Predictors of Early Emotional Eating: The Interaction of Parent Factors, Child Individual Differences, and Child Mood State

REBECCA ANN STONE

Doctor of Philosophy

ASTON UNIVERSITY

September 2022

Aston University

Predictors of Early Emotional Eating: The Interaction of Parent Factors, Child Individual Differences, and Child Mood State

Rebecca Ann Stone

Doctor of Philosophy

2022

Abstract

Emotional eating (EE) in children; the tendency to consume food in response to negative emotions; is associated with the development of childhood obesity. The Biopsychosocial Model suggests child EE arises from interactions between the parent, the child, and the environment. However, no research has yet examined how parent EE, parental feeding practices, and child individual differences interact to predict child EE, particularly in the context of different negative emotions. The overarching aim of this thesis was to explore these relationships during early childhood. In study 1 (N = 244) and study 2 (N = 185) parents completed an online questionnaire. Findings highlighted that the positive relationship between parent EE and child EE was fully mediated by parental emotional feeding and partially mediated by parental use of food as a reward and restriction of food. Further, medium-high child negative affect (study 1) and high child food approach (study 2) moderated these partial mediations. In study 3, 347 parent-child dyads participated in an online experiment study. There were no significant interactions between parent-reported child temperament, parental feeding practices, and child mood state in predicting the number of kilocalories children selected after a mood induction task. In study 4, using a laboratory experimental study with 119 children, children with high parentally reported negative affect, who also had parents who reported high emotional feeding, consumed significantly more kilocalories from sweet foods when experiencing boredom compared to a control group. Finally, in study 5 more objective measures of child temperament were used and children with lower motor impulsivity consumed significantly more kilocalories when experiencing boredom, compared to when experiencing sadness or a neutral mood. This thesis demonstrates that children's individual differences are key to shaping how much children eat in response to different mood states, alongside influences from parental feeding practices.

Keywords: Emotional eating. Eating behaviour. Children. Parents. Temperament. Impulsivity. Food approach. Boredom.

Dedication

To my younger self, who thought that she would never achieve.

“Don’t sell yourself short”

Acknowledgments

I cannot begin to express my thanks to my supervisor, Professor Claire Farrow, who without her unwavering support, kindness, and belief in my abilities, I'm not sure that I would have had the confidence to finish this PhD. I would also like to say a big thank you to my supervisors, Professor Jacqueline Blissett, and Professor Emma Haycraft. Thank you for your patience and guidance, you have truly helped me grow as a researcher and I will be forever grateful. It has been an absolute honour to work with you all - the 'dream team', and I owe this chapter of my life to you.

I must also thank my family and close friends who have quite frankly dealt with an antisocial demon for the last few months of this PhD. There are no words to describe how much I appreciate the unconditional love you have given me, regardless of how present I was. Mum, you are my best friend and your encouragement during this PhD has shown me just how special our bond is. I could not have done this without you, nor would I have wanted to. Dad, I'm still not convinced that you understand what I've been doing for these past three years, but I wouldn't have it any other way. You brought cheerfulness to all my dark days, and I know that Grandma is beaming with pride. Matt, you saved me from a complete spiral, and I honestly would not be at this point if you had not taken the time to protect your big sis. Your humour, light-heartedness, and obsession with sending cat/dog videos was invaluable. Jake, you have been my shoulder to cry on, my strength, and my number 1 fan. You have been by my side from undergraduate until now, and you have never let me feel like I was alone on this journey. My furry friends - Bella, Reggie, and Lottie, thank you for always being there when I needed to procrastinate, and for providing me with all the love, licks, and cuddles.

I am also so grateful for my PEAChes - where would we be without each other and café Patrón!? Nix, thank you for being my soul sister, and Kates, thank you for being my motivation.

Many thanks to the parents and children that have participated in this research. This thesis would not exist without their participation.

Finally, I would like to thank my research assistants, Priya, and Darshil, who made testing such an enjoyable experience. You two are my chicken and cheese super stars.

Table of contents

List of abbreviations

BMI	Body mass index
CEBQ	Children's Eating Behaviour Questionnaire
CBQ-VSF	Children's Behaviour Questionnaire – Very Short Form
CFPQ	Comprehensive Feeding Practices Questionnaire
DEBQ	Dutch Eating Behaviour Questionnaire
EE	Emotional eating
SSS	MacArthur's Scale of Subjective Social Status

List of tables

CHAPTER 2

CHAPTER 3

CHAPTER 4

CHAPTER 5

CHAPTER 6

List of figures

Publications and presentations derived from this thesis

Peer-reviewed publications

Stone, R. A., Haycraft, E., Blissett, J., & Farrow, C. (2022). Preschool-Aged Children's Food Approach Tendencies Interact with Food Parenting Practices and Maternal Emotional Eating to Predict Children's Emotional Eating in a Cross-Sectional Analysis. *Journal of the Academy of Nutrition and Dietetics*, *122*(8), 1465–1473. https://doi.org/10.1016/j.jand.2022.02.001

Stone, R. A., Blissett, J., Haycraft, E., & Farrow, C. (2022). Predicting preschool children's emotional eating: The role of parents' emotional eating, feeding practices and child temperament. *Maternal & Child Nutrition*, *18*(3). https://doi.org/10.1111/mcn.13341

In preparation

Stone, R. A., Blissett, J., Haycraft, E., & Farrow, C. (in preparation). Emotional eating following an online mood induction; the interaction between parental feeding practices and child temperament.

Stone, R. A., Haycraft, E., Blissett, J., & Farrow, C. (in preparation). Emotional eating following a laboratory mood induction: the interaction between parental feeding practices and child temperament.

Stone, R. A., Blissett, J., Haycraft, E., & Farrow, C. (in preparation). Does mood state moderate the relationship between behavioural measures of children's impulsivity and kilocalorie consumption?

Published conference abstracts

Stone, R. A., Farrow, C., Blissett, J., & Haycraft, E. (2022). Boredom-induced emotional eating in children aged 6-9-years. *Appetite*, 106253.

Stone, R. A., Blissett, J., Haycraft, E., & Farrow, C. (2021). The role of child temperament, parental feeding practices and parent emotional eating in predicting emotional eating in children aged 3-5y. *Appetite*, *169*, 105563.

Stone, R. A., Blissett, J., Haycraft, E., & Farrow, C. (2020). Parent and Child Predictors of Emotional Eating in Children Aged 3-5 years. *Appetite*, *157*, 104936.

Conference poster presentations

Stone, R. A., Farrow, C., Blissett, J., & Haycraft, E. (2022). Boredom-induced emotional eating in children aged 6-9-years. Poster Presentation. British Food and Drinking Group Annual Conference 2022, Online.

Stone, R. A., Blissett, J., Haycraft, E., & Farrow, C. (2021). The role of child temperament, parental feeding practices and parent emotional eating in predicting emotional eating in children aged 3-5-years. Poster Presentation. British Food and Drinking Group Annual Conference 2021, Online.

Oral presentations

Stone, R. A., Blissett, J., Haycraft, E., & Farrow, C. (2022). Preschool children's boredom-induced emotional eating in a laboratory setting. Oral presentation for Edulia Final Conference. Florence, Italy.

Stone, R. A., Farrow, C., Blissett, J., & Haycraft, E. (2021). Early Emotional Eating: An Online Experimental Study. Oral presentation for the Loughborough University Centre for Research into Eating Disorders and Behaviours Research Group. Loughborough University, UK.

Stone, R. A., Haycraft, E., Farrow, C., & Blissett, J. (2019). The Moderating Effect of Child Factors on the Impact of Parent Factors on Child Emotional Eating. Oral presentation for the Psychology of Eating in Adults and Children Research Group. Aston University, UK.

CHAPTER 1:

Introduction and literature review

1.1 Introduction

This literature review will discuss how children's eating behaviours, specifically emotional eating (EE), develop and may contribute to overweight and obesity in children. The review will detail the potential predictors of child EE and will discuss how these predictors may interact to shape child EE. Following this, the literature review will conclude with the aims of the thesis and the research questions that are to be addressed in each Chapter.

1.2 Obesity epidemiology

The adverse consequences of obesity are well documented, for example there is an increased risk for non-communicable diseases such as cardiovascular disease (e.g., Lewarne, 2022), some cancers (e.g., colon; Wolin et al., 2010), diabetes (e.g., Boles et al., 2017), and premature death (e.g., Smith et al., 2020) in adulthood. Obesity is a global critical health concern that can be observed in children and tracked into adulthood. The World Health Organisation (WHO) has provided evidence to suggest that the number of people worldwide living with obesity has tripled since 1975 (WHO, 2021). Body Mass Index (BMI), which is an index of weight to height, is the usual measurement of overweight and obesity in adults. Indices are categorised such that overweight is a BMI score of greater than or equal to 25 and obesity is a BMI score of greater than or equal to 30. In 2016, adults (age 18 and above) with overweight reflected approximately 39% of the worldwide population, while adults with obesity reflected approximately 13% of the worldwide population (WHO, 2021). Worryingly, the prevalence of obesity in children worldwide is also high. The typical measurement of childhood obesity is different from that used with adults because BMI does not account for a child's growth and development. Instead, BMI z-scores are utilised because they reflect a child's weight and height standardised for their age and sex (Child Growth Foundation, 1996; WHO, 2007). Among children and adolescents (aged 5-19-years), the prevalence of obesity worldwide has risen similarly for both boys and girls, from 4% in 1975 to over 18% in 2016 (WHO, 2021).

Taking a closer look at England's obesity statistics, the Health Survey for England (2019) reported that 36% of adults had overweight and 28% had obesity. In children, the National Child Measurement Programme 2020/2021 (NCMP) has reported that 13% of children in England aged 4-5-years had overweight and a further 14% had obesity. The prevalence of overweight and obesity increases as children progress through school and by the time children leave primary school in year 6, 26% are living with overweight and 15% are

living with obesity (Commons Library Research Briefing, 2022). It is important to support children with developing healthy eating habits from the early years because eating behaviours established during childhood often track into adulthood (Movassagh et al., 2017) and children who have obesity during childhood are five times more likely to have obesity in adulthood compared with children who maintain a healthy weight (Simmonds et al., 2016). Understanding the behavioural factors that predict overweight and obesity in childhood is important to potentially mitigate the later risk of adult obesity and its associated comorbidities.

In addition to the risk for obesity continuing into adulthood, obesity in childhood has also been found to have a profound impact on children's social and emotional experiences during childhood. Indeed, children as young as 3-years-old with obesity have been found to experience social marginalisation, stigmatisation, and discrimination because of their weight (Budd & Hayman, 2008). For instance, children with obesity tend to experience greater incidences of weight-related teasing and bullying from peers than children with healthy weight (Cheng et al., 2022). There are greater incidences of social rejection and isolation towards children with obesity (Harrison et al., 2016), for example, in a laboratory study of children aged 4-8-years, children with healthy weight indicated that they were less likely to help their peers pick up toys if their peer had overweight (Patel & Holub, 2012). In addition, those children with healthy weight were also asked to indicate who they would choose to have as a best friend. Those children with overweight were chosen less often as a best friend in comparison to children with healthy weight. Children with obesity have also been found to participate less in physical activity because they are slower and may experience shortness of breath (Niehoff, 2009). Lack of participation in physical activity not only maintains a heavier weight, but also restricts children's involvement with peers and may exacerbate the experience of social marginalisation (Sahoo et al., 2016). Indeed, children with obesity are reported to have lower quality of life, lower self-esteem, and greater incidences of depression (e.g., Ercan et al., 2020; Rankin et al., 2016). Therefore, it is imperative that the predictors of childhood obesity are identified so that they can be reduced, not only lowering the risk for obesity in adulthood but also the associated social consequences of obesity during childhood.

1.3 Children's eating behaviour

Children's eating behaviours have been conceptualised as '*food approach'* and '*food avoidance*' (Vandeweghe et al., 2016) and these behaviours are often measured using the Children's Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001). Typically, food approach behaviours are defined by children showing *food responsiveness* – a tendency to

respond to food cues in the environment, *desire to drink* – children wanting to drink frequently, *emotional over-eating* – overeating food in response to negative emotions (discussed later in section 1.4), and *enjoyment of food* – pleasure derived from eating (Vandeweghe et al., 2016). Conversely, food avoidance behaviours are defined by children exhibiting *satiety responsiveness* – ability to regulate in response to cues of fullness, *slowness in eating* – eating meals and foods slowly, *emotional under-eating* – eating less in response to negative emotions, and *food fussiness* – reluctance to try new foods or consume a varied diet. In children with obesity, the frequency of food avoidance behaviours is often significantly lower than in children with a healthy weight, whereas children with obesity are commonly found to display significantly greater food approach behaviours compared to children with healthy weight (Ayine et al., 2021). This suggests that food approach behaviours are obesogenic, because they result in more kilocalories consumed compared to kilocalories utilised (Karnik & Kanekar, 2012).

Longitudinal research with children has suggested that there are bidirectional relationships between emotional over-eating (a facet of food approach) and higher BMI from the ages of 4-years to 10-years (Derks et al., 2018), but that other food approach behaviours such as food responsiveness appear to be a consequence of having a higher BMI. Similarly, Warkentin et al. (2022) reported that higher fat mass and waist-to-height ratio as measured using tetrapolar bioelectrical impedance at 7-years-old predicted greater parent-reported child food approach behaviour, including enjoyment of food, food responsiveness, desire to drink, and emotional overeating at 10-years. However, importantly, this study did not include objective measures of child food intake or eating behaviour and instead relied on parental report of child appetite traits, which may be subject to bias. Collectively these findings suggest that food approach behaviours are important for understanding how child overweight and obesity both develops and persists, and that further research is needed to understand the development of food approach in particular. It may be particularly important to explore how child emotional overeating develops because this facet of food approach is relatively unexplored, appears to be most strongly related to environmental influences, and is associated with the development of non-communicable diseases in later life (all discussed in section 1.4).

1.4 Child emotional eating

EE is defined as overeating (EOE) or under-eating (EUE), irrespective of satiety, and in response to emotional states (Braet & Van Strien, 1997). EE in children commonly occurs in response to negative emotions such as sadness, anger, and boredom (Macht, 2008). EUE is not explored in this thesis because it is not considered an obesogenic eating behaviour;

rather, EUE is a facet of food avoidance, which is commonly associated with lower BMI (Jansen et al., 2012). For the duration of this thesis, unless stated otherwise, EE refers to overeating in response to negative emotions. EE is common and has been reported by 27% of parents of 5-year-old children (Carper et al., 2000) and 25% of parents of children aged 7–12-year-olds (van Strien & Oosterveld, 2008). EE can develop early, often in the preschool years (Herle et al., 2018), and is typically stable across childhood (Ashcroft et al., 2008). Children who emotionally eat often consume foods that are dense in energy (i.e., high in sugar and fat) (Nguyen-Michel et al., 2007), and this is believed to be a result of palatable food's ability to stimulate hedonic pleasure, thereby reducing the experience of negative emotions (Freitas et al., 2018). EE has been found to be highly dependent on a child's environment as heritability estimates of EE are negligible (Herle et al., 2018). This suggests that EE is not biologically determined and can perhaps be mitigated. The potential consequences of exhibiting EE include associations with poorer mental health outcomes in later life (e.g., Bulimia Nervosa; Ferrer-Garcia et al., 2017, Binge Eating Disorder; Kim et al., 2018, depression; Konttinen et al., 2019) and weight gain (e.g., Gibson, 2012). Therefore, as the expression of EE appears in early life (Herle et al., 2018) and is evidenced in adulthood (van Strien, 2018), understanding the drivers of child EE is essential for mitigating the development of this eating behaviour and avoiding its long-term consequences.

EE has been measured in children as young as 2-years-old using parent-report questionnaires (Haycraft & Blissett, 2012). One of the main functions of parent-report questionnaires is to provide insight into young children's eating behaviour as they lack the capacity to self-report (Varni et al., 2007). As previously described, the parent-report measure most commonly used to assess EOE is the CEBQ (Wardle et al., 2001). Despite the popularity of the CEBQ in child EE studies, findings are not always reliable as parents are used as a proxy to report on their child's eating behaviour. Parental reports of their child's eating behaviours may be confounded by their own eating behaviour, which may result in heightened attention towards their child's eating behaviour (Blissett et al., 2019). Parents' assessment of their child's eating may also be influenced by social desirability where answers given may be biased to not reflect negatively on themselves as parents (Bornstein et al., 2015). Despite these limitations the CEBQ has good internal reliability (Wardle et al., 2001) and has successfully captured eating behaviours that have been tracked across childhood (Ashcroft et al., 2008). The CEBQ is suitable for use with children and has since been adapted to measure infant's appetitive traits (with the Baby Eating Behaviour Questionnaire (BEBQ; Llewellyn et al., 2011)) and adult's appetitive traits (using the Adult Eating Behaviour Questionnaire (AEBQ; Hunot et al., 2016)).

Using experimental studies to assess child EE is one way to overcome some of the potential limitations of parent-reports. However, experimental studies that capture EE in children are rare. The lack of experimental research likely reflects the associated costs, effort, and time needed to conduct experimental research with children, alongside the complex ethical challenges of conducting studies that involve emotional manipulation in children. There have been three studies over the last decade that have begun to use experimental methods to explore EE in non-clinical samples of children (Blissett et al., 2010; Farrow et al., 2015; Tan & Holub, 2018), which are described in depth in section 1.8.2. These studies have been successful at inducing EE and have started to capture the factors associated with a higher prevalence of EE and contribute towards advancing theoretical understanding about the development of EE. Before considering the theoretical models and research evidence about what makes children more or less likely to develop EE, it is first important to consider how children's emotion regulation strategies develop.

1.5 Development of self-regulation of emotions

Emotion regulation reflects an individual's ability to monitor, evaluate, or modify reactions in response to emotions (Gross & Thompson, 2007). It is widely agreed that the ability to manage emotions is important in terms of emotional competency (Salovey & Sluyter, 1997). For example, reactions to emotions can be advantageous to an individual (Gross et al., 2006), or be inappropriate and impede functional fit within society (Koole, 2009). The main principle of EE is consuming food in response to negative emotions, suggesting that children who exhibit high EE are unable to select a more appropriate emotion regulation strategy in response to negative emotions other than eating. This supposition supports the Affect Regulation Model where EE is framed as a maladaptive coping strategy (Spoor et al., 2007).

Children's ability to regulate emotions appears to have a temperamental basis. The facet of temperament known as 'effortful control' (defined as children's ability to inhibit behavioural responses and use attentional resources; Rothbart & Bates, 2007) reflects a child's ability to self-regulate emotion, which is the opposite to the facet of temperament known as 'negative affect', which can be defined by heightened experiences of negative emotions without resolve (Rothbart & Bates, 2007). In early life, most infant experiences of emotions are regulated by their primary caregivers as their effortful control is still developing (Kopp, 1989). However, there are incidences of basic regulatory abilities in infants in the form of redirecting attention and self-soothing behaviours, such as thumb sucking to reduce negative affect (Rothbart & Sheese, 2007). Indeed, as children age, their development and ability to self-regulate emotions improves. For example, effortful control and executive

functioning increase with age, accompanied by motor developments which allow children to adjust their gaze and attention, for example, to turn away from something distressing (Rothbart et al., 1992). There are individual differences in children's temperament and self-regulation and these differences have been correlated with the prevalence of EE. For example, Harrist et al. (2013) found that in non-clinical school children, when there were increases in EE across the duration of a school year (where children were between 7 to 8-years-old), these were predicted by increases in children's reactivity to anger and worry across the school year, indicating less healthy emotion regulation. Therefore, it is likely that children's inability to self-regulate emotions, in part, increases their risk of developing EE (for a thorough discussion of temperament and child EE, see section 1.9.2).

In addition to the contribution of a child's developing temperament and effortful control, caregivers can shape the development of children's emotion-regulation through their parenting practices and responses to children's emotional reactions. Children acquire regulatory abilities from interactions with their caregivers (e.g., Eisenberg et al., 2010; Morris et al., 2007) and parents who are warm and responsive to their child's emotions are more likely to have children with lower negativity and better regulatory capacities (e.g., Russell et al., 2016; Spinrad et al., 2007), although of course this relationship is likely bidirectional with children who are less negative eliciting more warm interactions with their caregivers. In relation to children's eating behaviour, greater parental use of emotional feeding practices may foster poorer emotion regulation abilities in children (e.g., providing food to sooth a child) rather than fostering more appropriate responses to distress, which may undermine a child's ability to self-regulate their own emotions (Blissett et al., 2010) (for a thorough discussion of parental feeding practices and child EE, see section 1.8.2). In addition to learning through parenting practices, children may also learn through modelling behaviour. Parents are trusted authority figures (Savage, 2007), and if parents model emotion dysregulation to their children, their children may be more likely to imitate or assimilate this behaviour.

1.6 Theories of emotional eating

Several theories/models have used biological, psychological, and social factors to understand the mechanisms that shape the development of child EE. These include the Leptin Resistance Theory (Michels et al., 2017), the Psychosomatic Theory (Kaplan & Kaplan, 1957), Escape Theory (Heatherton & Baumeister, 1991), and the Biopsychosocial Model (Russell & Russell, 2018).

1.6.1 Leptin Resistance Theory

According to biological theories of EE, eating in response to negative emotions is abnormal. The typical stress response to acutely high-stress environments is the release of the hormone, cortisol. Cortisol inhibits appetite through the release of another hormone, leptin (Yau & Potenza, 2013). Leptin is an anorexigenic hormone that acts on the hypothalamus to inhibit hunger and induce satiety (Margetic et al., 2002). When exposure to emotional stimuli is prolonged, appetitive behaviour is unlike that of acute stress and, instead, appetite increases (Yau & Potenza, 2013). One suggestion for this overeating is the prolonged 'wear-and-tear' of the regulatory system from cortisol, known as 'allostatic load' (McEwen, 2005). Allostatic load is thought to give rise to biological changes that reduce the adaptability of the typical stress response (McEwen, 2004). Such biological changes include leptin resistance, where prolonged flooding of leptin (from exposure to high-stress environments) down-regulates and desensitizes cellular responses to leptin, which in turn increases, rather than decreases, food intake (Zhou & Rui, 2013). Most literature exploring the biological relationship between stress and EE has been conducted with adult samples, however recently child studies have been carried out. For example, in a cross-sectional study, Michels et al. (2017) found that in girls aged between 7-12-years-old, leptin acted as a moderator of the effects of stress on EE. Specifically, when stress was high, EE was highest in those with high leptin. This suggests that in girls, high stress increases the release of leptin, which may decrease leptin sensitivity, which then promotes high EE as these girls are leptin resistant meaning that they are not sensitive to the anorexigenic effect of high leptin. Indeed, this suggests that exposure to high stress environments could precipitate overweight and obesity by increasing leptin repeatedly, contributing to leptin resistance and overweight/obesity over time (Tomiyama, 2019). Indeed, this interpretation also lends itself to literature that has failed to find evidence of EE in very young children (Herle et al., 2018). As children age, they experience more incidences of stress. With age, this aggregated experience of stress may promote frequent leptin release and thus the potential for leptin resistance and overeating.

1.6.2 Psychosomatic Theory

Conversely, the Psychosomatic Theory (Kaplan & Kaplan, 1957) reflects a more psychological and social theory of EE. The Psychosomatic Theory draws upon concepts from classical conditioning where learning is considered a prerequisite to EE. Specifically, the theory posits that individuals with obesity have not learned to distinguish successfully between the arousal caused by hunger and negative emotion. Therefore, if children have parents who use palatable food as a form of emotion regulation during situations of distress, children may learn to associate feelings of distress with the consumption of palatable foods, leading to future EE. Indeed, children may continue to choose to consume palatable foods

because they have developed a habit, especially since consuming food reduces negative affect and thus may be reinforcing.

In support of this theory, Bongers and Jansen (2017) conducted a conditioning study with 47 female undergraduate students. Over 10 conditioning trials, music, text, film, memory, and pictures were used to evoke negative and neutral mood for 3-minutes each. Half of the sample was conditioned to eat chocolate during negative emotional states and not eat chocolate when in a neutral state (i.e., they were given chocolate when watching a sad film clip/ they were not given chocolate when watching a neutral film clip), and the rest of the sample was conditioned to eat chocolate during a neutral emotional state, and not to eat chocolate when in a negative emotional state (i.e., they were given chocolate when watching a neutral film clip/ they were not given chocolate when watching a sad film clip). Participants then listened to a sad song and were given the option of consuming chocolate or receiving two euros. Findings suggested that 86% of those conditioned to eat chocolate when in a negative emotional state chose chocolate over money, compared to 56% of those conditioned to eat chocolate when in a neutral emotional state. Importantly however, this general main effect of conditioning disappeared when BMI was controlled for. Instead, BMI was explored in interaction with conditioning, and it was reported that those with high BMI (i.e., +1SD mean = BMI of 23) who were conditioned to eat chocolate during a negative mood state, were trend significantly (p = .07) more likely to choose chocolate after listening to a sad song than those with high BMI who were conditioned to eat chocolate during a neutral mood state. These findings suggest that EE may arise out of classical conditioning between negative emotions and food intake, but that there is likely individual susceptibility to this learning, and that those with higher body weights are most likely to make this association.

In a similar vein, Passarelli et al. (2022) reported that eating activity words (e.g., eat, devour, consume, chew) could be paired with positive affective words (e.g., pleasurable, agreeable, good, happy) to induce preingestive salivation. To do this, a sample of satiated students had their salivary volume measured pre-conditioning using dental roll that had been in their mouth for 1-minute. Participants were then asked to provide explicit evaluations of 10 eating activities (e.g., “how much would you like to *eat* right now?”) on a 10-point visual analogue scale (1 = not at all, 10 = very much). They then participated in conditioning trials where eating activity words (e.g., eat, devour, consume, chew) or neutral words (e.g., elevator, grey, pencil, window) were paired with positive affective words (e.g., pleasurable, agreeable, good, happy). After conditioning, participants completed the same explicit evaluations again and had their salivary volume remeasured. Findings revealed that preingestive salivation (a prerequisite to consumption; Nederkoorn et al., 2000) was

significantly higher when eating activity words (e.g., eat) were paired with positive affective words (e.g., happy) than when eating activity words were paired with neutral words (e.g., pencil). This suggests that EE in response to positive emotions could be attributed to repeated pairing between eating activity words and positive affective words supporting learning theories of EE. However, this study was in relation to positive affect, not negative affect, and to eating activity words rather than actual eating. Future research would need to confirm whether it is possible to condition eating related words with negative affect information to induce preingestive salivation, although this would of course be ethically contentious and could heighten EE in participants. Additionally, future research is needed to ascertain whether actual food consumption can be paired with affect words, rather than food words.

1.6.3 Escape Theory

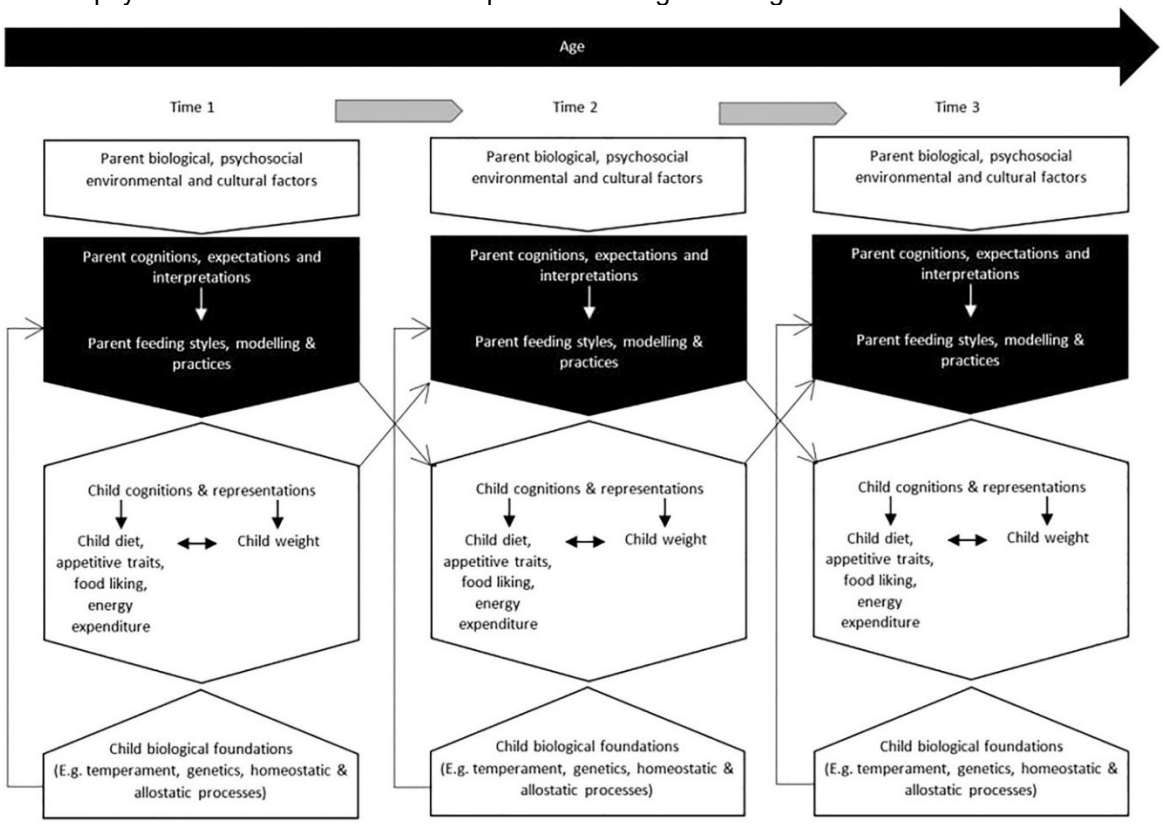
The Escape Theory draws upon operant learning and theorises that EE is a behavioural representation of 'escaping' the experience that negative emotions induce and avoiding aversive self-awareness (Heatherton & Baumeister, 1991). Support for this theory comes from qualitative research into the phenomenology of young adults with high EE tendencies (Shireen et al., 2022). During interviews, these adults with high EE suggested that they consumed food to regulate their emotions as food helped them to escape any negative feelings associated with negative emotions. Indeed, consuming food to 'escape' from negative emotions appears to decrease distress. It is suggested that palatable foods reduce distress because they stimulate hedonic pleasure, which provides comfort from experiencing negative emotions, an experience often described as "comfort eating" (van Strien et al., 2019). During future episodes of negative affect, individuals may choose to eat food in response because this has provided a positive and comforting effect previously.

1.6.4 Biopsychosocial Model

More recently the Biopsychosocial Model of the development of eating and weight in children was developed by Russell and Russell (2018) (see Figure 1.1); a model providing a more holistic understanding of how EE develops. This model assimilates influences from the parent, the child, and the environment to predict children's appetitive traits. It is a model of food approach behaviours generally but can be applied to EE. Specifically, influences from the parent include biological factors (such as temperament and genetics), and parenting behaviours (such as parental feeding practices and modelling of other behaviours). In terms of the child, children's biological foundations including temperament and genetics, alongside child weight, are believed to predict appetitive traits. These biological foundations are assumed to influence children's appetitive traits, but they are also assumed to influence

parents' behaviour through the feeding practices parents employ. The model operates using both unidirectional (where the parent influences the child or the child influences the parent) and bidirectional relationships (reciprocal relationships between the child and the parent). The model depicts how, over time, the relationships between parent and child continue but can also be transactional where what happens at time point 1 affects time point 2, which then affects time point 3. This model is advantageous as it incorporates developmental processes interacting with biological factors and this is likely reflective of the complexity of children's eating behaviour, since previous research reports that many different factors contribute to the development of child EE (see further details in sections 1.8, 1.9, and 1.11). It is for these reasons that the Biopsychosocial Model is proposed to account for the findings in the current thesis.

Figure 1.1
The Biopsychosocial Model of the development of eating and weight in children.



Note. Reprinted from "Biological and Psychosocial Processes in the Development of Children's Appetitive Traits: Insights from Developmental Theory and Research", by Russell, C., & Russell, A., 2018, *Nutrients*, *10*(6), p. 696. Licensed under CC BY 4.0.

The remainder of this literature review will discuss elements of the Biopsychosocial Model that have been associated with child EE (e.g., home food environment, parental EE, parental feeding practices, child food approach, and child temperament and impulsivity) and will extend this to explore evidence relating to the influence of differences in a child's mood state on child EE. The factors included in this review are not exhaustive as it is acknowledged there are other factors within the Biopsychosocial Model that are related to child EE (e.g., cultural factors), however these are outside the scope of this thesis.

1.7 The home food environment and child emotional eating

Wider influences from the social context have been shown to shape children's dietary intake and eating behaviour. Changes in the global food system have resulted in greater availability and accessibility of highly palatable foods (i.e., foods high in fats and sugar) (Dohle et al., 2018). Termed the 'Western diet', this diet appears to be driving the obesity pandemic (Swinburn et al., 2011). If parents provide a physical home food environment that is highly obesogenic, this environment has been found to facilitate children's preferences for highly palatable foods and promote their consumption (Birch, 1999). Indeed, in a study with preschool children, unhealthy food availability at home was significantly associated with

children's unhealthy snacking behaviour (Jang et al., 2021). Additionally, when socioeconomic status and weight status were controlled for, home food availability of unhealthy foods significantly predicted children's intake of these foods (Boles et al., 2019). This suggests that the availability of obesogenic food items in the home plays an important role in children's dietary intake.

Similarly, how parents construct their home food environments can determine what, when, and how much children eat during times of emotional distress. In a qualitative study that examined the experience of the COVID-19 lockdown, parents reported that their children consumed more sugary drinks and snacks when they were feeling bored as a result of being given unrestricted access to these foods in the home (Sylvetsky et al., 2022). Therefore, when children are given the opportunity to access unhealthy foods at home, they may be more likely to do so when emotionally aroused. This highlights the importance of considering the role of food accessibility in children's EE. Concerningly, in home food environments that are abundant with foods from the Western diet, children's consumption of fruit and vegetables is reportedly lower (Oddy et al., 2009; Schrempft et al., 2015). Indeed, the psychological consequences of consuming diets low in fruit and vegetables has been linked to lower well-being in adults (Tuck et al., 2019), and poorer mental health in children (O'Neil et al., 2014). Therefore, it is also possible that this poorer mental health and poorer well-being may also promote the overconsumption of palatable foods in the home due to the comforting effects of these foods (van Strien et al., 2019).

In addition to considering what foods children are eating, it is also important to consider *how* parents provide children with foods. Indeed, the feeding practices that parents use with their children have been shown to be important sociocultural factors that shape the development of children's eating behaviours, including their EE, as has parental engagement in EE themselves.

1.8 Parent factors linked to child emotional eating

Parents and primary caregivers are considered the primary agents of socialisation and exert a significant influence over their children's development in a range of areas (Savage et al., 2007). Throughout this thesis, the term 'parent' will be used for brevity to refer to both parents and primary caregivers.

As young children have little autonomy over their food choices (e.g., Ogden & Roy-Stanley, 2020), it falls upon parents to determine what foods are available and accessible to young children. How a parent uses food, be it through how they consume food themselves or through the feeding practices that they use, can ultimately shape the relationships that children develop with food (e.g., Blissett et al., 2010). The role of the parent is particularly

important when considering the predictors of child EE as although previous research has found high heritability estimates for food approach behaviours in children (such as enjoyment of food: 75%, Carnell et al., 2008), the heritability for EE in childhood has been found to be negligible (10% at 16-months-old and 4% at 5-years-old; Herle et al., 2018). Therefore, it seems that genetics are less important in the expression of child EE and exploring how the home environment promotes child EE (through parent factors) is a fruitful avenue for future research.

1.8.1 Parent emotional eating

Rooted within the Social Learning Theory (Bandura, 1977), young children are impressionable and seek guidance from authority figures (Savage et al., 2007). Therefore, parents may demonstrate eating behaviours that are subsequently 'modelled '(i.e., imitated) by their child. Parental modelling can be advantageous as healthy food acceptance and healthy weight can be promoted (Duffy et al., 2020). However, the reverse is also true where intake of unhealthy foods and weight gain can be exacerbated by children modelling unhealthy parental eating. This has been demonstrated qualitatively where observations of what parents consume predicted the food choices made by children aged 9-10-years-old (Ogden & Roy-Stanley, 2020). Given this, children might exhibit EE if their parents consume food to alleviate negative emotions. Through observation, a child may internalise and replicate parental dependence on food for emotion regulation in future situations. In a longitudinal study of mothers of 5-12-year-old girls, mothers who scored high on self-reported EE at time point 1 had daughters who more frequently emotionally ate 10 months later (at time point 2) (Zarychta et al., 2019). Although this study does suggest that modelling has occurred, the study did not explore potential mediators of the parent-child EE relationship, such as parental feeding practices, which may help to explain how parent EE and child EE are related. Tan and Holub (2015) addressed this limitation and found that parental EE with children aged 5-9-years predicted parentally reported child EE through parents' use of emotional feeding (using food to soothe a child's emotions, discussed in section 1.8.2). As feeding practices that use food to regulate children's emotions tend to use energy-dense foods (Raaijmakers et al., 2014), it is likely that this behaviour relates to child EE and also to greater risk of weight gain for children.

1.8.2 Parental feeding practices

Previous research has suggested that certain parental feeding practices can be related to the expression of child EE. This is thought to be because some feeding practices may unintentionally 'teach' children to eat for reasons other than hunger (e.g., Farrow et al., 2015; Herle et al., 2018; Zarychta et al., 2019). These feeding practices include parental use

of *food for emotion regulation, food as a reward,* and *food restriction*. In this thesis, these feeding practices are generally referred to collectively as '*non-responsive feeding practices'*. However, the published work presented in Chapters 2 and 3 also use the term *'controlling feeding'* to describe these feeding practices.

Taken individually, when parents use *food for emotion regulation* (e.g., giving a child food – often palatable and high calorie - because the child is upset), this may teach the child that eating such food is an appropriate way to deal with emotional distress. Through repeated experience of being given food in response to emotional arousal, children may become conditioned to eat in response to negative emotions. Questionnaire research concerning parental reports of their feeding practices is abundant and has found that emotional feeding is a significant predictor of greater child EE (e.g., Braden et al., 2014; Powell et al., 2017; Rodgers et al., 2013; Steinsbekk et al., 2018; Tan & Holub, 2015). In fact, Braden et al. (2014) reported that parent self-reported use of food for emotion regulation was associated with greater parent-report child EE significantly more than other variables such as maternal psychopathology and other non-responsive feeding practices. Similarly, Steinsbekk et al. (2018) extended Braden et al.'s (2014) work to examine the longitudinal impact of using food for emotion regulation. The study tracked a large sample of children from the age of 4 who were followed up at 6, 8, and 10 years old (TP1 *n* = 997, TP2 *n* = 795, TP3 *n* = 699, TP4 *n* = 702). Adjusting for BMI at each age and accounting for initial levels of EE and emotional feeding in the analysis, parental reports of frequent use of emotional feeding with children at 6 and 8 years was prospectively predictive of parent-reported child EE at 8 and 10 years. This provides convincing evidence to suggest that emotional feeding can have long-term consequences for children's eating behaviour.

In parentally reported questionnaire studies, parental *use of food as a reward* has also been explored in relation to child EE. With this feeding practice, food is used as a reward for a certain behaviour (e.g., offering sweets to a child as a reward for good behaviour). Research has found that parental reports of using greater food as a reward are associated with greater parent-reported EE in preschool children (Powell et al., 2017). Interestingly, the relationship identified was partially mediated by child self-regulation in eating. Specifically, increased use of food as a reward predicted decreased child self-regulation in eating, which then predicted greater child EE. Mechanistically, depletions in children's ability to regulate their own hunger and satiety may begin to explain how using food as a reward predicts subsequent child EE. The consequences of controlling a child's food intake through the provision of food as a reward may act counterproductively to teach children to learn to anticipate, or turn to, high calorie foods as rewards, even in the absence of hunger. Such associations decrease children's ability to regulate their own hunger and

satiety. Recently, a meta-analysis assessed the longitudinal relationships between parental use of non-responsive feeding practices (i.e., use of food as a reward, pressure to eat, food restriction, and emotional feeding) and children's eating behaviour (Wang et al., 2022). Fourteen longitudinal studies were identified and from these there were 19 statistically significant longitudinal effects of parental use of non-responsive feeding on children's eating behaviour identified. The pooled results of the meta-analysis revealed there were 5 statistically significant associations, including that use of food as a reward positively predicted increased likelihood of child EE. However, this pooled effect was only from the results of two studies (Jansen et al., 2020; Steinsbekk et al., 2016). Therefore, it seems that using food as a reward is associated with subsequent child EE cross-sectionally and longitudinally, but more longitudinal research is needed to understand how use of food as a reward functions to inform obesity prevention interventions.

Finally, parental use of *restriction of food* has also been associated with increased child EE in cross-sectional parental-report studies (e.g., Klosowska et al., 2020), and also longitudinal parental-report studies (e.g., Rodgers et al., 2013). When parents restrict foods, it is often well-intentioned. However, the way in which parents restrict foods can have counterproductive consequences. Parental restriction of food can occur for *health reasons* or *weight reasons*. Health reasons include "restricting access to food because [my] child would eat too much junk food if not", and weight reasons include "restricting access to food so that [my] child does not get fat" (examples taken from the Comprehensive Feeding Practices Questionnaire). Restriction can occur *covertly* or *overtly.* Overt restriction refers to the restriction of foods that the child is aware of; for example, having a 'treat' box full of chocolates that the child is not allowed to access. Whilst covert restriction is restriction without the child supposedly realising; for example, not having chocolates in the house that need to be restricted. Covert restriction has been suggested to be an effective strategy for limiting unhealthy food intake and use of this practice with 4-year-olds predicts greater child-reported preferences for fruit and vegetables at 6-years (Boots et al., 2019). Conversely, restricting food overtly is considered a non-responsive feeding practice that heightens children's preferences for restricted food types (e.g., Fisher & Birch, 1999; Jansen et al., 2007). Indeed, in Boots et al.'s (2019) work, use of overt restriction at 4-years of age predicted decreased preference for fruit and vegetables, and increased preferences for salty food and sweet treats at 6-years. In terms of child EE, it may be that under conditions of negative emotion children desire foods that are forbidden, and this is why restrictive feeding practices are associated with child EE.

Experimental studies exploring the relationship between parental feeding practices and child EE are sparse, yet the two which have been conducted report associations

between laboratory induced child EE and maternally reported use of food for emotion regulation, food as a reward, and restriction of food for health reasons. In a sample of 3-5-year-olds who had recently eaten until satiety, Blissett et al. (2010) manipulated child mood (negative/neutral) using a jigsaw task and a reward prize. In both the neutral and negative condition, children were told that they would receive a prize if they finished a jigsaw. In the neutral condition the children had all the jigsaw pieces available to complete the puzzle and received their prize. However, in the negative condition, children were unable to complete the jigsaw puzzle as a piece was intentionally missing. As the children could not finish the jigsaw, they could not receive their reward. The children's EE scores were explored in relation to the type of mood induction they were in and the feeding practices that their parents reported typically using. Results indicated that maternal use of food for emotion regulation was associated with children eating more cookies in the absence of hunger, irrespective of their mood. In addition, those children who were exposed to the negative mood condition *and* whose mothers often used food for emotion regulation, consumed more chocolate than did children in the neutral condition. However, there were no significant relationships identified between child EE and parental food restriction or use of food as a reward. These findings highlight that use of emotional feeding irrespective of child mood impacts children's consumption of unhealthy food, and during situations of negative mood, children who regularly experience emotional feeding are more susceptible to EE.

Farrow et al. (2015) followed the same group of children 2 years later and brought them into the laboratory when they were 5-7 years old to measure subsequent EE under conditions of emotional arousal. Farrow et al. found that children in the negative condition consumed more snack foods in the absence of hunger (i.e., more EE) compared to those in the neutral mood condition. They found that the prevalence of EE in the laboratory was more evident in the older children and speculate that the tendency and opportunity to emotionally overeat may increase in children between 4 and 6 years of age. Furthermore, they found that mothers who reported using greater food as a reward and greater restriction of food for health reasons with their 3-5-year-olds were more likely to have children who emotionally ate 2 years later (Farrow et al., 2015). Although this study failed to longitudinally replicate the association between using food for emotion regulation and child EE (see Blissett et al., 2010), there were longitudinal associations between other non-responsive feeding practices and the development of child EE. The follow up study was limited because of a small sample size at follow up (N = 41), which may have limited the ability to detect significant findings. Nonetheless, these studies underscore the relationship between use of non-responsive feeding practices and incidences of child EE. These findings support those from questionnaire studies but have more scientific rigour by using a laboratory approach, which

does not depend on maternal reports of children's experiences. What is yet to be explored is how differences in children's mood state (other than experiences of negative mood) may impact the relationship between parental feeding practices and child EE in the laboratory.

1.9 Child individual differences and child emotional eating

While the above research suggests that children's EE may be related to parent behaviours, there is also a wealth of literature to suggest that children's individual differences are important in shaping the development of EE. In particular, the contribution of child food approach tendencies, temperament, and impulsivity have been noted in research literature and this research will be evaluated next.

1.9.1 Child food approach behaviours

As described in section 1.3, food approach behaviours refer to a selection of eating behaviours that are associated with a heightened drive towards food (Vandeweghe et al., 2016). EE is part of the cluster of food approach behaviours, but there are several other facets of food approach that are highly correlated with and predictive of child EE (i.e., food responsiveness, desire to drink, and enjoyment of food). For example, in a parent-reported cross-lagged correlation study of 797 Norwegian children, high food responsiveness at age 6-years was correlated with greater EE tendencies cross-sectionally, and this relationship was prospectively predictive of EE two years later when children were 8-years-old (Steinsbekk et al., 2016). However, high enjoyment of food at age 6-years was only correlated with high child EE cross-sectionally, not prospectively two years later at follow up. Therefore, these findings suggest that children who display high EE also tend to display other appetitive traits, where food responsiveness may have a sustained influence on the expression of child EE. In another prospective study of 1657 German children, it was found that parent-reported food responsiveness, food enjoyment, and desire to drink were all significantly associated with child EE in children when aged 6-11-years (baseline) and these relationships were also prospectively associated at a one year follow up (Koch & Pollatos, 2014). Together these findings highlight the importance of considering other child food approach tendencies and how they may shape the development of a profile of behaviours associated with making EE more likely.

1.9.2 Child temperament and impulsivity

Temperament is considered as an innate characteristic that can predispose children to EE (Haycraft et al., 2011). Rothbart and Bates (2007) define temperament using three dimensions: (1) negative affect, (2) effortful control and, (3) surgency, and often assess these using variations of the Children's Behaviour Questionnaire (CBQ; Rothbart et al., 2001).

Each temperament dimension will be discussed in relation to the expression of child EE.

Negative affect is a dimension of temperament and is characterised by being more prone to experience negative emotions such as sadness (Rothbart & Bates, 2007). Child negative affect has been consistently linked with fussy and picky eating behaviour (Kidwell et al., 2018), and it has also been linked to more obesogenic eating behaviours. For example, in a longitudinal intervention study of 660 children, temperament and diet were assessed from 7-months-old until the age of 20-years (Lipsanen et al., 2020). Children grouped as 'negative/low emotion regulation' (i.e., temperaments where children displayed negative mood and low emotion regulation) had a less healthy diet across the 19 years compared to children grouped as 'positive/high emotion regulation' (i.e., temperaments where children displayed positive mood and good ability to regulate emotion), suggesting that negative affect is related to dietary intake across childhood. Negative affect has also been positively associated with child EE in cross-sectional (e.g., Holley et al., 2020; Messerli-Bürgy et al., 2018; Michopoulos et al., 2015) and longitudinal studies. In a longitudinal study, it was reported that high parentally reported child negative affect at age 4-years predicted greater parentally reported child EE at age 6, 8, and 10-years (Steinsbekk et al., 2018), which suggests that negative affect has a sustained effect on children's EE. It is theorised that children with high negative affect have heightened and more frequent episodes of negative emotions, so it is likely that these children may seek out palatable foods to soothe those negative emotions. Therefore, (high) child negative affect seems integral to understanding the expression of child EE.

Effortful control is defined as the degree of child self-regulation and emotional reactivity (Rothbart & Bates, 2007), with higher effortful control reflecting greater capacity for self-regulation and lower levels of emotional reaction. Lower effortful control in children has been linked to increased child EE in a longitudinal study measuring children's temperament over two years (Steinsbekk et al., 2020). The study reported that through parent-report, children with lower levels of effortful control at 6-years-old had increased EE at 8-years old. It is theorised that children with low effortful control are at a greater risk of displaying EE because one of the characteristics of low effortful control is poorer ability to inhibit emotional reactance (Rothbart & Bates, 2007). Therefore, when experiencing negative emotions, children with lower effortful control may be more susceptible to the breakdown of inhibitory control over emotional reactance, resulting in consumption of palatable foods to reduce arousal rather than employing alternative emotion regulation strategies. In other research conducted with children with overweight and obesity who were between 7-11-years-old, children with deficits in inhibitory control tasks (a facet of lower effortful control) showed increased evidence of eating in the absence of hunger (Adise et al., 2021). Indeed, eating in

the absence of hunger is an obesogenic eating behaviour that has often been linked to EE (Moens & Braet, 2007), suggesting that low effortful control may be an important predictor of child EE. However, in other cross-sectional research, effortful control was not associated with obesogenic eating behaviours in children aged 4-years (Leung et al., 2014). Leung and colleagues suggested that this may be a result of the study being cross-sectional as measures were only collected at 4-years-old. If measured prospectively, it is possible that the relationship between effortful control and child EE may develop over time, parallel with the development of child autonomy as this is when children have more freedom to govern their food intake. Therefore, (low) effortful control is important to consider when predicting child EE, particularly with older children.

A *surgent* temperament is characterized by high activity levels, high-intensity pleasure seeking, low shyness, and high impulsivity (Rothbart & Bates, 2007). Previous research assessing the relationship between surgency and child EE is mixed. There is evidence to suggest that high surgency is related to high food approach behaviour, but this relationship was found to be non-significant for child EE (Steinsbekk et al., 2020). Similarly, in a cross-sectional study, pre-schoolers with surgent temperaments were found to be more food responsive (Leung et al., 2016), overeat in response to external cues, have frequent desire to eat, derive pleasure from food, and eat in the absence of hunger more often (Leung et al., 2014). Moreover, in an experimental study with 4-6-year-old children, children with high surgency ate more candy than grapes compared to those with lower surgency (Zhou et al., 2019). Therefore, it seems that surgency is often related to obesogenic eating behaviours, but it has not previously been statistically linked with EE in children.

The temperamental trait of surgency includes impulsivity (Putnam & Rothbart, 2006), which is described as ‘speed of response initiation’, and is different to inhibitory control found in effortful control (defined as ‘the capacity to plan and to suppress inappropriate action’; Rothbart et al., 2007). Impulsivity has been consistently associated with child obesity (in 5-year-old children; Graziano et al., 2010) and in a meta-analytic review, a moderate effect size was found where impulsivity was higher in children with obesity compared to children with healthy weight (Thamotharan et al., 2013). It appears that high levels of impulsivity may predict obesogenic eating behaviours in children more strongly than measures of surgency, which includes broader indices of sociability and general approach tendencies. Impulsivity alone is a multifaceted concept and can be defined as a ‘*trait’* – an innate personality characteristic measured using questionnaire studies, or a ‘*state’* – a moment in time measured using behavioural tasks (Antons & Brand, 2018).

