.3758/BF03329832

Robinson M.J.F., Fischer A.M., Ahuja A., Lesser E.N., Maniates H. (2015) Roles of "Wanting" and "Liking" in Motivating Behavior: Gambling, Food, and Drug Addictions. In: Simpson E., Balsam P. (eds) Behavioral Neuroscience of Motivation. Current Topics in Behavioral Neurosciences, vol 27. Springer, Cham.

Robinson, E., & Higgs, S. (2013). Food choices in the presence of 'healthy' and 'unhealthy' eating partners. *British Journal of Nutrition, 109*(4), 765-771. https://doi.org/10.1017/s0007114512002000

Robinson, E., Fleming, A., & Higgs, S. (2014). Prompting healthier eating: Testing the use of health and social norm based messages. *Health Psychology*, *33*(9), 1057-1064. https://doi.org/10.1037/a0034213

Robinson, E., Kersbergen, I., & Higgs, S. (2014). Eating 'attentively' reduces later energy consumption in overweight and obese females. *British Journal of Nutrition*, *112*(4), 657-661. https://doi.org/10.1017/S000711451400141X

Robinson, T. E., & Berridge, K. C. (1993). The neural basis of drug craving: an incentive-sensitization theory of addiction. *Brain Research Reviews*, *18*(3), 247-291. https://doi.org/10.1016/0165-0173(93)90013-P

Robinson, T. E., & Berridge, K. C. (2003). Incentive-sensitization and drug 'wanting'. *Psychopharmacology*, *171*(3), 352-353. https://doi.org/10.1007/s00213-003-1602-z

Rodgers, R. F., Stritzke, W. G., Bui, E., Franko, D. L., & Chabrol, H. (2011). Evaluation of the French version of the Orientation Towards Chocolate Questionnaire: Chocolate-related guilt and ambivalence are associated with overweight and disordered eating. *Eating Behaviors, 12*(4), 254-260. https://doi.org/10.1016/j.eatbeh.2011.07.002

Romero, M., & Biswas, D. (2016). Healthy-left, unhealthy-right: Can displaying healthy items to the left (versus right) of unhealthy items nudge healthier choices? *Journal of Consumer Research*, *43*(1), 103-112. https://doi.org/10.1093/jcr/ucw008

Rozin, P., Bauer, R., & Catanese, D. (2003). Food and life, pleasure and worry, among American college students: Gender differences and regional similarities. *Journal of Personality and Social Psychology, 85*(1), 132. https://doi.org/10.1037/0022-3514.85.1.132

Rutters, F., Kumar, S., Higgs, S., & Humphreys, G. W. (2015). Electrophysiological evidence for enhanced representation of food stimuli in working memory. *Experimental Brain Research*, *233*(2), 519-528. https://doi.org/10.1007/s00221-014-4132-5

Salas-Salvadó, J., Guasch-Ferré, M., Lee, C. H., Estruch, R., Clish, C. B., & Ros, E. (2015). Protective effects of the Mediterranean diet on type 2 diabetes and metabolic syndrome. The *Journal of Nutrition, 146*(4), 920S-927S. https://doi.org/10.3945/jn.115.218487

Salas, X. R. (2015). The ineffectiveness and unintended consequences of the public health war on obesity. *Canadian Journal of Public Health, 106*(2), 79-81. https://doi.org/ 10.17269/cjph.106.4757

Salzberg, S. (1995). *Loving-kindness: The revolutionary art of happiness.* Boston: Shambala Publications.

Sauer-Zavala, S. E., Walsh, E. C., Eisenlohr-Moul, T. A., & Lykins, E. L. (2013). Comparing mindfulness-based intervention strategies: differential effects of sitting meditation, body scan, and mindful yoga. *Mindfulness*, *4*(4), 383-388. https://doi.org/10.1007/s12671-012-0139-9

Saunders, R. (2004). " Grazing": a high-risk behavior. *Obesity Surgery*, *14*(1), 98-102. https://doi.org/10.1381/096089204772787374

Schag, K., Teufel, M., Junne, F., Preissl, H., Hautzinger, M., Zipfel, S., & Giel, K. E. (2013). Impulsivity in binge eating disorder: food cues elicit increased reward responses and disinhibition. *Public Library of Science One*, *8*(10), e76542. https://doi.org/10.1371/journal.pone.0076542