When assessing impulsivity as a trait, parent-reports or child adapted versions of

questionnaires are used. However, questionnaire measures of trait impulsivity are unsuitable for use by children below the age of 7-years due to young children not having the level of understanding/self-reflection needed to complete such measures. Therefore, research concerning trait impulsivity and eating is limited to samples of older children/adolescents or to parent-report. A questionnaire measure commonly used to assess children's impulsivity is the child version of the Urgency, Premeditation (lack of), Perseverance (lack of), Sensation Seeking, Impulsive Behavior Scale (UPPS; Whiteside & Lynam, 2001). This measure defines impulsivity using *negative urgency* - the tendency to act rashly while in an intense negative mood*, lack of premeditation* - the tendency to not consider the consequences of actions, *lack of perseverance* - the tendency to have difficulty staying focused on a task that can be long, boring, or difficult, and *sensation seeking* - the tendency to seek out novel and thrilling experiences. In a study exploring trait impulsivity and eating behaviour in adolescents with severe obesity, findings suggested that those with severe obesity who reported having high negative urgency were more likely to report more EE and food addiction (Rose et al., 2018). This suggests that a potential precursor to adolescent EE may be negative urgency (trait impulsivity), defined by acting rashly whilst experiencing negative emotions. It must be noted though that as well as Rose et al. (2018) utilising an adolescent sample who may behave differently to a child sample, their work was also conducted on adolescents with severe obesity. Therefore, results may not be generalisable as associations between impulsivity and overeating may be more pronounced in individuals living with obesity (Bénard et al., 2018).

In other work, Ohrt et al. (2020) explored how parent-reported child impulsivity in 4-6-year-olds related to EE in response to a stressful situation. In this study, impulsivity was measured using the impulsivity subscale of the CBQ (Rothbart et al., 2001). There was a significant correlation between children's impulsivity and the number of kilocalories consumed under stress, where high impulsivity scores were correlated with a greater number of kilocalories consumed in response to stress. Similarly, using self-reports, children aged between 10-13-years who reported that they had high impulsivity (as measured using Eysenck's Impulsiveness Questionnaire; Eysenck et al., 1985) also reported that they had a greater tendency to eat in response to negative emotions (Farrow, 2012). These findings suggest that trait measures of impulsivity may be involved in understanding why children reach for food during negative emotional experiences. Children with high impulsivity may not be able to resist the urge to overconsume foods, especially during times of emotional arousal where self-regulation can be particularly depleted (Chester et al., 2016).

When assessing impulsivity as a state, behavioural measures of impulsivity are used. Unlike trait measures, behavioural measures are appropriate for use with younger children. Behavioural tasks include the Go-No-Go Task (Bezdjian et al., 2009), the Delay of

Gratification Task (Thompson et al., 1997), and the Circle Drawing Task (Verbeken et al., 2009). In the Go-No-Go Task, children's ability to inhibit the pre-potent response is assessed. An example of a classic Go-No-Go Task is showing children a series of 'Stop' and 'Go' commands, where 'Stop' means do not press any keys on the keyboard, and 'Go' means press the space bar on the keyboard. After a series of 'Go' commands (i.e., pressing the space bar), children are told to 'Stop' (i.e., not press anything), which is different from the previous 'Go' command. Children must inhibit their previous response for a new response and failures to change response suggests poorer ability to inhibit a pre-potent response. In the Delay of Gratification Task, children's ability to choose between a small immediate reward or a larger but delayed reward is assessed. An example of the Delay of Gratification Task is to ask children if they would like to receive 1 sticker now, or if they would like to wait until later to receive 3 stickers. Selecting the '*later'* option reflects better ability to delay gratification. Finally, in the Circle Drawing Task, children's motor impulsivity is assessed by asking children to trace the outline of a circle with their index finger as slowly as they can. Slower tracing is indicative of lower motor impulsivity. Measures of state impulsivity have been related to children's obesogenic eating, for example, in a sample of 126 children with obesity aged between 7-9-years, weaker performance on the Circle Drawing Task (i.e., higher motor impulsivity) was associated with greater child BMI (Kamijo et al., 2012). This finding was replicated by Bennett and Blissett (2017) where higher motor impulsivity was correlated with having heavier weight for height, but this relationship was only significant for girls. Additionally, Bennett and Blissett (2017) reported that children who performed less well on the Go-No-Go Task (i.e., struggled to inhibit a pre-potent response and so had higher impulsivity) consumed more kilocalories from food in a laboratory. Lastly, findings from a longitudinal study suggest that when children aged 4-years-old completed the Delay Gratification Task, each additional minute that the child delayed gratification for (i.e., higher delay time indicative of lower impulsivity) predicted a 0.2-point reduction in BMI at follow up in adulthood, 30-years later (Schlam et al., 2013). Overall, these findings suggest that incidences of high behavioural impulsivity are associated with a greater drive to eat, and lower incidences of behavioural impulsivity are associated with lower BMI in later life.

In a meta-analytic review, it was highlighted that behavioural measures of impulsivity tended to have larger effect sizes compared to trait measures of impulsivity that are often not significantly related to children's weight (Thamotharan et al., 2013). Thus, in addition to the fact that trait measures of impulsivity may heavily rely on parental report (which are limited by the difficulties in reporting on another person's impulsivity), these findings support the use of behavioural measures in children's eating behaviour research. However, although behavioural measures of impulsivity have been associated with children's appetitive traits

and BMI, they have not yet been explored specifically in relation to child EE. This is surprising given that trait impulsivity in children has been associated with EE. Therefore, exploring how state impulsivity is associated with child EE warrants further investigation.

1.10 Mood and child emotional eating

While much of the discussion thus far has focussed on the environment, the parent, and child individual differences in predicting child EE, it is important to acknowledge how differences in the emotions that children experience can influence their eating behaviour. EE is commonly viewed as a response to predominately negative mood; however, research suggests that EE can also arise from positive mood situations such as happiness. In an experimental laboratory study of 6-year-old children, those exposed to video clips from Disney's "*The Lion King",* where Simba sang 'I can't wait to be king', consumed more chocolate than children who viewed a neutral video clip (control condition) (Tan & Holub, 2018). Within this study, there was also a negative mood condition where children watched a video clip from Disney's *"The Lion King*" where Simba mourned the death of his father. Children in the negative condition consumed significantly more chocolate than children in the positive mood and control conditions. This suggests that positive emotions can be associated with EE in children, but that positive emotions are not as strongly related to snack food consumption as negative emotions.

Although the research to date on child EE has focussed on manipulating positive and negative mood, EE is conceptualised as eating in response to a range of negative emotions including disgust, anger, sadness, and boredom (Macht, 2008; Wardle et al., 2001). Focussing on the latter emotion, Koball et al. (2012) found that boredom uniquely predicts EE in adults, independently of the impact of general negative mood. Boredom as a construct is defined as the wandering of attention due to a lack of engagement with a stimulus (Danckert & Merrifield, 2018) and boredom is often viewed as a precursor to subsequent behaviour (e.g., Sundström et al., 2019). Havermans et al. (2015) reported that in a sample of 30 adults, those who were bored (after watching a monotonous film clip) snacked on more chocolate M&Ms than participants who watched a neutral film clip. Similarly, Moynihan et al. (2015) conducted a naturalistic study using food diaries and found that adults who reported more episodes of state-boredom consumed more kilocalories, fat, carbohydrates, and protein over the 1-week food diary. Moynihan et al. (2015) also used a laboratory study and reported that adults who completed a high boredom task compared to a low boredom task had an increased desire to snack as opposed to eating something healthy. These studies suggest that the experience of boredom can promote unhealthy food consumption in adults. However, there have been no investigations into the role of boredom in children's EE.

Exactly how boredom relates to EE is unclear, but it is possible that individual differences in impulsivity may help to explain the relationship. For example, Schell et al. (2019) found that in a sample of 998 undergraduate students, eating to alleviate boredom mediated the relationship between impulsivity and binge eating. Similarly, Moynihan et al. (2017) found that perceiving a situation as meaningless mediated the relationship between boredom and impulsiveness. Therefore, Moynihan and colleagues (2017) proposed an explanation where boredom-related EE is likely to be an expression of impulsivity that feelings of boredom created. It is important to explore EE in response to a range of different emotions in children and it would be valuable to evaluate whether there is also a relationship between boredom, impulsivity, and EE in children. Additionally, it would be interesting to see whether boredom induced EE in children elicits different snacking behaviour in comparison to experiences of other negative moods. This is especially important since boredom is a particularly common emotion in children (Westgate & Steidle, 2020). Given that children may be living within a food environment that is abundant with unhealthy food (see section 1.7), understanding how boredom is related to eating is important. Indeed, boredom is a modifiable mood state and, should evidence suggest it is related to EE, could prove a valuable intervention target.

1.11 A complex interaction: parent and child factors in child emotional eating

As discussed in this literature review, there are multiple parent and child factors that are associated with a greater likelihood of EE in children. Recently research has also begun to explore the interactive effects of parent and child factors, specifically parental feeding practices and child temperament on children's obesogenic eating behaviours. For example, Kidwell et al. (2018) found that parents of children aged 3-5-years with high negative affect were significantly more likely to use emotional feeding practices or use food as a reward than parents of children with low negative affect, both at baseline and 6 months subsequently; suggesting that a child's temperament can shape the feeding practices that they experience. Stifter and Moding (2018) have also reported that children with high surgency at 6-months whose mothers frequently used food for emotion regulation gained more weight over a year than those children with high surgency whose mothers did not frequently use food for emotion regulation. These studies underscore the importance of considering how the parent and child influence each other in shaping the expression of feeding practices and eating behaviours. How a child behaves because of their temperament may elicit more, or less, non-responsive feeding practices, and this in turn may exacerbate eating behaviour traits. For example, parents may be more likely to use emotional feeding with children who experience greater negative affect because these children typically experience more negative moods and are often poorer at emotion regulation. However, these more non-

responsive feeding practices may not only increase the prevalence of EE, but also reinforce more negative child mood.

Additionally, the relationship between parental emotional feeding and child EE is also likely to be bidirectional, with emotional feeding not only predicting greater EE, but child EE also reinforcing the use of emotional feeding (Steinsbekk et al., 2018). Whilst emotional feeding may 'teach' children to use food for emotion regulation, when children do exhibit EE parents may continue to use emotional feeding practices because they have successfully soothed the child before, thus creating a reinforcing relationship that strengthens the relationship between eating and emotions. Steinsbekk et al. (2018) also assessed the role of child negative affect in this relationship. They found that negative affect at 4-years-old predicted emotional feeding and child EE at 6-years-old. Additionally, children with high negative affect were at greater risk for the cascading relationship between emotional feeding and EE, where emotional feeding predicted child EE, and then child EE predicted emotional feeding and so on. However, it must be noted that other temperamental dispositions were not examined in this study. It remains to be seen how surgency and effortful control contribute to this relationship. In another study of 221 parents of children aged 4-6-years, structural equation modelling revealed that children with high levels of negative affectivity exhibited food approach behaviours, which in turn elicited restrictive feeding from parents, which in turn predicted higher child BMI (Liew et al., 2020). Therefore, taking these results together, findings suggest that the development of child EE and obesogenic eating behaviours are best assessed using an amalgamation of information about child temperament and parental feeding practices.

To date, what has not been explored in the literature is the relationship between parent factors (parents' own EE and parental feeding practices) and child factors (temperament and other food approach behaviours) and child EE in response to general negative mood. Additionally, a further unanswered question is how these parent factors and child individual differences interact to predict child EE in response to specific negative emotions, such as boredom. This is likely a result of previous research predominantly utilising parent-reports of child EE (e.g., using the CEBQ where general negative mood is measured), and so there is a need for future research to explore if parent factors and child individual differences interact with specific negative mood states to differentially predict child EE.

1.12 Aims of thesis

Considering the research discussed in this literature review, child EE appears to manifest because of a multitude of interlinked factors related to the environment, parent

factors, child individual differences, and child mood state. However, to date, there is a limited body of research that has explored these factors together using a paradigm that combines self-report and experimental measures.

The primary aim of this PhD is to explore the relationships between parent factors and child individual differences in the expression of children's EE across different mood states in preschool and primary school age children. Exploring this age range is vital as there is evidence of EE in children as young as two-years-old (Haycraft & Blissett, 2012) with EE increasing during early childhood (Blissett et al., 2010; Farrow et al., 2015), and it is believed that eating behaviours that are formed in childhood persist into adulthood (Movassagh et al., 2017). Therefore, understanding the predictors of EE in early life may provide evidence for future research to explore in the prevention of EE, which may help to foster healthy eating behaviours in children.

The objectives of the thesis are to:

- Assess whether self-reported parental feeding practices mediate the relationship between self-reported parent EE and parent-reported child EE in children aged 3-5-years (Chapter 2).
- Examine whether any mediating relationships between parent EE and child EE via parental feeding practices (Chapter 2) vary as a function of parent-reported child temperament (Chapter 2), or parent-reported child food approach tendencies in children aged 3-5-years (Chapter 3).
- Induce hypothetical EE using a virtual online paradigm with 6-9-year-old children[1] and explore whether parentally-reported parental feeding practices and child temperament predict greater hypothetical EE (Chapter 4).
- Induce child EE in a laboratory setting and explore the interactions between parent-reported parental feeding practices, parent-reported child temperament, and mood condition (sadness, boredom, control) on the number of kilocalories consumed by children aged 4-5-years (Chapter 5).

[1] Adjustments made due to COVID-19

As COVID-19 forced the laboratory studies (Chapters 5 and 6) to be delayed, an additional study was created (Chapter 4), which acted as a proxy to the laboratory work in Chapter 5. The methodology used in Chapter 4 to capture food choice was only suitable for children older than the original thesis age range of 3-5-years. Therefore, Chapter 4 was a modification to the PhD research in response to COVID-19 which explains why Chapter 4 utilised children aged 6-9-years-old.

- Assess differences in the strengths of relationships between two behavioural impulsivity measures (motor impulsivity and delay of gratification) and subsequent kilocalorie intake in the absence of hunger, between children aged 4-5-years in three mood conditions (bored, sadness, control) in a laboratory (Chapter 6).

CHAPTER 2:

Predicting preschool children's emotional eating: The role of parents' emotional eating, feeding practices, and child temperament

This Chapter was published in *Maternal and Child Nutrition* and so only small adjustments have been made for thesis consistency, cohesion, and flow.

Stone, R. A., Blissett, J., Haycraft, E., & Farrow, C. (2022). Predicting preschool children's emotional eating: The role of parents' emotional eating, feeding practices and child temperament. *Maternal & Child Nutrition*, *18*(3). https://doi.org/10.1111/mcn.13341

Abstract

Emotional eating (EE; defined as overeating irrespective of satiety and in response to emotional states) develops within childhood, persists into adulthood, and is linked with obesity. The origins of EE remain unclear, but parental behaviours (e.g., controlling feeding practices and modelling) and child characteristics (e.g., temperament) are often implicated. To date the interaction between these influences has not been well investigated. This study explores whether the relationship between parent EE and child EE is shaped by parental feeding practices, and if the magnitude of this relationship varies as a function of child temperament. Mothers (N = 244) of 3-5-year-olds completed questionnaires about their EE, feeding practices, their children's EE, and temperament. Results showed that parental use of food to regulate children's emotions fully mediated the relationship between parent EE and child EE and using food as a reward and restricting food for health reasons partially mediated this relationship. Analyses demonstrated that the mediated relationship between parent EE and child EE via use of food as a reward and restriction of food for health reasons varied as a function of child negative affect, where medium-high child negative affect moderated these mediations. These findings suggest child EE may result from interrelationships between greater parent EE, use of food as a reward, restriction of food for health reasons, and negative affective temperaments, but that greater use of food for emotion regulation may predict greater child EE irrespective of child temperament.

2.1 Introduction

Emotional eating (EE) is defined as over-eating, irrespective of satiety, and in response to emotional states that are typically negative (e.g., Michels et al., 2012). EE in children is commonly reported by parents (Steinsbekk et al., 2016: 65%), develops during preschool years (Herle et al., 2018), and is moderately stable across childhood (Ashcroft et al., 2008). Those who emotionally eat tend to consume palatable, energy-dense foods (i.e., high in sugar and fat) (e.g., Nguyen-Michel, Unger, & Spruijt-Metz, 2007).

Despite the prevalence of EE, such behaviour is biologically paradoxical as the biological response to a high-stress environment is to undereat (Yau & Potenza, 2013). Heinrichs and Richard (1999) suggested that stress promotes the release of cortisol which in turn suppresses appetite, potentially through the stimulation of leptin (Michels et al., 2017). As such, cortisol increases should decrease gut activity rather than induce it. This suggests that EE is a substantially learned behaviour driven by environmental factors (Herle et al., 2018). In adult studies EE is frequently associated with weight gain, obesity (e.g., Gibson, 2012) and poorer mental health (e.g., Ferrer-Garcia et al., 2017). As children's eating behaviours are likely to persist into adulthood (e.g., Nicklaus et al., 2004), it is important to understand how EE develops in early life to identify targets for prevention and intervention.

The exact causal underpinnings of EE remain unclear (e.g., Vervoort et al., 2020), but research has explored the contributions of parenting and child factors. In terms of parenting, parents exert a large influence over their children's eating (Savage et al., 2007) and parents who emotionally eat have been found to have children who emotionally eat as well (e.g., Yelverton et al., 2020). Given that EE in children is learned rather than inherited (Herle et al., 2018), children may emulate EE through parental modelling (Bandura, 1977). In addition, the feeding practices that parents use have been shown to predict the development of child EE. Feeding practices that are more controlling such as using *food for emotion regulation, food as a reward* or *restriction of food for health reasons*, may unintentionally 'teach' unhealthy eating behaviours since extrinsic control over a child's food intake may undermine a child's ability to recognise their own hunger and satiety (Farrow et al., 2015). Indeed, longitudinal studies have shown significant associations between these feeding practices and child EE (e.g., Steinsbekk et al., 2018), and this has also been demonstrated experimentally (Blissett et al., 2010; Farrow et al., 2015) where use of food for emotion regulation, for example, may teach children to use food as a means to regulate their emotional arousal. Likewise, being rewarded with food may encourage children to eat for non-appetitive reasons thus undermining their ability to regulate satiety (Jalo et al., 2019). Overtly restricting food for health reasons has also been shown to promote overconsumption of restricted foods, particularly in times of emotional arousal (Farrow et al., 2015).

Parenting practices and behaviours that have been associated with greater child EE often co-occur, with parents who report greater EE themselves also reporting greater use of emotional feeding practices (Rodgers et al., 2014), greater restriction of food for health reasons and/ or greater use of food as a reward (Haycraft, 2020). These non-nutritive controlling feeding practices have been shown to be counterproductive and undermining of appetite regulation (Birch et al., 2003), but they may also be a mechanism through which the relationship between parental and child EE can be explained. These practices have been shown to be particularly influential in children who are at higher risk of weight gain and obesity, highlighting the bi-directional relationships between children's characteristics and the feeding practices that they experience (e.g., Faith et al., 2004).

Indeed, research has demonstrated that individual differences in children, such as temperament, can shape the development of EE (e.g., Haycraft et al., 2011). Rothbart and Bates (2007) define temperament using three overarching dispositions: negative affect (heightened experience of negative emotions), surgency (proneness to being highly sociable and impulsive) and effortful control (increased self-regulation and less emotional reactivity). Negative affect has been consistently linked with child EE in both cross-sectional (e.g., Messerli-Bürgy et al., 2018) and longitudinal studies (e.g., Bjørklund et al., 2019). Steinsbekk et al. (2018, 2020) demonstrated that high negative affect at age 4 positively predicted child EE at 6, 8 and 10-years. This suggests that children who are prone to experience heightened negative emotions may be at increased risk of using food to regulate distress. In addition, lower levels of effortful control (i.e., less self-regulation) at age 6 have been shown to predict greater child EE at age 8. Lower effortful control may place children at greater risk of EE due to the associated lower impulse control (Rothbart & Bates, 2007; Steinsbekk et al., 2020) which may increase the likelihood of reaching for food in situations of emotional arousal. Child surgency has also been shown to predict obesogenic traits such as food responsiveness and enjoyment of food at 6-years (Steinsbekk et al., 2020), although in this study surgency was not predictive of child EE.

Russell and Russell (2018) developed a Biopsychosocial Model which suggests that the development of children's appetitive traits arises from a complex interaction between the child's environment (e.g., food availability), their caregiving experiences, and their innate dispositions. Similarly, the Behavioural Susceptibility Theory (BST) of obesity posits that specific genetic predispositions make some children more vulnerable to obesogenic environmental conditions (Llewellyn & Fildes, 2017). For example, Stifter and Moding (2018) found that more surgent children at 6 months, whose mothers used more food for emotion regulation, gained more weight over a one year period than less surgent children whose mothers used this feeding practice less often. It is possible that children with certain

temperamental dispositions (e.g., greater negative affect, surgency or poorer effortful control) may be more susceptible to environmental influences (e.g., controlling feeding practices or modelled parental EE) or more affected by these influences and thus more likely to emotionally eat (Bjørklund et al., 2019). For example, children with higher levels of negative affect may need longer to recover from emotional arousal and may find it more difficult to soothe themselves when distressed. When exposed to parental EE and more controlling feeding practices these children may be more likely to use food to regulate emotion. Research has begun to explore how parental eating, parental feeding, and child characteristics may interact together to shape child EE. For example, Tan and Holub found that the relationship between parent and child EE was mediated by emotional feeding, but that this was only the case for children who were low in self-regulation in eating (Tan & Holub, 2015). Research such as this, which considers the complex interactions that occur between parenting and child behaviours, can elucidate which parent-child behavioural combinations put children at the greatest risk of EE and may help to identify targets for intervention or prevention.

2.1.1 Aims and hypotheses

The aim of the current study was to explore the inter-relationships between parent EE, parental feeding practices and child temperament in predicting parental reports of child EE. It was hypothesised that a) there will be a positive relationship between parent and child EE and this relationship will be mediated by greater parental use of food for emotion regulation, food as a reward or restriction of food for health reasons; b) there will be a positive relationship between parent EE and child EE, mediated via these feeding practices and also moderated by children's temperament such that the mediated relationship will be evident only when children score highest in negative affect or surgency, or lowest in effortful control.

2.2 Method

2.2.1 Participants

Parents of 258 children aged 3-5-years took part in this cross-sectional online study. Fourteen participants were removed. 8 fathers were removed as they only represented 3% of respondents and there are notable differences between mothers and fathers on feeding practices. For example, fathers are less likely to monitor their child's food intake and to restrict access to food compared with mothers (Khandpur et al., 2014). Six parents who reported that they rarely ate with their child were also removed as they may not be able to accurately report their child's eating behaviour. After data cleaning, the final sample consisted of 244 mothers. Sample size calculations using G*Power for a linear multiple

regression recommended 115 participants to detect medium effect sizes (α = 0.05, power = 0.80), making the sample adequately powered.

2.2.2 Procedure and measures

Participants were recruited via social media (see Appendix A-1) to complete a questionnaire through Qualtrics. The study was approved by Aston Health and Life Sciences Ethics Committee (#1551; see Appendix B-1) and all participants provided informed consent (see Appendix C-1 and C-2). All procedures were conducted in accordance with the Declaration of Helsinki as revised in 1983. The questionnaire measures included:

Demographic questionnaire about parental age, sex, ethnicity, education level, child age, sex, height, and weight. Parents reported how often they ate with their child and the number of children they had. Parents also completed MacArthur's Scale of Subjective Status to measure perception of social status relative to others, with higher scores indicating greater perceived status (Adler et al., 2000) (see Appendix D-1)

The Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007) measures parents' use of feeding practices. Three subscales related to child EE were used for this study: food as a reward (3 items) (e.g*., "I offer my child his/her favourite foods in exchange for good behaviour"),* food for emotion regulation (3 items) (e.g., *"Do you give this child something to eat or drink if s/he is upset even if you think s/he is not hungry?"*), and restriction of food for health reasons (4 items) (e.g*., "If I did not guide or regulate my child's eating, he/she would eat too many junk foods"*). These subscales were selected because parental use of food as a reward and food for emotion regulation have been found to mediate the relationships between parent and child EE (Miller et al., 2020; Tan & Holub, 2015), and parental restriction of food for health reasons has been shown to be predictive of child EE over time (e.g., Farrow et al., 2015). The CFPQ has good internal validity and reliability (Musher-Eizenman & Holub, 2007) and in this sample McDonald's Omega (ω) was high for food for emotion regulation (0.74), and moderate for restriction for health reasons (0.63) and food as a reward (0.50) (Hinton et al., 2014) (see Appendix D-4).

The Dutch Eating Behaviour Questionnaire (DEBQ; van Strien et al., 1986) was used to measure parental EE subscale (e.g., *"Do you desire to eat when you are irritated?"*). Items were scored using a five-point Likert scale, where higher mean scores reflected higher EE. This measure has previously demonstrated good internal reliability (Cebolla et al., 2014), and ω was high in this sample (0.96) (see Appendix D-5).

The Children's Behaviour Questionnaire – Very Short Form (CBQ-VSF; Putnam & Rothbart, 2006) assesses child temperament. Negative affect (12 items) (e.g., *"My child is quite upset by a little cut or bruise"*), surgency (12 items) (e.g., *"My child often rushes into new situations"*) and effortful control (12 items) (e.g., *"My child is good at following instructions"*) were measured as they have been associated with obesogenic eating behaviours (Leung et al., 2014). The CBQ-VSF has acceptable internal reliability (de la Osa et al., 2014) and in the current sample, reliability was acceptable with ω = 0.78 for surgency and 0.79 for negative affect, and moderate for effortful control = 0.56 (see Appendix D-6).

The Children's Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001); contains eight subscales measuring different aspects of children's appetitive traits; four subscales measure food approach behaviours and four subscales measure food avoidant behaviour. For the current study, the emotional over-eating (4 items) subscale was used (e.g., *"My child eats more when worried")*. Items were scored using a five-point Likert scale (*"Never"* to *"Always")* where higher mean scores were indicative of higher levels of the eating behaviours. The CEBQ has demonstrated good reliability in previous work (Domoff et al., 2015) and too in the current sample with ω = 0.83 (see Appendix D-7).

2.2.3 Data analysis

2.2.3.1 Preliminary analysis of normality and confounding variables

Data were analysed using IBM SPSS Statistics version 26. Preliminary analyses assessed data distribution and identified any confounding variables. Kolmogorov-Smirnov tests showed that parent EE and child EE were skewed (parent EE: $D(244) = .064$, $p = .017$, child EE: $D(231) = .135$, $p < .001$), so non-parametric tests were employed. Spearman's Rho correlations assessed the relationships between continuous parent and child demographic variables with child EE and parent EE. Mann-Whitney U tests and Kruskal-Wallis H tests explored whether there were significant differences in parent EE or child EE based on categorical parent and child demographic variables.

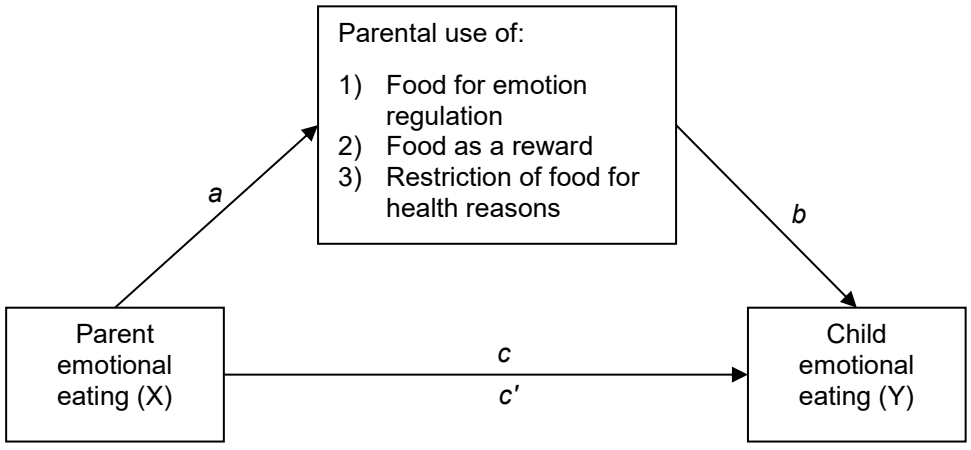
2.2.3.2 Main analysis

For the main analysis, mediation and moderated mediation were employed (due to a lack of alternative non-parametric approaches) using the PROCESS v4 plugin (Hayes, 2017). Any use of causal language (as is typical in mediation analyses (Preacher et al., 2007)) should be interpreted as associations due to the study's cross-sectional design. Mediation assumptions were examined (Hayes, 2017) and only the assumption of normality was violated. Yet, this violation was deemed acceptable as according to the Central Limit

Theorem, the current study's large sample size (>200) ensures that the distribution will be approximately normal despite statistical violation (Hayes, 2017).

Mediation analyses were used first to establish whether the relationship between parent EE (antecedent variable 'X') and child EE (outcome variable 'Y') could be explained by parental feeding practices (mediator variable 'M'). Mediation analyses computes the effect of X on M (the *a* path), the effect of M on Y (the *b* path), the effect of X on Y (the *c* path – the total effect) and the effect of X on Y controlling for M (the *c'* path – the direct effect). To determine whether mediation has occurred, an 'indirect effect' is also computed which is the total effect subtracted from the direct effect. This statistic uses 95% confidence intervals to infer significance when the confidence interval does not include zero, – i.e., that X predicts Y via M. After determining the presence of mediation, mediation can occur either 'fully' or 'partially'. Full mediation implies that X no longer affects Y after M has been controlled for (i.e., the *c'* path is non-significant). Partial mediation implies that the strength of the relationship between X and Y is less than that of the *c* pathway but is still significant in the presence of M (i.e., the *c'* path is significant). Three models were tested using PROCESS model 4 (simple mediation) using three parental feeding practices (food as a reward, food for emotion regulation, restriction for health reasons) (see Figure 2.1).

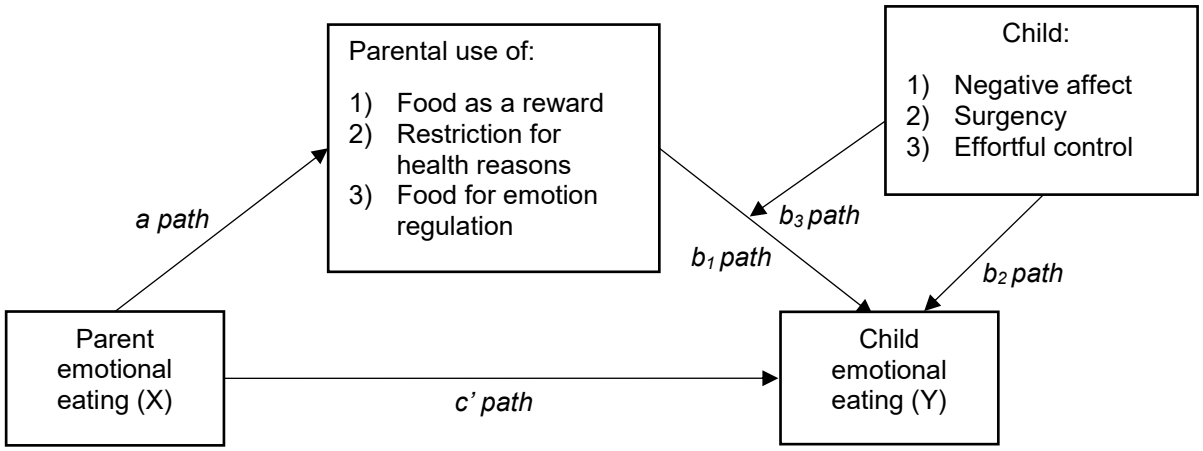
Figure 2.1
Combined conceptual mediation model (PROCESS #4) of the relationship between parent EE (X) and child EE (Y) with parental use of food for emotion regulation, food as a reward and restriction of food for health reasons as mediators (M). *c* = total effect of X on Y, *c'* = direct effect of X on Y controlling for M, *a* = effect of X on M, *b* = effect of M on Y.



If a mediating relationship was established, moderated mediations were then used to assess whether the mediated relationship between parent EE (X) and child EE (Y) via parental feeding practices (M), varied as a function of child temperament (moderator variable 'W'). In other words, we tested whether the indirect effect was conditional on different levels of child temperament. Nine models were tested using PROCESS model 14 (moderated

mediation) using three parental feeding practices (food as a reward, food for emotion regulation, restriction for health reasons) and three indices of child temperament (negative affect, surgency, effortful control) (see Figure 2.2).

Figure 2.2
Combined conceptual moderated mediation model (PROCESS #14) between parent EE (X) and child EE (Y) using mediator: parental use of food as a reward, parental use of restriction for health reasons and parental use of food for emotion regulation (M), and moderator: negative affect, surgency and effortful control (W). *c'* = direct effect of X on Y holding M and W constant, *a* = unconditional effect of X on M, b_1 = effect of M on Y. b_2 = effect of W on Y, b_3 = conditional effect of M on Y.



PROCESS Model 14 computes the *a* path (the unconditional effect of X on M; unconditional because the effect of X on M is not contingent on another variable), the *c'* path (the direct effect of X on Y, holding M and W constant), the b_1 path (the effect of M on Y), the b_2 path (the effect of W on Y), and the b_3 path (the conditional effect of M on Y; conditional because the effect of M on Y is contingent on levels of W). Model 14 also computes an 'index of moderated mediation' (Hayes, 2015) which is a statistic that combines all the individual pathways and computes the conditional indirect effect of X on Y via M at levels of W, using unstandardised beta coefficients and 95% confidence intervals to indicate significance. A significant index indicates that the mediating relationship between parent EE (X) and child EE (Y) via parental feeding practices (M) differs depending on the level of child temperament (W). The PROCESS macro automatically 'probes' the conditional indirect effect to determine at what level of temperament the indirect effect is a function of. Levels of child temperament were determined using -1*SD* below the mean for "low", the mean for "medium", and +1*SD* above the mean for "high" as this is standard statistical practice for creating levels of a moderator variable (Hayes, 2015). For negative affect, "low" reflects a score of 3.1 on the CBQ-VSF (Putnam & Rothbart, 2006) (e.g., "it is *slightly untrue* that my child is quite upset by a little cut or bruise"), "medium" reflects a score of 4.0 (e.g., "it is *neither true nor untrue*" and "high" reflects a score of 5.0 (e.g., "it is *slightly true*"). For surgency, "low" reflects a score of 3.5 on the CBQ-VSF (e.g., "it is *slightly untrue* that my child often rushes into new

situations"), "medium" reflects a score of 4.4 (e.g., "it is *neither true nor untrue*" and "high" reflects a score of 5.3 (e.g., "it is *slightly true*"). For effortful control, "low" reflects a score of 4.5 on the CBQ-VSF (e.g., "it is *neither true nor untrue* that my child is good at following instructions"), "medium" reflects a score of 5.1 (e.g., "it is *slightly true*" and "high" reflects a score of 6.0 (e.g., "it is *quite true*").

The *c path* in the simple mediations and the *a path* in the moderated mediations remained consistent, and so are only described once. For analyses using p-values, *p<.05* was used to indicate significance, and for analyses using bootstrapping, confidence intervals were used at 5000 samples.

2.3 Results

2.3.1 Sample characteristics

The final sample of 244 mothers had a mean age of 36 years (*SD* ± 3.97), 85.70% described themselves as White British and 86.50% held a degree level qualification. Mothers had a median of two children (*IQR* ± 0.73). Mothers' subjective social status (SSS) was 4.97 (*SD* ± 1.59) reflecting a middle-class demographic. Using mother's self-reported BMI data, 69.20% reported overweight and 20% reported obesity (mean BMI = 25.91 ± *SD* 6.85) reflecting percentage proportions similar to UK norms (Moody, 2019). Mean child age was 3.80 years (*SD* ± 0.76) and 52% of children were female. Mother's self-reported child BMI z-score data reported 82.50% of children with a healthy weight (mean BMI z-score = -0.13 ± *SD* 1.56), 7.80% with overweight, and 9.70% with obesity (standardised for child age and gender (Child Growth Foundation, 1996)).

2.3.2 Descriptive statistics

Mean scores of parent-reported parent and child individual differences are presented in Table 2.1. The mean scores for child EE in this sample are similar to other UK/US studies where parents of children in this age range have reported mean scores of 1.70 (Blissett et al., 2010). The mean scores for temperament are similar to Zhou et al. (2019) where parents report mean scores of 3.97 for negative affect, 4.76 for surgency and 5.29 for effortful control. The mean scores for parental feeding practices reflect those of other studies of parents of children in the same age range (Roberts et al., 2018; Russell et al., 2018). This suggests that the sample used are similar in their experiences of child feeding and eating to other published studies in the UK/US.

Table 2.1
Means (±*SD*) of parent-reported parent and child individual differences

Measure	Mean (±*SD*)	Min	Max
Parent Emotional Eating [a]	2.60 (1.01)	2.00	5.00

Child Emotional Eating [b]	1.82 (0.66)	1.00	5.00
Child Negative Affect [c]	4.04 (0.91)	1.58	6.80
Child Surgency [c]	4.36 (0.89)	1.92	7.00
Child Effortful Control [c]	5.17 (0.68)	2.75	6.50
Food as a Reward [c]	2.97 (0.96)	1.00	5.00
Restriction for Health Reasons [c]	2.87 (0.61)	1.00	5.00
Food for Emotion Regulation [c]	2.00 (0.75)	1.00	5.00

[a] n = 244. [b] n = 231. [c] n = 237.

2.3.3 Covariate analysis

Spearman's Rho correlations are presented in Table 2.2 and suggest that only parent BMI was significantly correlated with both parent EE and child EE. Mann-Whitney U tests indicated that there were no significant differences in parent EE or child EE based on child sex (parent EE: U = 7613.50, p = .738, child EE: U = 7193, p = .284). Kruskal-Wallis H tests revealed there were no significant differences in parent EE or child EE based on parent education (no degree, degree, postgraduate; parent EE: $H(2)$ = 3.64, p = .162, child EE: $H(2)$ = .432, p = .806). Kruskal-Wallis H tests also revealed there were no significant differences in parent EE or child EE based on parent ethnicity (parent EE: $H(13)$ = 14.57, p = .408, child EE: $H(13)$ = 10.47, p = .655). As a result, only parent BMI was controlled for in the main analyses.

Table 2.2
Spearman's Rho correlations between continuous parent and child demographics with parent EE and child EE (N = 244, two-tailed).

Measure	Parent EE	Child EE
Child age	-.006	.089
Parent age	-.052	-.013
SSS[a]	.081	-.070
Child BMI z-score[b]	.184	.116
Number of children	.026	.130*
Parent BMI[b]	.352**	.178*

[a] MacArthur's Scale of Subjective Social Status (SSS). [b] n = 103. [c] n = 185. ** p < .01, * p < .05.

2.3.4 Simple mediation

Exploring the role of parental feeding practices as mediators between parent EE and child EE.

Simple mediations were used to test the hypothesis that there will be a positive relationship between parent EE and child EE via greater parental use of food for emotion regulation, food as a reward or restriction of food for health reasons. Figure 2.1 presents the three models conceptually to assist in interpretation of mediational analyses.

1) Food for emotion regulation

As seen in Table 2.3 and illustrated by Figure 2.1, whilst controlling for parent BMI, parent EE was a significant positive predictor of child EE (c). Parent EE was positively and

significantly related to greater use of *food for emotion regulation* (*a*). Use of food for emotion regulation was also positively and significantly related to higher child EE, (*b*). The strength of the relationship between parent EE and child EE scores decreased when food for emotion regulation was held constant and was non-significant (*c'*). The significant indirect effect of parent EE on child EE via use of food for emotion regulation indicated that mediation had occurred. Taking the non-significant *c'* pathway and indirect effect together, this analysis demonstrated that full mediation had occurred. This means that the relationship between parent EE and child EE is likely a result of parental use of food for emotion regulation.

2) Food as a reward

As seen in Table 2.3 and illustrated by Figure 2.1, parent EE was also positively and significantly related to greater parental use of *food as a reward* (*a*). Use of food as a reward was significantly and positively related to greater child EE (*b*). The strength of the relationship between parent EE and child EE scores decreased when use of food as a reward was held constant but remained significant (*c'*). The significant indirect effect of parent EE on child EE via use of food as a reward indicated that mediation had occurred. The significant *c'* pathway and indirect effect together demonstrated that partial mediation had occurred. This means that the relationship between parent EE and child EE can be explained in part by parental use of food as a reward.

3) Restriction of food for health reasons

Table 2.3 (and illustrated by Figure 2.1) shows that parent EE was positively and significantly related to greater parental *restriction of food for health reasons* (*a*). Use of restriction for health reasons was significantly and positively related to greater child EE (*b*). The strength of the relationship between parent EE and child EE scores decreased when restriction for health reasons was held constant but remained significant (*c'*). The significant indirect effect of parent EE on child EE via use of restriction for health reasons indicated that mediation had occurred. Taking the significant *c'* pathway and indirect effect together showed that partial mediation had occurred. This means that the relationship between parent EE and child EE is explained in part by parental use of restriction for health reasons.

Table 2.3
Regression coefficients for *a, c, c' and b* pathways of each mediating feeding practice (M)

		Food for Emotion Regulation (M)[a]						Child EE (Y)[b]				
Antecedent		*B*[c]	*SE*	*t*	*p*	df		*B*	*SE*	*t*	*p*	df
Parent EE (X)[d]	*a*	0.24	0.05	5.23	<*.001*	182	*c*	0.24	0.05	4.89	<*.001*	182
		-	-	-	-	-	*c'*	0.13	0.05	2.69	*.080*	181

Food for Emotion Regulation (M)		-	-	-	-	-	*b*	0.46	0.07	6.55	<*.001*	181
		Indirect effect: B = 0.11, *SE* = 0.06, 95% CI [0.035, 0.215]										
		Food as a Reward (M)						Child EE (Y)				
Parent EE (X)	*a*	0.24	0.07	3.36	*.001*	182	*c*	0.24	0.05	4.89	<*.001*	182
		-	-	-	-	-	*c'*	0.19	0.05	4.00	<*.001*	181
Food as a Reward (M)		-	-	-	-	-	*b*	0.18	0.07	3.83	<*.001*	181
		Indirect effect: B = 0.05, *SE* = 0.02, 95% CI [0.013, 0.090]										
		Restriction for Health Reasons (M)						Child EE (Y)				
Parent EE (X)	*a*	0.23	0.06	4.17	<*.001*	182	*c*	0.24	0.05	4.89	<*.001*	182
		-	-	-	-	-	*c'*	0.15	0.05	3.30	*.001*	181
Restriction for Health Reasons (M)		-	-	-	-	-	*b*	0.37	0.06	6.21	<*.001*	181
		Indirect effect: B = 0.09, *SE* = 0.04, 95% CI [0.023, 0.175]										

Note. Analysis remains unchanged with addition of fathers. [a] M = mediator variable. [b] Y = dependent variable. [c] *B* = unstandardized beta coefficient. [d] X = antecedent variable.

2.3.5 Moderated mediation

Exploring the moderating role of temperament on the mediating relationship of parental feeding practices between parent EE and child EE.

To test the hypothesis that there will be a positive relationship between parent EE and child EE, via use of food for emotion regulation, food as a reward or restriction of food for health reasons, but only when children score high in negative affect or surgency, or score low in effortful control, moderated mediation analyses were employed. Two models yielded significant indexes of moderated mediation and so are described fully with a conceptual model to visualise the interaction (see Figure 2.2). The remaining seven models yielded non-significant indexes of moderated mediation and so are reported briefly in the text (see Appendix E-1).

1) Mediator: Food as a reward, Moderator: Negative affect

As seen in Table 2.4 and illustrated by Figure 2.2, the direct effect (*c'*) of parent EE scores on child EE scores was significant and positive when controlling for food as a reward. The unconditional effect (*a*) of parent EE on use of food as a reward was significant and positive. The conditional effect (b_3) of parental use of food as a reward and child negative affect on child EE scores yielded a significant positive interaction. Overall, the index for

moderated mediation was positive and significant, suggesting that the indirect effect of parent EE scores on child EE scores through the use of food as a reward varied as a function of child negative affect scores (moderated mediation). Probing the indirect effect at low, medium, and high values of child negative affect revealed that scores were positive for all values, but non-significant for low (*B* = 0.01, *SE* = 0.01, 95% CI [-0.020, 0.038], significant for medium (*B* = 0.04, *SE* = 0.02, 95% CI [0.009, 0.081] and significant for children scoring high (*B* = 0.07, *SE* = 0.03, 95% CI [0.015, 0.146] in negative affect. Therefore, parents who reported a greater tendency to emotionally eat also reported a greater use of food as a reward that translated into higher child EE scores, but only amongst those children who scored medium or high in negative affect.

2) Mediator: Restriction for health reasons, Moderator: Negative affect

As seen in Table 2.4 and illustrated by Figure 2.2, the direct effect (*c'*) of parent EE scores on child EE scores was significant and positive when controlling for restriction of food for health reasons. The unconditional effect (*a*) of parent EE on use of restriction of food for health reasons was significant and positive. The conditional effect (b_3) of parental use of restriction of food for health reasons and child negative affect scores on child EE scores yielded a significant positive interaction. Overall, the index for moderated mediation was positive and suggesting that the indirect effect of parent EE scores on child EE scores through the use of restriction of food for health reasons varied as a function of child negative affect scores (moderated mediation). Probing the indirect effect at low, medium, and high values of child negative affect revealed that scores were positive for all values, but non-significant for low (*B* = 0.02, *SE* = 0.02, 95% CI [-0.020, 0.073], significant for medium (*B* = 0.06, *SE* = 0.03, 95% CI [0.019, 0.125] and significant for children scoring high (*B* = 0.11, *SE* = 0.04, 95% CI [0.029, 0.200] in negative affect. Therefore, parents who reported a greater tendency to emotionally eat also reported greater use of restriction of food for health reasons that translated into higher child EE scores, but only amongst those children who scored higher in negative affect.

Table 2.4
Regression coefficients for *a, c', b_1, b_2 and b_3* pathways of each mediating feeding practice (M) with each moderating temperamental disposition (W).

		Food as a Reward (M)[a]						Child EE (Y)[b]				
Antecedent		*B*[c]	*SE*	*t*	*p*	df		*B*	*SE*	*t*	*p*	df
Parent EE (X)[d]	*a*	0.24	*0.07*	*3.36*	*.001*	182	*c'*	0.14	*0.05*	*2.89*	*.004*	179
Food as a Reward		-	-	-	-	-	b_1	0.16	*0.05*	*3.36*	*.001*	179
Negative Affect (W)[e]		-	-	-	-	-	b_2	0.16	*0.05*	*3.02*	*.003*	179

M x W		-	-	-	-	-	b_3	0.13	*0.05*	*2.85*	*.005*	179
		Index of moderated mediation: B = 0.03, *SE* = 0.02, 95% CI [0.002, 0.076]										
		Restriction for Health (M)						Child EE (Y)				
Parent EE (X)	*a*	0.23	*0.06*	*4.17*	*<.001*	182	*c'*	0.10	*0.05*	*2.10*	*.037*	179
Restriction for Health		-	-	-	-	-	b_1	0.28	*0.06*	*4.71*	*<.001*	179
Negative Affect (W)		-	-	-	-	-	b_2	0.17	*0.05*	*3.55*	*<.001*	179
M x W		-	-	-	-	-	b_3	0.19	*0.05*	*3.56*	*.001*	179
		Index of moderated mediation: *B* = 0.04, *SE* = 0.02, 95% CI [0.004, 0.095]										

Note. Analysis remains unchanged with addition of fathers. [a] M = mediator variable. [b] Y = dependent variable. [c] *B* = unstandardized beta coefficient. [d] X = antecedent variable. [e] W = moderator variable.

Non-significant indices for moderated mediation

The remaining models yielded non-significant indices for moderated mediation. This suggested that i) the indirect effect of parent EE scores on child EE scores through the use of food for emotion regulation did not vary as a function of child negative affect, ii) the indirect of parent EE scores on child EE scores through the use of food for emotion regulation, food as a reward, and restriction of food for health reasons, did not vary as a function of child surgency, and that iii) the indirect effect of parent EE scores on child EE scores through the use of food for emotion regulation, food as a reward, and restriction for health reasons, did not vary as a function of child effortful control (see Appendix E-1, and Figure 2.2 for conceptual model).

2.4 Discussion

The current study explored the potential mechanistic underpinnings of the relationship between parent EE and child EE. Our findings replicate previous studies that have demonstrated that feeding practices mediate the parent-child EE relationship (Miller et al., 2020; Tan & Holub, 2015), but this is the first study to report that child negative affect moderates the strength of these associations. The current study's findings demonstrate that the relationships between parent and child EE via parental use of food as a reward and restriction of food for health reasons depend in part on child temperament, and that these feeding practices predict the greatest levels of child EE with children who are medium-high in negative affect. In contrast, parental use of food for emotion regulation fully mediated the relationship between parent and child EE and there was no evidence of moderation by child temperament on this relationship. These findings add to our understanding about the complex inter-relationships between parental eating behaviour, parental feeding practices and child temperament in shaping parental reports of children's EE.

Simple Mediations

Simple mediation analyses demonstrated that parental use of food for emotion regulation fully mediated the positive relationship between parent EE and child EE. This is consistent with previous research which has shown that maternal experiences of stress have been linked to maternal EE and subsequent child EE via emotional feeding practices (Rodgers et al., 2014). Parents who regularly use food to cope with their own emotions may be more likely to use food to soothe their child's distress, and they may also use food as a tool with their child to regulate their own emotional arousal (Hamburg et al., 2014). The successful reduction in negative affect of both parent and child likely reinforces the use of emotional feeding, and previous interventions that have sought to increase parental responsiveness and reduce emotional feeding have proved successful in lowering child EE over time (Harris et al., 2020).

Simple mediation analyses also indicated that parental use of food as a reward and restriction of food for health reasons both partially mediated the positive relationship between parent EE and child EE. These findings support previous longitudinal studies which have suggested that these feeding practices help to explain how child EE develops (e.g., Farrow et al., 2015; Steinsbekk et al., 2016). It is likely that using palatable foods as rewards or restricting these foods for health reasons may increase children's motivation to consume these food types irrespective of hunger and thus increase incidences of obesogenic eating behaviours (Miller et al., 2020). The remaining analyses build upon these models and suggest that characteristics of children, specifically negative affect, also contribute to this mediating relationship between parental eating, parental feeding, and child EE.

Moderated Mediations

Moderated mediation analyses indicated that the mediating effect of parental use of food as a reward and restriction of food for health reasons between parent EE and child EE varied as a function of child negative affect. However, contrary to our predictions, we did not find support for child surgency or effortful control as significant moderators of this relationship, nor evidence of moderated mediation via parental use of food for emotion regulation. These results suggest that the positive relationship between parent EE and child EE that is explained in part by greater use of food as a reward or restriction of food for health reasons is only significant for children who are medium or high in negative affect.

Parents who have learned to use food to regulate their own emotions may also be more likely to use food as a reward with their children (de Lauzon-Guillain et al., 2009). Our

findings indicate that the mediating effect of using food as a reward varies depending on the level of child negative affect. Only those children who were rated as medium-high in negative affect had significantly higher levels of EE. Our simple mediations revealed that greater use of food as a reward only partially mediated the relationship between parent EE and child EE, suggesting that other factors may contribute to the parent-child EE link. However, when food was used as a reward with a child who was higher in negative affect, this combination was able to explain the parent-child EE relationship. It may be that for children with more frequent and/ or intense negative affect, parental use of food as a reward is effective in regulating emotional distress. This may reinforce and increase the incidence of this feeding practice (e.g., Miller et al., 2020), the rewarding effect of food for the child, and reinforce modelling of EE behaviours (Rothbart & Bates, 2007).

Parents who have a tendency to EE may also be more likely to focus on their children's diet and restrict unhealthy foods for health reasons, perhaps in an attempt to avoid their children developing similar unhealthy eating behaviours (Miller et al., 2020). Indeed, moderated mediations revealed that the indirect relationship between parent and child EE via use of restriction of food for health reasons was contingent on a child being medium or high in negative affect. Previous research has shown that children higher in negative affect are less likely to accept restriction at mealtimes (Farrow et al., 2018), which may result in greater rates of eating conflict. Higher negative affect in children is likely to shape both children's experiences of food restriction and children's responses to restrictive behaviour. A child with greater negative affect may be more likely to argue with their parents if food is restricted or repeatedly request or demand forbidden foods. This may heighten negative affect around foods and exacerbate the risk of children using food as a tool to deal with emotional arousal.