Schaumberg, K., Anderson, D. A., Anderson, L. M., Reilly, E. E., & Gorrell, S. (2016). Dietary restraint: what's the harm? A review of the relationship between dietary restraint, weight

trajectory and the development of eating pathology. *Clinical Obesity, 6*(2), 89-100. https://doi.org/10.1111/cob.12134

Schaumberg, K., Anderson, D. A., Kirschenbaum, D. S., & Earleywine, M. (2015). Participation as a leader in immersion weight loss treatment may benefit, not harm, young adult staff members. *Clinical Obesity, 5*(4), 226-235. https://doi.org/10.1111/cob.12106

Schmeichel, B. J., Vohs, K. D., & Duke, S. C. (2011). Self-control at high and low levels of mental construal. *Social Psychological and Personality Science*, *2*(2), 182-189. https://doi.org/10.1177/1948550610385955

Schmidt, R., Lüthold, P., Kittel, R., Tetzlaff, A., & Hilbert, A. (2016). Visual attentional bias for food in adolescents with binge-eating disorder. *Journal of Psychiatric Research*, *80*, 22-29. https://doi.org/10.1016/j.jpsychires.2016.05.016

Scholey, A., & Owen, L. (2013). Effects of chocolate on cognitive function and mood: A systematic review. *Nutrition Reviews*, *71*(10), 665-681. https://doi.org/10.1111/nure.12065

Schotte, D., Cools, J., & McNally, R. (1990). Film-induced negative affect triggers overeating in restrained eaters. *Journal of Abnormal Psychology*, *99*(3), 317-320. https://doi.org/10.1037/0021-843x.99.3.317

Schur, E. A., Heckbert, S. R., & Goldberg, J. H. (2010). The association of restrained eating with weight change over time in a community-based sample of twins. *Obesity*, *18*(6), 1146-1152. https://doi.org/10.1038/oby.2009.506

Sedikides, C., & Skowronski, J. (2020). In human memory, good can be stronger than bad. *Current Directions in Psychological Science*, *29*(1), 86-91. https://doi.org/10.1177/0963721419896363

Segal, Z. V., Teasdale, J. D., Williams, J. M., & Gemar, M. C. (2002). The mindfulness-based cognitive therapy adherence scale: Inter-rater reliability, adherence to protocol and treatment distinctiveness. *Clinical Psychology & Psychotherapy*, *9*(2), 131-138. https://doi.org/10.1002/cpp.320

Seguias, L., & Tapper, K. (2018). The effect of mindful eating on subsequent intake of a high calorie snack. *Appetite*, *121*, 93-100. https://doi.org/10.1016/j.appet.2017.10.041

Shalev, I., & Bargh, J. A. (2011). Use of priming-based interventions to facilitate psychological health: Commentary on Kazdin and Blase (2011). *Perspectives on Pychological Science, 6*(5), 488-492. https://doi.org/10.1177/1745691611416993

Shapiro, S. L., Astin, J. A., Bishop, S. R., & Cordova, M. (2005). Mindfulness-based stress reduction for health care professionals: results from a randomized trial. *International Journal of Stress Management*, *12*(2), 164. 10.1037/1072-5245.12.2.164

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, *62*(3), 373-386. https://doi.org/10.1002/jclp.20237

Shennan, C., Payne, S., & Fenlon, D. (2011). What is the evidence for the use of mindfulness-based interventions in cancer care? A review. *Psycho-oncology*, *20*(7), 681-697. https://doi.org/10.1002/pon.1819

Short, M. M., Mazmanian, D., Oinonen, K., & Mushquash, C. J. (2016). Executive function and self-regulation mediate dispositional mindfulness and well-being. *Personality and Individual Differences*, *93*, 97-103. https://doi.org/10.1016/j.paid.2015.08.007

Siep, N., Roefs, A., Roebroeck, A., Havermans, R., Bonte, M., & Jansen, A. (2009). Hunger is the best spice: An fMRI study of the effects of attention, hunger and calorie content on food reward processing in the amygdala and orbitofrontal cortex. *Behavioural Brain Research*, *198*(1), 149-158. https://doi.org/10.1016/j.bbr.2008.10.035

Sifneos, P. E. (1973). The prevalence of 'alexithymic' characteristics in psychosomatic patients. *Psychotherapy and Psychosomatics, 22*(2-6), 255-262. https://doi.org/10.1159/000286529

Sirois, F. M. (2015). A self-regulation resource model of self-compassion and health behavior intentions in emerging adults. *Preventive Medicine Reports*, *2*, 218-222. https://doi.org/10.1016/j.pmedr.2015.03.006

Sirois, F. M., Kitner, R., & Hirsch, J. K. (2015). Self-compassion, affect, and health-promoting behaviors. *Health Psychology*, *34*(6), 661. http://dx.doi.org/10.1037/hea0000158

Slentz, C. A., Houmard, J. A., & Kraus, W. E. (2009). Exercise, abdominal obesity, skeletal muscle, and metabolic risk: evidence for a dose response. *Obesity, 17*(3), S27-S33. https://doi.org/10.1038/oby.2009.385

Small, M., Bailey-Davis, L., Morgan, N., & Maggs, J. (2013). Changes in eating and physical activity behaviors across seven semesters of college. *Health Education & Behavior, 40*(4), 435-441. https://doi.org/10.1177/1090198112467801

Smarandescu, L., Walker, D., & Wansink, B. (2014). Mindless drinking: How gender and BMI relate to the consumption of alcohol. *International Journal of Drug Policy*, *25*(6), 1131-1134. http://dx.doi.org/10.1016/j.drugpo.2014.08.018

Smith, B. W., Shelley, B. M., Sloan, A. L., Colleran, K., & Erickson, K. (2018). A preliminary randomized controlled trial of a mindful eating intervention for post-menopausal obese women. *Mindfulness*, *9*(3), 836-849. https://doi.org/10.1007/s12671-017-0824-9

Smith, J. M., & Alloy, L. B. (2009). A roadmap to rumination: A review of the definition, assessment, and conceptualization of this multifaceted construct. *Clinical psychology review*, *29*(2), 116-128. https://doi.org/10.1016/j.cpr.2008.10.003

Snoek, H. M., Engels, R. C., Van Strien, T., & Otten, R. (2013). Emotional, external and restrained eating behaviour and BMI trajectories in adolescence. *Appetite*, *67*, 81-87. https://doi.org/10.1016/j.appet.2013.03.014

Spanos, S., Kenda, A., & Vartanian, L. (2015). Can serving-size labels reduce the portion-size effect? A pilot study. *Eating Behaviors, 16*, 40-42. https://doi.org/10.1016/j.eatbeh.2014.10.007

Spoor, S. T., Bekker, M. H., Van Strien, T., & van Heck, G. L. (2007). Relations between negative affect, coping, and emotional eating. *Appetite, 48*(3), 368-376. https://doi.org/10.1016/j.appet.2006.10.005

Sprake, E., Lavin, J., Grabowski, P., Russell, J., Featherstone, M., & Barker, M. (2017). Eating habits associated with body weight gain in female university students. *British Food Journal, 119*(12), 2571-2582. https://doi.org/10.1108/BFJ-10-2016-0495

Steenhuis, I., & Poelman, M. (2017). Portion size: Latest developments and interventions. *Current Obesity Reports*, *6*(1), 10-17. https://doi.org/10.1007/s13679-017-0239-x

Stroebele, N., & de Castro, J. (2006). Listening to music while eating is related to increases in people's food intake and meal duration. *Appetite, 47*(3), 285-289. https://doi.org/10.1016/j.appet.2006.04.001

Stroebele, N., Ogden, L., & Hill, J. (2009). Do calorie-controlled portion sizes of snacks reduce energy intake?. *Appetite*, *52*(3), 793-796. https://doi.org/10.1016/j.appet.2009.02.015

Stunkard, A., & Messick, S. (1985). The three-factor eating questionnaire to measure dietary restraint, disinhibition and hunger. *Journal of Psychosomatic Research*, *29*(1), 71-83. https://doi.org/22-399945

Sutterlin, B., & Siegrist, M. (2015). Simply adding the word "fruit" makes sugar healthier: The misleading effect of symbolic information on the perceived healthiness of food. *Appetite*, *95*, 252-261. https://doi.org/10.1016/j.appet.2015.07.011

Swinburn, B. A., Sacks, G., Hall, K. D., McPherson, K., Finegood, D. T., Moodie, M. L., & Gortmaker, S. L. (2011). The global obesity pandemic: shaped by global drivers and local environments. *The Lancet, 378*(9793), 804-814. https://doi.org/10.1016/S0140-6736(11)60813-1