Contrary to our hypotheses, the full mediating effect of parents' use of food to regulate emotion on the relationship between parent EE and child EE did not vary according to levels of child negative affect. It may be that the combination of modelling of EE alongside the use of food for emotion regulation is particularly problematic and is associated with a greater prevalence of child EE irrespective of other child characteristics. In addition, child surgency and effortful control did not moderate any of the models' indirect effects. This may be a result of the age of the children since it has been reported that surgency is only predictive of obesogenic behaviours from 6-8-years (Steinsbekk et al., 2020). Similarly, Leung et al. (2014) failed to find that preschool children's effortful control was related to obesogenic eating behaviour. As the current study included children between 3-5-years, any influence of surgency or effortful control on eating behaviour may strengthen as children age and autonomy over food intake increases (Scaglioni et al., 2018).

As with other aspects of eating behaviour (Butland et al., 2007), the development of child EE is likely a result from a complex interplay between multiple risk factors. The findings reported align with the Biopsychosocial Model of children's eating behaviour and highlight how child characteristics interact with parent behaviours to shape the development of children's eating behaviour. Parental feeding practices and parents' own EE behaviours interact together to predict child EE and the relationship between parent behaviours and child EE depends on child levels of negative affect. These findings suggest that children with more negative temperamental dispositions may be the most susceptible to the negative impacts of an environment that is highly controlling around food, or in which EE is a modelled parental behaviour. Given that these controlling and counterproductive feeding practices are more easily modified than a child's innate temperamental disposition, interventions to support healthy eating in children should seek to reduce the use of these parenting behaviours and increase the prevalence of more responsive feeding practices. Indeed, promising effects have been reported from a randomised control trial that taught and implemented responsive parenting; child EE reduced as a consequence of the intervention through the reduced use of controlling feeding practices (Harris et al., 2020). Mealtime interactions can be challenging for families, particularly when children express high levels of negative affect, and further research is needed to understand how parental feeding practices could be tailored to children with greater negative affect to foster a responsive, supportive feeding environment.

2.4.1 Limitations and future directions

Despite our study having a large sample size, it was constrained by its cross-sectional design. Previous research has documented the existence of bidirectional relationships between child temperament, parental emotional feeding and child EE (Steinsbekk et al., 2018), thus future longitudinal research is needed to assess this in the context of the models identified in this paper. This study also used parent self-reports as measures of child EE and parental feeding practices. These self-reports may not always map onto observable behaviour (Blissett et al., 2019) and can be subject to response bias (Bergmeier et al., 2015). Experimental studies where child EE and feeding practices are objectively measured on multiple occasions may provide a fruitful avenue for further research. Additionally, the current sample consisted of only mothers and thus we do not yet know whether the findings would apply within father-child relationships. Lastly, only the negative affect of the child was assessed as a moderating variable in the current study. It is likely that the negative affect of the parent could also act as a moderating variable on the relationships identified. Indeed, previous work has highlighted that poorer parental mental health is associated with the increased use of controlling feeding practices (e.g., Haycraft, 2020), suggesting that high parental negative affect could increase the use of controlling

feeding practices and thus child EE. Therefore, the current study could benefit from being expanded to consider the emotional climate of the parent as well as the child.

2.4.2 Conclusion

In conclusion, this study is the first to assess the interactive relationships between parental feeding practices and child temperament in the explanation of the association between parental reports of parent and child EE. In line with the Biopsychosocial Model and the Behavioural Susceptibility Theory, the findings offer a unique insight into how children's temperamental characteristics create specific vulnerabilities to environmental experiences of parental EE and controlling feeding practices. Our findings highlight how important it is to consider individual differences between children when considering how parenting contributes to the incidence of child EE. As the prevalence of child EE is increasing (e.g., Messerli-Bürgy et al., 2018), it is imperative that interventions for child obesity consider the role of parental behaviour alongside individual characteristics of children.

CHAPTER 3:

Preschool children's food approach tendencies interact with food parenting practices and maternal emotional eating to predict children's emotional eating in a cross-sectional analysis

This Chapter was published in the *Journal of the Academy of Nutrition and Dietetics* and so only small adjustments have been made for thesis flow. Additionally, where there is reference to '*food parenting practice'*, this term refers to '*parental feeding practices'*, but at the Journal's request this was changed.

Stone, R. A., Haycraft, E., Blissett, J., & Farrow, C. (2022). Preschool-Aged Children's Food Approach Tendencies Interact with Food Parenting Practices and Maternal Emotional Eating to Predict Children's Emotional Eating in a Cross-Sectional Analysis. *Journal of the Academy of Nutrition and Dietetics*, *122*(8), 1465–1473. https://doi.org/10.1016/j.jand.2022.02.001

Abstract

Children's tendency to eat while they are emotional, irrespective of satiety, is termed 'emotional eating' (EE). EE develops early in childhood and has been associated with maternal modelling of EE and food parenting practices. Additionally, individual differences in a child's appetitive traits (i.e., food approach behaviours) are related to the development of EE. The objective of this study was to examine whether the previously identified mediating relationship between maternal EE and child EE via maternal use of food as a reward, food for emotion regulation, or restriction of food for health reasons varies as a function of child food approach. A cross-sectional online questionnaire study was conducted of 185 mothers of children aged between 3-5-years were recruited between January 2020 to March 2020 from advertisements placed on social media in the United Kingdom. Questionnaires assessed child EE, child food approach tendencies, maternal EE, and food parenting practices. Using PROCESS v3.4, model 14, moderated mediations were employed to assess whether child food approach tendencies moderated the mediating effect of controlling food parenting practices between maternal EE and child EE. This study found the relationship between maternal reports of maternal EE and child EE was mediated by maternal use of food as a reward, but only for children with high food approach tendencies (*B* = 0.05, 95% CI 0.010, 0.101, R^2 = 48%). This study also found the relationship between maternal EE and child EE was mediated by maternal use of restriction for health reasons, but only when children showed medium (*B* = 0.02, 95% CI 0.004, 0.072) to high (*B* = 0.06, 95% CI 0.016, 0.110, R^2 = 51%) food approach tendencies. The potential for the intergenerational transmission of EE via the use of food as a reward and food restriction may be exacerbated when a child has higher food approach behaviours.

3.1 Introduction

When children experience emotions, usually those that are negative, a common response can be to consume food regardless of their satiety (emotional eating; EE) (Ashcroft et al., 2008). These foods are typically high in fat and sugar and provide hedonic pleasure that in turn regulates the child's experience of these emotions (Nguyen-Michel et al., 2007; van Strien et al., 2019). EE is considered biologically paradoxical; the body's natural response to intense emotions is to release appetite-suppressing hormones that inhibit the desire to eat (Stone & Brownell, 1994; Yau & Potenza, 2013). Yet, the prevalence of EE is high in children (Carper et al., 2000), remaining stable across childhood (Farrow & Blissett, 2012) and persisting into adulthood (Simmonds et al., 2016). This suggests that for some, the relationship between emotions and food is 'learnt', most likely during early childhood. EE in children has been related to higher waist-to-height ratios in 4-12-year-olds (Jani et al., 2020), and EE in adults is often associated with higher body mass index (BMI) and obesity (Aoun et al., 2019). Collectively, this evidence amplifies the importance of understanding the development of EE in early life (Herle et al., 2020).

Russell and Russell (Russell & Russell, 2018) proposed a Biopsychosocial Model to explain the development of children's eating behaviour and weight from infancy to early childhood. This model posits that obesogenic eating behaviours such as EE arise from interactions between biopsychosocial factors, such as genetic susceptibility, temperament and appetitive traits, as well as psychosocial and behavioural factors, such as food parenting practices (Russell & Russell, 2019; Russell & Russell, 2018). Early in childhood, parents act as gatekeepers and role models with regard to food (Savage et al., 2007). The way in which parents consume food themselves may be reflected in how their child consumes food. For example, behavioural modelling occurs through observation and imitation (Bandura, 1977) and if parents often consume food in response to emotions, they may teach their child that this is an appropriate response. Indeed, previous literature has consistently shown that parental EE is associated with greater child EE (Carbonneau et al., 2020; Ramalho et al., 2020).

Similarly, the food parenting practices parents use may inadvertently foster unhealthy eating behaviours in their children (Jalo et al., 2019). Specifically greater parental use of *food as a reward* and *food for emotion regulation* have been associated with greater child EE in cross-sectional (Tan & Holub, 2015) and longitudinal studies (Steinsbekk et al., 2016). Given that the foods used to regulate children's emotions and reward behaviours are typically energy-dense (Raaijmakers et al., 2014), children may learn to associate these foods with pleasure and the alleviation of negative emotions (Bongers et al., 2015), promoting future consumption in response to emotional arousal regardless of satiety (Rodenburg et al., 2014). Similarly, parental *restriction of food* has been associated with child EE both cross-

sectionally (e.g., Klosowska et al., 2020) and longitudinally (e.g., Farrow et al., 2015). Parents often restrict child food intake because of concerns about health or weight (Freitas et al., 2019). However, when children are aware that foods are restricted, they often express a greater desire for those foods and greater subsequent intake of them (Jansen et al., 2007). Indeed, these restricted foods can be used by children in situations of emotional arousal as a means of regulating their mood (Farrow et al., 2015).

The Biopsychosocial Model (Russell & Russell, 2018) also accounts for the influence of child characteristics in predicting early childhood eating behaviours, and this is supported by literature which has shown that child characteristics can shape EE. For example, the prevalence of EE is higher in female compared to male children (Birch & Fisher, 1998). However, less research has considered the role of child appetitive traits (i.e., food approach) in the development of EE. EE is one facet of food approach behaviour, other facets include *food responsiveness* (responding to food cues in the environment, and having a greater appetite), *desire to drink* and *enjoyment of food* (Vandeweghe et al., 2016). Food approach behaviours are often associated with child overweight (Ayine et al., 2021), and facets of food approach are all highly correlated with, and predictive of, child EE (Steinsbekk et al., 2016).

In Russell and Russell's reviews (Russell & Russell, 2019; Russell & Russell, 2018), they suggest that early childhood food approach behaviours evolve out of interactions between child characteristics and parental factors such as food parenting practices. Recent research has supported this proposition by demonstrating that parental restriction of food mediates the relationship between child food approach behaviours and child BMI (Zhou et al., 2020). Moreover, greater parental use of restriction of food for health reasons has been associated with greater child EE and child food responsiveness (Zohar et al., 2021). These findings suggest that child food approach behaviours may shape parental feeding behaviours (or vice versa) which in turn predict children's future eating behaviour and weight.

3.1.1 Aim and hypotheses

To date there is no study that explores the interactive effects of parent EE, food parenting practices and other child food approach behaviours on the development of early childhood EE. It was hypothesised that there will be a relationship between greater parent EE and greater child EE, mediated by greater use of parental use of food as a reward, restriction of food for health reasons, and use of food for emotion regulation, but moderated by children's food approach behaviour, such that the mediated relationships would be evident only when children score highly in food approach.

3.2 Method

3.2.1 Design

This cross-sectional online questionnaire study recruited participants from January 2020 – March 2020. Participants were recruited using convenience sampling from multiple social media platforms in the United Kingdom such as Facebook parenting groups, Twitter, Mumsnet and Netmums (see Appendix A-1). Multiple sources of social media were used to reduce selection bias.

3.2.2 Participants

Participants were parents of children aged between 3-5-years. Two hundred and forty-four parents completed the online study, after data screening the final sample included 185 mothers. The following data were excluded: 45 responses were incomplete; 8 responses from fathers because of documented differences between mothers and fathers in food parenting practices and this number was not large enough to make comparisons (Vollmer, 2021); 6 mothers who reported that they rarely ate with their child which cast doubt over the validity of their responses. Sample size calculations using G*Power are like that of Chapter 2 (115 participants recommended to detect medium effect sizes (α = 0.05, power = 0.80)).

3.2.3 Procedure and measures

After providing informed consent electronically, mothers completed a 20-minute questionnaire via Qualtrics (https://www.qualtrics.com) (see Appendix C-1 and C-2). At the end of the study, they had the opportunity to enter a £50 prize draw for an Amazon voucher thus reducing the chance of non-response bias. The study was approved by Aston University Health and Life Sciences Ethics Committee (#1551; see Appendix B-1). All procedures were conducted in accordance with the Declaration of Helsinki as revised in 1983. The survey included a battery of questionnaires, which are described in detail in Chapter 2.

Participant characteristics questionnaire: Please see Chapter 2 for more information about the participant characteristics questionnaire (named demographics questionnaire in Chapter 2).

The Dutch Eating Behaviour Questionnaire (DEBQ; van Strien et al., 1986); contains three subscales that measure aspects of mothers' own eating behaviour. In the current sample Cronbach Alpha's (α) = 0.95, indicated excellent reliability.

The Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007); measures parent's food parenting practices. In the current study, α was acceptable at 0.75 for use of food for emotion regulation, but for restriction of food for health reasons and use of food as a reward, α was moderate (0.65 and 0.52). Due to the small

number of items in each food parenting practice of the CFPQ, mean inter-item correlations were also assessed given that coefficient alpha is not always a good measure of internal consistency for scales with a small number of items (Clark & Watson, 1995). For use of food for emotion regulation, mean inter-item correlation = 0.50, for restriction of food for health reasons = 0.32 and for use of food as a reward = 0.26; all within the acceptable range of 0.15 - 0.50.

The Children's Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001); contains eight subscales measuring different aspects of children's appetitive traits. Child emotional-overeating was used as the outcome variable and food responsiveness, enjoyment of food, and desire to drink were averaged to create a moderating variable: "food approach" (Rodgers et al., 2013) (12 items). Items were scored using a five-point Likert scale (*"Never"* to *"Always")* where higher mean scores were indicative of higher levels of the eating behaviours. In the current sample, α was acceptable for emotional overeating (0.84), food responsiveness (0.83), enjoyment of food (0.90), and desire to drink (0.87). Overall, α was acceptable for food approach composite (0.85).

3.2.4 Data analysis

3.2.4.1 Normality and confounding variables

Data were analysed using IBM SPSS Statistics version 26 (Corp, 2019). To examine the distribution of study variables, Kolmogorov-Smirnov tests were used and revealed that maternal EE and child EE were skewed (maternal EE: $D(185) = .081$, $p = .005$, child EE: $D(185) = .125$, $p < .001$). As a result, non-parametric tests were used to identify confounding variables and moderated mediations were used in the main analysis with bootstrapping to account for this skewness. Spearman's Rho correlations were used to assess the relationships between continuous demographic variables with maternal EE and child EE. Mann-Whitney U tests and Kruskal-Wallis H tests were used to assess the relationships between categorical demographic variables with maternal EE and child EE.

3.2.4.2 Main analysis

For the main analysis, moderated mediations were employed using the PROCESS v3.4 plugin, model 14 (Hayes, 2017). Moderated mediations assess the degree to which the effect of antecedent variable (X) on outcome variable (Y) via a mediating variable (M) differs depending on different levels of a moderator variable (W). Moderated mediation is also known as a 'conditional indirect effect' because the effect of X on Y via M (i.e., the indirect effect), is conditional on a level (high, medium, or low) of another moderator variable W. PROCESS model 14 uses unstandardized beta coefficients (B) to quantify pathways

between variables and these can be either negative or positive. If B is positive, for every 1-unit increase in X, Y increases by B units, whereas if B is negative, for every 1-unit increase in X, Y decreases by B units (Hayes, 2017). Model 14 provides evidence of moderated mediation using Hayes' index of moderated mediation (Hayes, 2015) which is a quantification of the association between an indirect effect and a moderator. This statistic quantifies the amount by which two cases with the same value of W but that differ by one unit on X, are estimated to differ on Y through X's indirect effect on Y via M (Hayes, 2017). The index of moderated mediation uses confidence intervals to indicate significance and when a 95% bootstrapped confidence interval does not include zero, this indicates the moderated mediation is statistically significant. Please see Figure 3.1 for an example of model 14 using the study variables.

Three models were tested using food parenting practices (food as a reward, food for emotion regulation, and restriction for health reasons) as mediators (M), and child food approach as the moderator (W). They were used to assess the relationship between maternal EE (X) and child EE (Y). The language used to describe mediation analyses is causal in its nature (Preacher et al., 2007), but since the study design is cross sectional, its use should be interpreted as associations. To reduce multicollinearity (i.e., strong correlations between variables), mean-centering was used for all variables. 95% bootstrap confidence intervals at 5000 samples were used, and child food approach values (M) were conditioned at -1*SD* below the mean to indicate "low", mean to indicate "medium", and +1*SD* above the mean to indicate "high" levels of child food approach for all analyses. Child food approach was conditioned at low, medium and high using standard deviations which is standard statistical practice to create levels of a moderator variable (Hayes, 2017). "Low" reflects a score of 2.3 on the CEBQ[40] (i.e., "my child is *rarely* interested in food"), "medium" reflects a score of 2.9 on the CEBQ (i.e., "my child is *sometimes* interested in food") and "high" reflects a score of 3.5 on the CEBQ (i.e., "my child is *often* interested in food").

3.3 Results

3.3.1 Participant characteristics and individual differences

Participant characteristics and individual difference scores for maternal EE, child EE, food parenting practices and child food approach are presented in Table 3.1. Mothers had a mean age of 36-years, most described their ethnicity as White, and most were educated to degree level. Mothers had a mean of two children and a middle to upper-class subjective social status. Children were on average 3.8-years-old with 52% being female and 48% male.

Table 3.1

Means (±*SD*) of participant characteristics and individual differences in food parenting practices, emotional eating and food approach for mothers and children in a cross-sectional study obtained using questionnaire measures (N = 185)[a]

Measure	Mean ± *SD*	Min	Max
Maternal age (years)	36 ± 4.0	27	47
Maternal BMI	25.9 ± 6.9	15.9	45.9
Number of children	2 ± 0.7	1	5
Child age (years)	3.8 ± 0.7	3	5
Subject Social Status[b]	5.0 ± 1.6	1	9
Maternal Emotional Eating (DEBQ)	2.60 ± 1.01	2.00	5.00
Child Emotional Eating (CEBQ)	1.82 ± 0.66	1.00	5.00
Child Food Approach (CEBQ)	2.87 ± 0.61	1.67	5.00
Food as a Reward (CFPQ)	2.97 ± 0.96	1.00	5.00
Restriction for Health Reasons (CFPQ)	2.87 ± 0.61	1.00	5.00
Food for Emotion Regulation (CFPQ)	2.00 ± 0.75	1.00	5.00

Measure	n (%)
Maternal ethnicity[c]:	
White:	
English/Welsh/Scottish/Northern Irish/British	158 (86)
Irish	5 (3)
Mixed or Multiple ethnic groups:	
White and Black Caribbean	2 (1)
White and Asian	12 (6)
Asian or Asian British:	
Indian	3 (1.5)
Pakistani	1 (0.5)
Other ethnic group:	
Arab	2 (1)
Any other ethnic group	2 (1)
Maternal education:	
High School	7 (4)
Sixth Form	17 (9)
Undergraduate Degree	74 (40)
Postgraduate Degree	87 (47)
Sex of child:	
Female	96 (52)
Male	89 (48)

[a] All questionnaires use a five-point Likert scale with lower scores reflecting a lower use of this behaviour, and higher scores reflecting a greater use of this behaviour. [b] MacArthur's Scale of Subject Social Status uses ladder rungs to metaphorically represent perceived social status relative to others. Higher rungs indicate high perceived social status (Adler et al., 2000). [c] Maternal ethnicity determined using the UK Government's list of ethnic groups.

3.3.2 Covariate analysis

As seen in Table 3.2, Spearman's Rho correlations indicated that the only demographic variable significantly correlated with both maternal EE and child EE was maternal BMI. Mann-Whitney U tests indicated that there were no significant differences in maternal EE or child EE based on child sex (maternal EE: $U = 4625$, $p = .332$, child EE: $U = 4655.50$, $p = .287$). Kruskal-Wallis H tests revealed there were no significant differences in maternal EE or child EE based on maternal ethnicity (maternal EE: $H(13) = 14.58$, $p = .335$, child EE: $H(13) = 11.84$, $p = .571$). Kruskal-Wallis H tests also revealed there were no significant differences in maternal EE or child EE based on maternal education (maternal EE:

H(2) = 1.105, *p* = .576, child EE: *H*(2) = .669, *p* = .716), As a result, only maternal BMI was controlled for in the main analyses.

Table 3.2
Spearman's Rho correlations between continuous maternal and child demographics with maternal EE and child EE (N = 185, two-tailed).

Measure	Maternal EE	Child EE
Child age	-.032	.072
Maternal age	-.062	.017
SSS[a]	.075	-.109
Child BMI z-score[b]	.217	.109
Number of children	-.002	.164*
Maternal BMI	.352**	.178*

[a] MacArthur's Scale of Subjective Social Status (SSS). [b] *n* = 97. ** *p* < .01, * *p* < .05.

3.3.3 Moderated mediation

Exploring the moderating role of food approach on the mediating relationship of food parenting practices between maternal EE and child EE

The three moderated mediation models exploring the moderating role of food approach on the mediating relationship of food parenting practices between maternal EE and child EE presented in Table 3.3. The first and second model yielded significant indexes for moderated mediation and so individual pathways are described, a conceptual diagram is used to illustrate the interaction (Figure 3.1 and Figure 3.2), and probing statistics are given to convey the nature of this interaction. The *a* pathway remained the same and so is only reported once. The last model yielded a non-significant index of moderated mediation and so is reported only briefly.

Table 3.3

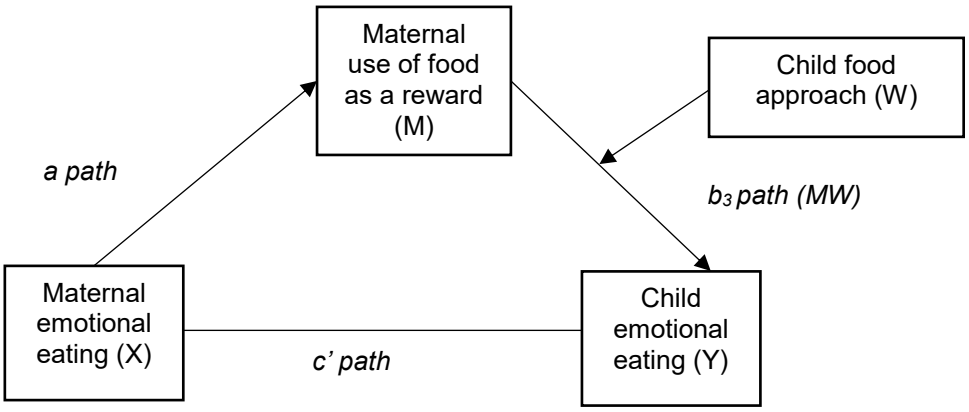
Moderated mediation models testing the mediating role of food parenting practices in the association between maternal EE and child EE, and the moderating role of child food approach on this association

		Food as a reward (M)						Child EE (Y)[b]				
Antecedent		*B*[c]	*SE*[d]	*t*	*P*	df[e]		*B*	*SE*	*t*	*P*	df
Maternal EE (X)[f]	*a*[g]	0.24	0.07	3.36	0.001	182	*c'*[h]	0.09	0.04	2.30	0.023	179
Food as a reward (M)		-	-	-	-		b_1[i]	0.07	0.04	1.69	0.093	179
Food approach (W)		-	-	-	-		b_2[j]	0.53	0.07	8.09	<0.001	179
M x W		-	-	-	-		b_3[k]	0.23	0.05	4.24	<0.001	179
Food as a reward, R^2[l] = 0.06*,* $F(2,182) = 5.67$*,* $p = .004$							*Child EE,* $R^2 = 0.48$*,* $F(5,179) = 33.48$*,* $p < .001$					
		Restriction for health (M)						Child EE (Y)				
Maternal EE (X)	*a*	0.24	0.06	4.17	0.004	182	*c'*	0.07	0.04	1.68	0.095	179
Restriction for health (M)		-	-	-	-		b_1	0.15	0.06	2.59	0.010	179
Food approach (W)		-	-	-	-		b_2	0.50	0.06	7.78	<.001	179
M x W		-	-	-	-		b_3	0.19	0.05	3.64	<.001	179
Restriction for health, $R^2 = 0.10$*,* $F(2,182) = 10.13$*,* $p < .001$							*Child EE,* $R^2 = 0.51$*,* $F(5,179) = 37.33$*,* $p < .001$					
		Food for emotion regulation (M)						Child EE (Y)				
Maternal EE (X)	*a*	0.24	0.05	5.23	<.001	182	*c'*	0.07	0.04	1.75	0.082	179
Food for emotion regulation (M)		-	-	-	-		b_1	0.20	0.07	2.86	0.005	179
Food approach (W)		-	-	-	-		b_2	0.49	0.07	7.12	<.001	179
M x W		-	-	-	-		b_3	0.17	0.06	2.99	0.003	179
Food for emotion regulation, $R^2 = 0.14$*,* $F(2,182) = 14.76$*,* $p < .001$							*Child EE,* $R^2 = 0.48$*,* $F(5,179) = 34.03$*,* $p < .001$					

[a] All models control for maternal body mass index (BMI) for N=185 mothers. [b] Y = outcome variable. [c] *B* = unstandardized beta. [d] *SE* = standard error. [e] df = degrees of freedom. [f] X = antecedent variable. [g] *a* = unconditional effect X on M (unconditional as the effect of X on M is not contingent (i.e., conditional) on another variable). [h] *c'* = direct effect of X on Y holding M and W constant. [i] b_1 = effect of M on Y. [j] b_2 = effect of W on Y. [k] b_3 = conditional effect of M on Y (conditional because the effect of M on Y is contingent on W). [l] R^2 = the amount of variance explained by the model for M and Y.

1) Mediator: Food as a reward, Moderator: Food approach

Figure 3.1
Conceptual moderated mediation model (PROCESS # 14) of the relationship between maternal EE (X) and child EE (Y) using mediator: food as a reward (M) and moderator: food approach (W).



Taking each path in Figure 3.1 individually, there was a significant direct effect (*c'*) of greater maternal EE scores on greater child EE scores where for every 1-unit increase of maternal EE, child EE increased by 0.09 units. There was a significant unconditional effect (*a*) of greater maternal EE on greater use of food as a reward where for every 1-unit increase of maternal EE, use of food as a reward increased by 0.24 units. There was a non-significant effect *(b_1)* of greater use of food as a reward on greater child EE scores where for every 1-unit increase in food as a reward, child EE increased by 0.07 units. There was a significant effect *(b_2)* of child food approach on child EE scores where for every 1-unit increase in child food approach, child EE increased by 0.53 units. The conditional effect (b_3) of maternal use of food as a reward on child EE was contingent on child food approach tendencies because of the significant interaction between use of food as a reward and child food approach on child EE (see Table 3.3).

The result from the index for moderated mediation was significant and positive, *B* = 0.06, *SE* = 0.03, 95% CI[0.010, 0.108], suggesting that there was an indirect effect of greater maternal EE scores on greater child EE scores through greater use of food as a reward and this indirect effect varied as a function of child food approach tendencies. Probing the indirect effect at low, medium, and high values of child food approach revealed that the moderated mediation was only significant at high levels of child food approach (see Table 3.4).

Table 3.4
Relationships between maternal EE and child EE via maternal use of food as a reward at different levels of child food approach.

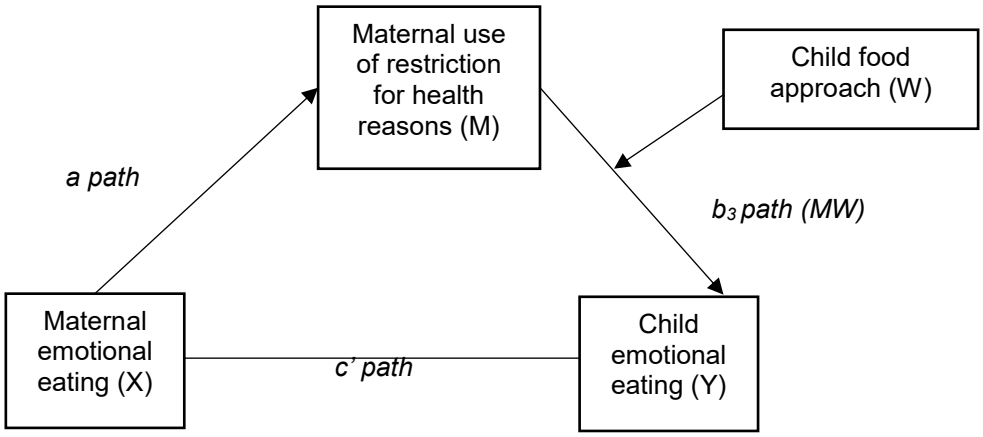
Child Food Approach[a]	Effect	*SE*[b]	LLCI[c]	ULCI[d]
-0.64 (Low)[e]	-0.02	0.02	-0.053	0.005
0.00 (Medium)[f]	0.02	0.01	-0.003	0.041
0.64 (High)[g]	0.05	0.02	0.010*	0.101*

[a] The CEBQ uses a five-point Likert scale. Child food approach values are mean centered. [b] *SE* = standard error. [c] LLCI = lower-level confidence interval. [d] ULCI = upper-level confidence interval. [e] Low = -1*SD* below the mean and reflects a score of 2.3 on the CEBQ (i.e., "my child is *rarely* interested in food"). [f] Medium = the mean food approach score of the sample and reflects a score of 2.9 on the CEBQ (i.e., "my child is *sometimes* interested in food"). [g] High = +1*SD* above the mean and reflects a score of 3.5 on the CEBQ (i.e., "my child is *often* interested in food"). * $p < .05$.

Therefore, mothers who had a greater tendency to emotionally eat (e.g., by 1-unit) also reported a greater use of food as a reward as a result, and that translated into greater child EE scores (0.05 units for 1-unit increase in maternal EE), but only amongst those children who scored high on food approach. The moderated mediation model explained 51% of the variance in child EE.

2) Mediator: Restriction of food for health reasons, Moderator: Food approach

Figure 3.2
Conceptual moderated mediation model (PROCESS # 14) of the relationship between maternal EE (X) and child EE (Y) using mediator: restriction for health reasons (M) and moderator: food approach (W).



Taking each path in Figure 3.2 individually, there was a non-significant direct effect (*c'*) of greater maternal EE scores on greater child EE scores where for every 1-unit increase of maternal EE, child EE increased by 0.07 units. There was a significant effect *(b_1)* of greater use of restriction for health reasons on greater child EE scores where for every 1-unit increase in restriction for health reasons, child EE increased by 0.15 units. There was a significant effect *(b_2)* of child food approach on child EE scores where for every 1-unit increase in child food approach, child EE increased by 0.50 units. The conditional effect (b_3) of maternal use of restriction for health reasons on child EE was contingent on child food

approach tendencies because of the significant interaction between use of restriction for health reasons and child food approach on child EE (see Table 3.3).

The result from the index for moderated mediation was significant and positive, *B* = 0.04, *SE* = 0.02, 95% CI[0.004, 0.089], suggesting that there was an indirect effect of greater maternal EE scores on greater child EE scores through greater use of restriction for health reasons varied as a function of child food approach. Probing the indirect effect at low, medium, and high values of child food approach revealed that the moderated mediation was only significant at medium-high levels of child food approach (see Table 3.5).

Table 3.5
Relationships between maternal EE and child EE via maternal use of restriction of food for health reasons at different levels of child food approach.

Child Food Approach[a]	Effect	*SE*[b]	LLCI[c]	ULCI[d]
-0.64 (Low)[e]	0.06	0.02	-0.037	0.045
0.00 (Medium)[f]	0.03	0.02	0.004*	0.072*
0.64 (High)[g]	0.06	0.02	0.016*	0.110*

[a] The CEBQ uses a five-point Likert scale. Child food approach values are mean centered. [b] *SE* = standard error. [c] LLCI = lower-level confidence interval. [d] ULCI = upper-level confidence interval. [e] Low = -1*SD* below the mean and reflects a score of 2.3 on the CEBQ (i.e., "my child is *rarely* interested in food"). [f] Medium = the mean food approach score of the sample and reflects a score of 2.9 on the CEBQ (i.e., "my child is *sometimes* interested in food"). [g] High = +1*SD* above the mean and reflects a score of 3.5 on the CEBQ (i.e., "my child is *often* interested in food"). * $p < .05$.

Therefore, mothers who had a greater tendency to emotionally eat (e.g., by 1-unit) also reported a greater use of restriction for health reasons as a result, and that translated into greater child EE scores (0.03-0.06 units for 1-unit increase in maternal EE), but only amongst those children who scored medium-high on food approach. The moderated mediation model explained 48% of the variance in child EE.

3) Mediator: Food for emotion regulation, Moderator: Food approach

The index for moderated mediation was non-significant, *B* = 0.04, *SE* = 0.03, 95% CI[-0.022, 0.084], suggesting that the indirect effect of maternal EE scores on child EE scores through the use of food for emotion regulation did not vary as a function of child food approach. All pathways are presented in Table 3.3.

3.4 Discussion

This study sought to explore the mechanistic underpinnings of the relationship between maternal EE and child EE by examining the role of food parenting practices and child food approach tendencies. Moderated mediations suggest that greater maternal use of food as a reward and restriction of food for health reasons mediate the relationship between greater maternal and child EE, but that this mediating relationship is only significant for children who are higher in food approach tendencies. These findings support the suggestion

that food parenting practices that are less responsive are a mechanism through which maternal EE may shape child EE, but the findings indicate that the strength of this relationship depends on the child's own appetitive traits, with children who experience greater food approach behaviours being the most influenced by food parenting practices that use high reward or restriction of food.

This study's findings concur with previous work which has shown that parent EE is linked to higher use of food as a reward (de Lauzon-Guillain et al., 2009), and that greater use of food as a reward (Roberts et al., 2018) and restriction for health reasons (Zhou et al., 2020) independently predict child EE and are associated with greater child food approach tendencies (Carnell et al., 2014). They also replicate previous research showing that food parenting practices mediate the relationships between maternal and child EE(Miller et al., 2020). However, this study is the first to explore these variables together in a conceptual model where child characteristics are considered alongside maternal EE and food parenting practices. The novel findings shed light on how children's eating behaviour tendencies interact with maternal feeding behaviours to predict EE, suggesting that children with high food approach tendencies may be the most susceptible to the maladaptive impacts of maternal modelling of EE and food parenting practices that are more rewarding and restrictive in nature. Contrary to the hypotheses, the relationship between maternal and child EE via maternal use of food for emotion regulation did not vary as a function of child food approach. Whilst this finding was surprising given previous literature identifying associations between emotional feeding and food approach (Rodgers et al., 2013), it may be that there is a more direct relationship between use of food for emotion regulation and child EE, irrespective of the child's food approach tendencies (Blissett et al., 2010).

The findings are consistent with the Biopsychosocial Model of overweight and obesity (Russell & Russell, 2018) and suggest that child EE forms from complex interactions between appetitive traits, genetic susceptibility and food parenting practices. Previous research has suggested that the heritability of some food approach tendencies is moderate to low (Herle et al., 2018; Llewellyn et al., 2010), and that food approach behaviours such as EE may be strongly influenced by behavioural and environmental experiences. Interventions which target these experiences may hold promise for reducing EE in children and interventions which target counterproductive food parenting practices (such as use of food as a reward, restriction of food, or emotional feeding) are likely to be helpful for families (Harris et al., 2020). Further work is needed to understand how mothers should respond to children with the highest levels of food approach where families are likely to find it difficult to manage their children's eating behaviours effectively and children are at the greatest risk of future overweight and obesity (Ayine et al., 2021). Given that EE tracks across childhood (Ashcroft

et al., 2008), interventions would be best delivered early in life, before food parenting practices become engrained and the counterproductive consequences for children have already occurred.

3.4.1 Strengths, limitations, and future directions

While this study benefits from a large sample size and presents results that are consistent with previous theoretical frameworks, it was constrained by its cross-sectional design, use of maternal reports of mother and child behaviour, and the reliance on a relatively homogeneous sample. Future research should seek to explore the models identified in this study at different time points to understand not only the stability, but also the bidirectionality of identified relationships. In addition, use of maternal reports should be supplemented by observational methods given the potential for response bias (Blissett et al., 2019). This study was based on a well-educated sample of middle-class White mothers and given the socioeconomic differences in eating behaviour and weight (Kininmonth et al., 2020), further research is needed with more diverse samples, including male and non-binary caregivers. Despite the current study identifying statistically significant models, the beta coefficient values were small, and the reliability according to coefficient alpha of some questionnaire subscales of the CFPQ were not optimal. Caution must be taken when considering what these findings mean in practical terms for families; clearly there are wider factors beyond those measured in this study that shape child EE. However, these results do provide a starting point to consider the combined relationships between maternal and child factors and how they interact to predict children's eating behaviour, especially since the moderated mediation models conferred large effect sizes (Cohen, 2013).

3.4.2 Conclusion

This study used maternal reports to consider the complex mechanism through which maternal EE and child EE are related. The proposed model suggests that according to maternal reports, maternal EE, food parenting practices and child food approach tendencies interact to predict child EE. This study illuminates a promising avenue for future work to explore how approaches to reduce child EE should consider the complex interactions that occur between food parenting practices and child appetitive traits that may influence child EE. Research has already shown that parenting practices around food can help to shape eating behaviours in children, but this study shows that the impact of those parenting practices depends in part on children's existing food approach tendencies. Further research is needed to understand how these findings can be used to support mothers of children who are more driven to eat and at greater risk of higher levels of EE.

CHAPTER 4:

Emotional eating following an online mood induction: the interaction between parental feeding practices and child temperament

Chapters 2, and 3 investigated the presence of a mediating relationship between parent-reported emotional eating (EE) and child EE via parental feeding practices, and whether these mediating relationships varied as a function of child temperament or child food approach. The methodology used in these Chapters was solely parent-report questionnaire, and whilst there are many strengths of using questionnaire studies to explore child EE, there is the possibility that they are subject to bias and are caveated by shared method variance. Additionally using the questionnaire in Chapters 2 and 3, child EE was only measured in terms of eating in response to a collection of negative moods (including worry, anxiety, annoyance, and boredom). It has been suggested that eating in response to boredom occurs independently from EE in response to other negative moods, but boredom-EE has never been explored in children before. Therefore, Chapter 4 operated as an online experimental study where video clips were used to induce different mood states in children and their subsequent snack food selection was measured using a hypothetical food choice task. Parental feeding practices and child temperament measurements were collected using the same parent-report measures as in Chapters 2 and 3. Chapter 4 was a novel attempt at simulating the emotional state that precedes eating (i.e., EE), in response to boredom, and was developed in response to COVID-19 restrictions on face-to-face interactions (see section 1.12 for further information).

4.1 Introduction

Emotional eating (EE) is defined as eating in response to emotions, particularly those that are negative (e.g., sadness, anger, boredom; Macht, 2008) and in the absence of hunger (Arnow et al., 1995). The foods that are consumed are often palatable (Nguyen-Michel et al., 2007) and therefore provide hedonic pleasure to alleviate the experience of negative mood (van Strien et al., 2019). To date, much of the literature on child EE has been based on questionnaire studies that cluster different negative emotional responses together. For example, the Children's Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001) is commonly used to measure EE, but does not distinguish between eating due to sadness, anger, worry, or boredom. Rather, it clusters these emotions together as 'negative mood'. Indeed, analyses from Chapters 2 and 3 were limited by using questionnaire studies to assess children's EE. Studies that have sought to use experimental methods with children have found that eating in response to negative emotions compared to a control group with no mood manipulation is related to greater intake of chocolate when mothers reported using food for emotion regulation (Blissett et al., 2010). However, to date, other specific negative emotions have not been explored in this way in children.

Boredom is a common emotion in children (Westgate & Steidle, 2020), yet there is limited research exploring how boredom may relate to children's food intake. Boredom is defined by feelings of dissatisfaction and a lack of purposefulness in one's current situation (Mikulas & Vodanovich, 1993). Koball and colleagues (2012) found that EE in response to boredom in undergraduate students independently predicted EE outside of 'negative mood', suggesting that mechanistically, boredom-EE may operate differently to sadness for example. Several studies with adults have shown that feelings of boredom that are experimentally induced are associated with the consumption of more palatable foods (Havermans et al., 2015; Moynihan et al., 2015), however this research has not yet been extended to children.

The COVID-19 pandemic provided a natural experiment for many families where boredom was heightened as many children were prevented from attending schools or childcare facilities, recreational sports activities, or from seeing friends or wider family (Panda et al., 2021). One study suggested that increased boredom as a result of the lockdown was significantly associated with parentally reported increased EE and frequency of snacking behaviour between meals in children aged 3-12-years-old (Philippe et al., 2021a). Although these results suggest that boredom may be related to greater EE in children, they rely on parental report and experimental research is needed that is not conflated by the additional emotional stresses resulting from a pandemic.

Additionally, as discussed in Chapter 1, feeding practices that are not responsive to children's hunger and satiety signals, and seek to override children's independence with how to use/consume food, are often associated with more unhealthy children's eating behaviours. These feeding practices include using food as a reward, using food for emotion regulation, and restricting access to food. In Chapter 2, the relationships between higher parent EE and higher child EE were mediated by higher use of these non-responsive feeding practices, but there is little literature exploring how these feeding practices may specifically relate to eating in the context of boredom. Previous research has found that, in response to children's boredom, parents reported an increase in using food for emotion regulation to alleviate their child's boredom (Carnell et al., 2011). In Carnell et al.'s (2011) study, interviews and diary data were collected from 22 mothers of children with healthy weight aged 3-5-years. Mothers reported on the specific feeding behaviours they had used and the underlying motivations for this choice. Mothers recalled that the use of emotional feeding was used in response to their child's boredom. Therefore, ascertaining how different parental feeding practices may relate to boredom induced EE is important.

Of course, parental feeding practices are not the only potential predictor of children's boredom-EE. Russell and Russell (2018) developed the Biopsychosocial Model, which posits that children's eating behaviour arises from child factors, parent factors, environmental factors, and interactions between these factors. In line with this theory, previous literature exploring the development of EE in relation to negative mood has explored the contribution of child temperament, often conceptualised according to negative affect, surgency, and effortful control (Rothbart & Bates, 2007). Each of these aspects of temperament has been associated with EE (e.g., Leung et al., 2014; Steinsbekk et al., 2020), and in Chapter 2 it was reported that children with higher negative affect seemed to be the most likely to be described as emotional eaters when they experienced higher parental EE and more non-responsive feeding practices. In terms of child boredom, previous literature suggests that children with more impulsive temperaments (a facet of surgency; Putnam & Rothbart, 2006) are more prone to experiences of boredom (Golubchik et al., 2021), and surgency has also been associated with more obesogenic eating behaviours (Leung et al., 2014). However, it remains to be seen whether children with more surgent or impulsive temperaments are predisposed to greater boredom induced EE.

In terms of inter-relationships between parental feeding practices, child individual differences, and child boredom-EE, there has been one study using adults' recollections from childhood which has attempted to explore these relationships in predicting EE. Barnhart et al. (2021) assessed adults' recollections of their experiences of parental feeding practices, their emotion regulation as a child and their current EE. Results indicated that there was a

significant moderation, where higher perceptions of restrictive feeding practices during childhood were more strongly related to greater boredom-EE when emotion regulation was low during childhood. This suggests that restrictive feeding predicts boredom-EE, and that this relationship is exacerbated by low emotion regulation. As emotion regulation is intertwined with child temperament, Barnhart et al.'s (2021) work underscores the importance of children's temperament and how differences in temperament can make children differentially susceptible to parental use of non-responsive feeding practices when experiencing boredom. However, these relationships have not yet been explored during childhood, and retrospective accounts from adulthood may lack accuracy.

Finally, previous research has been limited by its reliance of parent-reports of EE and retrospective measures of boredom-EE. There is a need for research to explore EE using more current and objective measures. Currently there are virtual measurements of children's food selection (i.e., hypothetical food choice tasks) that are thought to act as a proxy for children's actual food selection. Indeed, images of different portion sizes chosen on a computer survey have been found to positively relate to 7-10-year-old children's actual food intake in a laboratory (Diktas et al., 2022), and images of foods chosen on a computer have been associated with 9-year-old children's actual product purchases (Olsen et al., 2012). In other work, it has been possible to induce different emotions in children using video clips (Tan & Holub, 2018). To date, hypothetical food choice tasks have never been used to assess food selection in response to children's mood using video clips, despite their potential for providing data that may correlate with children's actual food intake.

4.1.1 Aim and hypotheses

The aim of the current study was to explore children's food selection in response to experimentally induced sadness and boredom (compared to a control condition) and to explore how food selection under these emotional conditions relates to parental feeding practices and child temperament. It was hypothesised there would be a main effect of mood condition, where children would select the most kilocalories from food in the boredom and the sadness condition, compared to the control condition. It was also hypothesised that parents who reported they used non-responsive feeding practices often would have children who selected the most kilocalories from snacks compared to low use. Additionally, it was hypothesised that children of parents who rated their children with high negative affect or surgency, would select the most kilocalories from snacks compared to children whose parents reported low ratings of these temperamental traits. Taken together, it was hypothesised that there would be a three-way interaction between mood condition, parental feeding practices, and child temperament in predicting kilocalorie selection, where children would select more kilocalories in the sadness and boredom conditions relative to a control

condition, particularly when their mothers used more non-responsive feeding practices and children were described as higher in negative affect or surgency.

4.2 Methods

4.2.1 Participants

A power calculation (G*Power for ANOVA) indicated that 93 parent-child dyads were required (large effect size (f = 0.40), 80% power, α = 0.05). Large effect sizes were used in the power analysis because large effect sizes were identified in Chapter 3 for parental feeding practices (r = .52) and medium to large effect sizes for temperament (r = .40) with children's EE, so theoretically an interaction with a large effect is plausible. In total, 366 parent-child dyads were recruited to an online study exploring eating behaviour in children. Families were recruited using social media (Facebook advertisements and Facebook groups) (see Appendix A-2). The inclusion criteria stipulated that participants were parents and their child, who was aged 6-9-years-old, because 6-9-years reflected the age of competency for similar virtual food choice task methods (Diktas et al., 2022; Olsen et al., 2012). Additionally, parents had to access the study using a desktop computer due to compatibility/functionality issues with tablets and phones, and this desktop had to have working audio as the study used video clips with audio. As such, to take part children could not have any hearing or sight impairments as the mood induction videos relied on both senses. Children were excluded if they had any allergies to any of the study foods; although images were used and not actual foods, allergies were expected to negatively impact food choices. After data cleaning (which included reviewing data quality - see section 4.2.4.2), 10 parents were excluded as they reported that they 'rarely ate' with their child on the demographic's questionnaire and it was felt that they could not report on regular experiences around feeding accurately. Two parents were excluded due to completing the questionnaire unusually quickly, suggesting a lack of attention was being paid to items (cut off = > 30-minutes), and seven participants were excluded due to failing two or more attention checks. Overall, 347 parent-child dyads were included for data analyses.

4.2.2 Design

Using a between-subjects design, dyads were randomly allocated to one of three conditions: sadness, boredom, or control. The study consisted of two phases where in phase one: children participated in a mood induction and completed a subsequent hypothetical food choice task. In phase two: all parents completed the same battery of questionnaires regardless of condition. There were three independent variables: mood condition, parental feeding practices, and child temperament. Mood condition consisted of three levels (sadness/boredom/control). Parental feeding practices measured three types of feeding

practices (use of restriction for health reasons, use of food as a reward, and use of food for emotion regulation), and child temperament measured three dispositions of temperament (negative affect, surgency, and effortful control). Feeding practices and temperaments were dichotomised using median splits into high vs. low. There were three dependent variables including overall total kilocalories selected, total sweet food kilocalories selected, and total savoury food kilocalories selected. The overall total kilocalories selected outcome variable was divided into two further outcome variables to ascertain whether sweetness or savoury were driving any EE effects identified. Previous research suggests that when people emotionally eat, they consume highly palatable food, which tend to be high in fat and sugar (Nguyen-Michel et al., 2007). Therefore, it was important that this study assessed the combined and independent effect of sweetness. Overall, the study operated a 2 x 2 x 3 design (high/low per feeding practice x high/low per temperament x sadness/boredom/control condition) where the effects of each of the three feeding practices (use of restriction for health reasons, use of food as a reward, and use of food for emotion regulation – split into high/low for each practice) and three temperamental traits (negative affect, surgency, effortful control – split into high/low for each trait) by mood condition (sadness, boredom, control) were assessed in turn.

4.2.3 Procedure

The study was approved by Aston University Health and Life Sciences Ethics Committee (#1646) (see Appendix B-2). All procedures were conducted in accordance with the Declaration of Helsinki as revised in 1983.

Using Qualtrics, parents provided consent for themselves and their child to participate electronically before taking part in the study (see Appendix C-3 and C-4). Parents were first asked to indicate their child's age and the sex of their child so that if randomised to the boredom condition, sex-specific Likert scales could be used to measure boredom (more detail can be found in section 4.2.4.1), and regardless of condition randomisation, children outside of the intended age-range could subsequently be detected. Parents were asked to sit next to or nearby their child whilst the child completed the child section of the study which lasted approximately 10-minutes. Children were first asked to indicate their hunger levels using the Teddy Bear Hunger Scale (Bennett & Blissett, 2014) (more detail can be found in section 4.2.4.1). Parents had been asked in the participant information sheet to ensure their child had consumed a meal at least 90-minutes before taking part. An audio description of the Teddy Bear Hunger Scale automatically played when children were presented with the scale. After indicating their hunger, children were randomly allocated to one of three mood conditions (sadness/boredom/control) using Qualtrics's randomisation procedure. Prior to the mood induction, children were asked to use a Likert scale to indicate their current mood (see

sections 4.2.4.1). Each Likert scale was accompanied by an audio description. Children then watched one of three video clips. Mood was then re-assessed using the same Likert scale. Next, children were presented with images of four snack foods (chocolate buttons, gummy bears, carrot batons, ready salted crisps) on a virtual buffet table. On the next screen children selected how much they would like to eat of the foods. After, children in the sadness and boredom conditions were shown the control condition video clip. Following this, children re-rated using either the smiley face rating scale if in sadness condition, or the boredom Likert scale if in boredom condition, to ensure that their mood had returned to baseline (or improved). Children's role in the study was then complete. Parents then completed phase two of the study, which was a battery of questionnaires lasting approximately 20-minutes. Within these questionnaires there were attention checks. Parents were asked to provide a brief 'verification' video or audio clip by email of their child prior to being compensated with a £7 Amazon voucher for their time (more detail can be found in section 4.2.4.2).

4.2.4 Measurements

Measures completed by adults and children are described below.

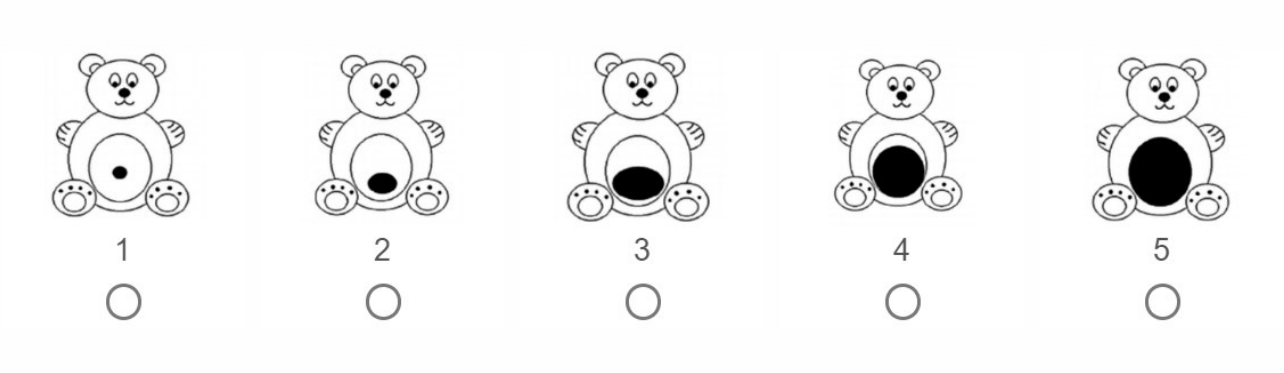
4.2.4.1 Child Measures

Teddy Bear Hunger Scale (Bennett & Blissett, 2014)

The Teddy Bear Hunger Scale is a five-point pictorial Likert scale used to illustrate fullness. The scale uses a graphic of a teddy bear whose stomach becomes increasingly shaded black to represent fullness. An audio description of each Likert-scale point was provided. A score of 1 reflects an empty stomach – *"Teddy is really hungry. Teddy's belly is empty, and it is rumbling",* whereas a score of 5 reflects a full stomach – "*Teddy is not hungry at all. Teddy's belly is very full, and he could not eat any more food".* The Teddy Bear Hunger Scale has been validated in 5-9-year-olds (Bennett & Blissett, 2014). An example of the scale is presented in Figure 4.1.

Figure 4.1

Teddy Bear Hunger Scale as presented on Qualtrics.



Sadness and control condition Likert scale

The Smiley Face Likert Scale was used to measure children's mood from happy to sad. This measure has been successfully used with children aged 3-5-years (Blissett et al., 2010) and 5-7-years (Farrow et al., 2015). This five-point Likert scale uses images of yellow emoticons ranging from "*Really sad*" (1), to "*Ok*" (3), to *"Really happy*" (5). An audio description of each Likert-scale point was provided. An example of the scale is presented in Figure 4.2.

Figure 4.2
Smiley Face Likert Scale as presented on Qualtrics.

Boredom mood Likert scale

A novel scale was developed to capture children's experiences of boredom. Boredom is defined by differences in posture, eye gaze, and gestures (Bull, 1978; Wallbott, 1998). An artist was commissioned to sketch a five-point Likert scale ranging from 1 (*"really bored"*) to 5 ("*really interested*"). Separate scales were developed for boys and girls. Children who were "really bored" were depicted sat down with their head on the table whilst children who were "really interested" were shown sat upright, their eyes wide and a wide grin. An audio description of each Likert-scale point was provided. An example of the scale for the boys is presented in Figure 4.3, and for girls in Figure 4.4.

Figure 4.3
Boredom mood Likert scale for boys as presented on Qualtrics

Figure 4.4
Boredom mood Likert scale for girls as presented on Qualtrics

The language used to describe the Likert scale was deemed acceptable as children aged 4-years and above can comprehend these emotion words (Baron-Cohen et al., 2010; Wellman et al., 1995). This scale was piloted with 14 children aged between 4-9-years (*M* = 6.32, ± *SD* = 1.44) where children had to match the description (e.g., "*really bored*") with the corresponding picture. Responses had a 91.42% accuracy rate and so the scale was deemed acceptable.

Mood induction videos

The sadness and control mood induction video clips were selected based on videos that have previously been used to induce those emotions in children effectively (Karim & Perlman, 2017). The sadness video clip was taken from Disney's "*The Lion King*" and shows a scene where Simba is mourning the death of his father. The control condition video clip was taken from Disney's "*The Little Mermaid*" and shows a scene where Sebastian the crab is singing "Under the Sea". It is acknowledged that the control video was likely to induce positive emotion rather than a neutral emotion, but this video clip was chosen so feelings induced differentiated from feelings of boredom. For the boredom video clip, a dripping tap on loop was used. The dripping tap video clip was novel, but it was selected as boredom arises out of situations that lack stimulation (Mikulas & Vodanovich, 1993; Moynihan et al., 2017). Additionally, using pilot testing, five parents and two children (aged 6 and 9-years) were shown the dripping tap video clip and confirmed that the video clip was very boring. To standardise for time, all videos were edited to be 3-minutes 30-seconds in duration. The

button to proceed with the study was removed from Qualtrics so that children were unable to advance from the video without it playing for the full duration.

Hypothetical food choice task

Previous literature suggests that the use of computerised portion size images (i.e., different portion size images of foods) is related to children's actual food consumption in the laboratory (Cox et al., 2021; Diktas et al., 2022). Additionally, images of foods chosen on a computer have been associated with children's actual product purchases (Olsen et al., 2012). Therefore, children were asked "*If you could have as much of everything as you want, how much would you eat right now?*". Children could choose from four snack foods: chocolate buttons, gummy bears, carrot batons, and ready salted crisps. The four snack foods were selected based upon their familiarity and likability to children. Foods were also selected based on whether they were either 'sweet' or 'savoury' – sweet: chocolate buttons and gummy bears; savoury: carrot batons and crisps.

Each snack was presented using six photographed images of varying portion sizes, based on each snack's recommended portion size for children (RPS). Images were all in colour, using natural daylight against a white background, and sized 300 x 300 pixels. All six images for each food were presented on the screen together. A number was written above each of the images depicting how many of the snack foods were in the bowl (e.g., "*24*" appearing above an image of 24 carrot batons). Images were presented in three columns across two rows, increasing in size from left to right. Image one showed an empty glass bowl that was equivalent to 0% of the RPS, image two showed 50% of the RPS, image three showed the RPS of the snack (100%), image four showed 200% of the RPS, image five showed 400% of the RPS, and image six showed 800% of the RPS. Kilocalories of each snack were determined using manufacturers' nutritional information (see Table 4.1 for breakdown).

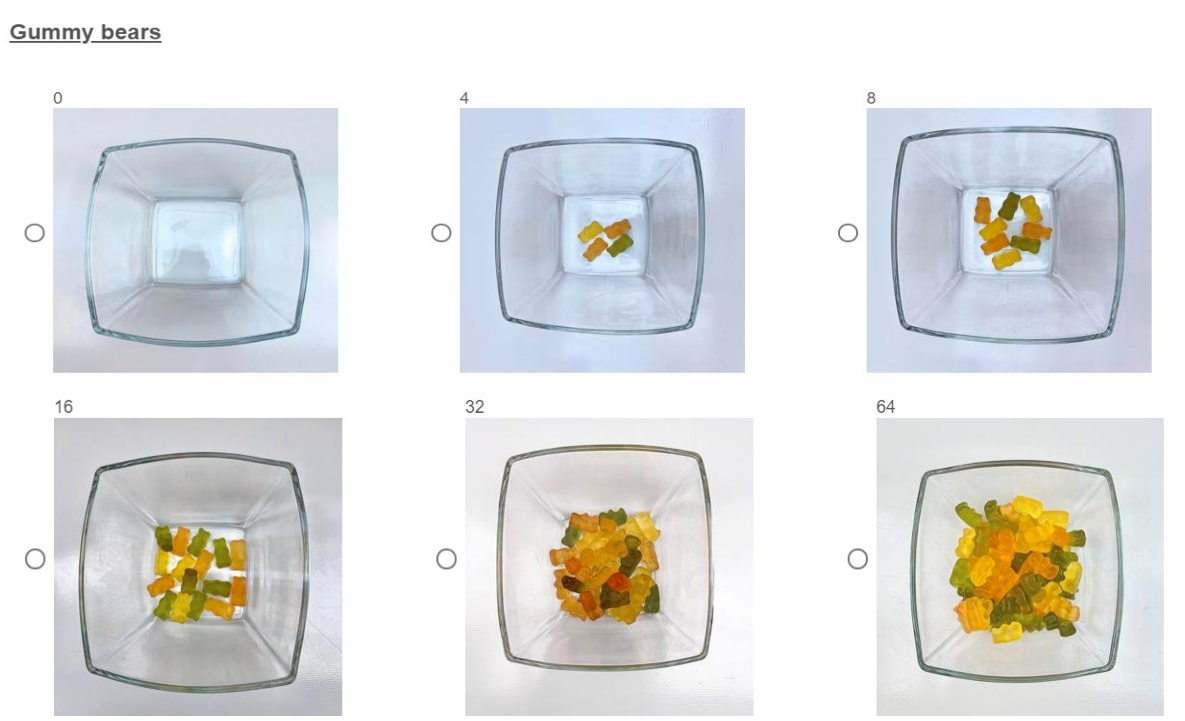
Table 4.1
The number of calories per snack food split by differing percentages of RPS (100%) to reflect the images presented to the child during the hypothetical food choice task.

	Number of Kilocalories					
	0%	50%	100% (RPS)	200%	400%	800%
Chocolate buttons	0	22	44	88	176	352
Gummy bears	0	33	66	132	264	528
Carrot batons	0	9	18	36	72	144
Crisps	0	13	26	52	104	208

Note. RPS = Recommended Portion Size.

Qualtrics' screen size was modified for the hypothetical food choice task so that the images of each portion size could span a wider screen than default whilst maintaining the custom image size. An example image is shown in Figure 4.5. Based on children's selected portion size, the corresponding kilocalories per chosen snack portion were then summed to determine the overall total calories selected, total sweet calories selected, and total savoury calories selected.

Figure 4.5
An example of how one snack (gummy bears) was presented on Qualtrics to the child using the hypothetical food choice task



4.2.4.2 Parent measures

Parents completed a variety of questionnaire measures, which are described in detail in Chapter 2.

Within the questionnaire measures (excluding the demographics questionnaire) there were built-in attention checks such as "*It is important that I pay attention. Please select*

'Strongly Disagree'". To be included in the data, parents could only make two errors. The duration of the study was also recorded to ascertain the likelihood that the parent had completed the questionnaires properly (i.e., > 30-minutes (including the first phase)). Seven parents made more than two errors, and two responses were not completed within the realistic timeframe. These participants were excluded from data analysis.

Demographics questionnaire

Parents self-reported their age, sex, height, weight (to be converted to BMI), education level, ethnicity, their child's age, sex, height, weight (to be converted to BMI z-scores). Parents indicated how may children they had, how often they ate with the child in the study per week, and if this child had watched Disney's "*The Lion King*" or Disney's "*The Little Mermaid*" before. Parents also reported their perceived socioeconomic status (SSS) using MacArthur's Scale of Subjective Social Status (Adler et al., 2000), which used a ladder as a metaphor for social status. Higher ladder rungs represented a higher perceived social status relative to others. MacArthur's Scale has shown good construct validity in previous research (Cundiff et al., 2013) (see Appendix D-2).

The Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007)

This scale assesses parents' use of feeding practices. In the current study, this measure showed good reliability for food for emotion regulation (α = 0.69), food as a reward (α = 0.71), and restriction of food for health reasons (α = 0.83).

The Dutch Eating Behaviour Questionnaire (DEBQ; van Strien et al., 1986)

This scale was used to measure parent EE. This measure had excellent reliability in the current study (α = 0.95).

The Children's Behaviour Questionnaire – Very Short Form (CBQ-VSF; Putnam & Rothbart, 2006)

This scale was used to assess children's temperament. In the current study, this measure had good reliability for negative affect (α = 0.76), surgency (α = 0.76) and effortful control (α = 0.71).

The Children's Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001)

This measure assesses children's eating behaviour. The measure had good reliability for child EOE (α = 0.81) in the study sample.

Email trigger – Child Verification

Upon completion of the study, parents were asked to input their email address which was used by Qualtrics to send a completion email to the parent using a Box (secure cloud service) email address. The 'child verification' phase was a novel attempt at ensuring those who completed the study were the intended study sample as this is a common flaw of online research (Wright, 2006). The completion email contained guidance on how the parents could send the researcher a short video/audio clip of their child. Parents were told to record - using either audio or video - their child answering "*What did you think of the videos that you just watched? How did they make you feel?"*. Parents were asked to reply to the completion email with the recording as an attachment and responses were saved to a secure Box folder. If a recording was not submitted, reminder emails were sent at 24-hours and 48-hours after completing the survey. The drop-out rate for this 'child verification' phase was a lot higher than anticipated at 40%. Therefore, it was decided that all completed responses that passed quality checks (see section 4.2.4.2.), regardless of video/audio verification, would be included in subsequent data analyses. This was decided on the basis that stringent quality control measures were already included in the questionnaire, so it is likely these methods mitigated poor data quality respectably. As mentioned, this was a novel attempt at ensuring a child participated, but in reality, this method was likely burdensome or challenging for participants.

4.2.5 Data analysis

IBM SPSS Statistics 26 was used for all data analyses.

4.2.5.1 Normality and confounding variable analyses

Kolmogorov-Smirnov tests were used to assess the normality of the three dependent variables (overall total kilocalories selected, total sweet kilocalories selected, and total savoury kilocalories selected). These tests revealed that the dependent variables were skewed (overall total kilocalories: $D(347) = .100$, $p < .001$, total sweet kilocalories: $D(347) = .152$, $p < .001$, total savoury kilocalories: $D(347) = .131$, $p < .001$). Therefore, subsequent covariate analyses between demographic variables and dependent variables were conducted using non-parametric tests (Spearman's Rho correlations, Mann-Whitney U tests and Kruskal-Wallis H tests). Spearman's Rho correlations assessed the relationship between differences in parent and child individual differences with the dependent variables.

4.2.5.2 Baseline difference and mood change analyses

One-way analysis of variance (ANOVA) was used to assess differences in parent and child continuous demographic variables between mood conditions as ANOVA is considered robust enough to account for a lack of normality and homogeneity (Field, 2013) (see

Appendix E-2). Chi-squared tests were used to assess differences in parent and child categorical demographic variables between conditions (see Appendix E-3). One-way ANOVAs were used to assess differences in parent and child individual difference between conditions. Wilcoxon Signed Ranks tests were used to examine changes in mood ratings within subjects' pre-post mood induction. Wilcoxon Signed Ranks tests were also used to assess mood change in children in the sadness and boredom condition mood after watching the control condition video (an attempt to return children's mood to baseline). Mann-Whitney U tests were used to assess differences in mood ratings at pre-mood induction between children in the sadness and control conditions, and again after the mood induction. As the boredom condition uses a different 5-point Likert scale to the control and sadness condition, no comparisons were made between boredom ratings against the control or sadness condition.

4.2.5.3 Main analysis

As previously mentioned, ANOVA is considered robust enough to be used with data that lack normality and homogeneity (Field, 2013). Therefore, analysis of covariance (ANCOVA) was used for the main data analyses (controlling for covariates parent BMI and children's responses on the hunger scale).

Main effects of independent variables

Main effects of mood condition (boredom/sadness/control), each child temperament (negative affect, surgency, effortful control – median split high/low), and each parental feeding practice (use of restriction for health reasons, use of food as a reward, and use of food for emotion regulation - median split high/low) were assessed using a series of one-way ANCOVAs. One-way ANCOVAs were used to identify the main effects as this allows for assessing main effects in the absence of the other independent variables whilst considering the main effects for the whole sample (N = 347) rather than of the grouped participants per interaction (see below).

Three-way ANCOVAs

To test the hypothesis that there would be a three-way interaction between parental feeding practices, child temperament, and mood condition on overall total kilocalories selected, total sweet kilocalories selected, and total savoury kilocalories selected, a series of three-way ANCOVAs were run controlling for covariates (parent BMI and children's hunger rating). The independent fixed variables were mood condition (sadness/boredom/control), parental feeding practices using median splits (high/low) for each feeding practice (use of restriction for health reasons, use of food as a reward, and use of food for emotion

regulation), and temperament using median splits (high/low) for each temperament (negative affect, surgency, effortful control). A total of nine ANCOVAs were run for each of the three dependent variables, and the three-way interactions assessed the two-way interactions of parental feeding practice x child temperament moderated by mood condition. Each of the dependent variables was explored in turn for evidence of three-way interactions. When a dependent variable presented a significant three-way interaction ($p < .05$), the interaction was explored further to understand its nature. To do this, a simple two-way ANCOVA was run across both levels (high vs. low) of temperament for the interaction between parental feeding practices and mood on the dependent variable. Evidence of a significant simple two-way ANCOVA (the level of temperament) was followed up with simple simple main effects of mood condition across both levels of parental feeding practice (high vs. low), but only for identified level of temperament ascertained through the previous significant simple two-way interaction. Lastly, evidence of a significant simple simple main effect of mood condition was followed up with simple simple pairwise comparisons using a Bonferonni correction to ascertain what mood condition (sadness vs. boredom vs. control) this differed for when looking at the previously identified significant level of temperament and level of parental feeding practice.

4.3 Results

4.3.1 Sample characteristics

Of the parents who took part, 17.30% were fathers and 82.70% were mothers (N = 347). Parents had a mean age of 35.57-years (range 24-49, *SD* ± 5.10), most described their ethnicity as White British (79%), and parents were well educated with 63.90% holding a degree level qualification. Parents self-rated their SSS using MacArthur's Scale of Subjective Social Status (Adler et al., 2000) and, on average, the sample reflected a perceived middle-class social status (*M* = 5.16, *SD* ± 1.71). Parents had a median of two children (*IQR* ± 2.00). Parent BMI data were provided by 336 parents; mean BMI was overweight (*M* = 28.17, *SD* ± 7.79). The children who took part were 53.3% male and 46.70% female and their mean age was 7.06 years (range: 6-9-years, *SD* ± 0.91). Child BMI z-scores were computed for 334 children based upon parental reports of children's height and weight. The mean child BMI z-score was standardised for age and sex (Child Growth Foundation, 1996) and reflected a healthy weight (*M* = 0.78, *SD* ± 1.98).

4.3.2 Covariate analysis

As seen in Table 4.2, Spearman's Rho correlations suggested that being hungrier significantly correlated with more overall total kilocalories, total sweet kilocalories, and total savoury kilocalories being selected. Additionally, parent BMI positively and significantly

correlated with overall total kilocalories selected and total sweet kilocalories selected. No other parent or child continuous demographic variables were significantly correlated with the dependent variables. Mann-Whitney U tests indicated that there were no significant differences in any of the three dependent variables based on child sex (overall total kilocalories: U = 13575, p = .131, total savoury kilocalories: U = 14314, p = .471, total sweet kilocalories: U = 13634, p = .145), parent sex (overall total kilocalories: U = 9294.50 , p = .333, total savoury kilocalories: U = 9768.50, p = .101, total sweet kilocalories: U = 8908, p = .671), or parental education (degree level or no degree) (overall total kilocalories: U = 12886, p = .270, total savoury kilocalories: U = 12953, p = .304, total sweet kilocalories: U = 13187, p = .441). Kruskal-Wallis H tests revealed there were no significant differences in any of the three dependent variables based on parental ethnicity (overall total kilocalories: H(15) = 11.56, p = .712, total savoury kilocalories: H(15) = 10.80, p = .767, total sweet kilocalories: H(15) = 10.80, p = .766), or whether the child had previously watched Disney's "*The Little Mermaid*" (overall total kilocalories: H(2) = 2.53, p = .283, total savoury kilocalories: H(2) = 14314, p = .471, total sweet kilocalories: H(2) = 13634, p = .145), or Disney's "*The Lion King"* (overall total kilocalories: H(2) = .182, p = .913, total savoury kilocalories: H(2) = .623, p = .732, total sweet kilocalories: H(2) = .3.22, p = .200). As a result, only parent BMI and children's hunger scale scores were controlled for in the main analyses.

Table 4.2
Spearman's Rho correlations between overall total kilocalories, total savoury kilocalories, and total sweet kilocalories selected with parent and child demographics (N = 347, two-tailed)

Measure	Overall Total Kcal	Total Sweet Kcal	Total Savoury Kcal
Child age	-.056	-.035	-.057
Child hunger	-.152**	-.133*	-.127*
Parent age[a]	.006	-.020	.094
SSS[b]	-.049	.028	-.050
Child BMI z-score[c]	-.067	-.084	.016
Number of children	.044	.028	.050
Parent BMI[d]	123*	.113*	.068

[a] n = 345. [b] MacArthur's Scale of Subjective Social Status (SSS). [c] n = 334. [d] n = 336. ** p < .01, * p < .05.

4.3.3 Baseline differences

One-way ANOVAs and Chi-squared tests revealed there were no significant differences between mood conditions for any continuous or categorical parent or child demographic variables (all p values >.05) (see Appendix E-2 and E-3). One-way ANOVAs also revealed that there were no significant differences between mood conditions for parent-reported CEBQ, DEBQ, CFPQ and CBQ-VSF subscales (all *p's* >.05) (see Table 4.3).

Table 4.3
Means (±*SD*) of parent-reported parent and child individual differences between mood condition.

Measure	Control (*n* = 122)	Sadness (*n* = 123)	Boredom (*n* = 102)	F	*p*
Child EOE [a]	2.27 (0.78)	2.43 (0.94)	2.37 (0.72)	1.18	.309
Child Surgency [a]	4.51 (0.86)	4.48 (0.93)	4.60 (0.80)	.581	.560
Child Negative Affect [a]	4.36 (0.88)	4.32 (0.95)	4.25 (0.85)	.434	.648
Child Effortful Control [a]	4.94 (0.85)	4.85 (0.71)	4.81 (0.69)	.852	.428
Parent EE [a]	2.81 (1.03)	2.75 (0.98)	2.68 (0.93)	.526	.591
Restriction for Health Reasons [b]	3.57 (1.01)	3.52 (1.00)	3.66 (0.98)	.508	.602
Food as a Reward [b]	3.02 (1.08)	3.06 (0.98)	3.09 (1.00)	.101	.904
Food for Emotion Regulation [b]	2.30 (0.64)	2.28 (0.71)	2.29 (0.63)	.042	.959

[a] Children's Eating Behaviour Questionnaire (CEBQ), Comprehensive Feeding Practices Questionnaire (CFPQ) and Dutch Eating Behaviour Questionnaire (DEBQ. [b] Children's Behaviour Questionnaire – Very Short Form (CBQ-VSF).

4.3.4 Mood change

Mood ratings in all conditions significantly changed from pre-mood induction to post-mood induction in the expected direction. Those children in the sadness condition became significantly less happy after watching a clip of Disney's "*The Lion King*". Those children in the control condition became significantly happier after watching a clip of Disney's "*The Little Mermaid*" (though remained rated as 4 on the Likert scale). Those in the boredom condition became significantly more bored after watching a clip of a dripping tap (see Table 4.4).

Table 4.4
Means (±*SD*) of children's pre-mood and post-mood induction ratings within each mood condition, and mood ratings after watching the control video in sadness and boredom conditions (Wilcoxon Signed Ranks test).

Mood Condition	Pre-test Mood	Post-test Mood	*Z*	*p*	Return to Baseline Mood	*Z*	*p*
Control (*n* = 122) [a]	4.13 (0.95)	4.43 (0.85)	-3.50	<.001	-	-	-
Sadness (*n* = 123) [a]	4.11 (0.90)	2.07 (1.00)	-9.24	<.001	4.32 (0.98)	-9.17	<.001
Boredom (*n* = 102) [b]	3.88 (1.17)	2.12 (1.25)	-7.29	<.001	2.62 (1.44)	-2.38	.017

[a] Sadness and Control condition assessed using the same 5-point smiley face Likert scale. [b] Boredom condition was assessed using a different 5-point pictorial Likert scale.

At pre-test (before watching the video), Mann-Whitney U tests suggested that there were no significant differences in mood between sadness and control conditions (U = 7338.50, p = .752). At post-test (after watching the video), Mann-Whitney U tests indicated that those in the sadness condition were significantly less happy than those in the control condition (U = 967, p < .001). Comparisons between sadness and bored and bored and control conditions were not assessed as they utilised different Likert scales. As seen in Table 4.4, mood ratings of the children in the sadness and boredom conditions significantly improved when shown the control condition video following the mood induction video.

4.3.5 Analysis of Covariance (ANCOVA)

4.3.5.1 Main effects

The means and standard deviations of the main effects for each dependent variable are presented in Table 4.5. As shown in Table 4.6, a series of one-way ANCOVAs indicated that there were no main effects of mood condition, surgency, effortful control, use of food as a reward, or use of food for emotion regulation on any dependent variable. There were two significant main effects. There was a significant main effect of children's negative affect, where more overall total kilocalories were selected by children with high negative affect compared to low, and more total sweet kilocalories were selected by children with high negative affect compared to low (see Figure 4.6). There was also a significant main effect of use of restriction for health reasons where more overall total kilocalories were selected when parents used high levels of restriction for health reasons compared to low, and more total sweet kilocalories were selected when parents used higher levels of restriction for health reasons compared to low (see Figure 4.7).

Table 4.5
Means (±*SD*) of kilocalories consumed by children for each main effect of mood condition, child temperament, and parental feeding practices on each dependent variable (N = 347).

Main Effect	Overall Total Kcal	Total Sweet Kcal	Total Savoury Kcal
Mood Condition:			
Control[a]	523.48 (326.08)	406.73 (307.15)	116.75 (85.48)
Sadness[b]	528.12 (347.65)	417.37 (312.28)	110.75 (87.56)
Boredom[c]	572.87 (368.07)	443.99 (307.15)	128.88 (102.05)
Negative Affect:			
High[d]	567.49 (348.31)	444.30 (304.74)	123.19 (91.18)
Low[e]	455.14 (327.11)	352.13 (283.32)	103.01 (90.87)
Surgency:			
High[f]	545.02 (341.82)	427.44 (306.22)	117.58 (87.12)
Low[g]	534.11 (351.44)	415.30 (297.98)	118.81 (95.85)
Effortful Control:			
High[h]	526.54 (354.40)	414.73 (310.16)	111.82 (93.44)
Low[i]	550.59 (339.63)	427.08 (295.36)	123.51 (89.55)
Restriction for health reasons:			
High[j]	589.63 (355.19)	467.85 (307.04)	121.78 (90.92)
Low[k]	481.89 (327.04)	367.85 (287.37)	114.04 (92.04)
Food as a reward:			
High[l]	535.50 (342.11)	422.01 (296.47)	113.49 (87.23)
Low[m]	546.32 (353.71)	420.56 (311.34)	125.75 (97.59)
Food for emotion regulation:			
High[n]	553.35 (347.59)	428.08 (295.70)	125.27 (95.15)
Low[o]	520.32 (344.36)	412.12 (311.02)	108.20 (85.15)

[a] *n* = 122. [b] *n* = 123. [c] *n* = 102. [d] *n* = 261. [e] *n* = 86. [f] *n* = 176. [g] *n* = 171. [h] *n* = 158. [i] *n* = 189. [j] *n* = 186. [k] *n* = 161. [l] *n* = 214. [m] *n* = 133. [n] *n* = 203. [o] *n* = 144.

Table 4.6
Main effects of parental feeding practices, child temperament, and mood condition on each dependent variable (one-way ANCOVA) [ab].

	Overall Total Kcal			Total Sweet Kcal			Total Savoury Kcal		
Main Effects	*F*	*p*	η_p^2	*F*	*p*	η_p^2	*F*	*p*	η_p^2
Mood condition	0.89	.413	.005	0.63	.535	.004	1.14	.321	.007
Negative affect	6.81	.009	.020	5.81	.016	.017	3.53	.061	.011
Surgency	0.18	.668	.001	0.17	.679	.001	0.07	.798	.000
Effortful control	0.02	.902	.000	0.01	.939	.000	0.51	.474	.002
Restriction for health reasons	8.64	.004	.025	9.76	.002	.029	0.65	.422	.002
Food as a reward	0.09	.764	.000	0.01	.936	.000	1.95	.164	.006
Food for emotion regulation	1.55	.214	.005	0.71	.400	.002	3.66	.057	.011

[a] Mood degree of freedom (df) = 2, feeding practices and temperaments df = 1, and error = 322. [b] Controlling for parent body mass index and children's hunger.

Figure 4.6
Clustered bar chart illustrating post-hoc analyses to compare the mean number of kilocalories selected between children with high and low negative affect. ** p = .009, * p = .016. Error bars show 95% confidence intervals.

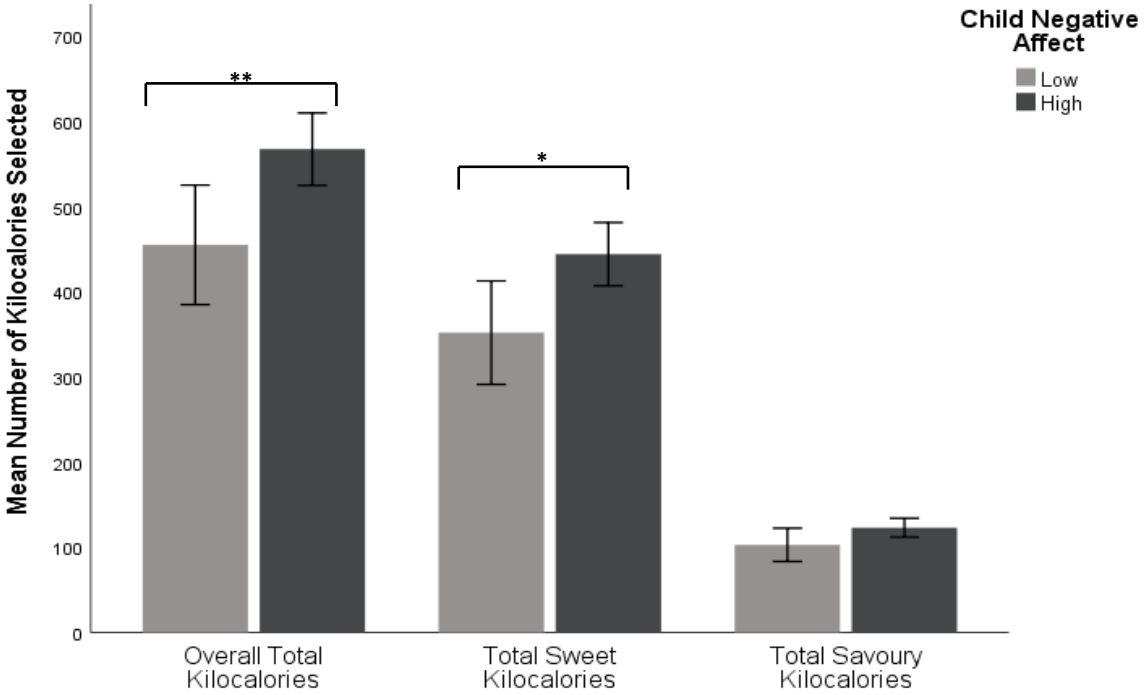
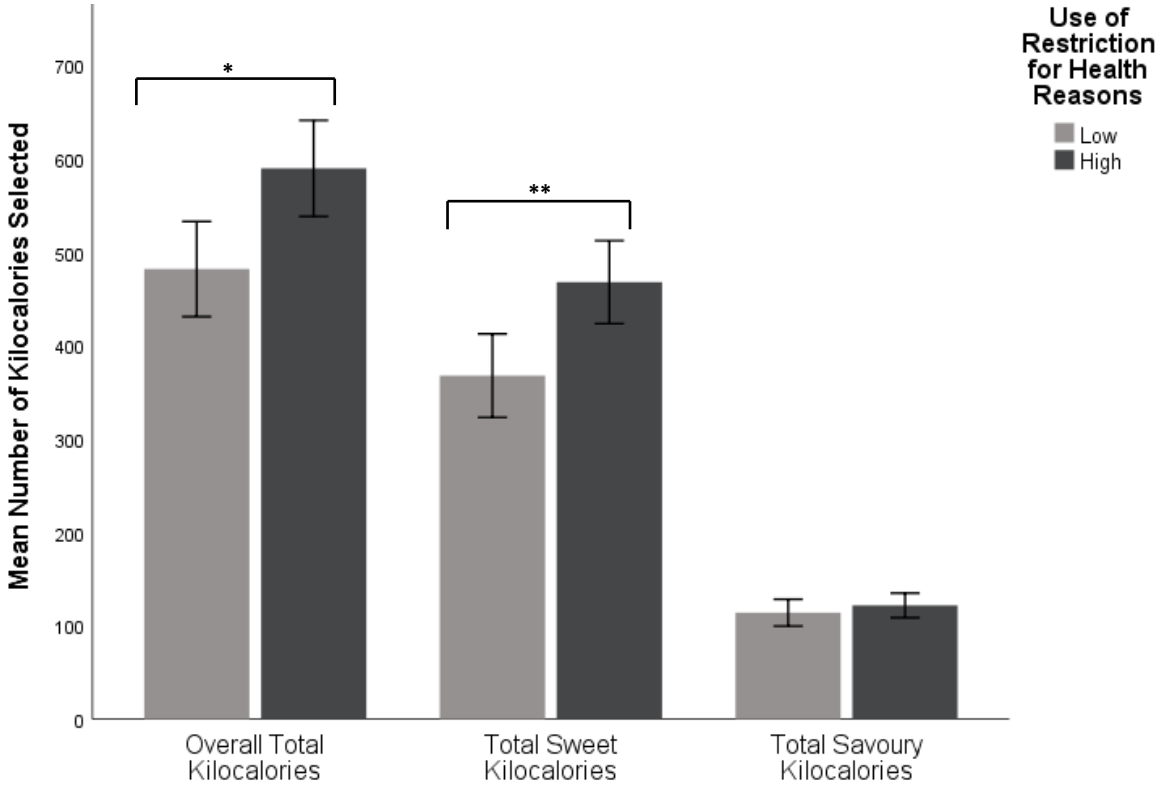


Figure 4.7
Clustered bar chart illustrating post-hoc analyses to compare the mean number of kilocalories selected between parents who reported using high and low levels of restriction for health reasons. ** p = .002, * p = .004. Error bars show 95% confidence intervals.



4.3.5.2 Three-way interaction

As seen in Table 4.7, three-way ANCOVAs suggested that there were no significant three-way interactions identified for any of the outcome variables. Subsequent analyses were not carried out.

Table 4.7
Three-way interactions between each parental feeding practice (high/low), child temperament (high/low) and mood condition (sadness/control/boredom) on outcome variables.[ab]

	Overall Total Kcal			Total Sweet Kcal			Total Savoury Kcal		
ANCOVA	*F*	*p*	η_p^2	*F*	*p*	η_p^2	*F*	*p*	η_p^2
RfHR[c] x NA[d] x Mood	1.62	.202	.010	1.33	.266	.008	0.94	.394	.007
RfHR x S[e] x Mood	2.10	.124	.013	2.50	.081	.015	1.44	.240	.009
RfHR x EC[f] x Mood	0.05	.948	.000	0.22	.804	.001	1.73	.180	.011
FaR[g] x NA x Mood	1.09	.340	.007	1.47	.234	.009	0.03	.976	.000
FaR x S x Mood	0.02	.978	.000	0.09	.920	.001	0.16	.856	.001
FaR x EC x Mood	0.30	.742	.002	0.99	.374	.006	1.55	.214	.010
FER[h] x NA x Mood	1.46	.234	.009	1.61	.202	.010	0.25	.778	.002
FER x S x Mood	1.92	.150	.012	1.47	.232	.009	2.12	.102	.011
FER x EC x Mood	0.10	.904	.001	0.15	.858	.001	0.01	.992	.000

[a] For all analyses, degrees of freedom (df) = 2 and error = 322. [b] Controlling for parent and children's hunger. [c] RFHR = restriction for health reasons. [d] NA = negative affect. [e] Surgency = S. [f] Effortful control = EC. [g] FaR = use of food as a reward. [h] FER = use of food for emotion regulation.

4.4 Discussion

The current Chapter sought to induce boredom, sadness, or a typical mood in children aged 6-9-years-old using video clips in an online experimental setting. The study then assessed children's subsequent snack food selection using a hypothetical food choice task and assessed how parent-reported child temperament and parental feeding practices interacted with children's mood state to predict kilocalories selected. Boredom and sadness were successfully induced, but there were no main effects of mood condition on kilocalories selected. There was a main effect of children's negative affect and parents' use of restriction for health reasons where more overall total kilocalories and total sweet kilocalories were selected by children when they scored high in negative affect rather than low, or when parents used more restriction for health reasons, rather than when parents reported low use of this practice. However, contrary to the hypotheses, there were no significant three-way interactions between children's mood, temperament, and parental feeding practices on kilocalories selected.

Findings from the main effect analyses replicate a wealth of literature that implicates high child negative affect (e.g., Bergmeier et al., 2014; Liew et al., 2020; Steinsbekk et al., 2020; van Eeden et al., 2020) and high parental use of restrictive feeding practices (e.g., Fisher & Birch, 1999; Philippe et al., 2021a; Shloim et al., 2015) as predictors of children's

overeating independently. Our results suggest that negative affect and restrictive feeding practices are related to children's portion size selection, and specifically to sweet food selection, which may help to explain children's overconsumption given the robust portion size effect on children's food consumption (Hetherington & Blundell-Birtill, 2018).

This Chapter is the first study to explore the interactions between children's mood state, child temperament, and parental feeding practices in terms of predicting children's kilocalorie selection. Contrary to the Biopsychosocial Model (Russell & Russell, 2018) and previous research depicting a relationship between parental feeding practices and mood in children's kilocalorie consumption (Blissett et al., 2010; Farrow et al., 2015), the current study found no evidence of such an interaction. It is important to note though that Blissett et al. (2010) and Farrow et al. (2015) assessed actual food consumption in the laboratory rather than food selection using a hypothetical food choice task. Therefore, the current finding that there was no evidence of any significant three-way interactions could perhaps reflect differences with the methodology used to assess EE. The potential limitations of using a hypothetical food choice task, and its suitability at assessing EE are discussed in subsequent paragraphs.

4.4.1 Weaknesses

EE is considered both a conscious and unconscious decision to reach for palatable foods in times of emotional arousal (Brytek-Matera, 2021). The hypothetical food choice task used in this Chapter asks the child to make a conscious choice regarding how much of each snack they would consume if they could. Therefore, it could be argued that the hypothetical food choice task is measuring something other than EE, rather, something much more conscious that may distract from the emotional state that was previously induced. Previous literature assessing brain activation in the absence of hunger in response to a forced choice between food pairs and non-food pairs in adults found that brain activation in response to food pairs differed to non-food pairs (Charbonnier et al., 2015). Charbonnier and colleagues found choosing between food pairs activated areas of the brain associated with attention (i.e., consciousness), whereas non-food pairs did not. Therefore, it seems that forced choices between food pairs (as is in the hypothetical food choice task) activates conscious attention as opposed to during actual consumption where there is a lack of conscious attention. True assessments of EE may come from ad-libitum buffets where children have free choice and can self-serve a range of foods.

In the current Chapter the hypothetical food choice task used six images of 0%, 50%, 100%, 200% and 400%, 800% of recommended portion size presented horizontally over two lines. Embling and colleagues have suggested that a hypothetical food choice task operating

using less than six portion size images presented horizontally may lack portion size variability (2021), and may also suffer from a lack of image clarity resulting from use of small-scale images (2019). Instead, they recommend an 'image carousel' for each snack where a slider function can be used to increase or decrease portion size selections. Additionally, the current hypothetical food choice task consisted of only four snack foods (crisps, chocolate buttons, carrot batons, and gummy bears), whereas others such as Pink and Cheon (2021) have used 25 snack options. A larger variety of snacks may maximise the chances of familiarity or liking by the child, thus allowing the hypothetical food choice task to be more reflective of the usual snacks chosen to be consumed during emotional arousal. This point is particularly pertinent as the food preferences of the children in Chapter 4 were not investigated/known prior to choosing the four snack foods. Furthermore, the hypothetical food choice task used in this Chapter may not have been a true reflection of the snack foods typically consumed when experiencing emotions. However, it is difficult to ascertain whether more choice and variability would be beneficial with children given that this would increase the cognitive demands of the task and the time taken to complete them, during which time the effects of the emotional manipulation might wane. It is not yet known whether feelings of boredom induced from a video clip are transient or sustained, although work with adults suggests that feelings of sadness induced from videos have a sustained effect of 25-minutes on the autonomic nervous system, in comparison to the effects of laughter which are much more transient (and which return to basal level after video) (Sakuragi et al., 2002).

4.4.2 Strengths

Despite the potential methodological weaknesses identified, this Chapter is not without its strengths. Indeed, the findings support the use of video stimuli to induce target emotions in children (Karim & Perlman, 2017; Siedlecka & Denson, 2018). Additionally, this Chapter was the first to successfully induce boredom in children using a video of a dripping tap and measure this experience of boredom using a novel pictorial Likert scale. The study also mirrors existing literature and Chapters 2 and 3, where restrictive feeding practices and negative affect are highlighted as important factors in the development of child EE (using parent-report).

4.4.3 Conclusion

To conclude, this research presents a promising avenue for future research where the consequences of less researched emotions, such as boredom, can be explored experimentally. In addition, this Chapter was the first to use a hypothetical food choice task to assess child EE, which during the COVID-19 pandemic, was a safer and more cost-effective alternative to a laboratory study. Whilst this study was not successful at detecting

significant interactions, we present clear design improvements that may aid detection in replication studies since portion size is a significant predictor of food intake and obesity in children (e.g., Fisher et al., 2007). However, where possible, future research should utilise laboratory studies to assess children's food consumption rather than hypothetical selection.

CHAPTER 5:

Emotional eating following a laboratory mood induction: the interaction between parental feeding practices and child temperament

In Chapter 4 an online experimental methodology was used successfully to induce boredom in children using a video clip of a dripping tap, and experiences of boredom were measured using a novel pictorial Likert scale. Findings indicated that parental feeding practices and child temperament were linked to children's food selection, with high parentally reported use of restriction of food for health reasons and high child negative affect being linked to overall kilocalorie and total sweet kilocalorie selection in this online task. Although the boredom paradigm led to greater reported boredom in children, this did not significantly shape children's food selection. Moreover, there was no significant three-way interaction between mood condition, parental feeding practices, and child temperament in predicting the number of kilocalories that children selected. These null effects may be a result of the online methodology used and the use of a hypothetical food choice task rather than a measure of children's actual eating behaviour. With this in mind, Chapter 5 operated as an experimental laboratory study, offering an improved opportunity to assess the impact of mood, child temperament, and parental feeding practices on child food consumption, using a more controlled methodological design.

5.1 Introduction

Laboratory studies offer several advantages to control the environment more rigorously in ways that can strengthen the design of eating behaviour studies. For example, the setting can be designed so that it is the same for all participants, standardised meals can be provided to ensure participants are eating in the absence of hunger, emotions can be induced in a controlled setting, and food intake can be measured ad-libitum using accurate recording measurements. However, to date there have only been three studies that have experimentally induced negative mood in children in a laboratory and then measured subsequent kilocalorie intake.

In one study, Blissett and colleagues (2010) explored emotional eating (EE) in a laboratory setting by offering children who had eaten to satiety access to snack foods or toys following a negative mood induction (compared to a control group of no mood induction). In their study, children were invited to complete a jigsaw puzzle in return for a sticker, but children in the negative mood condition were unable to complete the puzzle because a piece was missing. Children waited for 4-minutes whilst a researcher looked for the missing piece and, during that time, were given free access to snack foods or toys to play with. Afterwards, the missing piece was found, children received their sticker, and their mood returned to baseline. There was a significant main effect of mood condition whereby children ate more kilocalories from breadsticks under conditions of negative mood compared to the control group. There was also a significant main effect of parental feeding practices where children of parents who reported using high food for emotion regulation consumed more kilocalories from chocolate-chip cookies than those whose parents reported using low levels of food for emotion regulation. Moreover, children of mothers who reported using more food for emotion regulation consumed more chocolate under conditions of sadness compared to the control group. At a 2-year follow up, parents who reported the use of food as a reward and restriction of food for health reasons with their children at ages 3-5-years (baseline) were more likely to have children who consumed more kilocalories from snacks under conditions of sadness at follow up 2 years later (Farrow et al., 2015). This therefore suggests that under conditions of negative emotion, children's experiences of non-responsive feeding practices are predictive of kilocalorie intake from sweet foods.

Finally, Tan and Holub (2018) used video clips to induce sadness, happiness, and neutral mood in children aged 4-9-years-old, and then measured subsequent snack food consumption in the absence of hunger in the laboratory. Children were randomly assigned to a mood condition where, after watching the video clip, they had access to four snack foods (goldfish crackers, frosted animal cookies, chocolate teddy graham crackers, and chocolates) or could play with toys. They found that children in the sadness condition

consumed significantly more kilocalories from chocolate compared to those in the happy condition, and children in the happy condition consumed significantly more kilocalories from chocolate compared to the neutral condition. This suggests that feelings of sadness compared to feelings of happiness and a neutral condition promote the consumption of more palatable sweet foods. However, to date, no study has looked at whether feelings of boredom may differentially predict children's snack food intake in comparison to feelings of sadness or a control condition.

As discussed in Chapter 4, differences in parentally reported child temperament may exacerbate proneness to experiences of boredom (Golubchik et al., 2021). Indeed, in a study of college students, self-reported proneness to boredom and poor emotion regulation (which is intertwined with temperament) simultaneously predicted experiences of boredom-EE (Crockett et al., 2015). However, there is a distinct lack of laboratory work that has induced boredom to explore child EE and considered the role of child temperament in this relationship. As also discussed in Chapter 4, non-responsive feeding practices are beginning to be recognised in the development of boredom-EE (e.g., Carnell et al., 2011), where in qualitative research parents recall using emotional feeding during children's experiences of boredom. However, it is yet to be understood how these non-responsive feeding practices may relate to laboratory induced boredom-EE. As this thesis is guided by the Biopsychosocial Model (Russell & Russell, 2018), data analysis in Chapter 4 considered the relationship between parental feeding practices, child temperament, and mood condition in children's snack food selection. In the current Chapter, a laboratory methodology was utilised to assess children's actual snack food consumption and the effects that parental feeding practices, child temperament, and mood had on this.

5.1.1 Aim and hypotheses

The current study sought to explore the interactions between parental feeding practices (use of food for emotion regulation, use of food as a reward, restriction of food for health reasons), child temperament (negative affect, surgency, effortful control) and mood condition (sadness, boredom, control) on kilocalories consumed by children (overall total kilocalories, total sweet kilocalories, total savoury kilocalories) in a laboratory in the absence of hunger. It was hypothesised that there would be a main effect of mood condition on kilocalories consumed where those in the mood induction conditions (boredom and sadness) would consume more kilocalories than those in the control condition. It was also hypothesised that there would be a main effect of non-responsive feeding practices where children of parents who reported high use of non-responsive feeding practices would consume more kilocalories than parents who reported low use. Another hypothesised main effect was for children's temperament, where through using parent report, children with high

negative affect or surgency would consume more kilocalories than children with low scores on these temperamental traits. It was also hypothesised that there would be a three-way interaction between parental feeding practices, temperament, and mood condition. Specifically, it was hypothesised that children would consume significantly more kilocalories in the boredom or sadness condition compared to the control condition if their parent reported high use of non-responsive feeding practices and the child scored high in negative affect or surgency.

5.2 Methods

5.2.1 Participants

The power analysis from Chapter 4 is also applicable to the current Chapter as the study designs are identical but use different methodologies. In short, 93 parent-child dyads were required (using G*Power for ANOVA, large effect size (f = 0.40), 80% power, α = 0.05). The current study over-recruited a sample of 120 parent-child dyads so was sufficiently powered. Parents and their children were recruited using paid social media advertisements (Facebook; see Appendix A-3) that were parametrised based on distance to Aston University's Institute of Health and Neurodevelopment (location of laboratory), and the study inclusion/exclusion criteria. The inclusion criteria were parents and their children aged between 4-5-years, but only if they were not vegan, had no known allergies/intolerances to gluten, dairy, or nuts, and had no medical conditions that would affect eating. This study was applicable to vegetarians, but vegan alternatives or alternatives without gluten, dairy, or nuts were not offered since the foods being used were based on a previous study (Blissett et al., 2010). Those with medical conditions that would affect eating (e.g., Autism Spectrum Disorder, ASD) were excluded since the current study sought to examine eating behaviour in the general population. One parent-child dyad was excluded from analysis as during testing, the mother informed the researcher that their child was recently diagnosed with ASD. Overall, 119 parent-child dyads were included for data analyses.

5.2.2 Design

The study was approved by Aston University's Health and Life Sciences Ethics Committee (#1646) (see Appendix B-3) and Aston University's Institute of Health and Neurodevelopment (IHN) (see Appendix B-4). All parents provided informed consent for their own and their child's participation and use of imagery for educational purposes (see Appendix C-5, C-7, and C-8). Children also provided verbal assent to take part. All procedures were conducted in accordance with the Declaration of Helsinki as revised in 1983. This study took place during the COVID-19 pandemic where social distancing and

protective clothing were mandatory. Therefore, strict COVID procedures were followed throughout (see Appendix C-6).

This study used a between-subjects design where children were assigned using block randomisation to one of three mood conditions (sadness, boredom, control) to experience a mood induction paradigm. The control condition involved a task that induced no target emotion and so reflected a child's typical mood state. Following the mood induction, children had access to a buffet of snacks and their parents simultaneously completed a standardised battery of questionnaires regardless of the mood condition their child was randomised to. As in the previous study (Chapter 4), there were two independent variables consisting of three parental feeding practices (use of food for emotion regulation, use of food as a reward, restriction of food for health reasons) dichotomised using median splits into two levels of high and low, and three child temperaments (negative affect, surgency, effortful control) again dichotomised using median splits into two levels of high and low. There was also an independent variable of mood condition with three levels (sadness/boredom/control). Therefore, like in Chapter 4, this study operated using a 2 x 2 x 3 design where the effects of each parental feeding practice and each child temperament were assessed with mood condition in turn. The dependent variables for this study were total kilocalories consumed from all snacks (sum of the kilocalories from crisps, chocolate-chip cookies, chocolate buttons, grapes, breadsticks, and carrot batons), total kilocalories consumed from sweet snack foods (sum of the kilocalories from chocolate buttons, chocolate chip cookies and grapes), and total kilocalories consumed from savoury snack foods (sum of the kilocalories from carrots, crisps, and breadsticks).

5.2.3 Setting

The Eating Behaviour Laboratory at Aston University's Institute of Health and Neurodevelopment (IHN) consisted of one large room split into two rooms using an internal wall and door. There was also an adjacent kitchen used for preparing and storing food used in the study. The first room was 'the parent room' and in here there were computers for the researcher and parent and a colourful sofa for participants (see Figure 5.1). In the second room (named 'the task room'), there was a large children's mat on the floor with colourful and attractive age-appropriate toys bordering the room. In the centre of the room there was a children's dining table with two chairs suitable for parents and children (see Figure 5.2). The dividing wall between the parent room and the task room contained a one-way mirror that allowed parents to observe their children during testing. All cutlery and crockery used in the laboratory was child appropriate (plastic and colourful).

Figure 5.1

The Parent Room at Aston University's Institute of Health and Neurodevelopment Eating Behaviour Laboratory.

Figure 5.2
The Task Room at Aston University's Institute of Health and Neurodevelopment Eating Behaviour Laboratory.

5.2.4 Procedure

Testing sessions took place at either lunchtime (11:00-14:00) or dinner time (16:00-18:00), and parents were instructed not to provide their child with this meal prior to the session. Testing sessions lasted approximately 60-90-minutes.

Upon entering the nutrition laboratory, the parent and child were taken into the task room and given 10-minutes of free playtime using any of the toys within the room so that the child was familiarised with the surroundings. After 10-minutes, the parent and child were invited to sit at the dining table for a standardised meal (see section 5.2.5). The contents of the meal were explained, and the child was asked to "*eat as much as they could until their tummy was nice and full*". Mealtimes lasted around 30-minutes for most families. This was followed by two brief tasks related to another research question (not reported in this Chapter, see Chapter 6).

After the brief tasks, the child was invited to complete another task with the researcher in the task room whilst their parent completed questionnaires in the parent room (see section 5.2.5.2). The child could not see their parent during this time, but parents could hear their child or view them using the one-way mirror. The child was aware that their parent was close by and could be called if necessary. A confederate researcher supervised the parent's completion of the questionnaires, whilst the main researcher remained in the task room with the child.