Swinburn, B. A., Sacks, G., Lo, S. K., Westerterp, K. R., Rush, E. C., Rosenbaum, M., ... & Ravussin, E. (2009). Estimating the changes in energy flux that characterize the rise in obesity prevalence. *The American Journal of Clinical Nutrition, 89*(6), 1723-1728. https://doi.org/10.3945/ajcn.2008.27061

Tak, S. R., Hendrieckx, C., Nefs, G., Nyklíček, I., Speight, J., & Pouwer, F. (2015). The association between types of eating behaviour and dispositional mindfulness in adults with diabetes. Results from Diabetes MILES. The Netherlands. *Appetite*, *87*, 288-295. https://doi.org/10.1016/j.appet.2015.01.006

Tanay, G., & Bernstein, A. (2013). State Mindfulness Scale (SMS): Development and initial validation. *Psychological Assessment*, *25*(4), 1286-1299. https://doi.org/10.1037/a0034044

Tang, Y., Ma, Y., Wang, J., Fan, Y., Feng, S., & Lu, Q. et al. (2007). Short-term meditation training improves attention and self-regulation. *Proceedings of the National Academy of Sciences*, *104*(43), 17152-17156. https://doi.org/10.1073/pnas.0707678104

Tangney, J. P., Stuewig, J., & Mashek, D. J. (2007). Moral emotions and moral behavior. *Annual Review of Psychology, 58*, 345-372. https://doi.org/10.1146/annurev.psych.56.091103.070145

Tanton, J., Dodd, L., Woodfield, L., & Mabhala, M. (2015). Eating behaviours of British university students: A cluster analysis on a neglected issue. *Advances in preventive medicine, 2015*, 1-8.

Tapper, K. (2017). Can mindfulness influence weight management related eating behaviors? If so, how?. *Clinical Psychology Review, 53*, 122-134. https://doi.org/10.1016/j.cpr.2017.03.003

Tapper, K. (2018). Mindfulness and craving: effects and mechanisms. *Clinical Psychology Review*, *59*, 101-117. https://doi.org/10.1016/j.cpr.2017.11.003

Tapper, K., & Seguias, L. (2020). The effects of mindful eating on food consumption over a half-day period. *Appetite*, *145*, 104495. https://doi.org/10.1016/j.appet.2019.104495

Tapper, K., & Turner, A. (2018). The effect of a mindfulness-based decentering strategy on chocolate craving. *Appetite*, *130*, 157-162. https://doi.org/10.1016/j.appet.2018.08.011

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. https://doi.org/10.1016/j.appet.2008.11.012

Taylor, C., Webb, T., & Sheeran, P. (2013). 'I deserve a treat!': Justifications for indulgence undermine the translation of intentions into action. *British Journal of Social Psychology*, *53*(3): 501-520. https://doi.org/10.1111/bjso.12043

Te Morenga, L., Mallard, S., & Mann, J. (2013). Dietary sugars and body weight: systematic review and meta-analyses of randomised controlled trials and cohort studies. *The BMJ*, *346*, e7492. https://doi.org/10.1136/bmj.e7492

Teixeira, R. J., & Pereira, M. G. (2015). Examining mindfulness and its relation to self-differentiation and alexithymia. *Mindfulness, 6*(1), 79-87. https://doi.org/10.1007/s12671-013-0233-7

Terry, M. L., & Leary, M. R. (2011). Self-compassion, self-regulation, and health. *Self and Identity*, *10*(3), 352-362. https://doi.org/10.1080/15298868.2011.558404

Terry, M. L., Leary, M. R., Mehta, S., & Henderson, K. (2013). Self-compassionate reactions to health threats. *Personality and Social Psychology Bulletin*, *39*(7), 911-926. https://doi.org/10.1177/0146167213488213

Thomas, J. G., Bond, D. S., Phelan, S., Hill, J. O., & Wing, R. R. (2014). Weight-loss maintenance for 10 years in the National Weight Control Registry. *American Journal of Preventive Medicine, 46*(1), 17-23. https://doi.org/10.1016/j.amepre.2013.08.019

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. https://doi.org/10.1016/j.jneb.2011.03.143

Tran, U. S., Glück, T. M., & Nader, I. W. (2013). Investigating the Five Facet Mindfulness Questionnaire (FFMQ): Construction of a short form and evidence of a two-factor higher order structure of mindfulness. *Journal of Clinical Psychology, 69*(9), 951-965. https://doi.org/10.1002/jclp.21996