The child was asked by the researcher to indicate their mood rating using a Likert scale (see section 5.2.5.1). After this, the researcher followed a protocol to induce one of three mood condition (sadness, boredom, control). The control condition elicited no mood (i.e., typical mood) (see section 5.2.5.1). After each mood induction (including control condition), the same Likert scale that was used at pre-mood induction was shown to the child to assess mood change. Immediately after assessing mood change, the researcher presented a tray containing six snack food bowls (see 5.2.5.1, or Figure 5.3). The child was told that they could *"eat as much of the snacks as they wished, or they could go and play with any of the toys in the room*". Children were unaware they would only have 4-minutes to consume the snacks before being cleared away. The whole task lasted approximately 20-minutes. When the parent had completed the questionnaires, the child was reunited with their parent. Both parent and child were then invited to be weighed and measured by a researcher. Parent-child dyads were thanked for their participation and given a £30 Amazon voucher as compensation for their time and travel expenses.

5.2.5 Measures

Standardised meal

Following the protocol used by Blissett et al. (2010), parents and children were given the same pre-prepared lunch/dinner regardless of condition. The children's meal consisted of one white bread roll (cut in half) filled with one slice of chicken and one slice of cheese,

alongside 4 cheese crackers, 5 carrot batons, 2 chocolate chip cookies, and 3 pieces of chopped red apple. Parents' lunches were the same as the child's but had double the size of the children's sandwich (2 bread rolls, 2 slices of chicken, and 2 slices of cheese). Those children or parents who were vegetarian were given an extra slice of cheese instead of the sliced chicken. A cup of water was also provided for parents and children. Meals were weighed before and after the mealtime to determine the percentage intake of food. Children and parents could ask if they wanted more food, although none did.

5.2.5.1 Child measures

Mood induction

In all conditions children were invited to complete an age-appropriate jigsaw puzzle (24 pieces) to receive a small toy of their choice as a reward for solving the puzzle. Prizes were up to the value of £5 and included colouring sets, torches, Lego, and wooden jewellery. The Likert scales used to assess mood were the same as were used in Chapter 4 (section 4.2.4.1).

Sadness: The sadness condition replicated the procedure used by Blissett et al. (2010). Children were asked to rate their mood using the smiley face Likert scale. Children then attempted to complete the jigsaw but learned there was a jigsaw piece missing. The researcher told the child that they were not going to receive their prize because they did not complete the jigsaw. The child's mood was then re-rated using the smiley face Likert scale. After, the researcher informed the child that they would ask the confederate in the parent room to look for the piece, and whilst the confederate was searching for this, the child could eat any of the snack foods or play with the toys. The researcher also informed the child that they would search in the adjacent kitchen for the missing piece. The researcher could see the child, but the child could not see the researcher. After 4-minutes the snacks were cleared and the confederate in the parent room returned with the missing jigsaw piece. The child then completed the jigsaw, received their chosen prize, and re-rated their mood on the smiley face Likert scale.

Boredom: The boredom procedure used a novel "sit and wait" paradigm. Children were asked to rate their mood using the boredom pictorial Likert scale in the task room with the researcher. The researcher told the child that both researchers would complete the jigsaw with the child. The confederate researcher (waiting in the parent room) then entered the task room and said there was "*someone at the door of the laboratory*". The confederate left to speak with the pretend person and the researcher reminded the child that they had to wait for the confederate to return before doing the jigsaw. The researcher asked the child to sit and wait at the table whilst the researcher looked at some paperwork in the adjacent

kitchen while they waited for the confederate to return. This was to ensure the child was not distracted by the researcher or able to engage with them. The child sat and waited for 4-minutes and then the researcher returned from the kitchen and the child was asked to re-rate their mood using the boredom pictorial Likert scale. Immediately after mood rerating, the confederate re-entered the task room and both researchers explained to the child that they were going to the adjacent kitchen to count all the puzzle pieces to ensure they could complete the jigsaw, and in the meantime, the child could eat any of the snack foods provided or play with any of the toys. Counting the puzzle pieces was a bogus act, but it was to ensure the child remained bored (i.e., the child could not engage with researcher to change mood state) and that the child could eat any snacks free from researcher's judgement. Both researchers could see the child, but the child could not see them. After 4-minutes the researchers re-entered the task room from the kitchen, moved the snacks away, and the child completed the jigsaw. The child then received their prize, and their mood was re-rated on the boredom Likert scale. The decision to induce boredom prior to starting the jigsaw rather than after completing the jigsaw (before getting the prize) was made based upon the likelihood that making children wait for their toy may induce frustration rather than boredom.

Control: The control condition replicated the procedure used by Blissett et al. (2010). Children first rated their mood using the smiley face Likert scale. Children then attempted the jigsaw without obstacle. Upon completion, the child received their chosen prize, and their mood was reassessed using the smiley face Likert scale.

Snack foods

All children, regardless of mood condition, were provided with six bowls presented on a large tray containing six different snacks (replicating Blissett et al., 2010). The snacks totalled 331 calories and comprised 6g of salted crisps (32 kcal), 2 chocolate-chip cookies (115 kcal), 21 chocolate buttons (115 kcal), 9 green grapes (32 kcal), 2 carrot batons (6 kcal), and 3 mini breadsticks (31 kcal). The presentation of the snack foods on the tray was standardised (see Figure 5.3). Each snack food was weighed before presentation and after consumption. Manufacturers' nutritional information was used to calculate overall total kilocalories, total sweet kilocalories, and total savoury kilocalories consumed from snacks.

Figure 5.3
The snack food tray containing six bowls of snacks in the standardised presentation.

Likert scales assessing mood change

The Likert scale presented to the child depended upon the mood condition that the child was randomised to. Those in the sadness and control condition used the smiley face Likert scale, and those in the boredom condition used the pictorial boredom Likert scale. A full description of those Likert measures can be found in Chapter 4.

5.2.5.2 Parent measures

Parents completed the following measures (excluding the demographics questionnaire), which are described in detail in Chapter 2:

A demographics questionnaire

Parents completed a demographics questionnaire to assess parent and child characteristics. Parents self-reported their age, sex, height, weight (to be converted to BMI), education level, ethnicity, their child's age and sex. Parents indicated how may children they had, and parents also reported their perceived socioeconomic status (SSS) using MacArthur's Scale of Subjective Social Status (Adler et al., 2000) (see Chapter 4).

The Comprehensive Feeding Practices Questionnaire (CFPQ – Musher-Eizenman & Holub, 2007)

Parents completed the CFPQ to assess parental feeding practices. Three sub-scales were used from the CFPQ, and they all showed good reliability (food for emotion regulation, $\alpha = 0.73$; food as a reward, $\alpha = 0.76$; restriction of food for health reasons, $\alpha = 0.79$).

The Children's Behaviour Questionnaire – Very Short Form (CBQ-VSF - Putnam & Rothbart, 2006)

Parents also completed the CBQ-VSF to assess their child's temperamental dispositions. In the current study, the CBQ-VSF had good reliability for surgency ($\alpha = 0.75$), negative affect ($\alpha = 0.73$), and effortful control ($\alpha = 0.70$).

The Children's Eating Behaviour Questionnaire (CEBQ - Wardle et al., 2001)

Additionally, parents completed the emotional overeating (EOE) subscale of the CEBQ, which assessed children's EOE. The EOE subscale had good reliability in the current sample (α = 0.78).

The Dutch Eating Behaviour Questionnaire (DEBQ - van Strien et al., 1986)

Lastly, parents completed the EE subscale of the DEBQ, which assessed parent EE. The EE scale had excellent reliability in the current sample (α = 0.96).

Height and weight

At the end of the session, children were weighed and measured with their shoes removed (to be converted to BMI z-scores). Parents were also invited to be weighed and measured. If parents were weighed and measure, these metrics replaced any self-reported height and weight given during the demographic's questionnaire.

5.2.6 Data analysis

IBM SPSS Statistics 26 was used for all data analyses.

5.2.6.1 Normality and confounding variable analyses

The normality of the three dependent variables (overall total kilocalories consumed, total sweet kilocalories consumed, and total savoury kilocalories consumed) was assessed using Kolmogorov-Smirnov tests. These tests indicated that the dependent variables were skewed (overall total kilocalories: $D(118) = .141$, $p < .001$, total sweet kilocalories: $D(118) = .147$, $p < .001$, total savoury kilocalories: $D(118) = .262$, $p < .001$). Subsequent covariate analyses between demographic variables and dependent variables were conducted using non-parametric tests (Spearman's Rho correlations, Mann-Whitney U tests and Kruskal-Wallis H tests).

5.2.6.2 Baseline differences and mood change analyses

One-way Analysis of Variance (ANOVA) was used to examine any baseline differences in parent and child continuous demographics between conditions as ANOVA can be used with skewed data (Field, 2013) (see Appendix E-4). Baseline differences in parent and child categorical demographics between conditions were examined using Chi-squared tests (see Appendix E-5). Wilcoxon Signed Ranks tests were used to examine changes in mood from pre-mood induction to post-mood induction for sadness, boredom, and control condition. Wilcoxon Signed Ranks tests were also used to assess mood change in the sadness and boredom condition from post-mood induction to after completing the jigsaw

(returning to baseline). Mann-Whitney U tests were used to assess differences in children's baseline mood at pre-mood induction between sadness and control condition, and again to assess mood at post-mood induction between sadness and control condition. Comparisons between sadness and bored, and bored and control conditions were not assessed as they utilised different Likert scales.

5.2.6.3 Main analyses

ANOVA was used for the main data analyses as ANOVA is considered robust enough to account for a lack of normality and homogeneity (Field, 2013).

Main Effects of Independent Variables

To assess the main effects of mood condition (boredom/sadness/control), each child temperament (negative affect, surgency, effortful control – median split high/low), and each parental feeding practice (use of food for emotion regulation, food as a reward, restriction of food for health reasons - median split high/low), a series of one-way ANOVAs were used. Evidence of a significant main effect ($p < .05$) was followed up using post-hoc analysis using a Bonferroni correction.

Three-way ANOVA

To test the hypothesis that there would be a three-way interaction between parental feeding practices, child temperament and mood condition on overall total kilocalories consumed, total sweet kilocalories consumed, and total savoury kilocalories consumed, a series of three-way ANOVAs were run. The independent fixed variables were mood condition (sadness/boredom/control), parental feeding practices using median splits (high/low) for each feeding practice (use of food for emotion regulation, food as a reward, restriction of food for health reasons), and temperament using median splits (high/low) for each temperament (negative affect, surgency, effortful control). A total of nine ANOVAs were run for each of the three dependent variables, and the three-way interactions assessed the two-way interactions of parental feeding practice and child temperament moderated by mood condition. Each of the dependent variables were explored in turn for evidence of three-way interactions. Main effects and three-way interactions were first reported and then when a dependent variable presented a significant three-way interaction ($p < .05$), the interaction was explored to understand its nature.

To explore a significant three-way interaction, a simple two-way ANOVA was run assessing the interaction between parental feeding practices and mood condition across both levels (high vs. low) of child temperament. This two-way interaction was then followed

up with simple simple main effects to determine the effect of mood condition across both levels (high vs. low) of parental feeding practice and temperament. Lastly, evidence of a significant simple simple main effect of mood condition was followed up with simple simple pairwise comparisons using a Bonferonni correction to ascertain what mood condition (sadness vs. bored vs. control) kilocalorie intake differed when looking at the significant levels of temperament and feeding practice ascertained from the simple simple main effects analysis.

5.3 Results

5.3.1 Sample characteristics

For the parents and children who took part (N = 119), participant characteristics are reported in Table 5.1. The sample consisted of 110 mothers and 9 fathers. Parents had a mean age of 34 years and a mean BMI of overweight, most described their ethnicity as White, and most were educated to degree level. Parents had a mean of two children. Parents self-reported their subjective social status as middle-class. Children were on average 4-years-old, and 61 were female and 58 were male. The mean child BMI z-score was standardised for age and sex (Child Growth Foundation, 1996) and reflected a healthy weight. There were 88 children (73.95%) with healthy weight (BMI z-score between -2 and 1), 17 children (14.29%) with overweight (BMI z-score between 1 and 2), 11 children (9.24%) with obesity (BMI z-score > 2), and 3 (2.52%) with underweight (BMI z-score < -3) (WHO, 2007)

Table 5.1
Participant characteristics of parent-child dyads (N = 119).

Measure	Mean ± SD	Min	Max
Parental age (years)	34.30 ± 5.16	21	48
Parental BMI[a]	29.45 ± 1.30	17.06	49.48
Child BMI z-score	0.21 ± 1.06	-2.16	3.16
Number of children	2.26 ± 1.05	1.00	7.00
Child age (years)	4.42 ± 0.60	3.00	6.00
Subjective social status[b]	5.37 ± 1.37	1.00	8.00
Measure		**n (%)**	
Parental ethnicity[d]:			
White:			
English/Welsh/Scottish/Northern Irish/British		81 (68.10)	
Irish		1 (0.80)	
Mixed or Multiple ethnic groups:			
White and Black Caribbean		4 (3.40)	
White and Asian		2 (1.70)	
Black, Black British, Caribbean, or African:			
African		1 (0.80)	
Caribbean		4 (3.40)	
Asian or Asian British:			
Indian		6 (5.00)	
Pakistani		10 (8.40)	
Other ethnic group:			
Arab		3 (2.50)	
Any other ethnic group		7 (5.80)	
Parental education:			
High School		17 (14.30)	
Sixth Form		23 (19.30)	
Undergraduate Degree		51 (42.90)	
Postgraduate Degree		28 (23.50)	
Sex of parent:			
Female		110 (92.40)	
Male		9 (7.60)	
Sex of child:			
Female		61 (51.30)	
Male		58 (48.70)	

[a] *n* = 104. [b] MacArthur's Scale of Subjective Social Status (SSS). [c] *n* = 115. [d] Parental ethnicity determined using the UK Government's list of ethnic groups.

5.3.2 Covariate analysis

As seen in Table 5.2, none of the continuous parent or child demographics were significantly correlated with either overall total kilocalories consumed, total sweet kilocalories consumed, or total savoury kilocalories consumed. Mann-Whitney U tests indicated that there were no significant differences in any of the three dependent variables based on parent sex (overall total kilocalories: U = 499.00, p = .931, total sweet kilocalories: U = 536.50, p = .638, total savoury kilocalories: U = 374.00, p = .208), child sex (overall total kilocalories: U = 1636.50 , p = .576, total sweet kilocalories: U = 1624.50, p = .530, total savoury kilocalories: U = 1708.50, p = .857), or parent education (degree level or no degree) (overall total kilocalories: U = 1468.50, p = .601, total sweet kilocalories: U = 1531.50, p = .870, total

savoury kilocalories: U = 1299, p = .114). Kruskal-Wallis H tests revealed there were no significant differences in any of the dependent variables based on parental ethnicity (overall total kilocalories: H(10) = 13.14, p = .216, total sweet kilocalories: H(10) = 13.55, p = .194, total savoury kilocalories: H(10) = 17.40, p = .066), Therefore, none of these background variables were controlled for in subsequent analyses.

Table 5.2
Spearman's Rho correlations between overall total kilocalories, total sweet kilocalories and total savoury kilocalories consumed with parent and child demographics (N = 119, two-tailed).

Measure	Overall total kcal consumed	Total sweet kcal consumed	Total savoury kcal consumed
Parent age (years)	.098	.082	.115
Child age (years)	.099	.096	.078
SSS[a]	.088	.069	.136
Parent BMI[b]	.022	.022	.024
Child BMI z-score	.039	.033	.049
Number of children	-.113	-.124	.027

[a] MacArthur's Scale of Subjective Social Status (SSS). [b] n = 103.

5.3.3 Baseline differences

One-way ANOVAs and Chi-squared tests suggested that there were no significant differences between mood conditions for any continuous or categorical parent or child demographic variables (all p values >.05) (see Appendix E-4 and E-5). As seen in Table 5.3, one-way ANOVAs also indicated that there were no significant differences between mood conditions for all parent-reported CBQ-VSF, CEBQ, and DEBQ subscales, and parent-reported CFPQ subscales of use of food for emotion regulation and restriction of food for health reasons (all p values >.05). However, there was a significant difference between the CFPQ subscale of use of food as a reward where children in the control condition had parents who reported using food as a reward more than those in the sadness condition (p = .004), and children in the boredom condition had parents who reported using food as a reward more than those in the sadness condition (p = .002). There was no significant difference in parental use of food as a reward between children in the control condition and boredom condition (p = .869).

Table 5.3
Means (±*SD*) of parent-reported parent and child individual differences between mood condition (one-way ANOVA).

Measure	Sadness (*n* = 40)	Control (*n* = 40)	Boredom (*n* = 39)	F	*p*
Child Surgency[a]	4.67 (0.93)	4.81 (0.90)	4.76 (0.77)	.290	.749
Child Negative Affect[a]	4.25 (0.89)	4.04 (1.06)	4.17 (0.72)	.573	.565
Child Effortful Control[a]	5.21 (0.74)	5.21 (0.57)	5.28 (0.86)	.129	.879
Food for Emotion Regulation[b]	2.18 (0.78)	2.32 (0.69)	2.22 (0.66)	.408	.666
Food as a Reward[b]	2.83 (1.09)	3.51 (0.91)	3.55 (1.11)	6.09	.003
Restriction for Health Reasons[b]	3.59 (0.99)	3.59 (0.91)	3.46 (1.09)	.209	.812
Child EOE[c]	2.11 (0.82)	2.07 (0.70)	2.14 (0.76)	.089	.915
Parent EE[d]	2.57 (1.17)	2.65 (1.19)	2.73 (1.10)	.185	.831

[a] Comprehensive Feeding Practices Questionnaire (CFPQ). [b] Children's Behaviour Questionnaire – Very Short Form (CBQ-VSF). [c] Children's Eating Behaviour Questionnaire (CEBQ). [d] Dutch Eating Behaviour Questionnaire (DEBQ).

5.3.4 Mood change

As seen in Table 5.4, mood ratings in the sadness and boredom conditions significantly changed from pre-mood induction to post-mood induction in the expected direction. Those children in the sadness condition became significantly less happy, and those children in the boredom condition became significantly more bored. There was no significant change in mood ratings in the control condition between pre-mood induction and post-mood induction, which was expected since no mood was induced.

Table 5.4
Means (±*SD*) of children's pre-mood and post-mood induction ratings within each mood condition, and return to baseline mood in sadness and boredom condition (Wilcoxon Signed Rank test).

Mood Condition	Pre-test Mood	Post-test Mood	*Z*	*p*	Return to Baseline Mood	*Z*	*p*
Control (*n* = 40)[a]	4.85 (0.36)	4.95 (0.22)	-1.41	.157	-	-	-
Sadness (*n* = 40)[a]	4.75 (0.59)	2.80 (1.47)	-4.72	<.001	5.00 (1.47)	-5.05	<.001
Boredom (*n* = 39)[b]	4.46 (0.79)	3.82 (1.30)	-2.54	.011	4.56 (0.64)	-3.45	<.001

[a] Sadness and Control condition assessed using the same 5-point smiley face Likert scale. [b] Boredom condition was assessed using a different 5-point pictorial Likert scale.

At pre-test (before mood induction task), Mann-Whitney U tests suggested there were no significant difference between mood ratings in sadness and control condition (U = 771, p = .663). At post-test (after mood induction task), Mann-Whitney U tests indicated that those in the sadness condition were significantly less happy than those in the control condition (U = 154, p < .001). Comparisons between sadness and bored and bored and control conditions were not assessed as they utilised different Likert scales. As seen in Table 5.4, children in the sadness and boredom conditions significantly improved in mood after successfully completing the jigsaw.

5.3.5 Analysis of Variance (ANOVA)

5.3.5.1 Main effects

Table 5.5 depicts the means and standard deviations of the main effects for each dependent variable. As shown in Table 5.6, a series of one-way ANOVAs suggested that there was one significant main effect, and this was of mood condition on overall total kilocalories and total sweet kilocalories consumed. Post-hoc analyses using Bonferroni correction indicated that more overall total kilocalories were consumed when children were in the boredom condition compared to the control condition, but there was no significant difference in consumption between the boredom and sadness condition (p = .232), or sadness and control conditions (p = .731). Post-hoc analyses also revealed that more total sweet kilocalories were consumed when children were in the boredom condition compared to the control condition, but there was no significant difference in consumption between boredom and sadness (p = .201), or sadness and control conditions (p = .100) (see Figure 5.4).

Table 5.5
Means (±*SD*) of kilocalories consumed by children for each main effect of mood condition, child temperament, and parental feeding practices on each dependent variable (N = 119).

Main Effect	Overall Total Kcal	Total Sweet Kcal	Total Savoury Kcal
Mood Condition:			
Control[a]	52.87 (59.34)	47.19 (57.75)	5.69 (8.87)
Sadness[b]	69.29 (48.95)	58.59 (46.75)	10.69 (13.61)
Boredom[c]	94.41 (76.92)	83.16 (70.63)	11.25 (13.87)
Negative Affect:			
High[d]	75.66 (61.62)	65.83 (58.59)	9.83 (12.43)
Low[e]	68.02 (67.72)	59.53 (62.80)	8.49 (12.60)
Surgency:			
High[f]	72.93 (69.19)	62.52 (64.84)	10.41 (13.67)
Low[g]	71.06 (59.82)	63.11 (56.23)	7.95 (11.10)
Effortful Control:			
High[h]	78.58 (67.27)	69.25 (63.62)	9.32 (12.16)
Low[i]	63.82 (60.39)	54.79 (55.86)	9.03 (12.97)
Food for emotion regulation:			
High[j]	68.84 (63.01)	59.45 (60.34)	9.40 (12.19)
Low[k]	76.36 (66.79)	67.45 (60.95)	6.91 (12.97)
Food as a reward:			
High[l]	72.77 (67.59)	61.81 (62.09)	10.96 (13.51)
Low[m]	71.57 (63.06)	63.83 (59.94)	8.19 (11.82)
Restriction for health reasons:			
High[n]	72.55 (63.12)	64.30 (60.77)	8.25 (10.88)
Low[o]	71.27 (66.81)	60.83 (60.61)	10.44 (14.34)

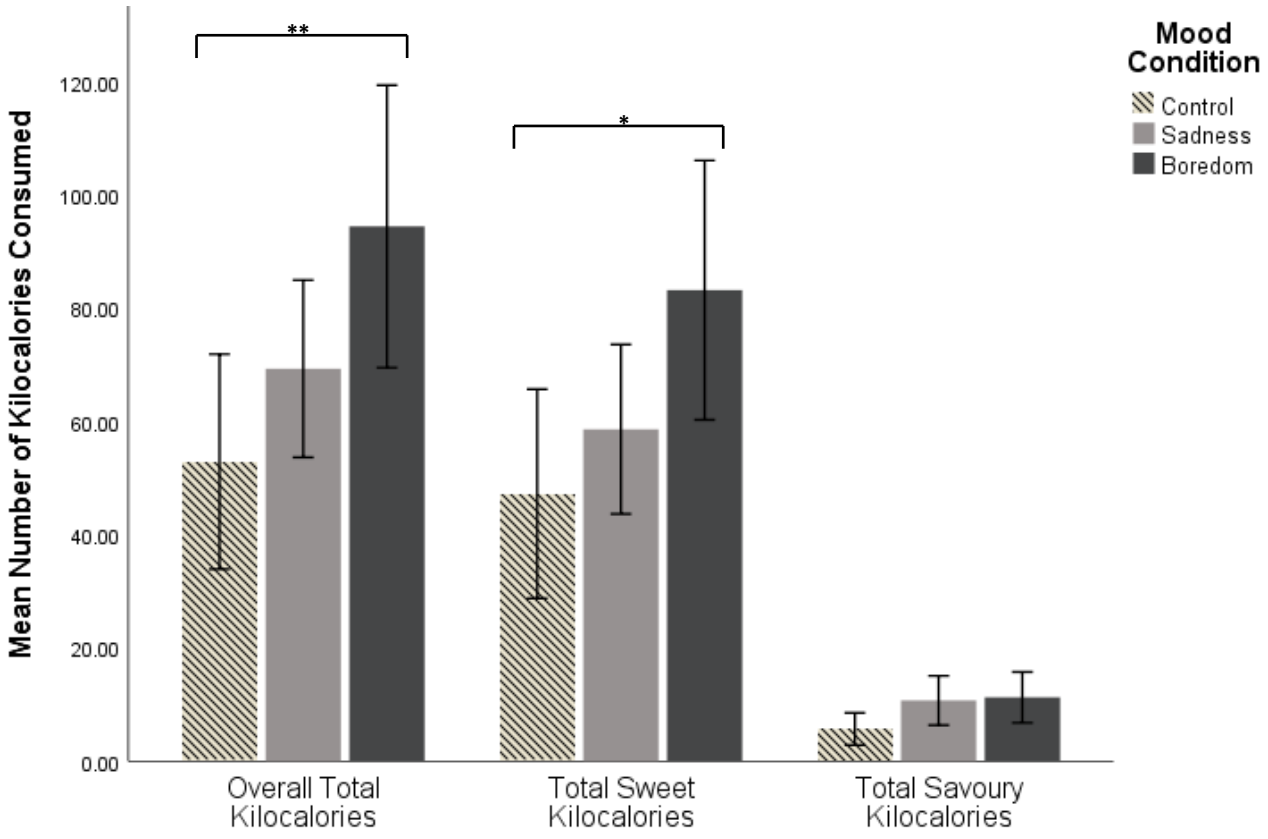
[a] n = 40. [b] n = 40. [c] n = 39. [d] n = 62. [e] n = 57. [f] n = 60. [g] n = 59. [h] n = 66. [i] n = 53. [j] n = 69. [k] n = 50. [l] n = 43. [m] n = 76. [n] n = 68. [o] n = 51.

Table 5.6
Main effects of parental feeding practices, child temperament and mood condition on each dependent variable (one-way ANOVA) [ab].

	Overall Total Kcal			Total Sweet Kcal			Total Savoury Kcal		
Main Effects	*F*	*p*	η_p^2	*F*	*p*	η_p^2	*F*	*p*	η_p^2
Mood condition	4.40	.014	.070	3.81	.025	.062	2.47	.089	.041
Child negative affect	0.42	.520	.004	0.32	.572	.003	0.34	.559	.003
Child surgency	0.03	.875	.000	0.00	.958	.000	1.16	.285	.010
Child effortful control	1.55	.216	.013	1.69	.196	.014	0.12	.898	.000
Food for emotion regulation	0.39	.532	.003	0.51	.478	.004	0.04	.833	.000
Food as a reward	0.01	.923	.000	0.02	.893	.000	1.36	.247	.011
Restriction for health reasons	0.01	.915	.000	0.10	.758	.001	0.89	.346	.008

[a] Mood condition degree of freedom (df) = 2, error df = 116. [b] Parental feeding practices and child temperaments df = 1, error df = 117.

Figure 5.4
Clustered bar chart illustrating post-hoc analyses to compare the mean number of kilocalories consumed per mood condition. ** *p* = .012, * *p* = .024 (adj Bonferroni). Error bars show 95% confidence intervals.



5.3.5.2 Three-way interaction

As seen in Table 5.7, three-way ANOVAs suggested that there were two significant three-way interactions. These were the interactive effect of use of food for emotion regulation, negative affect, and mood condition on total sweet kilocalories consumed, and the

interactive effect of the use of food as a reward, negative affect, and mood condition on total sweet kilocalories consumed. There were no other significant three-way interactions for any of the outcome variables.

Table 5.7
Three-way ANOVA interactions between each parental feeding practice (high/low), child temperament (high/low) and mood condition (sadness/control/boredom) on outcome variables[a]

	Overall Total Kcal			Total Sweet Kcal			Total Savoury Kcal		
Three-way ANOVA	*F*	*p*	η_p^2	*F*	*p*	η_p^2	*F*	*p*	η_p^2
RfHR[b] x NA[c] x Mood	1.29	.278	.024	.728	.485	.013	2.17	.112	.042
RfHR x S[d] x Mood	.648	.525	.012	1.11	.334	.020	1.90	.155	.034
RfHR x EC[e] x Mood	.531	.590	.010	.240	.787	.004	2.23	.113	.040
FaR[f] x NA x Mood	2.99	.055	.053	3.33	.040	.059	2.16	.120	.039
FaR x S x Mood	.125	.882	.002	.173	.841	.003	.488	.615	.009
FaR x EC x Mood	.354	.702	.007	.277	.759	.005	.511	.602	.009
FER[g] x NA x Mood	2.83	.063	.050	3.24	.043	.058	.086	.918	.002
FER x S x Mood	1.98	.143	.036	2.22	.114	.040	1.93	.150	.035
FER x EC x Mood	1.35	.264	.025	1.46	.237	.027	.578	.563	.011

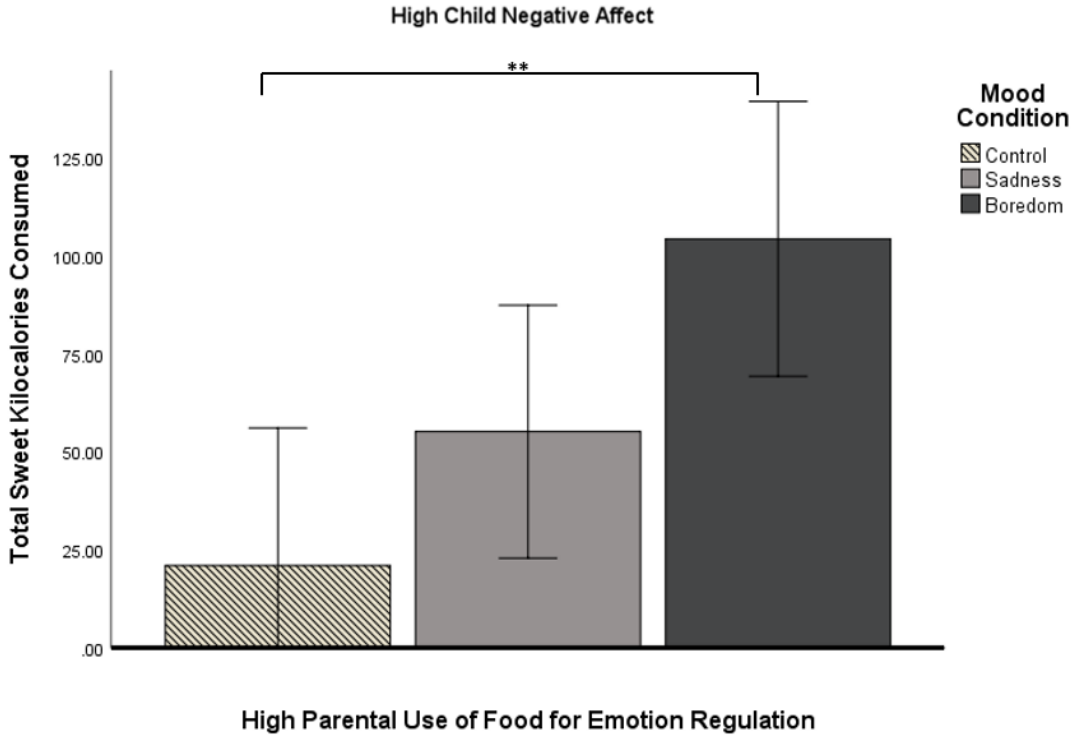
[a] For all analyses, degrees of freedom (df) = 2 and error df = 107. [b] RFHR = restriction for health reasons. [c] NA = negative affect. [d] S = surgency. [e] EC = effortful control. [f] FaR = use of food as a reward. [g] FER = use of food for emotion regulation.

Exploring the significant three-way interaction between parental use of food for emotion regulation, child negative affect, and mood condition on the total number of sweet kilocalories consumed from food

A simple two-way ANOVA suggested that there was no statistically significant simple two-way interaction between parental use of food for emotion regulation and mood condition for children with high negative affect, $F(2,107) = 1.84$, $p = .164$, $\eta_p^2 = .033$, or for children with low negative affect, $F(2,107) = 1.60$, $p = .206$, $\eta_p^2 = .029$. Simple simple main effect analysis suggested that there was a statistically significant simple simple main effect of mood condition for children with high negative affect who have parents who use high use of food for emotion regulation, $F(2,107) = 5.62$, $p = .005$, $\eta_p^2 = .095$, but not for children with high negative affect with parents who use low use of food for emotion regulation $F(2,107) = .506$, $p = .605$, $\eta_p^2 = .009$. There was no statistically significant simple simple main effect of mood condition for children with low negative affect who have parents who use high use of food for emotion regulation, $F(2,107) = .311$, $p = .733$, $\eta_p^2 = .006$ or for children with low negative affect with parents who use low use of food for emotion regulation $F(2,107) = 2.15$, $p = .121$, $\eta_p^2 = .039$. Therefore, there is an overall effect of mood condition on the number of total sweet kilocalories consumed for children with high negative affect with parents who used high use of food for emotion regulation.

Simple simple pairwise comparisons were run for children with high negative affect with parents who use high food for emotion regulation with a Bonferroni adjustment applied. Mean number of total sweet kilocalories consumed in the boredom condition was 104.36 kcal (*SE* = 17.69), 55.17 kcal (*SE* = 16.27) in the sadness condition, and 21.02 kcal (*SE* = 17.69) in the control condition. There was a statistically significant mean difference between the number of total sweet kilocalories consumed in the boredom condition and control condition of 83.34 kcal, 95% CI[22.50, 144.19], *p* = .004, with those in the boredom condition consuming more than the control condition. However, the difference between the boredom and sadness condition was not statistically significant (95% CI[-9.26, 107.66], *p* = .129), nor was the difference between the sadness and control condition (95% CI[24.31, 92.61], *p* = .475). Therefore, when a child scored high in negative affect *and* their parent used high use of food for emotion regulation, these children consumed more total sweet kilocalories when they experienced boredom (*n* = 11) compared to when they experienced a control condition (*n* = 11) (see Figure 5.5).

Figure 5.5
Simple simple pairwise comparisons (adj Bonferroni) for children with high negative affect with parents who use high use of food for emotion regulation comparing the number of total sweet kilocalories consumed between mood condition. ** *p* = .004, error bars show 95% confidence intervals.

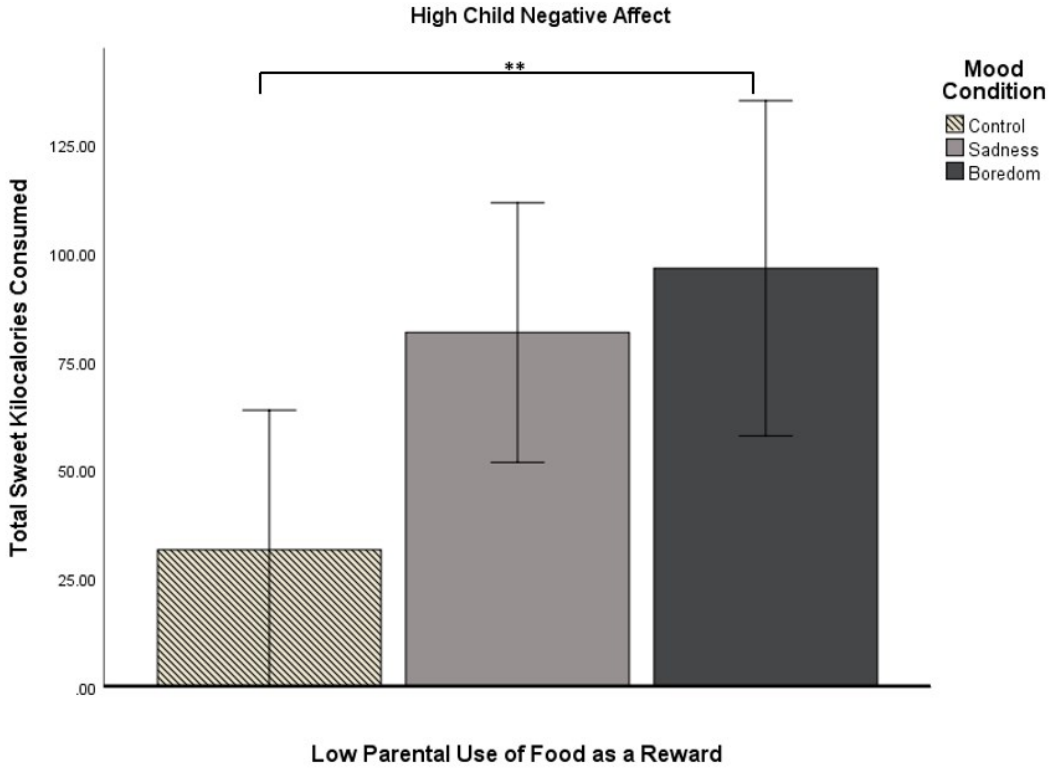


Exploring the significant three-way interaction between parental use of food as a reward, child negative affect, and mood condition on the total number of sweet kilocalories consumed from food.

A simple two-way ANOVA suggested that there was no statistically significant simple two-way interaction between parental use of food as a reward and mood condition for children with high negative affect, $F(2,107) = 1.74$, $p = .182$, $\eta_p^2 = .031$, or for children with low negative affect, $F(2,107) = 2.20$, $p = .115$, $\eta_p^2 = .040$. Simple simple main effect analysis suggested that there was a statistically significant simple simple main effect of mood condition for children with high negative affect who have parents who use low use of food as a reward, $F(2,107) = 4.00$, $p = .021$, $\eta_p^2 = .069$, but not for children with high negative affect with parents who use high use of food as a reward $F(2,107) = 2.18$, $p = .118$, $\eta_p^2 = .039$. There was also no statistically significant simple simple main effect of mood condition for children with low negative affect who have parents who use high use of food as a reward, $F(2,107) = 2.15$, $p = .121$, $\eta_p^2 = .039$ or for children with low negative affect with parents who use low use of food as a reward $F(2,107) = .919$, $p = .402$, $\eta_p^2 = .017$. Therefore, there is an overall effect of mood condition on the number of total sweet kilocalories consumed for children with high negative affect with parents who use low use of food as a reward.

Simple simple pairwise comparisons were run for children with high negative affect with parents who use low food as a reward with a Bonferroni adjustment applied. Mean number of total sweet kilocalories consumed in the boredom condition was 96.53 kcal (*SE* = 19.51), 81.72 kcal (*SE* = 15.14) in the sadness condition, and 31.60 kcal (*SE* = 16.24) in the control condition. There was a statistically significant mean difference between the number of total sweet kilocalories consumed in the boredom condition and control condition of 64.94 kcal, 95% CI[3.20, 126.67], $p = .036$ with those in the boredom condition consuming more than control condition. However, the difference between the boredom and sadness condition was not statistically significant (95% CI[-3.82, 104.08], $p = .078$), nor between the sadness and control condition (95% CI[-74.84, 45.22], $p = .999$). Therefore, when a child scored high in negative affect and their parent used low use of food as a reward, these children consumed more total sweet kilocalories when they experienced boredom ($n = 9$) compared to when they experienced a control condition ($n = 13$) (see Figure 5.6).

Figure 5.6
Simple simple pairwise comparisons (adj Bonferroni) for children with high negative affect with parents who use low use of food as a reward comparing the number of total sweet kilocalories consumed between mood condition. ** *p* = .036, error bars show 95% confidence intervals.



5.4 Discussion

This study implemented a laboratory experimental design to explore the interactions between children's mood state, parental feeding practices, and child temperament in predicting the number of kilocalories eaten in the absence of hunger by 4-5-year-old children from a snack buffet. The findings indicate that there were differences in the number of overall kilocalories and total sweet kilocalories consumed between mood conditions, where children consumed more kilocalories when experiencing feelings of boredom compared to no mood manipulation. There were two significant three-way interactions on the number of total sweet kilocalories consumed. First, when children with high negative affect had parents who reported using *high* use of food for emotion regulation, children consumed significantly more total sweet kilocalories under feelings of boredom compared to no mood manipulation. Second, when children with high negative affect had parents who reported using *low* use of food as a reward, children consumed more total sweet kilocalories under feelings of boredom compared to children experiencing no mood manipulation.

Supporting the study hypotheses, children who took part in the boredom condition consumed significantly more kilocalories from food compared to children in the control

condition. In fact, children consumed 79% more overall total kilocalories, and 76% more total sweet kilocalories in the boredom condition compared to control. This finding mirrors previous literature from adult samples where adults who watched a boring film segment consumed twice the number of kilocalories from M&M chocolate compared to those who watched a neutral film segment (Havermans et al., 2015). Despite popular opinion that children eat when they are bored (Klass, 2020), this study is the first to empirically study this phenomenon. We provide experimental evidence that children as young as 4-years-old eat more kilocalories from snacks when feeling bored in comparison to neutral mood, even when they have very recently eaten to satiety. Additionally, the effect size was medium and the differences in the means suggest that children in the boredom condition ate 42 more kilocalories overall (of which 36 kilocalories were from sweet snacks) compared to children in the control condition. If children are eating this many more kilocalories during one instance of boredom, given that boredom is believed to be a common emotion in children (Westgate & Steidle, 2020), the potential for excess kilocalorie intake in response to being bored across one day, one week, or one year, is potentially very significant. The fact that the main effect of boredom-EE occurred irrespective of child temperament or parental feeding practices highlights the importance of this emotion as a driver for eating in young children and one that should be considered by families who are concerned about children eating in the absence of hunger. According to parental report, EE in children appears to be a stable trait across childhood (Ashcroft et al., 2008), so children who eat more in response to boredom may therefore be predisposed to continue to eat when bored in later life. However, longitudinal research is needed to explore the stability of independently observed boredom-EE. Despite providing evidence for a main effect of mood condition, this study provided no support for the hypotheses that there would be main effects of non-responsive feeding practices or child temperament. This reinforces the narrative that an interaction of such variables contributes to children's eating behaviour.

It was also hypothesised that there would be a three-way interaction between parental feeding practices, child temperament, and mood condition. Specifically, that children would consume the most kilocalories in the boredom or sadness condition compared to the control condition if their parent reported using high levels of non-responsive feeding practices and the child scored highly in negative affect or surgency. Findings from this study partially supported this hypothesis since children consumed five times more total sweet kilocalories under feelings of boredom compared to the control condition if their parent reported greater use of food for emotion regulation and the child scored high in negative affect (boredom: M = 104.36, SE = 17.69 vs. control: M = 21.02, SE = 17.69). It may be that children who were bored ate significantly more kilocalories from sweet foods if they were high in negative affect

and exposed to higher use of food for emotion regulation because parental use of food for emotion regulation tends to be associated with the use of sweet, high calorie and energy dense foods in the context of regulating the child's emotional arousal. Parents who use this feeding practice more frequently may have found that these foods are effective at comforting their child in response to emotional arousal (van Strien et al., 2019) and through repeated exposure, children may learn to find comfort in those sweet foods.

Children with high negative affect often perceive heightened experiences of negative emotions (Rothbart & Bates, 2007) and struggle with regulating such emotions (Rothbart & Sheese, 2007). Therefore, children with high negative affect may be more likely to experience more incidences of parental use of food for emotion regulation to regulate their more negative mood. Indeed, in Chapters 2 and 3 we found that when parents rated their children as higher in negative affect this was associated with greater parental reported use of non-responsive feeding practices, and in previous literature children with high negative affect have been found to elicit and encourage parental use of emotional feeding (Steinsbekk et al., 2018). In situations of boredom, children with high negative affect may be unable to self-soothe as easily as their peers with low negative affect, and, if they have been exposed to greater parental use of food for emotion regulation, they may learn to associate food with a reduction in distress and be more likely to consume sweet foods to relieve feelings of boredom. As the control condition did not evoke an emotion per se, there is less of a need for the child to regulate this experience using sweet foods, even if they were rated high negative affect or if their parents often used food to regulate their emotions. Indeed, mood ratings indicated children were relatively content in the control condition. Importantly, the effect size for this significant three-way interaction was medium. This demonstrates the importance of considering children's temperament and parental feeding practices in children's boredom-EE, and that over time, these factors could make a difference to children's caloric intake which may predispose obesity.

As previously mentioned, the current study found no evidence of surgency effects; either as a significant main effect or involved in a significant three-way interaction. In fact, there has been no evidence that surgency is related to child EE in any of the studies thus far in this thesis. This suggests that the temperamental trait of surgency, as measured by the CBQ-VSF, may not be related to children's EE. Indeed, the trait of surgency includes different dimensions such as high impulsivity, high intensity pleasure (the amount of pleasure or enjoyment that children experience in situations involving high stimulus intensity), and high activity (Rothbart & Bates, 2007). It is possible that the collective of these behavioural traits - defined as surgency - is not associated with EE, but instead individual traits of a surgent

temperament may best predict EE, especially in times of boredom where stimulus engagement is low, and children may be more inclined to seek out alternative stimulation.

It was surprising that there was no evidence of a significant difference in children's kilocalorie consumption when experiencing sadness compared to the control condition for children with high negative affect who had parents reporting high use food for emotion regulation. Previous research has demonstrated that children eat significantly more kilocalories from chocolate when experiencing negative mood compared to a control condition if their mothers reported using more food for emotion regulation (Blissett et al., 2010). However, the mean intake of total sweet kilocalories in the sadness condition for children with high negative affect whose parents reported high use of food for emotion regulation was 55.17 kcal (*SE* = 16.27) compared to the control condition mean of 21.02 kcal (*SE* = 17.69). Therefore, the trend in these means suggest that children with high negative affect who had parents who reported using high use of food for emotion regulation did eat more kilocalories from food, but not enough to represent a significant difference in this sample.

The second significant three-way interaction also partially supported the hypothesis that children would consume more kilocalories when experiencing boredom compared to a control condition if parents rated their child high in negative affect or surgency and reported high use of non-responsive feeding practices. This is because children consumed three times more total sweet kilocalories when experiencing feelings of boredom compared to control condition if the child was rated highly in negative affect, but this was in the context of a parent who reported *low* use of food as a reward (boredom: *M* = 96.53, *SE* = 19.51 vs. control: *M* = 31.60, *SE* = 16.24). In the literature, high use of food as a reward is related to greater child EE (e.g., Miller et al., 2020), however in the current study low parentally reported use of food as a reward interacted with high negative affect to predict greater boredom-EE. This finding was surprising and difficult to interpret, it may perhaps reflect the unequal sample sizes found with only 43 parents reporting high use of food as a reward compared to 76 parents reporting low use of this practice.

5.4.1 Strengths, limitations, and future directions

The current study has many strengths, including its use of a rigorous experimental laboratory design to induce mood and assess food intake. This study effectively replicated Blissett et al.'s (2010) mood induction paradigm for negative mood and a control condition with no mood induction. Moreover, this study is the first to have successfully developed and implemented a mood induction paradigm to induce boredom in children. However, despite using an experimental laboratory design, child temperament and parental feeding practices

were measured using parent self-report, which are susceptible to response bias and inaccuracies (e.g., Bergmeier et al., 2015; Blissett et al., 2019). Future research should seek to supplement questionnaire measures of parental feeding practices with observations during mealtime interactions, and questionnaire measures of child temperament could be validated by more objective measures of temperament such as the Laboratory Temperament Assessment Battery (Lab-TAB). It is also important to note that children only had access to the snack foods for 4-minutes, and it remains to be seen whether giving children free access to snack foods for a longer period would alter the study findings. This is of particular interest when considering boredom-EE as real-life experiences of boredom, and/or access to palatable foods, may not be limited to 4-minutes in duration. However, it is also unclear how durable the emotions induced by the mood induction paradigms were and whether increasing the free access period would instead lose the essence of the emotion induced.

5.4.2 Conclusion

In conclusion, this study is the first to find empirical evidence that children eat more kilocalories when feeling bored. Additionally, this study is the first of its kind to suggest that child temperament and parental feeding practice interact to predict boredom-EE in a laboratory setting. Results suggest that feelings of boredom differentially predict children's snack food intake, and that child negative affect and parental emotional feeding play an important role in the expression of this relationship.

CHAPTER 6:

Does mood state moderate the relationship between behavioural measures of children's impulsivity and kilocalorie consumption?

In Chapter 5, it was established that children who experienced feelings of boredom consumed a greater number of kilocalories than children who experienced a neutral mood. Additionally, children with high negative affect who also had parents who reported high use of food for emotion regulation consumed a greater number of kilocalories under conditions of boredom compared to a control condition of typical mood. However, there was no evidence of any other three-way interactions, or surgency or effortful control on child EE. However, previous research has found strong relationships between surgency and obesogenic eating behaviour, and impulsivity (a facet of surgency) is regularly linked with obesity and child emotional eating (EE). Thus, there is a need to examine the separate effect of impulsivity, independent from surgency, using objective assessment. Therefore, Chapter 6 utilised objective behavioural measures of impulsivity to explore the contribution of this facet of surgency in the expression of children's EE under conditions of different mood.

6.1 Introduction

Impulsivity is a facet of surgent temperament (Putnam & Rothbart, 2006), and previous literature has described a positive relationship between 5.5-year-old children's impulsivity and paediatric obesity (Graziano et al., 2010), and between higher impulsivity and higher child emotional eating (EE) (Farrow, 2012). Impulsivity is a multifaceted concept and is defined by fast reactions that are without foresight and in response to external and internal stimuli (Moeller et al., 2001). Children's impulsivity can be assessed using either questionnaire measures, which assess *trait* impulsivity (i.e., an innate personality characteristic), or through using behavioural measures, which assess *state* impulsivity (i.e., a moment in time). In previous research, trait measures have been linked to overeating in children (e.g., Goldschmidt et al., 2019; Scholten et al., 2014). Trait measures are better at capturing a child's general tendency to behave impulsively, which state measures cannot do. However, trait measures of children's impulsivity may be limited in that they either rely on parent-reports or are only suitable for self-report by children aged 7-years and above.

In contrast, state measures of impulsivity can be completed by younger children using behavioural tasks, which test the ability to delay gratification, inhibit a pre-potent response, or assess motor impulsivity (i.e., act without thinking). Previous research has found that aspects of behavioural impulsivity are related to overeating. For example, Bennett and Blissett (2019) found that children who scored poorly in their ability to inhibit a pre-potent response or delay gratification consumed more kilocalories from food in the laboratory. Bennett and Blissett (2017) also found that higher motor impulsivity in girls was correlated with having heavier weight. Therefore, motor impulsivity seems an important facet of impulsivity to measure in children because if children tend to act on impulse, it is possible that when autonomy over food intake increases in later life, they may overeat. Additionally, children's ability to delay gratification seems important to measure as evidence of children's inability to postpone an immediate gain in favour of greater and later rewards, may be indicative of overeating in the future. Findings from a large meta-analysis have reported that impulsivity is greatest amongst children with overweight and obesity in comparison to their peers with healthy weight, and that this relationship is moderated by the type of measure used to assess impulsivity (Thamotharan et al., 2013). Behavioural measures of impulsivity tend to have larger effect sizes compared to self-report measures which are often not-significantly associated with weight. Therefore, behavioural impulsivity measures should be considered when assessing the relationships between impulsivity and children's food intake.