Traversy, G., & Chaput, J. P. (2015). Alcohol consumption and obesity: an update. *Current Obesity Reports*, *4*(1), 122-130. https://doi.org/10.1007/s13679-014-0129-4

Tremmel, M., Gerdtham, U. G., Nilsson, P. M., & Saha, S. (2017). Economic burden of obesity: a systematic literature review. *International Journal of Environmental Research and Public Health, 14*(4), 435. https://doi.org/10.3390/ijerph14040435

Tsafou, K. E., De Ridder, D. T., van Ee, R., & Lacroix, J. P. (2016). Mindfulness and satisfaction in physical activity: A cross-sectional study in the Dutch population. *Journal of Health Psychology*, *21*(9), 1817-1827. https://doi.org/10.1177/1359105314567207

Turner, T., & Hingle, M. (2017). Evaluation of a mindfulness-based mobile app aimed at promoting awareness of weight-related behaviors in adolescents: a pilot study. *Journal of Medical Internet Research*, *6*(4), 67. https://doi.org/0.2196/resprot.6695

Vadeboncoeur, C., Townsend, N., & Foster, C. (2015). A meta-analysis of weight gain in first year university students: is freshman 15 a myth?. *BioMed Central Obesity*, *2*(1), 22. https://doi.org/10.1186/s40608-015-0051-7

van Dam, N. T., Sheppard, S. C., Forsyth, J. P., & Earleywine, M. (2011). Self-compassion is a better predictor than mindfulness of symptom severity and quality of life in mixed anxiety and depression. *Journal of Anxiety Disorders*, *25*(1), 123-130. https://doi.org/10.1016/j.janxdis.2010.08.011

van de Veer, E., van Herpen, E., & van Trijp, H. C. (2016). Body and mind: Mindfulness helps consumers to compensate for prior food intake by enhancing the responsiveness to physiological cues. *Journal of Consumer Research*, *42*(5), 783-803. https://doi.org/10.1093/jcr/ucv058

van Herpen, E., van den Broek, E., van Trijp, H. C., & Yu, T. (2016). Can a virtual supermarket bring realism into the lab? Comparing shopping behavior using virtual and pictorial store representations to behavior in a physical store. *Appetite*, *107*, 196-207. https://doi.org/10.1016/j.appet.2016.07.033

van Strien, T. (2018). Causes of emotional eating and matched treatment of obesity. *Current Diabetes Reports*, *18*(6). https://doi.org/10.1007/s11892-018-1000-x

van Strien, T., & Ouwens, M. (2003). Validation of the Dutch EDI-2 in one clinical and two nonclinical populations. *European Journal of Psychological Assessment*, *19*(1), 66. https://doi.org/10.1027/1015-5759.19.1.66

van Strien, T., & Ouwens, M. A. (2007). Effects of distress, alexithymia and impulsivity on eating. *Eating Behaviors, 8*(2), 251-257. https://doi.org/10.1016/j.eatbeh.2006.06.004

van Strien, T., Frijters, J., Bergers, G., & Defares, P. (1986). The Dutch Eating Behavior Questionnaire (DEBQ) for assessment of restrained, emotional, and external eating behavior. *International Journal of Eating Disorders*, *5*(2), 295-315. https://doi.org/10.1002/1098-108

van Strien, T., Herman, C. P., & Verheijden, M. W. (2009). Eating style, overeating, and overweight in a representative Dutch sample. Does external eating play a role?. *Appetite*, *52*(2), 380-387. https://doi.org/10.1016/j.appet.2008.11.010

van Strien, T., Herman, C. P., & Verheijden, M. W. (2012). Eating style, overeating and weight gain. A prospective 2-year follow-up study in a representative Dutch sample. *Appetite, 59*(3), 782-789. https://doi.org/10.1016/j.appet.2012.08.009

van Strien, T., Herman, C. P., Engels, R. C., Larsen, J. K., & van Leeuwe, J. F. (2007). Construct validation of the Restraint Scale in normal-weight and overweight females. *Appetite, 49*(1), 109-121. https://doi.org/10.1016/j.appet.2007.01.003

van Strien, T., Konttinen, H. M., Ouwens, M. A., van de Laar, F. A., & Winkens, L. H. (2020). Mediation of emotional and external eating between dieting and food intake or BMI gain in women. *Appetite, 145*, 104493. https://doi.org/10.1016/j.appet.2019.104493

Vermeer, W., Steenhuis, I., & Poelman, M. (2014). Small, medium, large or supersize? The development and evaluation of interventions targeted at portion size. *International Journal Of Obesity, 38*(S1), S13-S18. https://doi.org/10.1038/ijo.2014.84

Versluis, I., & Papies, E. (2015). Eating less from bigger packs: Preventing the pack size effect with diet primes. *Appetite*, *100*, 70-79. https://do.org/10.1016/j.appet.2016.02.011

Volkow, N. D., & Wise, R. A. (2005). How can drug addiction help us understand obesity?. *Nature Neuroscience*, *8*(5), 555-560. https://doi.org/10.1038/nn1452

Von Humboldt, S., Monteiro, A., & Leal, I. (2017). Validation of the PANAS: A measure of positive and negative affect for use with cross-national older adults. *Review of European Studies, 9*, 10. https://doi.org/10.5539/res.v9n2p10

Vuilleumier, P. (2005). How brains beware: Neural mechanisms of emotional attention. *Trends in Cognitive Sciences*, *9*(12), 585-594. https://doi.org/10.1016/j.tics.2005.10.011

Wagner, D. D., Boswell, R. G., Kelley, W. M., & Heatherton, T. F. (2012). Inducing negative affect increases the reward value of appetizing foods in dieters. *Journal of Cognitive Neuroscience, 24*(7), 1625-1633. https://doi.org/10.1162/jocn_a_00238

Walach, H., Buchheld, N., Buttenmüller, V., Kleinknecht, N., & Schmidt, S. (2006). Measuring mindfulness—the Freiburg mindfulness inventory (FMI). *Personality and individual differences*, *40*(8), 1543-1555. https://doi.org/10.1016/j.paid.2005.11.025

Wallis, D., & Hetherington, M. (2004). Stress and eating: The effects of ego-threat and cognitive demand on food intake in restrained and emotional eaters. *Appetite*, *43*(1), 39-46. https://doi.org/10.1016/j.appet.2004.02.001

Wanden-Berghe, R. G., Sanz-Valero, J., & Wanden-Berghe, C. (2010). The application of mindfulness to eating disorders treatment: A systematic review. *Eating disorders, 19*(1), 34-48. https://doi.org/10.1080/10640266.2011.533604

Wang, Y. C., McPherson, K., Marsh, T., Gortmaker, S. L., & Brown, M. (2011). Health and economic burden of the projected obesity trends in the USA and the UK. *The Lancet, 378*(9793), 815-825. https://doi.org/10.1016/S0140-6736(11)60814-3

Wang, Y.C., Beydoun, M. A., Liang, L., Caballero, B., & Kumanyika, S. K. (2008). Will all Americans become overweight or obese? Obesity prevalence and health care cost projections. *The Federation of American Societies for Experimental Biology Journal, 22*, 295-1. https://doi.org/10.1096/fasebj.22.1_supplement.295.1

Wansink, B. (2004). Environmental factors that increase the food intake and consumption volume of unknowing conumers. *Annual Review of Nutrition, 24*(1), 455-479. https://doi.org/10.1146/annurev.nutr.24.012003.132140

Wansink, B. (2010). From mindless eating to mindlessly eating better. *Physiology & Behavior*, *100*(5), 454-463. https://doi.org/10.1016/j.physbeh.2010.05.003

Wansink, B., & Kim, J. (2005). Bad popcorn in big buckets: portion size can influence intake as much as taste. *Journal of Nutrition Education and Behavior*, *37*(5), 242-245. https://doi.org/10.1016/S1499-4046(06)60278-9

Wansink, B., & Sobal, J. (2007). Mindless eating: The 200 daily food decisions we overlook. *Environment and Behavior*, *39*(1), 106-123. https://doi.org/10.1177/0013916506295573

Wansink, B., & van Ittersum, K. (2007). Portion size me: Downsizing our consumption norms. *Journal Of the American Dietetic Association, 107*(7), 1103-1106. https://doi.org/10.1016/j.jada.2007.05.019

Wansink, B., & van Ittersum, K. (2012). Fast food restaurant lighting and music can reduce calorie intake and increase satisfaction. *Psychological Reports, 111*(1), 228-232. https://doi.org/10.2466/01.pr0.111.4.228-232