In addition to the potential differences between different types of impulsivity and eating behaviour, it is also possible that impulsivity may shape eating behaviour differently depending on the mood state that a child is experiencing. Boredom is a discrete emotion that

typically results from a lack of engagement with a stimulus (Danckert & Merrifield, 2018). Indeed, feelings of boredom are accompanied by an appraised lack of meaning from a situation (Moynihan et al., 2015). Boredom presents a meaning-threat thereby acting as a precursor to subsequent hedonic behaviours (e.g., eating in the absence of hunger) to regain purposefulness and to escape the meaninglessness of a boring situation (van Tilburg & Igou, 2012). It has been argued that the hedonic behaviours that follow experiences of boredom are likely to be expressions of impulsivity that boredom breeds (Moynihan et al., 2017). As was ascertained in Chapter 5, children who experienced feelings of boredom consumed more kilocalories from snacks than those in a control condition. Despite no surgency effects being found in Chapter 5, it remains to be seen whether children with high impulsivity (a facet of a surgent temperament), when bored, are more susceptible to responding with increased snacking to escape the unpleasant feelings that boredom promotes. Previous literature has explored this in adults and those self-reporting high levels of impulsivity also reported greater eating in response to boredom (Wrzosek et al., 2018). Research has begun to explore the relationship between impulsivity and EE in response to negative emotions in children and adolescents, and has found that from self-reports, children (10-13-years-old) with higher impulsivity are more likely to emotionally eat in response to negative emotions (Farrow, 2012). Additionally, adolescents who self-reported difficulties in impulse control during negative mood states were more likely to report experiences of EE and food addiction (Rose et al., 2018). However, neither Farrow (2012) nor Rose et al. (2018) utilised objective, behavioural measures of child impulsivity, nor did they explore the relationship between impulsivity in relation to boredom-induced EE.

6.1.1 Aim and hypotheses

The current study builds on the findings of Chapter 5 and assesses whether the strength of the relationship between two behavioural impulsivity measures (motor impulsivity and the ability to delay gratification – assessed in turn) and children's kilocalorie consumption varies depending on mood condition (boredom, sadness, control). It was hypothesised that mood condition would moderate the relationship between impulsivity and kilocalorie consumption. Specifically, children who scored higher in motor impulsivity on the Circle Drawing Task (CDT) or lower in their ability to delay gratification on the Delay of Gratification Task (DGT) would consume more kilocalories when in the boredom condition compared to the sadness and control condition.

6.2 Methods

This Chapter describes measures collected as part of the laboratory study detailed in Chapter 5.

6.2.1 Procedure

The procedure for this study is identical to Chapter 5 but includes additional data collected after parents and children had consumed their standardised meal.

After the mealtime, the parent and child were invited into the parent room (Figure 5.1). The child was presented with two behavioural impulsivity tasks by the researcher. These tasks took approximately 10-minutes to complete. After completion, the child was invited back into the task room with the researcher whilst their parent remained in the parent room and completed questionnaires supervised by the confederate. Following this, children completed a mood induction task with subsequent access to a snack buffet (as detailed in Chapter 5).

6.2.2 Measures

Standardised meal

The standardised meal given to the children at the start of the study is detailed in detail in Chapter 5.

The Circle Drawing Task (CDT; Verbeken et al., 2009)

The CDT was used to assess children's motor impulsivity. Children were instructed to trace with their index finger the outline of a large circle on a laminated piece of A4 paper on the table they were sat at. Then, the instruction was repeated to the children, but this time the children were asked to trace the outline of the circle as slowly as possible. The time taken to trace the outline of the circle when asked to trace slowly was recorded by the researcher using a stopwatch. Faster tracing (i.e., smaller values) of the outline of the circle were indicative of higher motor impulsivity. The CDT has acceptable test-retest reliability (r = 0.57) in young children (Gandolfi & Viterbori, 2020), and in terms of validity, is a significant predictor of inhibition latent factor in preschool children (Usai et al., 2014).

Delay of Gratification Task (DGT; Thompson et al., 1997)

The DGT was used to assess children's ability to choose between a small but immediate reward or a larger but delayed reward. The DGT used the standard choice paradigm where children had the option to choose an immediate but smaller reward, or a delayed but larger reward. In the current study, children were offered stickers as rewards. These stickers were yellow stars to ensure children were not choosing rewards based on

appearance. The stickers chosen "*later*" were counted out one by one (e.g., *1...2...3*… etc.) and placed into an envelope where the researcher explained each time that the envelope was going to be given to the parent and the child would get the stickers that evening. This acted as a filler activity in between each sticker offering. Those stickers chosen "*now*" were placed in a pile in front of the child to have now. The child was encouraged to stick the sticker onto their clothing if they wished as this acted as another filler activity in between each sticker offering.

Two researchers were involved in this task. The first researcher demonstrated the task to the child by explaining that this task was all about stickers and the child had to pick if they wanted stickers "*now*", or more stickers "*later*" (where "*later*" meant that evening). The researcher asked the second researcher "*would you like 1 sticker now, or 6 more stickers later?"* The second researcher chose the "*1 sticker now*" option and the first researcher placed the sticker in a pile in front of the second researcher. The task was repeated but the second researcher selected the "*later*" option and those six stickers were placed into an envelope. After demonstrating this to the child, the first researcher offered the child *"1 sticker now or 5 more stickers later?",* and this was repeated, in order, for "*1 sticker now or 2 more later?"*, *"1 sticker now or 3 more later?"*, *"1 sticker now or 4 more later?"*, and *"1 sticker now or 6 more stickers later?*". The number of times the child chose to delay their reward was recorded as a total score, with higher scores being indicative of greater ability to delay gratification (coded as: 1 = if they chose delayed, greater reward, 0 = if they chose the immediate, smaller reward). This procedure has been used successfully in previous research with children (Ding et al., 2021; Prencipe & Zelazo, 2005).

Mood induction, Likert scales, and snack foods

The mood induction task that induced sadness, boredom and a control condition, and the associated Likert scales to assesses this mood change, are described in detail in Chapter 5. The snack foods used are also described in Chapter 5. The Manufacturer's nutritional information was used to calculate overall total kilocalories, total sweet kilocalories and total savoury kilocalories consumed.

6.2.3 Data analysis

IBM SPSS Statistics 26 was used for all analyses in this Chapter.

6.2.3.1 Normality and confounding variable analyses

As described in Chapter 5, the dependent variables (kilocalories consumed from snacks) were not normally distributed, and there were no significant covariates between participant demographics and dependant variables. For the current Chapter, additional

Kolmogorov-Smirnov tests were run to assess the distribution of the behavioural impulsivity tasks. These tests indicated that data were skewed (CDT: $D(118) = .163$, $p < .001$, DGT: $D(118) = .213$, $p < .001$). Additional Spearman's Rho correlations were used to assess the relationship between behavioural impulsivity tasks and continuous participant demographics (Table 6.1). Mann-Whitney U tests and Kruskal-Wallis H tests were used to assess the relationship between categorical participant demographics and behavioural impulsivity tasks (Section 6.3.1).

6.2.3.2 Baseline differences and mood change

As was described in Chapter 5, one-way ANOVA and Chi-square tests were used to examine baseline differences between conditions for parent and child continuous and categorical demographic variables (see Appendix E-4 and E-5). One-way ANOVAs were used to examine baseline differences in behavioural impulsivity tasks between mood conditions as ANOVA is robust enough to deal with non-normally distributed data (Field, 2013) (Table 6.2). In relation to mood change, see Chapter 5 for associated statistics where children in the sadness condition became significantly less happy, those children in the boredom condition became significantly more bored, and those children in the control condition remained happy.

6.2.3.3 Main analyses

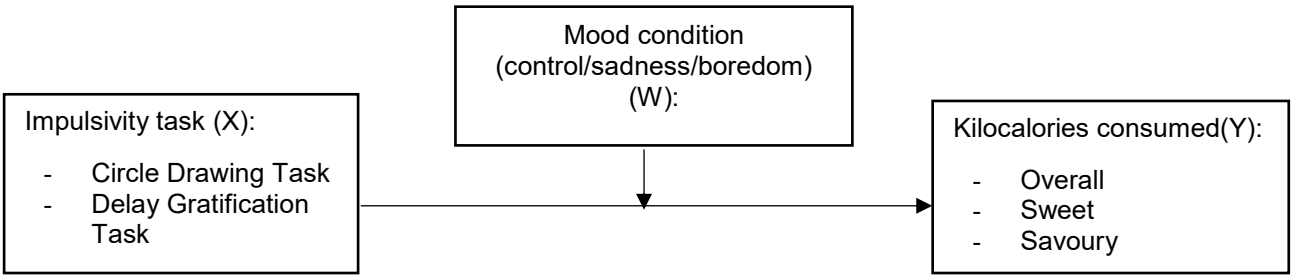
For the main data analyses, moderation analyses using a multicategorical moderator were employed using the PROCESS v4 plug in, model 1 (Hayes, 2017). Multicategorical moderation analysis was chosen as this regression technique assesses whether different levels of a categorical variable can significantly change (i.e., moderate) the strength of a relationship between two continuous X and Y variables, as assessed using unstandardised beta (B) and p values ($p < .05$). Multicategorical moderation analysis determines how the effect of antecedent variable X on outcome variable Y differs depending on levels of moderator variable (W).

The current study assessed the presence of a moderating relationship between each impulsivity task score – CDT or DGT (X) - and the number of overall, sweet, or savoury kilocalories consumed (Y), moderated by mood condition (control, sadness, boredom – W) (see Figure 6.1). Therefore, six moderation models were tested. The current study used a multicategorical moderating variable (i.e., multiple mood condition levels) suggesting that evidence of a significant moderation interaction (XW) was indicative of W (a mood condition) significantly altering the strength of X's (impulsivity task) effect on Y (kilocalories consumed).

The multicategorical moderator, mood condition, was indicator-coded with the A condition (reference condition, i.e., the condition compared against) as “control”, the B condition as “sadness”, and the C condition as “boredom”. This yielded two “dummy” variables, A vs. B = W_1 (control vs. sadness), A vs. C = W_2 (control vs. boredom). Moderation analysis provided the estimated difference in Y between W_1 when holding X constant (X = 0) (b_1), the estimated difference in Y between W_2 when holding X constant (assuming X = 0) (b_2), the conditional effect of X on Y in the reference condition (A - control) (b_3), the difference in the relationship between X on Y in the A condition (control) and the relationship between X on Y in the B condition (sadness) (b_4), and the difference in the relationship between X on Y in the A condition (control) and the relationship between X on Y in C condition (boredom) (b_5). Following this, the reference condition was recoded to B condition (sadness) to allow for comparisons of all mood conditions on the relationship between X and Y to be assessed (i.e., B vs C = W_3 (sadness vs. boredom). The statistics provided by the recoded moderation analysis estimated the difference in Y between W_3 when holding X constant (assuming X = 0) (b_{1b}), the conditional effect of X on Y in the reference condition (B - sadness) (b_{3b}), and the difference in the relationship between X on Y in the B condition (sadness) and the relationship between X on Y in the C condition (boredom) (b_{4b}). The moderation pathways of interest that explore the interaction of W on X and Y are b_4, b_5, and b_{4b}.

Significant moderation interactions (significant b_4, b_5, or b_{4b} pathways) were probed to understand how the impulsivity task’s (X) relationship with kilocalorie intake (Y) was moderated by mood condition (W). This was achieved using simple slope analysis and visualised using line graphs at low (-1*SD* below mean), medium (mean) and high (+1*SD* above mean) values of the impulsivity task (X). In all analyses, mean centering was used for all variables (Hayes, 2007) and 95% bootstrap confidence intervals at 5000 samples. Analyses were repeated for each impulsivity task (CDT and DGT) and each kilocalorie consumption measure (overall total kilocalories, total sweet kilocalories, total savoury kilocalories consumed).

Figure 6.1
Conceptual moderation model of the effect of behavioural impulsivity task (X) on kilocalories consumed (Y) moderated by mood condition (W).



Note. Variable X utilised one of the two behavioural impulsivity tasks in each analysis. Variable W was a multicategorical variable with three mood levels. Variable Y utilised one of the three kilocalorie consumptions measures in each analysis.

6.3 Results

6.3.1 Sample characteristics and covariate analysis

The participant characteristics are described in Chapter 5 and the covariate analyses of the demographic variables with the dependent variables are also described in Chapter 5. As seen in Table 6.1, no behavioural impulsivity tasks scores significantly correlated with any continuous participant characteristics. Mann-Whitney U tests indicated that there were no significant differences in CDT scores or DGT scores based on parent sex (CDT: $U = 499$, $p = .931$, DGT: $U = 471$, $p = .837$), child sex (CDT: $U = 1741$, $p = .989$, DGT: $U = 1664$, $p = .671$), or parent education (degree level or no degree; CDT: $U = 1730$, $p = .334$, DGT: $U = 1699$, $p = .412$). Kruskal-Wallis H tests revealed there were no significant differences in CDT scores or DGT scores based on parental ethnicity (CDT: $H(10) = 6.47$, $p = .774$, DGT: $H(10) = 8.69$, $p = .561$), Therefore, no covariates were used in subsequent analyses.

Table 6.1
Spearman's Rho correlation coefficients between CDT scores and DGT scores and continuous participant characteristics (N = 119, two-tailed).

Measure	CDT Score	DGT Score
Parent age (years)	.087	-.003
Child age (years)	.032	-.014
SSS[a]	.028	-.001
Parent BMI[b]	-.024	.122
Child BMI z-score	.066	.080
Number of children	.022	-.146

[a] MacArthur's Scale of Subjective Social Status (SSS). [b] $n = 103$.

6.3.2 Baseline differences

As described in Chapter 5, there were no significant differences between conditions on any parent and child continuous or categorical demographic variables (see Appendix E-4 and E-5). Baseline differences between mood condition of parent and child individual differences are reported in Chapter 5. Extending this to include behavioural impulsivity task differences, one-way ANOVAs suggested that there were no significant differences between mood conditions on impulsivity task scores (both *p*'s > .05) (see Table 6.2).

Table 6.2
Means (±*SD*) of children's CDT scores and DGT scores between mood conditions.

Measure	Sadness (*n* = 40)	Control (*n* = 40)	Boredom (*n* = 39)	F	*p*
Circle Drawing Task: Slow Tracing Time (s)	22.26 (17.49)	18.76 (21.94)	16.44 (12.13)	1.09	.340
Delay Gratification Task: Number of Delays	1.73 (1.15)	1.63 (1.13)	1.84 (1.15)	.342	.711

6.3.3 Moderation analysis

One model yielded a significant moderation interaction (a significant b_4, b_5, or b_{4b} pathway). For this model, each statistical pathway is described below with the significant moderation interaction visualised graphically and probed. The remaining five models yielded non-significant moderation interactions so are reported briefly in the text (see Appendix E-6 for the statistical pathways of each non-significant model).

1) Circle Drawing Task and overall total kilocalories consumed

As seen in Table 6.3, among those children in the control condition, the relationship between CDT scores and the number of overall total kilocalories consumed was positive, but non-significant (b_3). The estimated difference in overall total kilocalories consumed between those children in the control condition and those in the sadness condition when CDT scores were held constant (X = 0) was non-significant (b_1). The estimated difference in overall total kilocalories consumed between those in the control condition and those in the boredom condition when CDT score were held constant (X = 0) was significant and positive (b_2).

As seen in Table 6.3, among those in the sadness condition, the relationship between CDT scores and the number of overall total kilocalories consumed was negative, but non-significant (b_{3b}). The estimated difference in overall total kilocalories consumed between those in the sadness condition and those in the boredom condition when CDT were held constant (X = 0) was significant and positive (b_{1b}). The relationship between CDT scores and overall total kilocalories consumed did not significantly differ between those children in the control condition and those in the sadness condition (b_4).

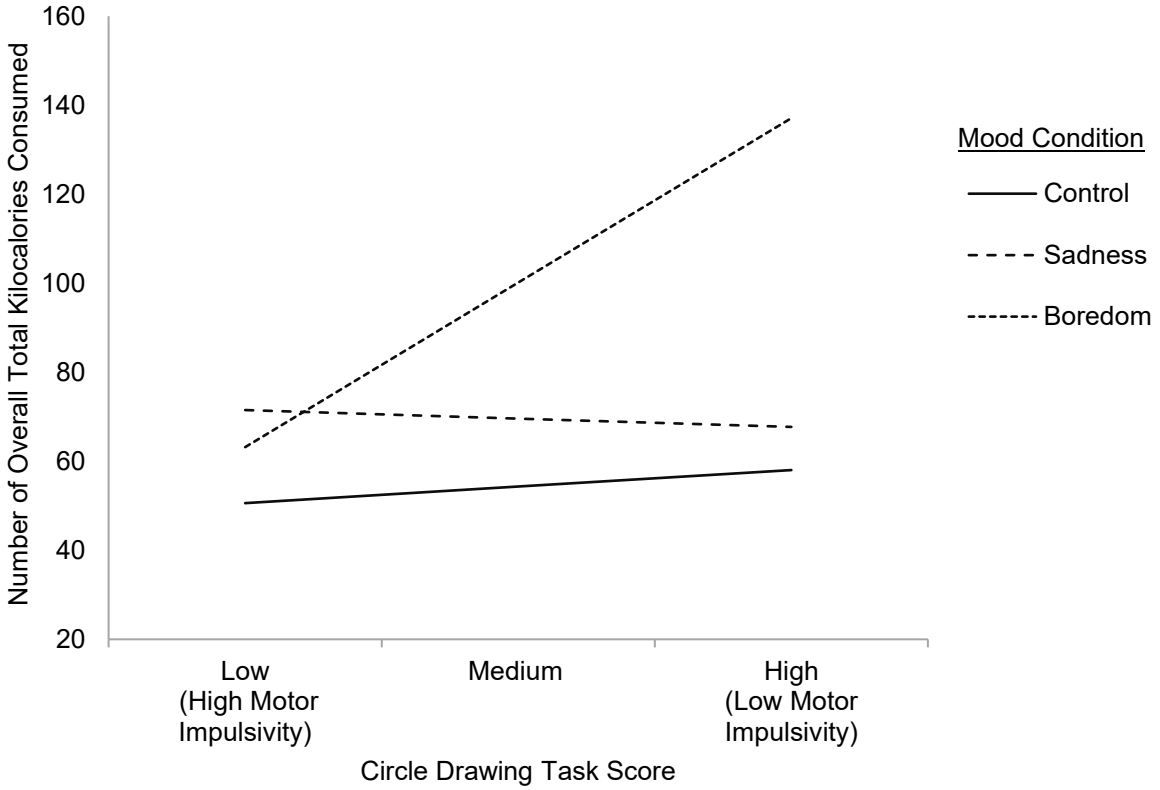
As seen in Table 6.3, the relationship between CDT scores and overall total kilocalories consumed significantly differed between those children in the control condition and those in the boredom condition (b_5), and between those children in the sadness condition and those in the boredom condition (b_{4b}). As illustrated by Figure 6.2, those children in the boredom condition with higher CDT scores (lower motor impulsivity) consumed significantly more overall total kilocalories from food compared to those children in the control condition (137.09 kcal vs. 58.02 kcal) and sadness condition (137.09 vs. 67.72 kcal) who also had higher CDT scores (lower motor impulsivity).

Table 6.3
Regression Coefficients for *the* b_3, b_1, b_2, b_{3b}, b_{1b}, b_4, b_5, and b_{4b} pathways for the significant moderation interaction of mood condition on CDT scores and overall total kilocalories consumed (N = 119).

		Overall Total Kcal (Y)[a]			
Circle Drawing Task		*B*[b]	*SE*	*T*	*p*
X (CDT)[c]	b_3[d]	.21	.46	.46	.646
Control vs Sadness (W_1)[e]	b_1[f]	15.30	14.01	1.09	.277
Control vs Boredom (W_2)[e]	b_2[g]	45.82	14.17	3.23	.002
X	b_{3b}[h]	-.11	.57	-.19	.850
Sadness vs Boredom (W_3)[i]	b_{1b}[j]	30.52	14.19	2.15	.034
XW_1	b_4[k]	-.32	.73	-.44	.663
XW_2	b_5[l]	1.88	.94	1.99	.048
XW_3	b_{4b}[m]	2.20	1.00	2.20	.030

Note. Degrees of freedom = 112. [a] Y = outcome variables. [b] B = unstandardised beta. [c] CDT = Circle Drawing Task, X variable. [d] b_3 = The conditional effect of X on Y when the reference condition is A (control). [e] Indicator coding dummy variables (A vs. B = W_1, A vs. C = W_2,). [f] b_1 = The estimated difference in Y between W_1 when X = 0. [g] b_2 = The estimated difference in Y between W_2 when X = 0. [h] b_{3b} = the conditional effect of X on Y when the reference condition is B (sadness). [i] Indicator coding dummy variables (B vs. C = W_3). [j] b_{1b} = the estimated difference in Y between W_3 when X = 0. [k] b_4 = The difference in the relationship between X on Y in the A condition and the relationship between X on Y in the B condition. [l] b_5 = the difference in the relationship between X on Y in the A condition and the relationship between X on Y in C condition. [m] b_{4b} = The difference in the relationship between X on Y in the B condition and the relationship between X on Y in the C condition.

Figure 6.2
Feeling of boredom verses feelings of sadness or a control condition moderate the association between CDT scores and the number of overall total kilocalories consumed



Further simple slope analysis revealed that when children were in the boredom condition and with higher CDT scores (lower motor impulsivity) compared to lower CDT scores (higher motor impulsivity), children consumed significantly more overall total kilocalories from food (137.09 kcal vs. 63.18 kcal), simple slope $B = 2.09$, $SE = 0.83$, $t(113) = 2.53$, $p = .013$.

Non-significant moderations

The remaining moderation analyses yielded non-significant interactions (i.e., no evidence of a moderated relationship). The relationship between CDT scores and total sweet kilocalories, CDT scores and total savoury kilocalories consumed, and DGT scores and overall total kilocalories, DGT scores and total sweet kilocalories, and DGT scores and total savoury kilocalories did not significantly differ between those children in the control condition and those in the sadness condition (b_4), those children in the control condition and those in the boredom condition (b_5), or those children in the sadness condition and those in the boredom condition (b_{4b}) (see Appendix E-6).

6.4 Discussion

This study set out to explore the ways in which different mood states moderated the relationship between children's behavioural impulsivity measures and kilocalorie consumption. The data for this study was collected in the same laboratory visits as those reported in Chapter 5, but this study extends those findings to ascertain whether the relationship between behavioural impulsivity and kilocalorie consumption differs depending on a child's mood.

It was hypothesised that feelings of boredom compared to feelings of sadness or control would alter the strength of the relationship between behavioural impulsivity task scores and the number of overall kilocalories consumed. Specifically, it was hypothesised that children with higher scores on motor impulsivity (i.e., children who were quicker to trace a circle), or lower scores in their ability to delay gratification (i.e., the tendency to choose smaller immediate rewards), would consume significantly more kilocalories from snacks in the boredom condition compared to the sadness and control condition. Findings from the current study did not support this hypothesis and instead suggested that whilst feelings of boredom compared to sadness and a control condition did significantly moderate the relationship between motor impulsivity scores and overall kilocalories consumed, the relationship was significant only for children with *lower*, rather than higher, motor impulsivity. Specifically, children consumed significantly more overall total kilocalories from snacks under feelings of boredom when they scored lower in motor impulsivity compared to children in the sadness and control condition who also scored lower in motor impulsivity. Further, children who experienced feelings of boredom and scored lower in motor impulsivity consumed significantly more overall total kilocalories from snacks compared to children who experienced feelings of boredom and scored higher in motor impulsivity. There was no evidence of any other significant moderation by mood condition between motor impulsivity and kilocalorie consumption, nor was there between the ability to delay gratification and kilocalorie consumption.

Children with lower motor impulsivity ate 2.5 times the number of overall total kilocalories when bored compared to children with lower motor impulsivity in the sadness and control conditions. They also consumed twice as many overall total kilocalories compared to children with higher motor impulsivity who were in the boredom condition. These findings were contrary to literature that suggests high impulsivity predicts greater levels of over-eating in children. For example, previous research has found that high motor impulsivity is associated with greater snack food intake (Bennett & Blissett, 2017, 2020). In the current study, the unusual findings may be the result of the measures of impulsivity used (Circle Drawing Task and Delay of Gratification Task). It may be that these measures of behavioural impulsivity were not important determinants of child EE in the current study. Future research

could include more measures of behavioural impulsivity, such as the Go-No-Go-Task which was originally desired for this study but was not utilised due to problems downloading the necessary software. It is also possible that these unusual findings are the result of aspects of the study design, such as the availability of distracting toys in addition to food, as detailed next.

At the start of the study, children were given 10-minutes of free play time with toys in the task room to settle in. During the EE task, children who were in the boredom condition were instructed to “sit and wait” for the confederate researcher to return from answering the door and were not allowed to get out of their seat, nor play with anything in the room in the meantime. Therefore, children were surrounded by toys that they had previously played with (during the settling in period) but were not allowed to engage with them for 4-minutes. After this time, the researcher presented the children with snacks and suggested that the child could eat anything, or they could play with the toys. It is possible that when this decision was presented to children with higher motor impulsivity, the toys - which children had been viewing for 4-minutes - were a considerable distraction that children wanted to return to, particularly since these toys had been restricted from the children but in sight for 4-minutes. Indeed, children with lower impulse control when told not to touch a toy, touch the toy more than those children with better inhibitory control (Carlson & Wang, 2007). This, in turn, may have displaced food consumption activity, resulting in lower consumption of snacks for this more impulsive group.

Additionally, previous research suggests that the proximity of a reward-cue increases impulsive motor choice in adults (O’Connor et al., 2021). Extrapolating to the children in this study, who were unaware that there was to be a buffet of snack foods available after the 4-minute waiting period, the rewarding cue was likely to have been the nearby toys. As the toys were within close proximity to the children (at an equal distance with the placement of the snacks), children with higher motor impulsivity may have responded by choosing to play with the toys more so than children with lower motor impulsivity. It is possible that children with lower motor impulsivity when given the choice to eat or play, have less reward value for the toys in comparison to the snacks provided and were not entirely distracted by the toys. This meant that children with lower motor impulsivity engaged with the EE task more and thus consumed more kilocalories. To this end, the boredom paradigm likely produced a false benchmark for the number of kilocalories consumed in the boredom condition.

The possibility that the surrounding toys acted as a distraction from eating during the boredom condition is further supported by the fact that there were no significant differences in kilocalorie consumption between the sadness and control condition for children lower or

higher in motor impulsivity. During the sadness and control condition, the children were likely occupied by a jigsaw puzzle placed on the table where the child was sitting. The toys with which the children had previously played with perhaps held less value as the children's attention was directed towards the jigsaw task before being given access to the buffet. Therefore, this suggests that within the boredom condition, leaving children with more motor impulsivity to "sit and wait" whilst being surrounded by tempting toys may not be conducive to accurately assessing food intake during experiences of boredom. The paradigm in its current form might instead reflect a child's ability to alter goal-orientated behaviour when for those with high motor impulsivity, the goal was to play with the toys. Therefore, future research should seek to improve the boredom condition within this study by displaying the snack foods amongst the toys during the 4-minute waiting period so it is a fairer choice for children. This design adaption would control for the distractibility of the toys equally with the presence of snack foods, allowing researchers to ascertain whether there are differences in the relationships between motor impulsivity scores and kilocalorie consumption during feelings of boredom, and if this relationship differed from feelings of sadness or neutral mood.

6.4.1 Strengths and future directions

This study is the first to speculate that children with high motor impulsivity might choose to play with toys over snacking during feelings of boredom. However, this supposition requires further work to examine competing behaviours. Nonetheless, this study is the first to explore how behavioural impulsivity predicts kilocalorie intake during experimentally induced feelings of boredom, sadness, and neutral mood in children. The study provides the basis of a novel paradigm that could be developed by future research to understand how differences in children's behavioural impulsivity are related to EE. Future research could explore the use of other behavioural impulsivity measures such as the Go-No-Go Task, as this facet of impulsivity was not captured in the current study.

6.4.2 Conclusion

In conclusion, the current Chapter sought to examine whether the relationship between behavioural measures of impulsivity and kilocalorie consumption were moderated by mood condition. Results suggested that mood condition significantly moderated the relationship between motor impulsivity and children's kilocalorie consumption during feelings of boredom compared to feelings of sadness and a control condition, but in an unexpected direction. It is likely that the measures used to assess children's behavioural impulsivity in the current study were not important in predicting child EE, and other measures may have been better suited. Additionally, potential limitations within the study design of the boredom condition may have confounded the study results, where those with higher motor impulsivity

may have been distracted by the surrounding toys in the laboratory. Careful attention should be given to the issues raised in the current study when exploring the relationship between behavioural impulsivity and boredom-EE in future research.

CHAPTER 7:

General Discussion

7.1 Introduction

This Chapter begins by summarising the background literature relating to the development of children's emotional eating (EE) and the aims of the thesis. Next, the principal findings from all Chapters are synthesised and discussed to demonstrate how the research in this thesis has advanced our understanding about child EE. Then, considerations regarding methodological strengths and weakness of the thesis are discussed. Finally, implications for practice and future directions are presented.

7.2 Summary of background and aims

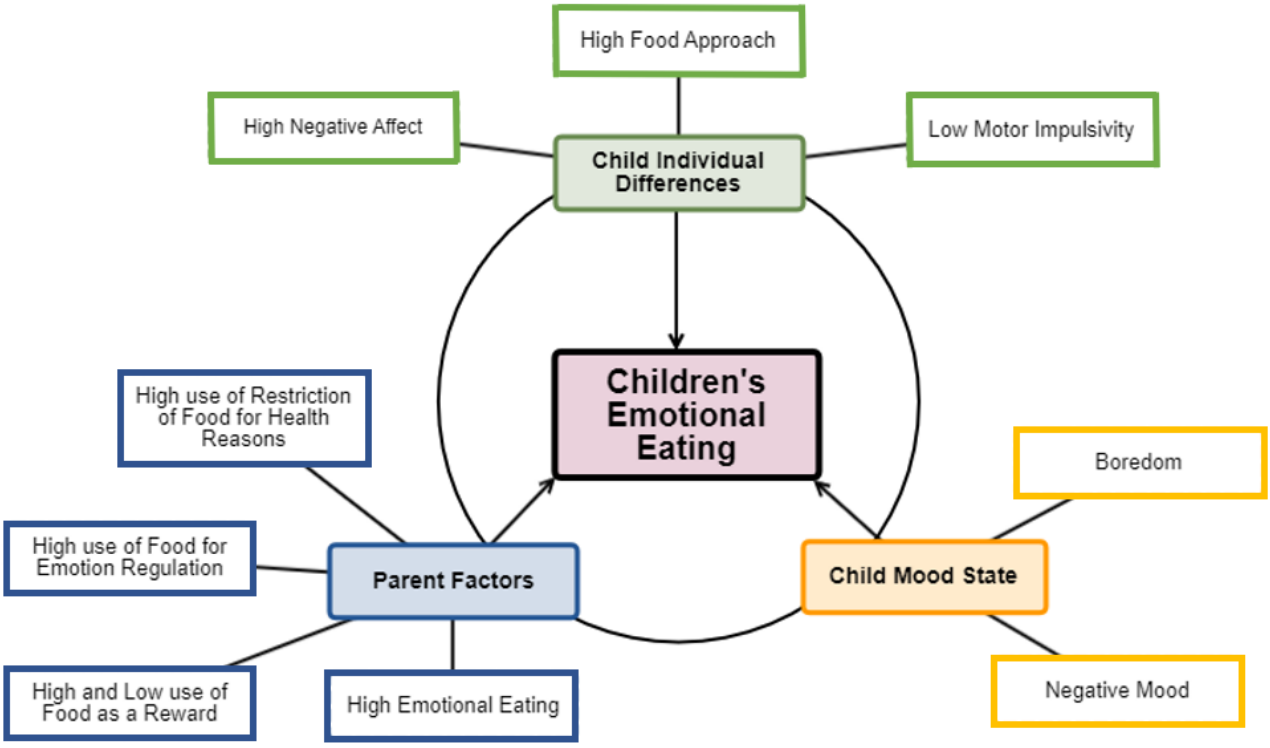
A quarter of parents of 5-year-old children (Carper et al., 2000) and parents of 7-12-year-old children (van Strien & Oosterveld, 2008) report that their child emotionally eats. Children who emotionally eat tend to consume palatable and calorific foods that are high in sugar and fat (e.g., Nguyen-Michel et al., 2007), which places them at greater risk of overeating and obesity in later life (e.g., Aoun et al., 2019). Despite EE being potentially harmful for health, advice regarding how best to manage EE during childhood is lacking. How EE develops in childhood remains unclear, but in a recent model of children's eating behaviour it is suggested that children's individual differences (temperament and food approach behaviours) and parent factors (parental feeding practices and parent EE) may interact to predict child EE (Russell & Russell, 2018). However, to date, little research has explored these interactions. Additionally, most research in this field has utilised parent-reports of child EE, which measure EE in response to general negative mood (Wardle et al., 2001). Specific negative emotions that constitute negative mood, such as boredom, may differentially predict children's EE (Koball et al., 2012). Indeed, boredom-EE has never been explored in children, despite being a common emotion experienced during childhood (Westgate & Steidle, 2020) and popular opinion suggesting that children eat more when they are bored (Klass, 2020). The overarching aim of this thesis was to explore the relationships between child individual differences and parenting factors in the expression of preschool and school aged children's EE across different moods, specifically negative mood, boredom, and sadness. Specific objectives were to:

- Assess whether self-reported parental feeding practices mediate the relationship between self-reported parent EE and parent-reported child EE in children aged 3-5-years (Chapter 2).

- Examine whether any mediating relationships between parent EE and child EE via parental feeding practices (Chapter 2) vary as a function of parent-reported child temperament (Chapter 2), or parent-reported child food approach tendencies in children aged 3-5-years (Chapter 3).
- Induce hypothetical EE using a virtual online paradigm with 6-9-year-old children and explore whether parentally-reported parental feeding practices and child temperament predict greater hypothetical EE (Chapter 4).
- Induce child EE in a laboratory setting and explore the interactions between parent-reported parental feeding practices, parent-reported child temperament, and mood condition (sadness, boredom, control) in predicting the number of kilocalories consumed by children aged 4-5-years (Chapter 5).
- Assess differences in the strengths of relationships between two behavioural impulsivity measures (motor impulsivity and delay of gratification) and subsequent kilocalorie intake in the absence of hunger, between children aged 4-5-years in three mood conditions (bored, sadness, control) in a laboratory (Chapter 6).

Figure 7.1 summarises the significant predictors of child EE in relation to child individual differences, parent factors, and child mood state that have been identified from the Chapters in this thesis. A thorough discussion of the relationships between these predictors will be provided in the following sections.

Figure 7.1
A model of the significant predictors of child EE that were identified in the thesis.



7.3 Principal findings

7.3.1 Parental emotional eating

Findings from multiple mediation analyses in Chapters 2 and 3 indicated that greater parentally reported EE in parents was associated with greater parentally reported EE in 3-5-year-old children directly. Additionally, these analyses indicated that parent EE was predictive of child EE in interaction with non-responsive feeding practices (parental use of food for emotion regulation, use of food as a reward, and use of restriction of food for health reasons) and child individual differences (child negative affect and food approach). Previous research has reported a positive association between parent EE and child EE both directly (e.g., Yelverton et al., 2020) and in interaction with other parent and child factors (e.g., Miller et al., 2020). The results from Chapters 2 and 3 support this previous research and highlight the importance of exploring how parental EE interacts with individual child characteristics to predict children's eating behaviour. These findings emphasise the power of parents and their

role as agents of socialisation (Savage et al., 2007), they also provide support for Social Learning Theories, which emphasise the impact of *modelled behaviour* where children observe and then imitate behaviours of trusted authority figures such as parents (Bandura, 1977). It is important to remember that these findings were based on parental report and this modelling effect may result from parents with higher EE also attending more to potential expressions of EE in their children compared to other parents (Blissett et al., 2019). These findings highlight how individual differences in children (or parents' perceptions of those differences) can shape the impact of parental EE on child EE and suggest that children with more negative affective temperaments or higher food approach tendencies may be more likely to be influenced by parental modelling of EE compared to others. In addition, parental feeding practices were also central to statistically explaining the relationship between parent EE and child EE.

7.3.2 Parental feeding practices

The feeding practices that parents reported using with their children were predictive of child EE throughout this thesis. Parents have been described as the 'gatekeepers' to food (e.g., Savage et al., 2007), and the rules and behaviours that parents use around the provision of food can shape the development of a child's relationship with food. Across all studies except that described in Chapter 6, all of the non-responsive feeding practices measured were associated with greater child EE (i.e., use of food for emotion regulation, use of food as a reward, and use of restriction of food for health reasons). These feeding practices have previously been described as maladaptive and non-responsive because they are rooted in parents controlling their child's food intake (Tan et al., 2021), and ultimately undermining the child's experience of regulating their own hunger and satiety. Others have argued that behaviours such as using food as a reward or for emotion regulation could 'teach' children to eat in the absence of hunger as a tool to regulate emotional arousal (e.g., Farrow et al., 2015). Findings from this thesis corroborate the existing research and support suggestions that parents should reduce the use of these non-responsive feeding practices due to their negative associations with healthy eating behaviour during childhood (e.g., Farrow et al., 2015; Jansen et al., 2020; Steinsbekk et al., 2018). Whilst this thesis did not examine the effectiveness of responsive parenting as an alternative to using non-responsive feeding practices, the findings from this thesis recommend the reduced use of non-responsive feeding practices, which is a characteristic of responsive parenting that has been shown to successfully reduce child EE in children aged 2.5-years-old (Harris et al., 2020). The results for each feeding practice are discussed in turn next.

7.3.2.1 <u>Restriction of food for health reasons</u>

Chapter 2 explored whether there was a mediating relationship between parentally reported parent EE and child EE via parentally reported feeding practices. Results suggested that there was evidence of a significant positive partial mediation between parent EE and child EE through parental use of restriction of food for health reasons. Specifically, the positive relationship between parent EE and child EE was explained partially through greater parental restriction of food from the child. Similarly, in Chapter 4, children of parents who reported high use of restriction of food for health reasons selected more kilocalories than children of parents who reported low use of restriction of food for health reasons. The findings from Chapters 2 and 4 corroborate existing literature that highlights the counterproductive consequences of overt control over child food intake (e.g., Farrow et al., 2015). They also extend previous research by finding that even with different measures (parent-reported child EE in Chapter 2, and child hypothetical food choice in Chapter 4), parentally reported high use of restriction of food for health reasons was consistently associated with more obesogenic children's eating behaviour. The restriction of palatable foods has been suggested to increase the desirability of those foods, making children more likely to consume those foods in excess when they have access, especially during times of negative mood (Fisher & Birch, 1999b). Importantly, these findings are cross-sectional, and causation is unclear. It is also quite likely that parents will use increased levels of food restriction with children who demonstrate greater EE tendencies (e.g., Shloim et al., 2015), potentially reinforcing a negative cycle that perpetuates EE.

Chapters 2 and 3 used moderated mediation to assess whether the mediating role of restriction of food for health reasons between parent EE and child EE varied as a function of parent-reported child temperament or child food approach behaviours. Both child negative affect and child food approach tendencies moderated this mediating relationship. Previous research has similarly found that the negative consequences of restrictive feeding practices differed depending on child temperament and food approach. For example, the impact of restriction on children's food intake depends upon children's inhibitory control (Rothbart & Bates, 2007), and children with low inhibitory control have been found to consume significantly more kilocalories from food in the absence of hunger than children with high inhibitory control (Rollins et al., 2014b). In addition, children with more avid appetites have been found to be more susceptible to the impact of restriction on increasing food intake (Rollins et al., 2014a). Whilst we cannot ascertain causality in the cross-sectional relationships identified in Chapters 2 and 3, it may be that individual differences in children increase parental control around feeding. These findings highlight the complex interactions that exist between parental feeding practices and child individual differences in shaping child EE and illustrate the potential differential susceptibility to feeding practices based on

individual differences. Further longitudinal and experimental work is needed to explore how the parent and child influence each other in more detail, to help inform the development of interventions to support healthy eating behaviour during childhood.

7.3.2.2 Food for emotion regulation

In Chapter 2, a full positive mediating relationship was found between parent-reported parent EE and child EE via parent-reported emotional feeding practices, suggesting that this feeding practice is one mechanism through which parent EE and child EE are related. This mediating relationship was further analysed to explore the role of child individual differences (Chapter 2 exploring child temperament and Chapter 3 exploring child food approach), but children's individual differences did not moderate this mediating relationship. These findings highlight the important role that emotional feeding has in terms of explaining the relationship between parent EE and child EE; a role that does not appear to depend on children's individual differences. The maladaptive consequences of emotional feeding have been established previously, for example in a randomised controlled trial that aimed to increase responsive parenting and lower child EE (Harris et al., 2020). Harris and colleagues found that their intervention led to lower parental emotional feeding and lower perceived child EE in comparison to a control group, and that it was emotional feeding that explained the intervention effect. Emotional feeding involves using food as a tool with children to sooth negative emotion. Use of this feeding practice likely teaches children to eat in response to negative mood through repeated exposure to the pairing and association of food and eating with negative emotional arousal (Farrow et al., 2015). However, it is also likely that children who emotionally eat often will elicit greater emotional feeding from their parents. Parents may then learn that food is an effective tool to use in response to their child's distress; reinforcing a vicious cycle that may become more engrained over time.

In Chapter 5, the impact of parental use of food for emotion regulation appeared to be particularly significant for children with high negative affect when experiencing feelings of boredom. Specifically, children with high negative affect who had parents who reported high use of emotional feeding consumed five times the number of kilocalories from sweet foods under feelings of boredom compared to a control condition. This is likely because children with high negative affect tend to have more intense and frequent episodes of negative emotions and are less able to regulate their experiences of these (Rothbart & Bates, 2007). Indeed, these more intense episodes of distress may elicit greater use of emotional feeding from parents in an attempt to soothe the child (e.g., Kidwell et al., 2018). The increased use of emotional feeding is likely to encourage children to use food as a tool to regulate emotions and children may then be more likely to use food as a comfort in the future when experiencing negative emotion (e.g., Steinsbekk et al., 2018). The findings from Chapter 5

are aligned with the Affect Regulation Model (Spoor et al., 2007), which postulates that deficits in children's emotion regulation (a characteristic of high negative affect) predict the use of maladaptive coping strategies (i.e., eating) to regulate experiences of negative emotions, and this is likely to have been learned from exposure to parental use of emotional feeding. These novel findings from Chapter 5 suggest that use of emotional feeding with children with high negative affect may be particularly detrimental for boredom induced EE.

In Chapters 2 and 5, the age range of the children overlapped. Indeed, findings from these studies indicated that parental use of food for emotion regulation was associated with children's EE. However, in Chapter 4, use of food for emotion regulation was not associated with children's kilocalories selection. It is possible that this is a result of the methodology used to assess hypothetical child EE in Chapter 4. As discussed in section 4.4.1, the hypothetical food choice task was perhaps unsuitable for measuring child EE as it could have been measuring something other than EE because the task asked children to make a conscious choice between portion size pictures. This exercise of consciousness may have distracted children from the emotional state that was previously induced. Therefore, this may explain why emotional feeding was not related to children's hypothetical EE in Chapter 4. It is also possible that as children in Chapter 4 were between 6-9-years-old, compared to Chapters 2 and 5 where children were 3-5 years old, this meant children were in full time education. As a result, parents of these older children may have fewer opportunities to use emotional feeding practices because they are with their children less. This might help to explain why parental use of food for emotion regulation was associated with younger children's EE, but not with older children's EE.

Findings from Chapters 2 and 5 emphasise the complexity of children's EE and are aligned with the Biopsychosocial Model of children's eating behaviour (Russell & Russell, 2018) where EE is theorised to develop out of interactions between the environment, child factors, and parent factors - including emotional feeding practices. The findings from Chapters 2 and 5 also corroborate existing literature that advises parents to reduce the use of emotional feeding due to the unhealthy eating behaviours associated with this feeding practice (e.g., Braden et al., 2014; Rodgers et al., 2013). Findings also promote the importance of considering the individuality of children where a "one size fits all" approach to reducing child EE is not appropriate. Further research should ascertain the effectiveness of tailoring interventions for children with high levels of negative affect, particularly when considering the use of emotional feeding, as the negative consequences of eating in response to boredom may be more pronounced.

7.3.2.3 Food as a reward

Although existing literature suggests that parental use of food as a reward is positively associated with greater EE (e.g., Miller et al., 2020; Rodgers et al., 2013; Steinsbekk et al., 2016), the findings of this thesis are somewhat mixed when considering the association between this feeding practice and child EE. In Chapters 2 and 3, simple mediations found a significant positive partial mediation between parent-reported parent EE and child EE through use of food as a reward. Specifically, the positive relationship between parent EE and child EE was explained partially through greater use of food as a reward. It is likely that parental use of food as a reward partially mediated this relationship because the foods used to reward children are typically palatable and this exposure may increase children's drive to consume palatable foods, especially during times of emotional arousal (Steinsbekk et al., 2016). Through associative learning, children may pair the emotions relating to rewarding experiences with the consumption of palatable foods, regardless of satiety (as parents often do not consider a child's hunger when using food as a reward; Musher-Eizenman & Holub, 2007). During future experiences of emotional arousal, these children may be more likely to seek to replicate the learned positive association by consuming similar, palatable foods. As the mediations were only partial, this suggested that use of food as a reward only explains part of the relationship between parent EE and child EE, and that there remains a direct effect of parent EE on child EE, perhaps through a modelling effect. Indeed, this could also indicate that there are other important mediators of this relationship that are yet to be considered.

Furthering the simple mediations, moderated mediations in Chapters 2 and 3 suggested that child temperament and child food approach tendencies moderated the mediating relationship between parent EE and child EE via parental use of food as a reward. Specifically, using food to reward children was predictive of child EE, especially for children with high negative affect or high levels of food approach. The 'use of food as a reward' scale measures the use of food as a reward for good behaviour and withholding food in response to bad behaviour. Children with high negative affect may be more likely to have more frequent and more intense experiences of negative emotions (Rothbart & Bates, 2007), which may be perceived as 'bad' behaviour thereby eliciting greater use of food as a reward. Children with heightened negative affect may also experience more intense emotions when happy or upset, exacerbating the strength of any pairing of food provision for good behaviour or food restriction for bad behaviour. In terms of food approach, using food as a reward may be more successful with children who are driven by food, further encouraging use of this feeding practice. Although this practice may be effective at controlling behaviour in the short term, frequent use of food to reward behaviour is likely to impair children's ability to regulate hunger and satiety and increase obesogenic eating behaviours (Jansen et al., 2020).

Taken together, the novel findings presented in Chapters 2 and 3 highlight that the use of food as a reward may be more detrimental for certain children, depending on their temperament or their approach towards food. However, in Chapter 5, when children with high negative affect had parents who reported *lower* use of food as a reward, these children consumed significantly *more* kilocalories from sweet foods under feelings of boredom compared to no mood manipulation. This finding was surprising and is contrary to previous literature. It is important to note that there were limitations to Chapter 5 that may help to explain this spurious finding (discussed in section 5.4.1). Furthermore, the findings between these studies may relate to differences in how child EE was assessed; with Chapters 2 and 3 using parental-report of child EE, whilst Chapter 5 used a laboratory study design assessing children's actual food intake in response to a mood induction paradigm.

7.3.3 Child temperament

Children's individual differences such as their temperamental dispositions were also associated with child EE in this thesis. Temperament was assessed using parent-report and each aspect of temperament is considered in turn below.

7.3.3.1 Negative affect

Across Chapters 2, 4, and 5, high levels of parentally reported negative affect in children was related to child EE. Chapter 2 demonstrated, for the first time, that the mediating relationship between parent-reported parent EE and child EE via use of food as a reward and restriction of food for health reasons held only for children with medium-high levels of negative affect. In Chapter 4, using a novel interactive hypothetical food choice task, children with high negative affect were more likely to select a greater number of kilocalories from snacks compared to children with lower negative affect. Further, in Chapter 5, using a novel laboratory design, children with high negative affect who also had parents who reported high use of emotional feeding, consumed more kilocalories when feeling bored compared to a control condition.

The fact that parentally reported high negative affect was consistently associated with child EE across these Chapters using a range of different study designs, demonstrates the important role of negative affect in relation to child EE. This may be because one characteristic of negative affect is the heightened experience of negative mood and an inability to regulate emotion (Rothbart & Bates, 2007). If a child is experiencing more vivid and frequent episodes of negative emotions, they may also need to use emotion regulation strategies more frequently. In the absence of healthier emotion regulation strategies, children with high negative affect may be more prone to using food as a tool to cope with emotional experiences. Indeed, in a longitudinal study of preschool children, increases in EE were

predicted by decreases in emotion regulation (Harrist et al., 2013), suggesting that deficits in emotional regulation (a characteristic of high negative affect) may promote the overconsumption of food. However, it is important to acknowledge the possibility that despite parents perceiving their child as high in negative affect, findings could instead reflect the difficulties parents may be having. Indeed, parents who report higher parenting difficulties also report more difficulties with their own emotion regulation, which in turn is related to their child having difficulties in this area (Zimmer-Gembeck et al., 2022). As mentioned in section 1.5, EE may constitute one behaviour that reflects difficulties with emotion regulation. Difficulties in parental emotion regulation may lead to difficulties in scaffolding healthy emotion regulation in children, potentially through modelling EE or by using non-responsive feeding practices (as demonstrated in Chapters 2, 3, and 5). Indeed, factoring child emotionality and emotional responsiveness into obesity interventions may be key for determining intervention success (further suggestions for future research/intervention are given in section 7.5).

7.3.3.2 Effortful control

Throughout the studies in this thesis there was no evidence of children's effortful control being related to their EE. Previous research regarding the relationship between effortful control and child EE is mixed. In a longitudinal study, it was reported that from age 6 to 8-years low levels of effortful control predicted greater emotional overeating (Steinsbekk et al., 2020). However, in research assessing children aged 4-years, low effortful control was not related to obesogenic eating behaviours, including EE (Leung et al., 2014). It is possible that the studies in this thesis did not capture an association between parent-reported effortful control and child EE because of the age range of the children assessed. Indeed, in Steinsbekk et al.'s (2020) work, they were only able to establish a relationship between effortful control and emotional overeating in children between age 6 to 8-years, but not with children aged 4 to 6-years. In Chapters 2, 3, and 5 the children were aged 3-5-years and they may therefore not have developed effortful control enough for it to impact on their eating behaviour. As children age, they become more autonomous over their food intake (Ogden & Roy-Stanley, 2020), and so deficits in effortful control may only become clear when children are more responsible for their food choices. Indeed, deficits in effortful control include poor self-regulation, and so when experiencing negative emotions, children with low effortful control may consume palatable foods as a maladaptive regulation strategy. Previous research has found children aged 4-years with low effortful control were more likely to be overweight at age 11-years (Seeyave et al., 2009) suggesting that the relationship between effortful control and eating behaviour may develop over time. However, this line of reasoning does not account for the lack of evidence of an association in Chapter 4, which assessed

children aged 6-9-years, although, this may be a result of the use of an alternative methodology in this Chapter, which is discussed in section 4.4.1.

7.3.3.3 Surgency and impulsivity

Findings from the studies in Chapters 2, 4, and 5 indicated that parentally reported child surgency was not related to child EE, yet in Chapter 6, behaviourally measured child impulsivity was related to child EE. Surgency is comprised of multiple facets, including impulsivity (Putnam & Rothbart, 2006). In previous research, surgency has not been consistently associated with child EE (e.g., Steinsbekk et al., 2020), although higher surgency has been associated with other obesogenic eating behaviours such as food responsiveness (Leung et al., 2014). While the broader concept of surgency appears to be unrelated to child EE in the literature, impulsivity has been found to relate to child EE. For example, using self-reports, children aged between 10-13-years who reported that they had high impulsivity also reported that they had a greater tendency to emotionally eat (Farrow, 2012). Similarly, using parent-report, 4-6-year-old children with higher impulsivity consumed more kilocalories in response to stress, in comparison to children with lower impulsivity (Ohrt et al., 2020). This research suggests that children with high impulsivity are less able to resist using food in emotional situations and that this contributes to overconsuming food. Therefore, in the current thesis, it is possible that potential effects of 'surgency' were not detected in earlier Chapters because of the need to examine the separate effect of each facet of surgency, and perhaps with objective assessment. This was the rationale for conducting analyses examining the relationships between behavioural measures of impulsivity and EE in Chapter 6.