Wansink, B., Cheney, M., & Chan, N. (2003). Exploring comfort food preferences across age and gender. *Physiology & Behaviour*, *79*(4-5), 739-747. https://doi.org/10.1016/s0031-9384(03)00203-8

Wansink, B., Just, D., & Payne, C. (2009). Mindless eating and healthy heuristics for the irrational. *American Economic Review*, *99*(2), 165-169. https://doi.org/ 10.1257/aer.99.2.165

Wansink, B., Painter, J., & North, J. (2005). Bottomless Bowls: Why visual cues of portion size may influence intake. *Obesity Research, 13(*1), 93-100. https://doi.org/10.1038/oby.2005.12

Wardle, J., & Cooke, L. (2005). The impact of obesity on psychological well-being. *Best Practice & Research Clinical Endocrinology & Metabolism*, *19*(3), 421-440. https://doi.org/10.1016/j.beem.2005.04.006

Wareham, N. J., van Sluijs, E. M., & Ekelund, U. (2005). Physical activity and obesity prevention: a review of the current evidence. *Proceedings of the Nutrition Society, 64*(2), 229-247. https://doi.org/10.1079/PNS2005423

Warren, J. M., Smith, N., & Ashwell, M. (2017). A structured literature review on the role of mindfulness, mindful eating and intuitive eating in changing eating behaviours: effectiveness and associated potential mechanisms. *Nutrition Research Reviews, 30*(2), 272-283. https://doi.org/10.1017/S0954422417000154

Watson, D., Clark, L., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality And Social Psychology*, *54*(6), 1063-1070. https://doi.org/10.1037/0022-3514.54.6.1063

Webb, J. B., & Forman, M. J. (2013). Evaluating the indirect effect of self-compassion on binge eating severity through cognitive–affective self-regulatory pathways. *Eating Behaviors*, *14*(2), 224-228. https://doi.org/10.1016/j.eatbeh.2012.12.005

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. https://doi.org/10.1037//0022-3514.53.1.5

Werner, K. H., Jazaieri, H., Goldin, P. R., Ziv, M., Heimberg, R. G., & Gross, J. J. (2012). Self-compassion and social anxiety disorder. Anxiety, *Stress & Coping, 25*(5), 543-558. https://doi.org/10.1080/10615806.2011.608842

Werthmann, J., Field, M., Roefs, A., Nederkoorn, C., & Jansen, A. (2014). Attention bias for chocolate increases chocolate consumption–an attention bias modification study. *Journal of*

Behavior Therapy and Experimental Psychiatry, *45*(1), 136-143. https://doi.org/10.1016/j.jbtep.2013.09.009

Werthmann, J., Roefs, A., Nederkoorn, C., Mogg, K., Bradley, B. P., & Jansen, A. (2011). Can (not) take my eyes off it: Attention bias for food in overweight participants. *Health Psychology*, *30*(5), 561. https://doi.org/10.1037/a0024291

Werthmann, J., Roefs, A., Nederkoorn, C., Mogg, K., Bradley, B. P., & Jansen, A. (2013). Attention bias for food is independent of restraint in healthy weight individuals—An eye tracking study. *Eating Behaviors*, *14*(3), 397-400. https://doi.org/10.1016/j.eatbeh.2013.06.005

Willem, C., Gandolphe, M. C., Roussel, M., Verkindt, H., Pattou, F., & Nandrino, J. L. (2019). Difficulties in emotion regulation and deficits in interoceptive awareness in moderate and severe obesity. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity, 24*(4), 633-644. https://doi.org/10.1007/s40519-019-00738-0

Williamson, D. A., Martin, C. K., York-Crowe, E., Anton, S. D., Redman, L. M., Han, H., & Ravussin, E. (2007). Measurement of dietary restraint: validity tests of four questionnaires. *Appetite, 48*(2), 183-192. https://doi.org/10.1016/j.appet.2006.08.066

Wilson, T. D., & Gilbert, D. T. (2008). Explaining away: A model of affective adaptation. *Perspectives on Psychological Science*, *3*(5), 370-386. https://doi.org/10.1111/j.1745-6924.2008.00085.x

Wing, R. R., & Phelan, S. (2005). Long-term weight loss maintenance. *The American Journal of Clinical Nutrition*, *82*(1), 222S-225S. https://doi.org/10.1093/ajcn/82.1.222S

Wispe, L. (1991). *The psychology of sympathy.* New York: Plenum.