Findings from Chapter 6 are the first to provide evidence that when using behavioural measures of impulsivity, an association between motor impulsivity and child EE is observed. What has already been established in previous child research is that *higher* motor impulsivity is related to higher snacking behaviour (Bennett & Blissett, 2019), and that self-reported high impulsivity is related to self-reported high EE (Farrow, 2012). Findings from Chapter 6 indicated that it was *lower* motor impulsivity that was associated with higher boredom induced EE than sadness induced EE or a control condition. This suggests that behavioural measures of impulsivity are related to boredom-EE. However, findings from Chapter 6 were unexpected and may reflect the infancy of the novel paradigm used to assess child EE and behavioural impulsivity. As was discussed in Chapter 6, children were invited to play with toys for 10-minutes during the settling in period. In the boredom condition, children were restricted/forbidden from playing with those same toys for 4-minutes, whilst still being able to view them. Restricting access to the toys was likely to have enticed children with high motor impulsivity to engage in playtime after the 4-minute waiting period rather than engage with

food. Indeed, when children with or without high impulsivity were told not to touch a toy, children with high impulsivity touched the forbidden toy more often (Carlson & Wang, 2007). This potential limitation of the design of Chapter 6 presents a direction for future research, where studies should ensure that the rewarding value of the toys is equal to that of snack foods used during an emotional manipulation. For example, snack foods could be presented amongst the toys, rather than brought out after 4-minutes of viewing the toys.

7.3.4 Mood state

The current thesis used the Children's Eating Behaviour Questionnaire (CEBQ) in Chapters 2 and 3 as a measure of children's EE; a scale characterised as eating in response to general negative mood. Conversely, in Chapters 4, 5, and 6, child EE was explored directly by experimentally inducing specific negative emotions (sadness and boredom). The relationship between each mood state and child EE identified in this thesis is considered in turn below.

7.3.4.1 Negative mood

Findings from Chapters 2 and 3 suggest that EE as measured by the CEBQ, which is EE in response to a range of negative mood states (specifically worry, annoyance, anxiety, and boredom) was predicted by greater parentally reported: EE, non-responsive feeding practices, child negative affect, and child food approach tendencies. There was evidence of a positive mediating relationship between parent EE and child EE via using food for emotion regulation, food as a reward, and restricting food for health reasons. These findings support previous literature that has associated greater use of non-responsive feeding practices with greater child EE (e.g., Steinsbekk et al., 2018). Findings from Chapters 2 and 3 also suggest that this mediating relationship was moderated by child negative affect and child food approach, corroborating previous research that has found that child individual differences are predictive of EE (e.g., Leung et al., 2014; Liew et al., 2020), but extending this to show that that child individual differences have differential associations with child EE in response to general negative mood depending on parent EE and parental feeding practices used. Chapters 2 and 3 add to an existing body of literature exploring the predictors of general child EE, and the implications for theory and future directions are discussed in section 7.5.

7.3.4.2 Specific negative emotions

When exploring the effect of inducing specific negative emotions on children's eating behaviour, the current thesis yielded varying results. The specific negative emotions induced, sadness and boredom, are discussed below.

Sadness: In Chapter 4, sadness was induced using a video clip of Disney's *"The Lion King"* where Simba mourned the death of his father. Results from this study suggested that there was a significant decrease in children's happiness after watching the video clip. This suggested that experimentally inducing sadness online was effective with children aged 6-9-years, and this mirrors previous research that has used videos to experimentally induce mood (Tan & Holub, 2018). Similarly, in Chapters 5 and 6, using a laboratory experimental design, a jigsaw puzzle was used to induce sadness where a puzzle piece was missing meaning children were unable to win a prize. This paradigm was effective at inducing negative mood and children were significantly less happy after the mood induction paradigm, replicating findings from previous research (Blissett et al., 2010).

Surprisingly, in Chapter 4 there was no evidence of the experience of sadness being associated with children's selection of kilocalories, contrasting findings from Tan and Holub (2018) and Blissett et al. (2010). In their research, Tan and Holub (2018) found that children in a sadness condition (induced using a video clip) consumed more energy from chocolate, whilst Blissett et al. (2010) found that children in the sadness condition consumed significantly more kilocalories from breadsticks than those children in the control condition. It is possible that Chapter 4 did not find an association between sadness and kilocalorie selection because of differences in how EE was assessed. In Chapter 4, EE was assessed using a hypothetical food choice task, which is very different to the real-food buffet selections used by both Tan and Holub (2018) and Blissett et al. (2010). This difference in the measure of EE may mean that Chapter 4 is measuring something quite different to EE. The hypothetical food choice task required children to think about how much they would like to eat, a conscious task that may be very different from the unconscious act of EE. Therefore, more objective measures of intake are recommended in the future. It must be noted though that Chapter 4 was designed in response to the COVID-19 pandemic, which did not permit face-to-face laboratory testing. Therefore, despite not reflecting EE and instead measuring hypothetical food selection, Chapter 4 was an innovative attempt at simulating a laboratory eating study. Despite this methodology appearing less effective at capturing eating behaviour than in-person paradigms, it instead proved to be highly effective at inducing emotional states.

The fact that Chapter 5 did not find any associations between sadness and the number of *overall total* kilocalories consumed mirrors findings from Blissett et al. (2010), who only found a significant difference in the number of kilocalories consumed from breadsticks in the sadness condition compared to the control condition. Importantly, the difference in the intake of kilocalories from breadsticks was extremely small (~ 5 kcal) and in reality, unlikely to be meaningful. Blissett and colleagues only found important meaningful differences in

caloric intake when the sadness mood induction was looked at in interaction with parental feeding practices. They found that children in the sadness condition who had parents who reported using more emotional feeding practices, consumed more kilocalories from chocolate, than did those in the control condition. To this end, their findings are akin with the findings of Chapter 5 where mood induction (boredom) in interaction with parental feeding practices (and child temperament) were associated with the largest differences in kilocalorie intake.

***Boredom**:* This thesis is the first to experimentally induce boredom in children. In Chapter 4, boredom was induced using an online video clip of a dripping tap, and after watching the video clip children rated themselves as significantly more bored. In Chapter 5 boredom was induced in a laboratory using a "sit and wait" paradigm where children had to wait before completing a jigsaw puzzle. This procedure was entirely novel and the children who were in the boredom condition also rated themselves as significantly more bored after the manipulation. Therefore, Chapters 4 and 5 provided two successful paradigms to induce boredom both online (in children aged 6-9-years) and in the laboratory (in children 4-5-years), which future research can utilise. However, it remains to be seen whether these paradigms are age-specific and whether they would be as effective with younger or older children, for example the 4-minute waiting paradigm may be more challenging for younger children and may not be as effective at inducing boredom in older children.

Results from Chapter 4 suggested that there was no evidence of any significant relationships between children's kilocalorie selection and feelings of boredom. However, in Chapter 5 there was evidence of boredom induced EE. It appears that boredom-EE is more effectively measured in the laboratory compared to using an online methodology with hypothetical food choices. It is also possible that the age of the children in Chapter 4 contributed to a less sustained effect of the boredom mood induction. Older children typically have better affect regulation (Sanchis-Sanchis et al., 2020) and so experiences of boredom induced from the video clip of a dripping tap may have been more quickly resolved compared to the sit and wait paradigm used with younger children in the laboratory (in Chapter 5 children were 4-5-years-old).

In Chapter 5, there was a main effect of mood condition where those children who experienced feelings of boredom consumed double the number of kilocalories from food compared to children in the control condition. This finding is the first to suggest that boredom-EE begins as early as the pre-school years, and it supports research with adults, which has found that they consume more kilocalories when feeling bored compared to a neutral mood (Havermans et al., 2015; Moynihan et al., 2015). Similarly, findings from

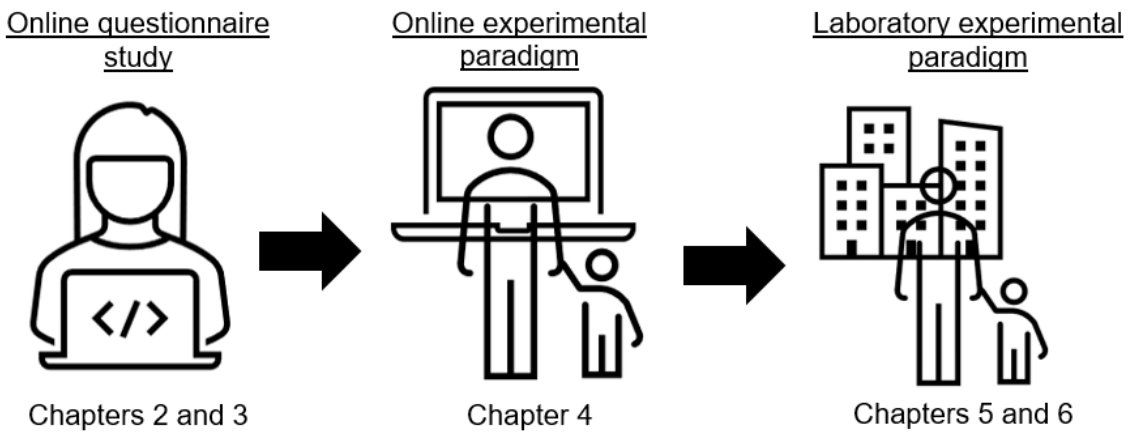
Chapter 5 echo Koball et al.'s (2012) finding that boredom is a distinct emotion existing independently of negative mood (as was measured in Chapters 2 and 3). It is possible that the experience of boredom in the laboratory (Chapter 5) was more reflective of real experiences of boredom for children who are unlikely to continue to watch a recording that is boring them. Indeed, we cannot be sure whether all children fully attended to the dripping tap video clip: they may have moved around, talked to their parents, or interacted with something else whilst they waited for the video to finish. Future research using eye-tracking technology could explore children's engagement with this task in more detail. In comparison, in the laboratory children were closely monitored to ensure that they sat and waited, and their boredom was clearly visible in many cases.

In addition to finding evidence of a main effect of boredom on children's EE, Chapter 5 also demonstrated an interaction between children's experiences of boredom, child negative affect, and emotional feeding. Specifically, children who were reported to have high negative affect *and* whose parents reported high use of food for emotion regulation, consumed a greater number of kilocalories under conditions of boredom compared to a control condition. These findings reflect the possibility of differential susceptibility of children with high negative affect to boredom-EE and emotional feeding. Indeed, children with high negative affect may be more sensitive to the adverse effects of emotional feeding and when bored, this sensitivity may be exacerbated more so than when experiencing a neutral mood. These findings suggest that greater parental use of emotional feeding may be one mechanism through which boredom-EE operates. Overall, boredom induced EE in children is an underexplored behaviour that warrants further investigation. Longitudinal work is needed to understand, over time, how negative affect and emotional feeding may predict boredom-EE and whether there is a bidirectional relationship, as identified for more general negative mood-EE, child negative affect, and emotional feeding (Steinsbekk et al., 2018). The current thesis begins to unpack the unique experience of boredom-EE in children, but far more research is needed in this area.

7.4 Strengths and limitations

The research reported in this thesis has several strengths. One strength is the variety of the study designs used across Chapters and their associated benefits (see Figure 7.2).

Figure 7.2
A flow diagram illustrating the change in study design used between Chapters in this thesis



Chapters 2 and 3 were able to capture a large (N = 185-244) sample of parent-reports of child EE. This resulted in a highly powered sample that utilised well validated measures to gain insight into how parent factors and child individual differences interacted to statistically predict child EE. In Chapter 4, a novel online experimental paradigm was used to assess children's kilocalorie selection after children viewed a mood induction video clip. The idea was that the different mood induction videos would stimulate an emotional state that children would be in when making food choices. This methodology was employed during a lockdown resulting from the COVID-19 pandemic and so was practical, safe, and had wide reach (N = 347). Chapter 4 also used children as participants, which increased the validity of the data obtained.

In Chapter 5, children's EE was assessed in a laboratory where children participated in a mood induction task and then had access to a buffet of snack foods. The laboratory design provided a highly scientifically rigorous study. As a standardised procedure was followed, this allowed for control over extraneous variables (e.g., the presence of a sibling interfering with the target child's emotional response to the mood induction paradigm, or the child walking away from the emotional induction) and future research could utilise this procedure in study designs. Chapter 5 yielded several interesting findings and provided the first empirical evidence that children eat more in response to boredom regardless of satiety. Chapter 6 drew on this laboratory design but also incorporated behavioural tasks to measure children's impulsivity. Objective measures of children's impulsivity offer more validity than questionnaire measures, and whilst only two tasks were used, their use provided a unique, but unexpected, insight into the relationship between state impulsivity and children's eating behaviour in response to different mood conditions.

Another strength of the thesis is that Chapters 4, 5 and 6 provided successful methods of inducing sadness and boredom in children aged 6-9-years and 4-5-years. Chapter 4 showed the usefulness of using video clips administered online for inducing

sadness (a video clip of Disney's *"The Lion King"*) and boredom (a video clip of a dripping tap). Chapter 5 validated the use of the missing jigsaw piece paradigm to induce sadness (Blissett et al., 2010), and showed how boredom could be induced in a laboratory using a "sit and wait" paradigm. The methods of mood induction used in these Chapters were inexpensive, simple to employ, and could be easily replicated in future mood induction studies.

While there are many strengths to the research presented in this thesis, there are also several limitations. The limitations of using parent-reports to assess child EE have already been acknowledged and largely relate to shared methods variance between parent EE and child EE, social desirability bias, and potential issues with inaccurate reporting such that parents of 3-year-olds may not know if their child is eating more when they are sad (Blissett et al., 2019). This thesis also used parent-reports to assess parental feeding practices and child temperament. Parents may answer inaccurately based upon their own perception of their parenting, which may differ from another parent's or caregiver's perception (e.g., Bergmeier et al., 2015; Haycraft & Blissett, 2008). Similarly, parent-reports of child temperament may be impacted by social desirability as parents may be reluctant to disclose negative child behaviour (e.g., Bornstein et al., 2015). Nevertheless, parent-reports do offer parents anonymity, which may counteract these limitations. Moreover, parent-reports allow for assessments of 'typical' behaviour, which may be more accurate than laboratory or observational studies where, for example, the excitement or novelty relating to being observed or visiting a laboratory may cause a child (and their parent) to act differently.

Chapters 2, 3, and 4 operated as online studies, which meant that they lacked experimental control. Operating online, it was impossible to control or monitor what parents and children were doing. Therefore, engagement with the study paradigm or responses to questionnaires may have been impacted by distractions or inattention. To counter this, attention and speed checks were embedded into the online study described in Chapter 4 to attempt to filter out participants who might not be fully engaged. Parents were also asked to provide a verification recording to filter out any non-parent participants. The fact that the dropout rate for this verification was 40% raises several questions about how difficult it was for parents to upload recordings, the potential concerns parents may have had about the safety of such recordings, or the possibility that non-parent participants were trying to engage with the study for payment. In future studies these challenges need to be considered.

Lastly, the thesis relied upon cross-sectional research designs, which meant that the findings cannot inform conclusions about directionality. This is especially important to note since previous research has highlighted the bidirectionality between parental feeding

practices and child EE (e.g., Berge et al., 2020; Steinsbekk et al., 2018). Originally this PhD was designed to have a longitudinal study in the laboratory, following the participants from Chapter 5 over a 1-year period to explore the impact of parental feeding practices and child temperament on the development of child EE over time. However, due to the COVID-19 pandemic where in-person testing was prevented, this element had to be removed and instead Chapter 4 was created. In the future, a longitudinal design like this but utilising a longer time period would allow for an in-depth assessment of the factors shaping the development of EE across early childhood.

7.5 Implications and future directions

The overarching aim of the current thesis was to explore the relationships between parent factors (parent EE and parental feeding practices) and child individual differences (temperament and food approach) in the expression of children's EE across different mood states in preschool and primary school age children. Child EE is an obesogenic eating behaviour that is strongly associated with the development of overweight and obesity in later life (e.g., Aoun et al., 2019). Therefore, there is a need to support the healthy development of children to offset the expression of such obesogenic eating behaviours before they track through childhood and into adulthood. Identifying key drivers of child EE allows for a greater understanding to inform intervention development.

Findings from the studies reported within this thesis provide insight into the complexity of child EE. Previous research has tended to report the individual associations between child and parent factors, but the current thesis highlights the importance of considering how the parent and child interact to shape child EE. The findings from this thesis align with the Biopsychosocial Model of children's eating behaviour (Russell & Russell, 2018), which informed the design of this thesis. What this research has highlighted, which the Biopsychosocial Model does not account for, is the role of different emotional states in the expression of appetitive traits. Findings underscore how differences in children's mood state can evoke greater EE when in combination with temperament and feeding practices. This suggests that the relationship between parental feeding practices and child temperament in predicting child EE is more complex than a simple direct relationship and may vary depending on differences in mood states. Indeed, this research was the first to measure the effect of boredom on children's eating behaviour in interaction with child temperament and parental feeding practices. Those children with high negative affect (as reported using parent-report), who also had parents who reported using high emotional feeding, consumed five times the number of kilocalories from sweet foods when experiencing boredom compared to a control condition. This finding underscores the potential differential

susceptibility that children's temperament has for non-responsive feeding practices and experiences of boredom. The Biopsychosocial Model could be extended to acknowledge such contextual differences in children's emotions in the expression of children's appetitive traits.

It is not yet known whether there is merit in targeting child negative affect to reduce child EE, as child temperament is far less modifiable than parental feeding practices and mood state. However, future research could replicate Chapter 5 using a sample of children with high negative affect, where half of the sample could have received emotion regulation training, and the other half could be a control group. Such a study would provide novel insight into whether emotion regulation to mood induction is 'in the moment' (evidenced by the emotion regulation training), or if the impact of negative affect is more shaped by the frequency of experiencing negative affect. Elucidating this distinction would provide important implications for intervention development, as using emotion regulation training for children with high negative affect may be futile if the relationship between negative affect and child EE is less 'in the moment'. Previous interventions have found success in teaching parents to use more responsive feeding practices to reduce child EE (e.g., Harris et al., 2020), and it could be that such interventions need to be adapted to take into consideration the impact of parenting a child with high negative affect and/ or high food approach. As child EE is largely shaped by the environment (Herle et al., 2018), teaching families effective ways to cope with the ever increasing obesogenic environment (Dohle et al., 2018), and to parent in ways that are responsive and teach children hunger and emotion regulation strategies, may be key to reducing child EE.

The findings in this thesis are the first to manipulate and measure the effect that feelings of boredom have on children's eating behaviour. Those children who experienced boredom consumed double the number of kilocalories from snacks compared to children in the control condition. As the experience of boredom is important in the development of children's sense of self and creativity (Eastwood & Gorelik, 2022), it is not recommended that children could or should avoid being bored, but instead that they learn to experience boredom without turning to food. Future research could explore whether it is possible to teach parents to divert their child's attention away from food when feeling bored (in the absence of hunger). Future research could also explore whether restructuring the home food environment to become more challenging to access food reduces boredom-EE, as this allows for the experience of boredom without ease of obtaining food.

Additionally, future research could replicate Chapters 5 and 6 with children who have overweight and obesity to ascertain whether similar patterns are found in relation to

boredom-EE. It may be that the predictors of boredom-EE are different for children with overweight and obesity. For example, in children who are living with overweight or obesity, it is unknown whether negative affect plays a significant role in the expression of boredom-EE, or whether more restrictive or emotional feeding practices correlate more with the expression of boredom-EE. Ascertaining this information would be useful for intervention development as incidences of obesogenic eating are likely to be more common in children with overweight and obesity (e.g., Ayine et al., 2021), and so the development of tailored interventions could be particularly important for this demographic.

7.6 Conclusion

In conclusion, the findings from this thesis have made a valuable contribution to the literature that explores the predictors of children's EE. Indeed, this thesis advances our understanding by beginning to elucidate the complex relationships by which parent factors, child individual differences, and child mood state are linked with child EE. The research findings provide compelling evidence to show that high parentally reported child negative affect, food approach tendencies, and non-responsive feeding practices are all detrimental in the manifestation of preschool children's EE. Given that neither child temperament, nor appetitive traits are particularly malleable to change because of their genetic underpinnings, parental feeding practices appear the most viable targets for interventions aimed at reducing child EE. The findings from this thesis are the first to empirically demonstrate how situations of boredom can evoke excessive consumption of kilocalories compared to feelings of neutral mood. As boredom is a particularly common emotion in children (Westgate & Steidle, 2020), it is possible that children may be frequently overconsuming food and over time this may contribute to weight gain and risk of developing obesity. Future research is needed to explore how parents can manage children's experiences of boredom in ways that avoid eating in the absence of hunger. This thesis underscores the importance of considering the role of the parent, alongside that of the child, and the emotional context in which they interact, in shaping the expression of EE in children.

List of references

Adise, S., White, C. N., Roberts, N. J., Geier, C. F., & Keller, K. L. (2021). Children's inhibitory control abilities in the presence of rewards are related to weight status and eating in the absence of hunger. *Appetite*, *167*, 105610. https://doi.org/https://doi.org/10.1016/j.appet.2021.105610

Adler, N. E., Epel, E. S., Castellazzo, G., & Ickovics, J. R. (2000). Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy, White women. *Health Psychology*, *19*(6), 586–592. https://doi.org/10.1037/0278-6133.19.6.586

Antons, S., & Brand, M. (2018). Trait and state impulsivity in males with tendency towards Internet-pornography-use disorder. *Addictive Behaviors*, *79*, 171–177. https://doi.org/10.1016/j.addbeh.2017.12.029

Aoun, C., Nassar, L., Soumi, S., El Osta, N., Papazian, T., & Rabbaa Khabbaz, L. (2019). The Cognitive, Behavioral, and Emotional Aspects of Eating Habits and Association With Impulsivity, Chronotype, Anxiety, and Depression: A Cross-Sectional Study. *Frontiers in Behavioral Neuroscience*, *13*. https://doi.org/10.3389/fnbeh.2019.00204

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. *International Journal of Eating Disorders*, *18*(1), 79–90. https://doi.org/10.1002/1098-108X(199507)18:1<79::AID-EAT2260180109>3.0.CO;2-V

Ashcroft, J., Semmler, C., Carnell, S., van Jaarsveld, C. H. M., & Wardle, J. (2008). Continuity and stability of eating behaviour traits in children. *European Journal of Clinical Nutrition*, *62*(8), 985–990. https://doi.org/10.1038/sj.ejcn.1602855

Ayine, P., Selvaraju, V., Venkatapoorna, C. M. K., Bao, Y., Gaillard, P., & Geetha, T. (2021). Eating Behaviors in Relation to Child Weight Status and Maternal Education. *Children*, *8*(1), 32. https://doi.org/10.3390/children8010032

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Barnhart, W. R., Braden, A. L., & Dial, L. A. (2021). Emotion Regulation Difficulties Strengthen Relationships Between Perceived Parental Feeding Practices and Emotional Eating: Findings from a Cross-Sectional Study. *International Journal of Behavioral Medicine*, *28*(5), 647–663. https://doi.org/10.1007/s12529-021-09959-z

Baron-Cohen, S., Golan, O., Wheelwright, S., Granader, Y., & Hill, J. (2010). Emotion Word Comprehension from 4 to 16 Years Old: A Developmental Survey. *Frontiers in*

Evolutionary Neuroscience, *2*. https://doi.org/10.3389/fnevo.2010.00109

Bénard, M., Bellisle, F., Etilé, F., Reach, G., Kesse-Guyot, E., Hercberg, S., & Péneau, S. (2018). Impulsivity and consideration of future consequences as moderators of the association between emotional eating and body weight status. *International Journal of Behavioral Nutrition and Physical Activity*, *15*(1). https://doi.org/10.1186/s12966-018-0721-1

Bennett, C., & Blissett, J. (2014). Measuring hunger and satiety in primary school children. Validation of a new picture rating scale. *Appetite*, *78*, 40–48. https://doi.org/10.1016/j.appet.2014.03.011

Bennett, C., & Blissett, J. (2017). Parental monitoring may protect impulsive children from overeating. *Pediatric Obesity*, *12*(5), 414–421. https://doi.org/10.1111/ijpo.12159

Bennett, C., & Blissett, J. (2019). Multiple measures of impulsivity, eating behaviours and adiposity in 7-11-year-olds. *Appetite*, *133*, 217–222. https://doi.org/https://doi.org/10.1016/j.appet.2018.11.002

Bennett, C., & Blissett, J. (2020). Interactive effects of impulsivity and dietary restraint over snack intake in children. *Appetite*, *146*, 104496. https://doi.org/10.1016/j.appet.2019.104496

Berge, J. M., Miller, J., Veblen-Mortenson, S., Kunin-Batson, A., Sherwood, N. E., & French, S. A. (2020). A Bidirectional Analysis of Feeding Practices and Eating Behaviors in Parent/Child Dyads from Low-Income and Minority Households. *The Journal of Pediatrics*, *221*, 93-98.e20. https://doi.org/10.1016/j.jpeds.2020.02.001

Bergmeier, H. J., Skouteris, H., Haycraft, E., Haines, J., & Hooley, M. (2015). Reported and Observed Controlling Feeding Practices Predict Child Eating Behavior after 12 Months. *The Journal of Nutrition*, *145*(6), 1311–1316. https://doi.org/10.3945/jn.114.206268

Bergmeier, H., Skouteris, H., & Hetherington, M. (2015). Systematic research review of observational approaches used to evaluate mother-child mealtime interactions during preschool years. *American Journal of Clinical Nutrition*, *101*(1), 7–15. https://doi.org/10.3945/ajcn.114.092114

Bergmeier, H., Skouteris, H., Horwood, S., Hooley, M., & Richardson, B. (2014). Associations between child temperament, maternal feeding practices and child body mass index during the preschool years: A systematic review of the literature. *Obesity Reviews*, *15*(1), 9–18. https://doi.org/10.1111/obr.12066

Bezdjian, S., Baker, L. A., Lozano, D. I., & Raine, A. (2009). Assessing inattention and impulsivity in children during the Go/NoGo task. *British Journal of Developmental*

Psychology, *27*(2), 365–383. https://doi.org/10.1348/026151008X314919

Birch, L. L. (1999). Development of Food Preferences. *Annual Review of Nutrition*, *19*(1), 41–62. https://doi.org/10.1146/annurev.nutr.19.1.41

Birch, L. L., & Fisher, J. O. (1998). Development of eating behaviors among children and adolescents. *Pediatrics*, *101*(3 Pt 2), 539–549. http://pediatrics.aappublications.org/content/101/Supplement_2/539.abstract

Birch, L. L., Fisher, J. O., & Davison, K. K. (2003). Learning to overeat: maternal use of restrictive feeding practices promotes girls' eating in the absence of hunger. *The American Journal of Clinical Nutrition*, *78*(2), 215–220. https://doi.org/10.1093/ajcn/78.2.215

Bjørklund, O., Wichstrøm, L., Llewellyn, C. H., & Steinsbekk, S. (2019). Emotional Over- and Undereating in Children: A Longitudinal Analysis of Child and Contextual Predictors. *Child Development*, *90*(6), 803–818. https://doi.org/10.1111/cdev.13110

Blissett, J., Farrow, C., & Haycraft, E. (2019). Relationships between observations and parental reports of 3–5 year old children's emotional eating using the Children's Eating Behaviour Questionnaire. *Appetite*, *141*. https://doi.org/10.1016/j.appet.2019.104323

Blissett, J., Haycraft, E., & Farrow, C. (2010). Inducing preschool children's emotional eating: relations with parental feeding practices. *The American Journal of Clinical Nutrition*, *92*(2), 359–365. https://doi.org/10.3945/ajcn.2010.29375

Boles, A., Kandimalla, R., & Reddy, P. H. (2017). Dynamics of diabetes and obesity: Epidemiological perspective. *Biochimica et Biophysica Acta (BBA) - Molecular Basis of Disease*, *1863*(5), 1026–1036. https://doi.org/https://doi.org/10.1016/j.bbadis.2017.01.016

Boles, R. E., Johnson, S. L., Burdell, A., Davies, P. L., Gavin, W. J., & Bellows, L. L. (2019). Home food availability and child intake among rural families identified to be at-risk for health disparities. *Appetite*, *134,* 135-141. https://doi.org/10.1016/j.appet.2018.12.002.

Bongers, P., & Jansen, A. (2017). Emotional eating and Pavlovian learning: evidence for conditioned appetitive responding to negative emotional states. *Cognition and Emotion*, *31*(2), 284–297. https://doi.org/10.1080/02699931.2015.1108903

Bongers, P., van den Akker, K., Havermans, R., & Jansen, A. (2015). Emotional eating and Pavlovian learning: Does negative mood facilitate appetitive conditioning? *Appetite*, *89*, 226–236. https://doi.org/10.1016/j.appet.2015.02.018

Boots, S. B., Tiggemann, M., & Corsini, N. (2019). Pumpkin is "yucky"!: A prospective study

of overt and covert restriction in the development of young children's food preferences. *Appetite*, *135*, 54–60. https://doi.org/https://doi.org/10.1016/j.appet.2018.12.035

Bornstein, M. H., Putnick, D. L., Lansford, J. E., Pastorelli, C., Skinner, A. T., Sorbring, E., Tapanya, S., Uribe Tirado, L. M., Zelli, A., Alampay, L. P., Al-Hassan, S. M., Bacchini, D., Bombi, A. S., Chang, L., Deater-Deckard, K., Di Giunta, L., Dodge, K. A., Malone, P. S., & Oburu, P. (2015). Mother and father socially desirable responding in nine countries: Two kinds of agreement and relations to parenting self-reports. *International Journal of Psychology*, *50*(3), 174–185. https://doi.org/10.1002/ijop.12084

Braden, A., Rhee, K., Peterson, C. B., Rydell, S. A., Zucker, N., & Boutelle, K. (2014). Associations between child emotional eating and general parenting style, feeding practices, and parent psychopathology. *Appetite*, *80*, 35–40. https://doi.org/10.1016/j.appet.2014.04.017

Braet, C., & Van Strien, T. (1997). Assessment of emotional, externally induced and restrained eating behaviour in nine to twelve-year-old obese and non-obese children. *Behaviour Research and Therapy*, *35*(9), 863–873. https://doi.org/10.1016/S0005-7967(97)00045-4

Brytek-Matera, A. (2021). Negative Affect and Maladaptive Eating Behavior as a Regulation Strategy in Normal-Weight Individuals: A Narrative Review. *Sustainability*, *13*(24), 13704. https://doi.org/10.3390/su132413704

Budd, G. M., & Hayman, L. L. (2008). Addressing the childhood obesity crisis: a call to action. *MCN: The American Journal of Maternal/Child Nursing, 33*(2), 111–120. https://doi.org/10.1097/01.NMC.0000313419.51495.ce

Bull, P. (1978). The interpretation of posture through an alternative methodology to role play. *British Journal of Social and Clinical Psychology*, *17*(1), 1–6. https://doi.org/10.1111/j.2044-8260.1978.tb00888.x

Butland, B., Jebb, S., Kopelman, P., & Mcpherson, K. (2007). *Tackling Obesities: Future Choices-Project Report 2 nd Edition Government Office for Science Foresight Tackling Obesities: Future Choices-Project report*. www.foresight.gov.uk

Carbonneau, N., Goodman, L. C., Roberts, L. T., Bégin, C., Lussier, Y., & Musher-Eizenman, D. R. (2020). A look at the intergenerational associations between self-compassion, body esteem, and emotional eating within dyads of mothers and their adult daughters. *Body Image*, *33*, 106–114. https://doi.org/10.1016/j.bodyim.2020.02.007

Carlson, S. M., & Wang, T. S. (2007). Inhibitory control and emotion regulation in preschool children. *Cognitive Development*, *22*(4), 489–510.

https://doi.org/https://doi.org/10.1016/j.cogdev.2007.08.002

Carnell, S., Benson, L., Driggin, E., & Kolbe, L. (2014). Parent feeding behavior and child appetite: Associations depend on feeding style. *International Journal of Eating Disorders*, *47*(7), 705–709. https://doi.org/10.1002/eat.22324

Carnell, S., Cooke, L., Cheng, R., Robbins, A., & Wardle, J. (2011). Parental feeding behaviours and motivations. A qualitative study in mothers of UK pre-schoolers. *Appetite*, *57*(3), 665–673. https://doi.org/https://doi.org/10.1016/j.appet.2011.08.009

Carnell, S., Haworth, C. M. A., Plomin, R., & Wardle, J. (2008). Genetic influence on appetite in children. *International Journal of Obesity*, *32*(10), 1468–1473. https://doi.org/10.1038/ijo.2008.127

Carper, J. L., Fisher, J. O., & Birch, L. L. (2000). Young girls'emerging dietary restraint and disinhibition are related to parental control in child feeding. *Appetite*, *35*, 121–129. https://doi.org/10.1006/appe.2000.0343

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

Charbonnier, L., van der Laan, L. N., Viergever, M. A., & Smeets, P. A. M. (2015). Functional MRI of Challenging Food Choices: Forced Choice between Equally Liked High- and Low-Calorie Foods in the Absence of Hunger. *PLoS ONE*, *10*(7), e0131727. https://doi.org/10.1371/journal.pone.0131727

Cheng, S., Kaminga, A. C., Liu, Q., Wu, F., Wang, Z., Wang, X., & Liu, X. (2022). Association between weight status and bullying experiences among children and adolescents in schools: An updated meta-analysis. *Child Abuse & Neglect*, *134*, 105833. https://doi.org/10.1016/j.chiabu.2022.105833

Chester, D. S., Lynam, D. R., Milich, R., Powell, D. K., Andersen, A. H., & DeWall, C. N. (2016). How do negative emotions impair self-control? A neural model of negative urgency. *NeuroImage*, *132*, 43–50. https://doi.org/10.1016/j.neuroimage.2016.02.024

Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, *7*(3), 309–319. https://doi.org/10.1037/1040-3590.7.3.309

Cohen, J. (2013). Statistical Power Analysis for the Behavioral Sciences. In *Statistical Power Analysis for the Behavioral Sciences*. Routledge. https://doi.org/10.4324/9780203771587

Commons Library Research Briefing. (2022). *Obesity Statistics*. https://researchbriefings.files.parliament.uk/documents/SN03336/SN03336.pdf

Corp., I. (2019). *IBM SPSS Statistics for Windows* (No. 26). IBM Corp.

Cox, J. S., Hinton, E. C., Sauchelli, S., Hamilton-Shield, J. P., Lawrence, N. S., & Brunstrom, J. M. (2021). When do children learn how to select a portion size? *Appetite*, *164*, 105247. https://doi.org/10.1016/j.appet.2021.105247

Crockett, A. C., Myhre, S. K., & Rokke, P. D. (2015). Boredom proneness and emotion regulation predict emotional eating. *Journal of Health Psychology*, *20*(5), 670–680. https://doi.org/10.1177/1359105315573439

Cundiff, J. M., Smith, T. W., Uchino, B. N., & Berg, C. A. (2013). Subjective Social Status: Construct Validity and Associations with Psychosocial Vulnerability and Self-Rated Health. *International Journal of Behavioral Medicine*, *20*(1), 148–158. https://doi.org/10.1007/s12529-011-9206-1

Danckert, J., & Merrifield, C. (2018). Boredom, sustained attention and the default mode network. *Experimental Brain Research*, *236*(9), 2507–2518. https://doi.org/10.1007/s00221-016-4617-5

de la Osa, N., Granero, R., Penelo, E., Domènech, J. M., & Ezpeleta, L. (2014). The short and very short forms of the Children's Behavior Questionnaire in a community sample of preschoolers. *Assessment*, *21*(4), 463–476. https://doi.org/10.1177/1073191113508809

de Lauzon-Guillain, B., Musher-Eizenman, D., Leporc, E., Holub, S., & Charles, M. A. (2009). Parental Feeding Practices in the United States and in France: Relationships with Child's Characteristics and Parent's Eating Behavior. *Journal of the American Dietetic Association*, *109*(6), 1064–1069. https://doi.org/10.1016/j.jada.2009.03.008

Derks, I. P. M., Sijbrands, E. J. G., Wake, M., Qureshi, F., Van Der Ende, J., Hillegers, M. H. J., Jaddoe, V. W. V., Tiemeier, H., & Jansen, P. W. (2018). Eating behavior and body composition across childhood: A prospective cohort study 11 Medical and Health Sciences 1117 Public Health and Health Services. *International Journal of Behavioral Nutrition and Physical Activity*, *15*(1). https://doi.org/10.1186/s12966-018-0725-x

Diktas, H. E., Keller, K. L., Roe, L. S., & Rolls, B. J. (2022). Children's Portion Selection Is Predicted by Food Liking and Is Related to Intake in Response to Increased Portions. *The Journal of Nutrition*, nxac162. https://doi.org/10.1093/jn/nxac162

Ding, N., Frohnwieser, A., Miller, R., & Clayton, N. S. (2021). Waiting for the better reward: Comparison of delay of gratification in young children across two cultures. *PLoS ONE*, *16*(9), e0256966. https://doi.org/10.1371/journal.pone.0256966

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

Domoff, S. E., Miller, A. L., Kaciroti, N., & Lumeng, J. C. (2015). Validation of the Children's Eating Behaviour Questionnaire in a low-income preschool-aged sample in the United States. *Appetite*, *95*, 415–420. https://doi.org/10.1016/j.appet.2015.08.002

Duffy, K. A., Green, P. A., & Chartrand, T. L. (2020). Mimicry and Modeling of Health(-Risk) Behaviors: How Others Impact Our Health(-Risk) Behaviors Without Our Awareness. *Journal of Nonverbal Behavior*, *44*(1), 5–40. https://doi.org/10.1007/s10919-019-00318-x

Eastwood, J. D., & Gorelik, D. (2022). Losing and Finding Agency. *The Moral Psychology of Boredom*, 111.

Eeden, A. E., Hoek, H. W., Hoeken, D., Deen, M., & Oldehinkel, A. J. (2020). Temperament in preadolescence is associated with weight and eating pathology in young adulthood. *International Journal of Eating Disorders*, *53*(5), 736–745. https://doi.org/10.1002/eat.23241

Eisenberg, N., Spinrad, T. L., & Eggum, N. D. (2010). Emotion-related self-regulation and its relation to children's maladjustment. *Annual Review of Clinical Psychology*, *6*, 495–525. https://doi.org/10.1146/annurev.clinpsy.121208.131208

Embling, R., Lee, M. D., Price, M., & Wilkinson, L. L. (2021). Testing an online measure of portion size selection: a pilot study concerned with the measurement of ideal portion size. *Pilot and Feasibility Studies*, *7*(1), 177. https://doi.org/10.1186/s40814-021-00908-x

Embling, R., Price, M., Lee, M., & Wilkinson, L. (2019). Food-variety-focused labelling does not increase ideal portion size, expected fullness or snack intake. *Food Quality and Preference*, *73*, 46–55. https://doi.org/https://doi.org/10.1016/j.foodqual.2018.12.005

Ercan, T. M. F., & Özcebe, L. H. (2020). Relations of self-esteem, obesity and peer bullying among middle school students in Turkey, *European Journal of Public Health*, *30*(5). https://doi.org/10.1093/eurpub/ckaa166.936

Eysenck, S. B. G., Pearson, P. R., Easting, G., & Allsopp, J. F. (1985). Age norms for impulsiveness, venturesomeness and empathy in adults. *Personality and Individual Differences*, *6*(5), 613–619. https://doi.org/https://doi.org/10.1016/0191-8869(85)90011-X

Faith, M. S., Berkowitz, R., Stallings, V., Kerns, J., Storey, M., & Stunkard, A. (2004).

Parental Feeding Attitudes and Styles and Child Body Mass Index: Prospective Analysis of a Gene-Environment Interaction. *Pediatrics*, *114*(4), e429–e436. https://doi.org/https://pediatrics.aappublications.org/content/114/4/e429

Farrow, C., & Blissett, J. (2012). Stability and continuity of parentally reported child eating behaviours and feeding practices from 2 to 5 years of age. *Appetite*, *58*(1), 151–156. https://doi.org/10.1016/j.appet.2011.09.005

Farrow, C. V. (2012). Do parental feeding practices moderate the relationships between impulsivity and eating in children? *Eating Behaviors*, *13*(2), 150–153. https://doi.org/10.1016/j.eatbeh.2011.11.015

Farrow, C. V., Haycraft, E., & Blissett, J. M. (2018). Observing Maternal Restriction of Food with 3–5-Year-Old Children: Relationships with Temperament and Later Body Mass Index (BMI). *International Journal of Environmental Research and Public Health*, *15*(6), 1273. https://doi.org/10.3390/ijerph15061273

Farrow, C. V, Haycraft, E., & Blissett, J. M. (2015). Teaching our children when to eat: How parental feeding practices inform the development of emotional eating-a longitudinal experimental design. *American Journal of Clinical Nutrition*, *101*(5), 908–913. https://doi.org/10.3945/ajcn.114.103713

Ferrer-Garcia, M., Pla-Sanjuanelo, J., Dakanalis, A., Vilalta-Abella, F., Riva, G., Fernandez-Aranda, F., Sánchez, I., Ribas-Sabaté, J., Andreu-Gracia, A., Escandón-Nagel, N., Gomez-Tricio, O., Tena, V., & Gutiérrez-Maldonado, J. (2017). Eating behavior style predicts craving and anxiety experienced in food-related virtual environments by patients with eating disorders and healthy controls. *Appetite*, *117*, 284–293. https://doi.org/10.1016/j.appet.2017.07.007

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. SAGE Publications.

Fisher, J. O., & Birch, L. L. (1999a). Restricting Access to Foods and Children's Eating. *Appetite*, *32*(3), 405–419. https://doi.org/10.1006/appe.1999.0231

Fisher, J. O., & Birch, L. L. (1999b). Restricting access to palatable foods affects children's behavioral response, food selection, and intake. *The American Journal of Clinical Nutrition*, *69*(6), 1264–1272. https://doi.org/10.1093/ajcn/69.6.1264

Fisher, J. O., Liu, Y., Birch, L. L., & Rolls, B. J. (2007). Effects of portion size and energy density on young children's intake at a meal. *The American Journal of Clinical Nutrition*, *86*(1), 174–179. https://doi.org/10.1093/ajcn/86.1.174

Foundation, C. G. (1996). *Cross sectional stature and weight reference curves for the UK.*

Freitas, A., Albuquerque, G., Silva, C., & Oliveira, A. (2018). Appetite-Related Eating Behaviours: An Overview of Assessment Methods, Determinants and Effects on Children's Weight. *Annals of Nutrition and Metabolism*, *73*(1), 19–29. https://doi.org/10.1159/000489824

Freitas, F. R., Moraes, D. E. B., Warkentin, S., Mais, L. A., Ivers, J. F., & Taddei, J. A. A. C. (2019). Maternal restrictive feeding practices for child weight control and associated characteristics. *Jornal de Pediatria*, *95*(2), 201–208. https://doi.org/10.1016/j.jped.2017.12.009

Gandolfi, E., & Viterbori, P. (2020). Inhibitory Control Skills and Language Acquisition in Toddlers and Preschool Children. *Language Learning*, *70*(3), 604–642. https://doi.org/10.1111/lang.12388

Gibson, E. L. (2012). The psychobiology of comfort eating. *Behavioural Pharmacology*, *23*(5 and 6), 442–460. https://doi.org/10.1097/FBP.0b013e328357bd4e

Goldschmidt, A. B., Smith, K. E., Lavender, J. M., Engel, S. G., & Haedt-Matt, A. (2019). Trait-level facets of impulsivity and momentary, naturalistic eating behavior in children and adolescents with overweight/obesity. *Journal of Psychiatric Research*, *110*, 24–30. https://doi.org/10.1016/j.jpsychires.2018.12.018

Golubchik, P., Schoen, G., & Weizman, A. (2021). Mood and Proneness to Boredom Are Associated with Poorer Continuous Performance Test Results, Which May Improve with Methylphenidate Treatment, in Attention-Deficit/Hyperactivity Disorder. *Journal of Child and Adolescent Psychopharmacology*, *31*(4), 310–314. https://doi.org/10.1089/cap.2021.0001

Graziano, P. A., Calkins, S. D., & Keane, S. P. (2010). Toddler self-regulation skills predict risk for pediatric obesity. *International Journal of Obesity*, *34*(4), 633–641. https://doi.org/10.1038/ijo.2009.288

Gross, J. J., Richards, J. M., & John, O. P. (2006). Emotion Regulation in Everyday Life. In *Emotion regulation in couples and families: Pathways to dysfunction and health.* (pp. 13–35). American Psychological Association. https://doi.org/10.1037/11468-001

Gross, J. J., & Thompson, R. A. (2007). Emotion Regulation: Conceptual Foundations. In *Handbook of emotion regulation.* (pp. 3–24). The Guilford Press.

Hamburg, M. E., Finkenauer, C., & Schuengel, C. (2014). Food for love: the role of food offering in empathic emotion regulation. *Frontiers in Psychology*, *5*, 233. https://doi.org/10.3389/fpsyg.2014.00032

Harris, H. A., Anzman-Frasca, S., Marini, M. E., Paul, I. M., Birch, L. L., & Savage, J. S.

(2020). Effect of a responsive parenting intervention on child emotional overeating is mediated by reduced maternal use of food to soothe: The INSIGHT RCT. *Pediatric Obesity*, *15*(10). https://doi.org/10.1111/ijpo.12645

Harrison, S., Rowlinson, M., & Hill, A. J. (2016). "No fat friend of mine": Young children's responses to overweight and disability. *Body Image*, *18*, 65–73. https://doi.org/10.1016/j.bodyim.2016.05.002

Harrist, A. W., Hubbs-Tait, L., Topham, G. L., Shriver, L. H., & Page, M. C. (2013). Emotion regulation is related to children's emotional and external eating. *Journal of Developmental and Behavioral Pediatrics*, *34*(8), 557–565. https://doi.org/10.1097/DBP.0b013e3182a5095f

Havermans, R. C., Vancleef, L., Kalamatianos, A., & Nederkoorn, C. (2015). Eating and inflicting pain out of boredom. *Appetite*, *85*, 52–57. https://doi.org/10.1016/j.appet.2014.11.007

Haycraft, E. (2020). Mental health symptoms are related to mothers' use of controlling and responsive child feeding practices: A replication and extension study. *Appetite*, *147*, 104523. https://doi.org/10.1016/j.appet.2019.104523

Haycraft, E., & Blissett, J. (2012). Predictors of paternal and maternal controlling feeding practices with 2- to 5-year-old children. *Journal of Nutrition Education and Behavior*, *44*(5), 390–397. https://doi.org/10.1016/j.jneb.2010.03.001

Haycraft, E., Farrow, C., Meyer, C., Powell, F., & Blissett, J. (2011). Relationships between temperament and eating behaviours in young children. *Appetite*, *56*(3), 689–692. https://doi.org/10.1016/j.appet.2011.02.005

Haycraft, E. L., & Blissett, J. M. (2008). Maternal and Paternal Controlling Feeding Practices: Reliability and Relationships With BMI. *Obesity*, *16*(7), 1552–1558. https://doi.org/10.1038/oby.2008.238

Hayes, A. F. (2015). An Index and Test of Linear Moderated Mediation. *Multivariate Behavioral Research*, *50*(1), 1–22. https://doi.org/10.1080/00273171.2014.962683

Hayes, F. A. (2017). *Introduction to Mediation, Moderation, and Conditional Process Analysis Second Edition A Regression-Based Approach* (Second). Guilford Publications. https://www.guilford.com/books/Introduction-to-Mediation-Moderation-and-Conditional-Process-Analysis/Andrew-Hayes/9781462534654

Heatherton, T. F., & Baumeister, R. F. (1991). Binge eating as escape from self-awareness. *Psychological Bulletin*, *110*(1), 86–108. https://doi.org/10.1037/0033-2909.110.1.86

Heinrichs, S. ., & Richard, D. (1999). The role of corticotropin-releasing factor and urocortin in the modulation of ingestive behavior. *Neuropeptides*, *33*(5), 350–359. https://doi.org/10.1054/npep.1999.0047

Herle, M., Fildes, A., & Llewellyn, C. H. (2018). Emotional eating is learned not inherited in children, regardless of obesity risk. *Pediatric Obesity*, *13*(10), 628–631. https://doi.org/10.1111/ijpo.12428

Herle, M., Smith, A. D., Kininmonth, A., & Llewellyn, C. (2020). The Role of Eating Behaviours in Genetic Susceptibility to Obesity. *Current Obesity Reports*, *9*(4), 512–521. https://doi.org/10.1007/s13679-020-00402-0

Hetherington, M. 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

Hinton, R. P., McMurrary, I., & Brownlow, C. (2014). Using SPSS to Analyse Questionnaires: Reliability. In *SPSS Explained* (p. 356).

Holley, C. E., Haycraft, E., & Farrow, C. (2020). Unpacking the relationships between positive feeding practices and children's eating behaviours: The moderating role of child temperament. *Appetite*, *147*, 104548. https://doi.org/10.1016/j.appet.2019.104548

Hunot, C., Fildes, A., Croker, H., Llewellyn, C. H., Wardle, J., & Beeken, R. J. (2016). Appetitive traits and relationships with BMI in adults: Development of the Adult Eating Behaviour Questionnaire. *Appetite*, *105*, 356–363. https://doi.org/10.1016/j.appet.2016.05.024

Jalo, E., Konttinen, H., Vepsäläinen, H., Chaput, J.-P., Hu, G., Maher, C., Maia, J., Sarmiento, O. L., Standage, M., Tudor-Locke, C., Katzmarzyk, P. T., & Fogelholm, M. (2019). Emotional Eating, Health Behaviours, and Obesity in Children: A 12-Country Cross-Sectional Study. *Nutrients*, *11*(2), 351. https://doi.org/10.3390/nu11020351

Jang, M., Brown, R., & Vang, P. Y. (2021). The Relationships Between Parental Stress, Home Food Environment, and Child Diet Patterns in Families of Preschool Children. *American Journal of Health Promotion*, *35*(1), 131-139. doi:10.1177/0890117120929541

Jani, R., Agarwal, C. K., Golley, P., Shanyar, N., Mallan, K., & Chipchase, L. (2020). Associations between appetitive traits, dietary patterns and weight status of children attending the School Kids Intervention Program. *Nutrition and Health*, *26*(2), 103–113. https://doi.org/10.1177/0260106020910962

Jansen, E., Mulkens, S., & Jansen, A. (2007). Do not eat the red food!: Prohibition of snacks

leads to their relatively higher consumption in children. *Appetite*, *49*(3), 572–577. https://doi.org/10.1016/j.appet.2007.03.229

Jansen, P. W., Derks, I. P. M., Mou, Y., Rijen, E. H. M., Gaillard, R., Micali, N., Voortman, T., & Hillegers, M. H. J. (2020). Associations of parents' use of food as reward with children's eating behaviour and BMI in a population-based cohort. *Pediatric Obesity*, *15*(11). https://doi.org/10.1111/ijpo.12662

Jansen, P. W., Roza, S. J., Jaddoe, V. W., Mackenbach, J. D., Raat, H., Hofman, A., Verhulst, F. C., & Tiemeier, H. (2012). Children's eating behavior, feeding practices of parents and weight problems in early childhood: results from the population-based Generation R Study. *The International Journal of Behavioral Nutrition and Physical Activity*, *9*, 130. https://doi.org/10.1186/1479-5868-9-130

Kamijo, K., Khan, N. A., Pontifex, M. B., Scudder, M. R., Drollette, E. S., Raine, L. B., Evans, E. M., Castelli, D. M., & Hillman, C. H. (2012). The Relation of Adiposity to Cognitive Control and Scholastic Achievement in Preadolescent Children. *Obesity*, *20*(12), 2406–2411. https://doi.org/10.1038/oby.2012.112

Kaplan, H. I., & Kaplan, H. S. (1957). The psychosomatic concept of obesity. *The Journal of Nervous and Mental Disease*, *125*(2), 181–201. https://doi.org/10.1097/00005053-195704000-00004

Karim, H. T., & Perlman, S. B. (2017). Neurodevelopmental maturation as a function of irritable temperament. *Human Brain Mapping*, *38*(10), 5307–5321. https://doi.org/10.1002/hbm.23742

Karnik, S., & Kanekar, A. (2012). Childhood obesity: a global public health crisis. *International Journal of Preventive Medicine*, *3*(1), 1–7.