Woods, A., Poliakoff, E., Lloyd, D., Kuenzel, J., Hodson, R., & Gonda, H. et al. (2011). Effect of background noise on food perception. *Food Quality and Preference*, *22*(1), 42-47. https://doi.org/10.1016/j.foodqual.2010.07.003

World Health Organisation (2003). *Promoting fruit and vegetable consumption around the world* Retrieved from https://www.who.int/dietphysicalactivity/fruit/en/

World Health Organisation (2020). *Obesity and overweight.* Retrieved from https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

Wu, S., Cai, T., & Luo, X. (2017). Validation of the Dutch eating behavior questionnaire (DEBQ) in a sample of Chinese adolescents. *Psychology, Health & Medicine, 22*(3), 282-288. https://doi.org/10.1080/13548506.2016.1173712

Yannakoulia, M., Panagiotakos, D. B., Pitsavos, C., Tsetsekou, E., Fappa, E., Papageorgiou, C., & Stefanadis, C. (2008). Eating habits in relations to anxiety symptoms among apparently healthy adults. A pattern analysis from the ATTICA Study. *Appetite, 51*(3), 519-525. https://doi.org/10.1016/j.appet.2008.04.002

Yeomans, M., & Coughlan, E. (2009). Mood-induced eating. Interactive effects of restraint and tendency to overeat. *Appetite*, *52*(2), 290-298. https://doi.org/10.1016/j.appet.2008.10.006

Young, L., & Nestle, M. (2002). The Contribution of Expanding Portion Sizes to the US Obesity Epidemic. *American Journal of Public Health*, *92*(2), 246-249. https://doi.org/10.2105/ajph.92.2.246

Young, L., & Nestle, M. (2007). Portion Sizes and Obesity: Responses of Fast-Food Companies. *Journal Of Public Health Policy*, *28*(2), 238-248. https://doi.org/10.1057/palgrave.jphp.3200127

Zamariola, G., Vlemincx, E., Corneille, O., & Luminet, O. (2018). Relationship between interoceptive accuracy, interoceptive sensibility, and alexithymia. *Personality and Individual Differences, 125*, 14-20. https://doi.org/10.1016/j.paid.2017.12.024

Zeidan, F., Johnson, S. K., Diamond, B. J., David, Z., & Goolkasian, P. (2010). Mindfulness meditation improves cognition: Evidence of brief mental training. *Consciousness and Cognition, 19*(2), 597-605. https://doi.org/10.1016/j.concog.2010.03.014

Zimmermann, F. F., Burrell, B., & Jordan, J. (2018). The acceptability and potential benefits of mindfulness-based interventions in improving psychological well-being for adults with advanced cancer: a systematic review. *Complementary Therapies in Clinical Practice*, *30*, 68-78. https://doi.org/10.1016/j.ctcp.2017.12.014

Zlatevska, N., Dubelaar, C., & Holden, S. (2014). Sizing up the effect of portion size on consumption: A meta-analytic review. *Journal of Marketing, 78(*3), 140-154. https://doi.org/10.1509/jm.12.0303

APPENDICES

Appendix A1: Published Manuscript of Chapter 7

Appendix A2: Published Manuscript of Chapter 8

Appendix A3: Published Manuscript of Chapter 9

Appendix B1: Ethics Approval Letter (from Chapter 3)

Appendix B2: Ethics Approval Letter (from Chapter 4)

Appendix B3: Ethics Approval Letter (from Chapter 5)

Appendix B4: Ethics Approval Letter (from Chapter 6 and Chapter 7)

Appendix B5: Ethics Approval Letter (from Chapter 8)

Appendix B6: Ethics Approval Letter (from Chapter 9)

Appendix C1: Mindful Construal Diary – Raisin (from Chapter 4)

Appendix C2: Mindful Construal Diary (from Chapter 5 and Chapter 6)

Appendix C3: Mindful Construal Diary – Self Kindness to the Mind (from Chapter 7)

Appendix C4: Mindful Construal Diary – Self Kindness to the Mind and Body (from Chapter 7)

Appendix C5: Mindful Construal Diary – Self-Immersed (from Chapter 8)

Appendix C6: Mindful Construal Diary – Self-Distanced (from Chapter 8)

Appendix D: Sample of Images Used During Eye-Tracking (from Chapter 4)

For information on Appendices, please contact the author.