Khandpur, N., Blaine, R. E., Fisher, J. O., & Davison, K. K. (2014). Fathers' child feeding practices: A review of the evidence. *Appetite*, *78*, 110–121. https://doi.org/10.1016/j.appet.2014.03.015

Kidwell, K. M., Kozikowski, C., Roth, T., Lundahl, A., & Nelson, T. D. (2018). Concurrent and longitudinal associations among temperament, parental feeding styles, and selective eating in a preschool sample. *Journal of Pediatric Psychology*, *43*(5), 572–583. https://doi.org/10.1093/jpepsy/jsx148

Kim, Y. R., Hwang, B. I., Lee, G. Y., Kim, K. H., Kim, M., Kim, K. K., & Treasure, J. (2018). Determinants of binge eating disorder among normal weight and overweight female college students in Korea. *Eating and Weight Disorders*, *23*(6), 849–860. https://doi.org/10.1007/s40519-018-0574-2

Kininmonth, A. R., Smith, A. D., Llewellyn, C. H., & Fildes, A. (2020). Socioeconomic status and changes in appetite from toddlerhood to early childhood. *Appetite*, *146*, 104517. https://doi.org/10.1016/j.appet.2019.104517

Klass, P. (2020, May 18). Emotional Eating in Quarantined Kids. *The New York Times*. https://www.nytimes.com/2020/05/18/well/family/children-emotional-eating-coronavirus.html?smid=url-share

Klosowska, J., De Henauw, S., Verbeken, S., Braet, C., Wijnant, K., & Michels, N. (2020). The influence of parents on childhood weight status: relation with eating behaviour. *Proceedings of the Nutrition Society*, *79*, E428. https://doi.org/10.1017/S0029665120003766

Koball, A. M., Meers, M. R., Storfer-Isser, A., Domoff, S. E., & Musher-Eizenman, D. R. (2012). Eating when bored: Revision of the emotional eating scale with a focus on boredom. *Health Psychology*, *31*(4), 521–524. https://doi.org/10.1037/a0025893

Koch, A., & Pollatos, O. (2014). Interoceptive sensitivity, body weight and eating behavior in children: a prospective study. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.01003

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 Behavioral Nutrition and Physical Activity*, *16*(1). https://doi.org/10.1186/s12966-019-0791-8

Koole, S. L. (2009). The psychology of emotion regulation: An integrative review. *Cognition & Emotion*, *23*(1), 4–41. https://doi.org/10.1080/02699930802619031

Kopp, C. B. (1989). Regulation of distress and negative emotions: A developmental view. *Developmental Psychology*, *25*(3), 343–354. https://doi.org/10.1037/0012-1649.25.3.343

Leung, C. Y. Y., Lumeng, J. C., Kaciroti, N. A., Chen, Y. P., Rosenblum, K., & Miller, A. L. (2014). Surgency and negative affectivity, but not effortful control, are uniquely associated with obesogenic eating behaviors among low-income preschoolers. *Appetite*, *78*, 139–146. https://doi.org/10.1016/j.appet.2014.03.025

Leung, C. Y. Y., Miller, A. L., Kaciroti, N. A., Chen, Y. P., Rosenblum, K., & Lumeng, J. C. (2016). Low-income pre-schoolers with higher temperamental surgency enjoy and respond more to food, mediating the path to higher body mass index. *Pediatric Obesity*, *11*(3), 181–186. https://doi.org/10.1111/ijpo.12042

Lewarne, T. (2022). Understanding the role of nutrition in preventing non-communicable

diseases and supporting planetary health. *Nursing Standard*, *37*(3), 61–66. https://doi.org/10.7748/ns.2022.e11814

Liew, J., Zhou, Z., Perez, M., Yoon, M., & Kim, M. (2020). Parental Child-Feeding in the Context of Child Temperament and Appetitive Traits: Evidence for a Biopsychosocial Process Model of Appetite Self-Regulation and Weight Status. *Nutrients*, *12*(11), 3353. https://doi.org/10.3390/nu12113353

Lipsanen, J., Elovainio, M., Hakulinen, C., Tremblay, M. S., Rovio, S., Lagström, H., Jaakkola, J. M., Jula, A., Rönnemaa, T., Viikari, J., Niinikoski, H., Simell, O., Raitakari, O. T., Pahkala, K., & Pulkki-Råback, L. (2020). Temperament profiles are associated with dietary behavior from childhood to adulthood. *Appetite*, *151*, 104681. https://doi.org/10.1016/j.appet.2020.104681

Llewellyn, C. H., & Fildes, A. (2017). Behavioural Susceptibility Theory: Professor Jane Wardle and the Role of Appetite in Genetic Risk of Obesity. *Current Obesity Reports*, *6*(1), 38–45. https://doi.org/10.1007/s13679-017-0247-x

Llewellyn, C. H., van Jaarsveld, C. H., Johnson, L., Carnell, S., & Wardle, J. (2010). Nature and nurture in infant appetite: analysis of the Gemini twin birth cohort. *The American Journal of Clinical Nutrition*, *91*(5), 1172–1179. https://doi.org/10.3945/ajcn.2009.28868

Llewellyn, C. H., van Jaarsveld, C. H. M., Johnson, L., Carnell, S., & Wardle, J. (2011). Development and factor structure of the Baby Eating Behaviour Questionnaire in the Gemini birth cohort. *Appetite*, *57*(2), 388–396. https://doi.org/10.1016/j.appet.2011.05.324

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

Margetic, S., Gazzola, C., Pegg, G., & Hill, R. (2002). Leptin: a review of its peripheral actions and interactions. *International Journal of Obesity*, *26*(11), 1407–1433. https://doi.org/10.1038/sj.ijo.0802142

McEwen, B. S. (2004). Protection and Damage from Acute and Chronic Stress: Allostasis and Allostatic Overload and Relevance to the Pathophysiology of Psychiatric Disorders. *Annals of the New York Academy of Sciences*, *1032*(1), 1–7. https://doi.org/10.1196/annals.1314.001

McEwen, B. S. (2005). Stressed or stressed out: What is the difference? *Journal of Psychiatry and Neuroscience*, *30*(5), 315–318.

Messerli-Bürgy, N., Stülb, K., Kakebeeke, T. H., Arhab, A., Zysset, A. E., Leeger-Aschmann, C. S., Schmutz, E. A., Meyer, A. H., Ehlert, U., Garcia-Burgos, D., Kriemler, S., Jenni,

O. G., Puder, J. J., & Munsch, S. (2018). Emotional eating is related with temperament but not with stress biomarkers in preschool children. *Appetite*, *120*, 256–264. https://doi.org/10.1016/j.appet.2017.08.032

Michels, N., Sioen, I., Braet, C., Eiben, G., Hebestreit, A., Huybrechts, I., Vanaelst, B., Vyncke, K., & De Henauw, S. (2012). Stress, emotional eating behaviour and dietary patterns in children. *Appetite*, *59*(3), 762–769. https://doi.org/10.1016/j.appet.2012.08.010

Michels, N., Sioen, I., Ruige, J., & De Henauw, S. (2017). Children's psychosocial stress and emotional eating: A role for leptin? *International Journal of Eating Disorders*, *50*(5), 471–480. https://doi.org/10.1002/eat.22593

Michopoulos, V., Powers, A., Moore, C., Villarreal, S., Ressler, K. J., & Bradley, B. (2015). The mediating role of emotion dysregulation and depression on the relationship between childhood trauma exposure and emotional eating. *Appetite*, *91*, 129–136. https://doi.org/10.1016/j.appet.2015.03.036

Mikulas, W. L., & Vodanovich, S. j. (1993). The essence of boredom. *Psychological Review*, *43*(1), 3.

Miller, N., Mallan, K. M., Byrne, R., de Jersey, S., Jansen, E., & Daniels, L. A. (2020). Non-responsive feeding practices mediate the relationship between maternal and child obesogenic eating behaviours. *Appetite*, *151*, 104648. https://doi.org/10.1016/j.appet.2020.104648

Moeller, F. G., Barratt, E. S., Dougherty, D. M., Schmitz, J. M., & Swann, A. C. (2001). Psychiatric Aspects of Impulsivity. *American Journal of Psychiatry*, *158*(11), 1783–1793. https://doi.org/10.1176/appi.ajp.158.11.1783

Moens, E., & Braet, C. (2007). Predictors of disinhibited eating in children with and without overweight. *Behaviour Research and Therapy*, *45*(6), 1357–1368. https://doi.org/https://doi.org/10.1016/j.brat.2006.10.001

Moody, A. (2019). *Health Survey for England 2019: Overweight and obesity in adults and children*. NHS Digital. https://files.digital.nhs.uk/9D/4195D5/HSE19-Overweight-obesity-rep.pdf

Morris, A. S., Silk, J. S., Steinberg, L., Myers, S. S., & Robinson, L. R. (2007). The Role of the Family Context in the Development of Emotion Regulation. *Social Development (Oxford, England)*, *16*(2), 361–388. https://doi.org/10.1111/j.1467-9507.2007.00389.x

Movassagh, E. Z., Baxter-Jones, A. D. G., Kontulainen, S., Whiting, S. J., & Vatanparast, H. (2017). Tracking Dietary Patterns over 20 Years from Childhood through Adolescence

into Young Adulthood: The Saskatchewan Pediatric Bone Mineral Accrual Study. *Nutrients*, *9*(9). https://doi.org/10.3390/nu9090990

Moynihan, A. B., Igou, E. R., & van Tilburg, W. A. P. (2017). Boredom Increases Impulsiveness. *Social Psychology*, *48*(5), 293–309. https://doi.org/10.1027/1864-9335/a000317

Moynihan, A. B., Tilburg, W. A. P. van, Igou, E. R., Wisman, A., Donnelly, A. E., & Mulcaire, J. B. (2015). Eaten up by boredom: consuming food to escape awareness of the bored self. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.00369

Musher-Eizenman, D., & Holub, S. (2007). Comprehensive feeding practices questionnaire: Validation of a new measure of parental feeding practices. *Journal of Pediatric Psychology*, *32*(8), 960–972. https://doi.org/10.1093/jpepsy/jsm037

Nederkoorn, C., Smulders, F. T. Y., & Jansen, A. (2000). Cephalic phase responses, craving and food intake in normal subjects. *Appetite*, *35*(1), 45–55. https://doi.org/https://doi.org/10.1006/appe.2000.0328

Nguyen-Michel, S. T., Unger, J. B., & Spruijt-Metz, D. (2007). Dietary correlates of emotional eating in adolescence. *Appetite*, *49*(2), 494–499. https://doi.org/10.1016/j.appet.2007.03.005

Nicklaus, S., Boggio, V., Chabanet, C., & Issanchou, S. (2004). A prospective study of food preferences in childhood. *Food Quality and Preference*, *15*(7–8), 805–818. https://doi.org/10.1016/j.foodqual.2004.02.010

Niehoff, V. (2009). Childhood obesity: a call to action. *Bariatric Nursing and Surgical Patient Care*, *4*, 17–23. doi: 10.1089/bar.2009.9996

O'Connor, D. A., Janet, R., Guigon, V., Belle, A., Vincent, B. T., Bromberg, U., Peters, J., Corgnet, B., & Dreher, J. C. (2021). Rewards that are near increase impulsive action. *Science*, *24*(4), 102292. https://doi.org/https://doi.org/10.1016/j.isci.2021.102292

O'Neil, A., Quirk, S. E., Housden, S., Brennan, S. L., Williams, L. J., Pasco, J. A., Berk, M., & Jacka, F. N. (2014). Relationship between diet and mental health in children and adolescents: a systematic review. *American Journal of Public Health*, *104*(10), e31-42. https://doi.org/10.2105/AJPH.2014.302110

Oddy, W. H., Robinson, M., Ambrosini, G. L., O'Sullivan, T. A., de Klerk, N. H., Beilin, L. J., Silburn, S. R., Zubrick, S. R., & Stanley, F. J. (2009). The association between dietary patterns and mental health in early adolescence. *Preventive Medicine*, *49*(1), 39–44. https://doi.org/https://doi.org/10.1016/j.ypmed.2009.05.009

Ogden, J., & Roy-Stanley, C. (2020). How do children make food choices? Using a think-aloud method to explore the role of internal and external factors on eating behaviour. *Appetite*, *147*. https://doi.org/10.1016/j.appet.2019.104551

Ohrt, T. K., Perez, M., Liew, J., Hernández, J. C., & Yu, K. Y. (2020). The influence of temperament on stress-induced emotional eating in children. *Obesity Science & Practice*, *6*(5), 524–534. https://doi.org/10.1002/osp4.439

Olsen, A., Kildegaard, H., Gabrielsen, G., Thybo, A. K., & Møller, P. (2012). Measuring children's food preferences: Using pictures in a computerized conjoint analysis. *Journal of Sensory Studies*, *27*(4), 264–276. https://doi.org/10.1111/j.1745-459X.2012.00391.x

Panda, P. K., Gupta, J., Chowdhury, S. R., Kumar, R., Meena, A. K., Madaan, P., Sharawat, I. K., & Gulati, S. (2021). Psychological and Behavioral Impact of Lockdown and Quarantine Measures for COVID-19 Pandemic on Children, Adolescents and Caregivers: A Systematic Review and Meta-Analysis. *Journal of Tropical Pediatrics*, *67*(1), fmaa122. https://doi.org/10.1093/tropej/fmaa122

Passarelli, D. A., Amd, M., de Oliveira, M. A., & de Rose, J. C. (2022). Augmenting salivation, but not evaluations, through subliminal conditioning of eating-related words. *Behavioural Processes*, *194*, 104541. https://doi.org/10.1016/j.beproc.2021.104541

Patel, S. L., & Holub, S. C. (2012). Body size matters in provision of help: factors related to children's willingness to help overweight peers. *Obesity, 20*(2), 382–388. https://doi.org/10.1038/oby.2011.314

Philippe, K., Chabanet, C., Issanchou, S., & Monnery-Patris, S. (2021a). Child eating behaviors, parental feeding practices and food shopping motivations during the COVID-19 lockdown in France: (How) did they change? *Appetite*, *161*, 105132. https://doi.org/10.1016/j.appet.2021.105132

Philippe, K., Chabanet, C., Issanchou, S., & Monnery-Patris, S. (2021b). Young Children's Eating in the Absence of Hunger: Links With Child Inhibitory Control, Child BMI, and Maternal Controlling Feeding Practices. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.653408

Pink, A. E., & Cheon, B. K. (2021). Development of a Simplified Portion Size Selection Task. *Foods*, *10*(5), 1121. https://doi.org/10.3390/foods10051121

Powell, E. M., Frankel, L. A., & Hernandez, D. C. (2017). The mediating role of child self-regulation of eating in the relationship between parental use of food as a reward and child emotional overeating. *Appetite*, *113*, 78–83. https://doi.org/10.1016/j.appet.2017.02.017

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions. *Multivariate Behavioral Research*, *42*(1), 185–227. https://doi.org/10.1080/00273170701341316

Prencipe, A., & Zelazo, P. D. (2005). Development of Affective Decision Making for Self and Other: Evidence for the Integration of First- and Third-Person Perspectives. *Psychological Science*, *16*(7), 501–505. https://doi.org/10.1111/j.0956-7976.2005.01564.x

Putnam, S. P., & Rothbart, M. K. (2006). Development of short and very short forms of the Children's Behavior Questionnaire. *Journal of Personality Assessment*, *87*(1), 102–112. https://doi.org/10.1207/s15327752jpa8701_09

Raaijmakers, L. G., Gevers, D. W., Teuscher, D., Kremers, S. P., & van Assema, P. (2014). Emotional and instrumental feeding practices of Dutch mothers regarding foods eaten between main meals. *BMC Public Health*, *14*(1), 171. https://doi.org/10.1186/1471-2458-14-171

Ramalho, S., Félix, S., Goldschmidt, A. B., Silva, D., Costa, C., Mansilha, H. F., & Conceição, E. M. (2020). Maternal Eating Behavior and Problematic Eating Behaviors of Children Undergoing Weight Loss Treatment: A Cluster Analysis. *Childhood Obesity*, *16*(7), 499–509. https://doi.org/10.1089/chi.2020.0094

Rankin, J., Matthews, L., Cobley, S., Han, A., Sanders, R., Wiltshire, H. D., & Baker, J. S. (2016). Psychological consequences of childhood obesity: psychiatric comorbidity and prevention. *Adolescent Health, Medicine and Therapeutics*, *7*, 125–146. https://doi.org/10.2147/AHMT.S101631

Roberts, L., Marx, J. M., & Musher-Eizenman, D. R. (2018). Using food as a reward: An examination of parental reward practices. *Appetite*, *120*, 318–326. https://doi.org/10.1016/j.appet.2017.09.024

Rodenburg, G., Kremers, S. P., Oenema, A., & van de Mheen, D. (2014). Associations of parental feeding styles with child snacking behaviour and weight in the context of general parenting. *Public Health Nutrition*, *17*(5), 960–969. https://doi.org/10.1017/S1368980013000712

Rodgers, R. F., Paxton, S. J., Massey, R., Campbell, K. J., Wertheim, E. H., Skouteris, H., & Gibbons, K. (2013). Maternal feeding practices predict weight gain and obesogenic eating behaviors in young children: A prospective study. *International Journal of Behavioral Nutrition and Physical Activity*, *10*(1), 24. https://doi.org/10.1186/1479-5868-10-24

Rodgers, R. F., Paxton, S. J., McLean, S. A., Campbell, K. J., Wertheim, E. H., Skouteris, H., & Gibbons, K. (2014). Maternal negative affect is associated with emotional feeding practices and emotional eating in young children. *Appetite*, *80*, 242–247. https://doi.org/10.1016/j.appet.2014.05.022

Rollins, B. Y., Loken, E., Savage, J. S., & Birch, L. L. (2014a). Effects of restriction on children's intake differ by child temperament, food reinforcement, and parent's chronic use of restriction. *Appetite*, *73*, 31–39. https://doi.org/https://doi.org/10.1016/j.appet.2013.10.005

Rollins, B. Y., Loken, E., Savage, J. S., & Birch, L. L. (2014b). Maternal controlling feeding practices and girls' inhibitory control interact to predict changes in BMI and eating in the absence of hunger from 5 to 7 y. *The American Journal of Clinical Nutrition*, *99*(2), 249–257. https://doi.org/10.3945/ajcn.113.063545

Rose, M. H., Nadler, E. P., & Mackey, E. R. (2018). Impulse Control in Negative Mood States, Emotional Eating, and Food Addiction are Associated with Lower Quality of Life in Adolescents with Severe Obesity. *Journal of Pediatric Psychology*, *43*(4), 443–451. https://doi.org/10.1093/jpepsy/jsx127

Rothbart, M. K., Ahadi, S. A., Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: the Children's Behavior Questionnaire. *Child Development*, *72*(5), 1394–1408. https://doi.org/10.1111/1467-8624.00355

Rothbart, M. K., & Bates, J. E. (2007). Temperament. In *Handbook of Child Psychology* (pp. 99–166). John Wiley & Sons, Inc. https://doi.org/10.1002/9780470147658.chpsy0303

Rothbart, M. K., & Sheese, B. E. (2007). Temperament and Emotion Regulation. In *Handbook of emotion regulation.* (pp. 331–350). The Guilford Press.

Rothbart, M. K., Ziaie, H., & O'Boyle, C. G. (1992). Self-regulation and emotion in infancy. *New Directions for Child Development*, *55*, 7–23. https://doi.org/10.1002/cd.23219925503

Russell, B. S., Lee, J. O., Spieker, S., & Oxford, M. L. (2016). Parenting and Preschool Self-Regulation as Predictors of Social Emotional Competence in 1st Grade. *Journal of Research in Childhood Education*, *30*(2), 153–169. https://doi.org/10.1080/02568543.2016.1143414

Russell, C. G., Haszard, J. J., Taylor, R. W., Heath, A. L. M., Taylor, B., & Campbell, K. J. (2018). Parental feeding practices associated with children's eating and weight: What are parents of toddlers and preschool children doing? *Appetite*, *128*, 120–128. https://doi.org/10.1016/j.appet.2018.05.145

Russell, C. G., & Russell, A. (2019). A biopsychosocial approach to processes and pathways in the development of overweight and obesity in childhood: Insights from developmental theory and research. *Obesity Reviews*, *20*(5), 725–749. https://doi.org/10.1111/obr.12838

Russell, C., & Russell, A. (2018). Biological and Psychosocial Processes in the Development of Children's Appetitive Traits: Insights from Developmental Theory and Research. *Nutrients*, *10*(6), 692. https://doi.org/10.3390/nu10060692

Sahoo, K., Sahoo, B., Choudhury, A. K., Sofi, N. Y., Kumar, R., & Bhadoria, A. S. (2015). Childhood obesity: causes and consequences. *Journal of Family Medicine and Primary Care*, *4*(2), 187–192. https://doi.org/10.4103/2249-4863.154628

Sakuragi, S., Sugiyama, Y., & Takeuchi, K. (2002). Effects of Laughing and Weeping on Mood and Heart Rate Variability. *Journal of Physiological Anthropology and Applied Human Science*, *21*(3), 159–165. https://doi.org/10.2114/jpa.21.159

Salovey, P., & Sluyter, D. J. (1997). Emotional development and emotional intelligence: Educational implications. In *Emotional development and emotional intelligence: Educational implications.* Basic Books.

Sanchis-Sanchis, A., Grau, M. D., Moliner, A. R., & Morales-Murillo, C. P. (2020). Effects of Age and Gender in Emotion Regulation of Children and Adolescents. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.00946

Savage, J. S., Fisher, J. O., & Birch, L. L. (2007). Parental influence on eating behavior: Conception to adolescence. *Journal of Law, Medicine and Ethics*, *35*(1), 22–34. https://doi.org/10.1111/j.1748-720X.2007.00111.x

Scaglioni, S., De Cosmi, V., Ciappolino, V., Parazzini, F., Brambilla, P., & Agostoni, C. (2018). Factors Influencing Children's Eating Behaviours. *Nutrients*, *10*(6), 706. https://doi.org/10.3390/nu10060706

Schell, S. E., Brassard, S. L., & Racine, S. E. (2019). Extending the Acquired Preparedness model of binge eating: Testing the indirect effects of high-risk personality traits on binge eating via positive and negative reinforcement expectancies. *Appetite*, *140*, 206–212. https://doi.org/10.1016/j.appet.2019.05.020

Schlam, T. R., Wilson, N. L., Shoda, Y., Mischel, W., & Ayduk, O. (2013). Preschoolers' delay of gratification predicts their body mass 30 years later. *Journal of Pediatrics*, *162*(1), 90–93. https://doi.org/10.1016/j.jpeds.2012.06.049

Scholten, E. W. M., Schrijvers, C. T. M., Nederkoorn, C., Kremers, S. P. J., & Rodenburg, G. (2014). Relationship between Impulsivity, Snack Consumption and Children's Weight.

PLoS ONE, *9*(2), e88851. https://doi.org/10.1371/journal.pone.0088851

Schrempft, S., van Jaarsveld, C. H. M., Fisher, A., & Wardle, J. (2015). The Obesogenic Quality of the Home Environment: Associations with Diet, Physical Activity, TV Viewing, and BMI in Preschool Children. *PLoS ONE*, *10*(8), e0134490. https://doi.org/10.1371/journal.pone.0134490

Seeyave, D. M., Coleman, S., Appugliese, D., Corwyn, R. F., Bradley, R. H., Davidson, N. S., Kaciroti, N., & Lumeng, J. C. (2009). Ability to Delay Gratification at Age 4 Years and Risk of Overweight at Age 11 Years. *Archives of Pediatrics & Adolescent Medicine*, *163*(4), 303–308. https://doi.org/10.1001/archpediatrics.2009.12

Shireen, H., Castelli, S., Legault, M., Dor-Ziderman, Y., Milad, J., & Knäuper, B. (2022). *Phenomenological Support for Escape Theory: A Qualitative Study Using Explicitation Interviews with Emotional Eaters (pre-print)*.

Shloim, N., Edelson, L. R., Martin, N., & Hetherington, M. M. (2015). Parenting Styles, Feeding Styles, Feeding Practices, and Weight Status in 4–12 Year-Old Children: A Systematic Review of the Literature. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.01849

Siedlecka, E., & Denson, T. F. (2018). Experimental Methods for Inducing Basic Emotions: A Qualitative Review. *Emotion Review*, *11*(1), 87–97. https://doi.org/10.1177/1754073917749016

Simmonds, M., Llewellyn, A., Owen, C. G., & Woolacott, N. (2016). Predicting adult obesity from childhood obesity: A systematic review and meta-analysis. *Obesity Reviews*, *17*(2), 95–107. https://doi.org/10.1111/obr.12334

Sylvetsky, A. C., Kaidbey, J. H., Ferguson, K., Visek, A. J., & Sacheck, J. (2022) Impacts of the COVID-19 Pandemic on Children's Sugary Drink Consumption: A Qualitative Study. *Frontiers in Nutrition, 9*. https://doi.org/10.3389/fnut.2022.860259.

Smith, J. D., Fu, E., & Kobayashi, M. A. (2020). Prevention and Management of Childhood Obesity and Its Psychological and Health Comorbidities. *Annual Review of Clinical Psychology*, *16*, 351–378. https://doi.org/10.1146/annurev-clinpsy-100219-060201

Spinrad, T. L., Eisenberg, N., Gaertner, B., Popp, T., Smith, C. L., Kupfer, A., Greving, K., Liew, J., & Hofer, C. (2007). Relations of maternal socialization and toddlers' effortful control to children's adjustment and social competence. *Developmental Psychology*, *43*(5), 1170–1186. https://doi.org/10.1037/0012-1649.43.5.1170

Spoor, S. T. P., Bekker, M. H. J., 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

Steinsbekk, S., Barker, E. D., Llewellyn, C., Fildes, A., & Wichstrøm, L. (2018). Emotional Feeding and Emotional Eating: Reciprocal Processes and the Influence of Negative Affectivity. *Child Development*, *89*(4), 1234–1246. https://doi.org/10.1111/cdev.12756

Steinsbekk, S., Belsky, J., & Wichstrøm, L. (2016). Parental Feeding and Child Eating: An Investigation of Reciprocal Effects. *Child Development*, *87*(5), 1538–1549. https://doi.org/10.1111/cdev.12546

Steinsbekk, S., Bjørklund, O., Llewellyn, C., & Wichstrøm, L. (2020). Temperament as a predictor of eating behavior in middle childhood – A fixed effects approach. *Appetite*, *150*, 104640. https://doi.org/10.1016/j.appet.2020.104640

Stifter, C. A., & Moding, K. J. (2018). Infant temperament and parent use of food to soothe predict change in weight-for-length across infancy: early risk factors for childhood obesity. *International Journal of Obesity*, *42*(9), 1631–1638. https://doi.org/10.1038/s41366-018-0006-4

Stone, A. A., & Brownell, K. D. (1994). The stress-eating paradox: Multiple daily measurements in adult males and females. *Psychology & Health*, *9*(6), 425–436. https://doi.org/10.1080/08870449408407469

Sundström, M., Hjelm-Lidholm, S., & Radon, A. (2019). Clicking the boredom away – Exploring impulse fashion buying behavior online. *Journal of Retailing and Consumer Services*, *47*, 150–156. https://doi.org/10.1016/j.jretconser.2018.11.006

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. *Lancet (London, England)*, *378*(9793), 804–814. https://doi.org/10.1016/S0140-6736(11)60813-1

Tan, C. C., Herzog, N. K., & Mhanna, A. (2021). Associations between supportive and undermining coparenting and controlling feeding practices. *Appetite*, *165*, 105326. https://doi.org/https://doi.org/10.1016/j.appet.2021.105326

Tan, C. C., & Holub, S. C. (2015). Emotion Regulation Feeding Practices Link Parents' Emotional Eating to Children's Emotional Eating: A Moderated Mediation Study. *Journal of Pediatric Psychology*, *40*(7), 657–663. https://doi.org/10.1093/jpepsy/jsv015

Tan, C. C., & Holub, S. C. (2018). The effects of happiness and sadness on Children's snack consumption. *Appetite*, *123*, 169–174. https://doi.org/10.1016/j.appet.2017.12.021

Thamotharan, S., Lange, K., Zale, E. L., Huffhines, L., & Fields, S. (2013). The role of

impulsivity in pediatric obesity and weight status: A meta-analytic review. *Clinical Psychology Review*, *33*(2), 253–262. https://doi.org/https://doi.org/10.1016/j.cpr.2012.12.001

Thompson, C., Barresi, J., & Moore, C. (1997). The development of future-oriented prudence and altruism in preschoolers. *Cognitive Development*, *12*(2), 199–212. https://doi.org/10.1016/S0885-2014(97)90013-7

Tomiyama, A. J. (2019). Stress and Obesity. *Annual Review of Psychology*, *70*(1), 703–718. https://doi.org/10.1146/annurev-psych-010418-102936

Tuck, N.-J., Farrow, C., & Thomas, J. M. (2019). Assessing the effects of vegetable consumption on the psychological health of healthy adults: a systematic review of prospective research. *The American Journal of Clinical Nutrition*, *110*(1), 196–211. https://doi.org/10.1093/ajcn/nqz080

Usai, M. C., Viterbori, P., Traverso, L., & De Franchis, V. (2014). Latent structure of executive function in five- and six-year-old children: A longitudinal study. *European Journal of Developmental Psychology*, *11*(4), 447–462. https://doi.org/10.1080/17405629.2013.840578

van Strien, T. (2018). Causes of Emotional Eating and Matched Treatment of Obesity. *Current Diabetes Reports*, *18*(6), 35. https://doi.org/10.1007/s11892-018-1000-x

van Strien, T., Frijters, J. E. R., Bergers, G. P. A., & Defares, P. B. (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/10.1002/1098-108X(198602)5:2<295::AID-EAT2260050209>3.0.CO;2-T

van Strien, T., Gibson, E. L., Baños, R., Cebolla, A., & Winkens, L. H. H. (2019). Is comfort food actually comforting for emotional eaters? A (moderated) mediation analysis. *Physiology & Behavior*, *211*, 112671. https://doi.org/10.1016/j.physbeh.2019.112671

van Strien, T., & Oosterveld, P. (2008). The children's DEBQ for assessment of restrained, emotional, and external eating in 7- to 12-year-old children. *International Journal of Eating Disorders*, *41*(1), 72–81. https://doi.org/10.1002/eat.20424

van Tilburg, W. A. P., & Igou, E. R. (2012). On boredom: Lack of challenge and meaning as distinct boredom experiences. *Motivation and Emotion*, *36*(2), 181–194. https://doi.org/10.1007/s11031-011-9234-9

Vandeweghe, L., Vervoort, L., Verbeken, S., Moens, E., & Braet, C. (2016). Food Approach and Food Avoidance in Young Children: Relation with Reward Sensitivity and Punishment Sensitivity. *Frontiers in Psychology*, *7*, 928.

https://doi.org/10.3389/fpsyg.2016.00928

Varni, J. W., Limbers, C. A., & Burwinkle, T. M. (2007). How young can children reliably and validly self-report their health-related quality of life?: An analysis of 8,591 children across age subgroups with the PedsQL™ 4.0 Generic Core Scales. *Health and Quality of Life Outcomes*, *5*(1), 1. https://doi.org/10.1186/1477-7525-5-1

Verbeken, S., Braet, C., Claus, L., Nederkoorn, C., & Oosterlaan, J. (2009). Childhood obesity and impulsivity: An investigation with performance-based measures. *Behaviour Change*, *26*(3), 153–167. https://doi.org/10.1375/bech.26.3.153

Vervoort, L., Naets, T., De Guchtenaere, A., Tanghe, A., & Braet, C. (2020). Using confidence interval-based estimation of relevance to explore bottom-up and top-down determinants of problematic eating behavior in children and adolescents with obesity from a dual pathway perspective. *Appetite*, *150*, 104676. https://doi.org/10.1016/j.appet.2020.104676

Vollmer, R. L. (2021). The relationship between parental food parenting practices & child eating behavior: A comparison of mothers and fathers. *Appetite*, *162*, 105193. https://doi.org/10.1016/j.appet.2021.105193

Wallbott, H. G. (1998). Bodily expression of emotion. *European Journal of Social Psychology*, *28*(6), 879–896. https://doi.org/10.1002/(SICI)1099-0992(1998110)28:6<879::AID-EJSP901>3.0.CO;2-W

Wang, J., Zhu, B., Wu, R., Chang, Y.-S., Cao, Y., & Zhu, D. (2022). Bidirectional Associations between Parental Non-Responsive Feeding Practices and Child Eating Behaviors: A Systematic Review and Meta-Analysis of Longitudinal Prospective Studies. *Nutrients*, *14*(9), 1896. https://doi.org/10.3390/nu14091896

Wardle, J., Guthrie, C. A., Sanderson, S., & Rapoport, L. (2001). Development of the children's eating behaviour questionnaire. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *42*(7), 963–970. https://doi.org/10.1111/1469-7610.00792

Warkentin, S., Fildes, A., & Oliveira, A. (2022). Appetitive behaviors and body composition in school-age years: Bi-directional analyses in a population-based birth cohort. *Appetite*, *168*, 105770. https://doi.org/https://doi.org/10.1016/j.appet.2021.105770

Wellman, H. M., Harris, P. L., Banerjee, M., & Sinclair, A. (1995). Early understanding of emotion: Evidence from natural language. *Cognition & Emotion*, *9*(2–3), 117–149. https://doi.org/10.1080/02699939508409005

Westgate, E. C., & Steidle, B. (2020). Lost by definition: Why boredom matters for psychology and society. *Social and Personality Psychology Compass*, *14*(11), e12562.

https://doi.org/https://doi.org/10.1111/spc3.12562

Whiteside, S. P., & Lynam, D. R. (2001). The five factor model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences*, *30*(4), 669–689. https://doi.org/10.1016/S0191-8869(00)00064-7

WHO. (2021). *Obesity and Overweight*. World Health Organisation. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

Wolin, K. Y., Carson, K., & Colditz, G. A. (2010). Obesity and cancer. *The Oncologist*, *15*(6), 556–565. https://doi.org/10.1634/theoncologist.2009-0285

Wrzosek, M., Sawicka, A., Tałałaj, M., Wojnar, M., & Nowicka, G. (2018). Impulsivity and vitamin D in bariatric surgery candidates. *Pharmacological Reports*, *70*(4), 688–693. https://doi.org/10.1016/j.pharep.2018.02.005

Yau, Y. H. C. C., & Potenza, M. N. (2013). Stress and eating behaviors. *Minerva Endocrinologica*, *38*(3), 255–267. http://www.ncbi.nlm.nih.gov/pubmed/24126546

Yelverton, C. A., Geraghty, A. A., O'Brien, E. C., Killeen, S. L., Horan, M. K., Donnelly, J. M., Larkin, E., Mehegan, J., & McAuliffe, F. M. (2020). Breastfeeding and maternal eating behaviours are associated with child eating behaviours: findings from the ROLO Kids Study. *European Journal of Clinical Nutrition*. https://doi.org/10.1038/s41430-020-00764-7

Zarychta, K., Kulis, E., Gan, Y., Chan, C. K. Y., Horodyska, K., & Luszczynska, A. (2019). Why are you eating, mom? Maternal emotional, restrained, and external eating explaining children's eating styles. *Appetite*, *141*, 104335. https://doi.org/10.1016/j.appet.2019.104335

Zhou, Y., & Rui, L. (2013). Leptin signaling and leptin resistance. *Frontiers of Medicine*, *7*(2), 207–222. https://doi.org/10.1007/s11684-013-0263-5

Zhou, Z., Liew, J., Yeh, Y.-C. C., & Perez, M. (2020). Appetitive Traits and Weight in Children: Evidence for Parents' Controlling Feeding Practices as Mediating Mechanisms. *The Journal of Genetic Psychology*, *181*(1), 1–13. https://doi.org/10.1080/00221325.2019.1682506

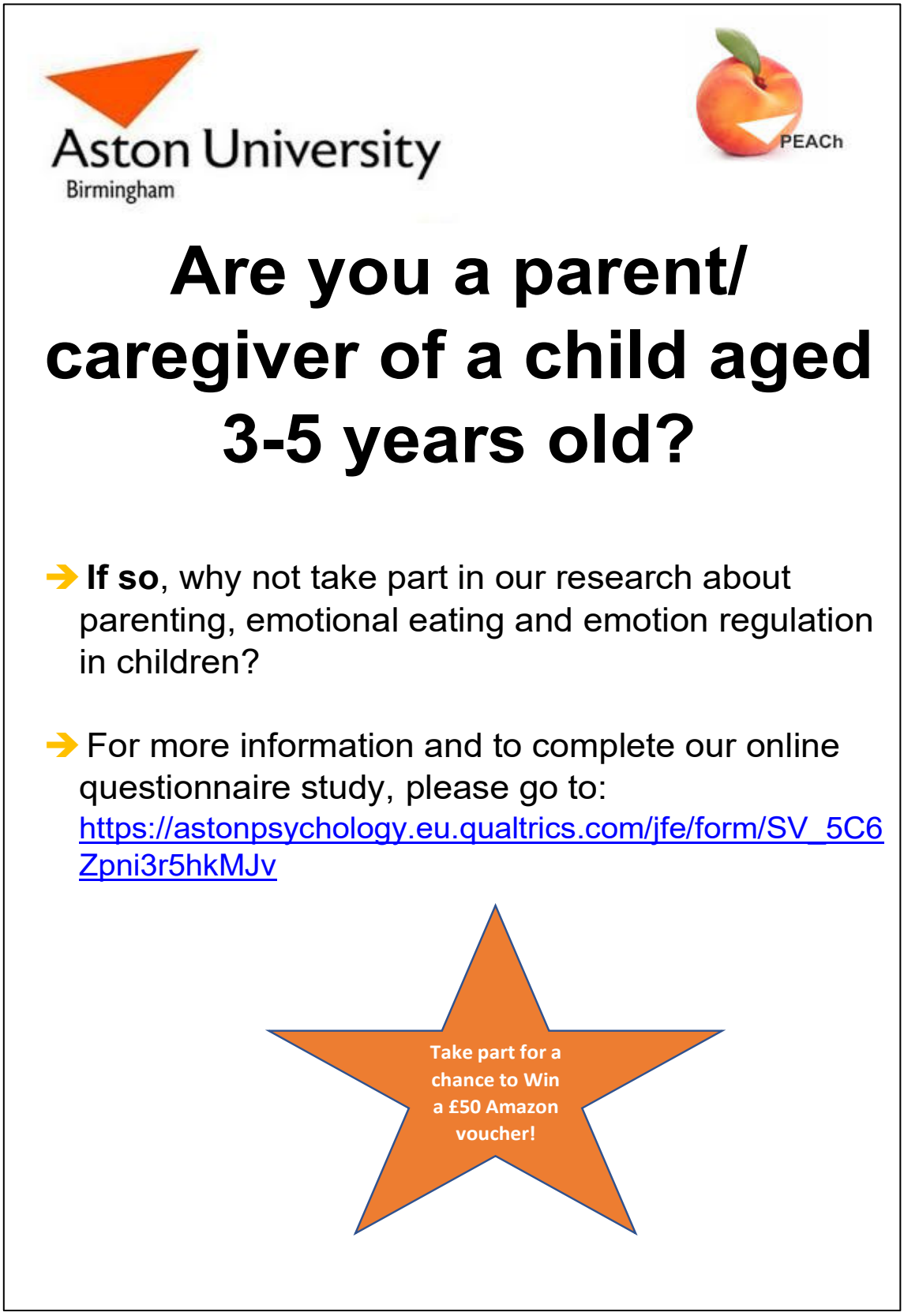
Zhou, Z., SooHoo, M., Zhou, Q., Perez, M., & Liew, J. (2019). Temperament as Risk and Protective Factors in Obesogenic Eating: Relations Among Parent Temperament, Child Temperament, and Child Food Preference and Eating. *The Journal of Genetic Psychology*, *180*(1), 75–79. https://doi.org/10.1080/00221325.2019.1575180

Zimmer-Gembeck, M. J., Rudolph, J., Kerin, J., & Bohadana-Brown, G. (2022). Parent

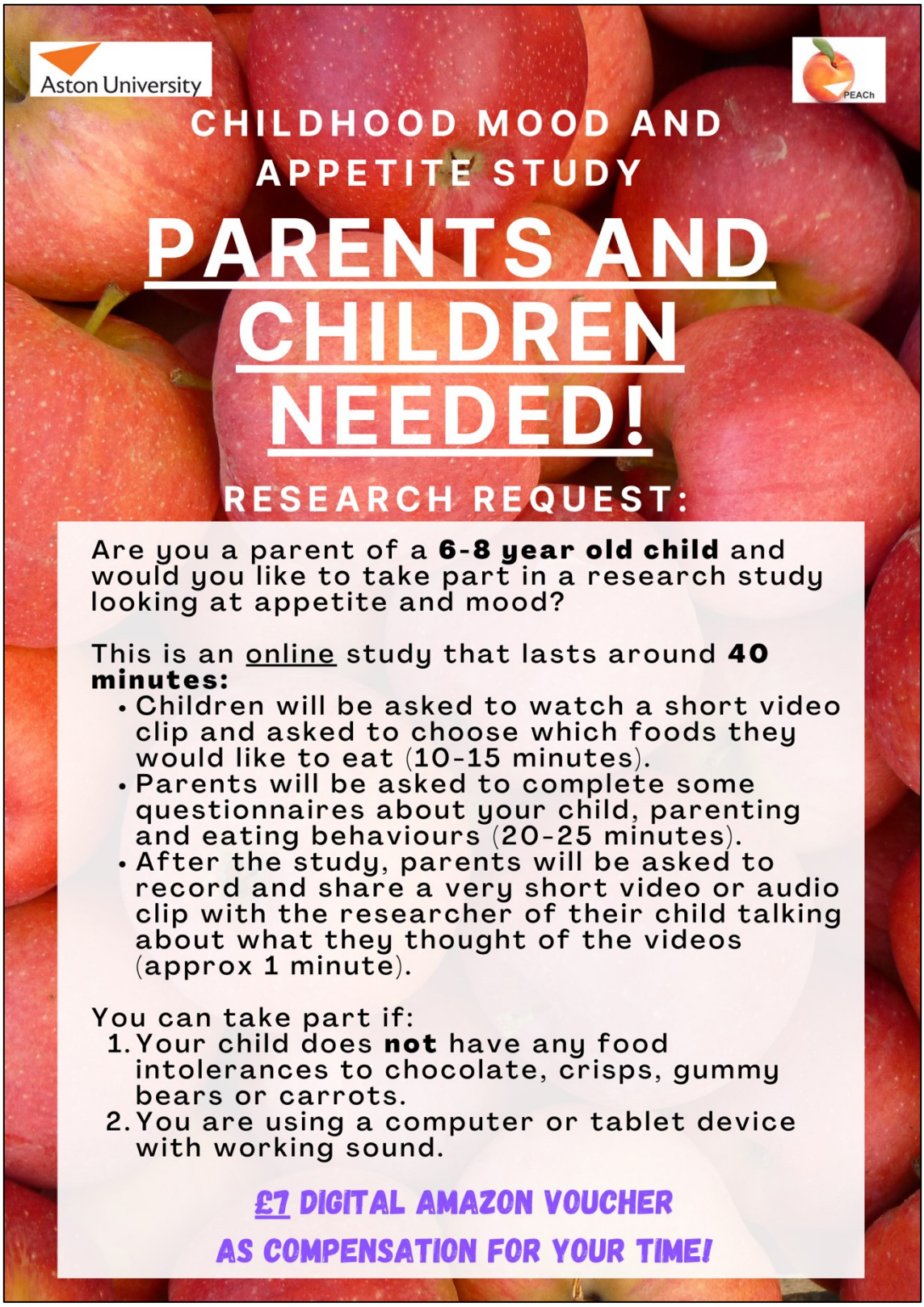
emotional regulation: A meta-analytic review of its association with parenting and child adjustment. *International Journal of Behavioral Development*, *46*(1), 63–82. https://doi.org/10.1177/01650254211051086

Zohar, A. H., Lev-Ari, L., & Bachner-Melman, R. (2021). Two to Tango? The Dance of Maternal Authority and Feeding Practices with Child Eating Behavior. *International Journal of Environmental Research and Public Health*, *18*(4), 1650. https://doi.org/10.3390/ijerph18041650

Appendix A-1: Chapter 2 and Chapter 3 - Study poster



Appendix A-2: Chapter 4 - Study poster



Appendix A-3: Chapter 5 and Chapter 6 - Study poster

PEACh

Aston University
Birmingham

Childhood Mood and Appetite Study

Parents and Children Needed

Research Request:

Are you a parent of a 4-5 year-old child and would you like to take part in a **research study** looking at appetite and mood?

The study involves a **one-off session** at Aston University, **lasting around 90 minutes**. During this time, you would eat lunch/dinner with your child (provided using **PPE** and **highest hygiene protocols**), complete some questionnaires, and your child would complete some simple tasks as part of a study looking at **children's food choices** and **appetite**.

You will be given **£30** Amazon voucher as compensation for your time and travel, and your child will receive a **small toy** for taking part.

You and your child can only take part in this study if you are **not vegan** and have **no known allergies or intolerances to: gluten, dairy or nuts.**

If you are interested in taking part or would like further details, please contact the PhD researcher whose details are below to book your spot!

Rebecca Stone: [redacted]**@aston.ac.uk**

Appendix B: Ethical approvals

Appendix B-1: Chapter 2 and Chapter 3 - Ethical approval

Aston University
Birmingham

Aston Triangle
Birmingham B4 7ET
United Kingdom
Tel +44 (0)121 204 3000
www.aston.ac.uk

Memo

Life and Health Sciences Ethics Committee's Decision Letter

To : **Claire Farrow, Rebecca Ann Stone**

Cc: Charanjit Bhatti

Administrator, Life and Health Sciences Ethics Committee

From: Dr Rebecca Knibb

Chair, Life and Health Sciences Ethics Committee

Date 29/11/19

Subject: **Project #1551 Emotion regulation and emotional eating in children**

Thank you for your submission. The additional information for the above proposal has been considered by the Chair of the LHS Ethics Committee.

Please see below for details of the decision and the approved documents.

Reviewer's recommendation: Favourable opinion

Please see the tabled list below of approved documents:

Documentation	Version/s	Date	Approved
Response to reviewer's comments	1	22/10/19	✓
Updated ethics application form	2	22/10/19	✓
Participant information sheet	2	22/10/19	✓
Consent form	2	22/10/19	✓
Consent form (online version)	1	22/10/19	✓
Risk assessment	2	22/10/19	✓
Amended emotion regulation checklist	1	22/10/19	✓
Recruitment poster and social media advert	1	22/10/19	✓

Yours sincerely,

Dr Rebecca Knibb
Chair, LHS Ethics Committee

Appendix B-2: Chapter 4 - Ethical approval

Aston University
BIRMINGHAM UK

Aston University
Birmingham B4 7ET
United Kingdom

+44 (0)121 204 3000
www.aston.ac.uk

11 December 2020

Professor Claire Farrow Student: Rebecca Stone College of Health and Life Sciences

Study title:	Online Childhood Mood and Appetite Study
REC REF:	#1646

Confirmation of Ethical Opinion

On behalf of the Committee, I am pleased to confirm a favourable opinion for the amendment to this research as described in the Amendment Request Form dated 01/12/2020 received 07/12/2020 (appendix a)

Documents approved

Document	*Version*	*Date*
Ethics Application Form – Amendment	3	01/12/2020
Online Version - Consent Form	2	01/12/2020
Online Version - Participant Information Sheet	2	01/12/2020
Online Version – Protocol	2	01/12/2020
Online Version – Risk Assessment	2	01/12/2020
Social Media Advert	1	01/12/2020
Email trigger	1	01/12/2020

With the Committee's best wishes for the success of this project.

Yours sincerely

Professor James Wolffsohn,
Acting Chair, University Research Ethics Committee

Appendix B-3: Chapter 5 and Chapter 6 - Ethical approval

Aston University
BIRMINGHAM UK

Aston University
Birmingham B4 7ET
United Kingdom

+44 (0)121 204 3000
www.aston.ac.uk

16 October 2020

Professor Claire Farrow
Student: Rebecca Ann Stone
College of Health and Life Sciences

Dear Claire, Rebecca,

Study title:	The Development of Early Emotional Eating: A Laboratory Study
REC REF:	# 1646

Confirmation of Favourable Ethical Opinion (with conditions)

On behalf of the Committee, I am pleased to confirm a favourable opinion (with condirions) for the above research on the basis of the application described in the application form, protocol and supporting documentation listed below.

Conditions of approval:

- All face to face participant research must be conducted under strict adherence to the latest government and university guidelines for social distancing. Please ensure that you monitor the situation on a regular basis at https://www.gov.uk/government/publications/staying-alert-and-safe-socialdistancing and https://www2.aston.ac.uk/current-students/healthwellbeing/coronavirus.
- Continued approval of Aston Brain Centre for on campus research (Appendix A)

Approved documents

The final list of documents reviewed and approved by the Committee is as follows.

Document	*Version*	*Date*
Participant Information Sheet	2	09/07/2020
Consent Form	2	09/07/2020

Consent Form	2	09/07/2020
Debrief form	2	09/07/2020
Emotion regulation checklist	1	22/10/2019
Test pack: child tasks	1	04/06/2020
Test pack: parent tasks	2	09/07/2020
Consent to contact form	1	04/06/2020
Poster	1	04/06/2020
Social media advert	1	04/06/2020
Risk Assessments		
Food consumption and food allergy	1	03/06/19
Food hygiene	1	03/06/19
Food preparation	1	03/06/19
Use of electric microwave oven	1	03/06/19
Standard operating procedures		
Management of illness		03/06/19
Cleaning of kitchen and observation area after food preparation and testing, plus maintenance of social distancing under COVID19.		22/07/20
Personal Hygiene and prevention of food contamination.		03/06/19
Using paediatric observational laboratory for food provision and behavioural tasks in the Aston Brain Centre (ABC) during the COVID–19 Pandemic.	1	July 2020

Wishing you every success with your research.

Yours sincerely

Professor James Wolffsohn Acting Chair, University Research Ethics Committee

Appendix B-4: Chapter 5 and Chapter 6 - IHN approval

From: Kessler, Klaus <k.kessler@aston.ac.uk>
Sent: 13 October 2020 11:45
To: Stone, Rebecca A (Research Student) <180185391@aston.ac.uk>
Cc: Wood, Amanda <a.wood4@aston.ac.uk>; Foley, Elaine <e.foley@aston.ac.uk>; Woodhall, Gavin <g.l.woodhall@aston.ac.uk>; Worthen, Sian <s.f.worthen@aston.ac.uk>; Wang, Hongfang <h.wang26@aston.ac.uk>; Burgess, Adrian <A.P.BURGESS@aston.ac.uk>; Farrow, Claire <c.farrow@aston.ac.uk>; Blissett, Jacqueline <j.blissett1@aston.ac.uk>; Seri, Stefano <s.seri@aston.ac.uk>; ABC Admin <abc_admin@aston.ac.uk>; Woodhall, Karen <K.A.Woodhall@aston.ac.uk>
Subject: Project: The development of early emotional eating

Dear Rebecca
Thank you again for your very clear and articulate project presentation and we are happy for the project to move forward. ABC admin could you please allocate a project number for booking? (Thanks!)

There were some questions raised about access to PCs outside the observation lab, when the lab is in use by other projects. We understand that this would require specific software to be installed on one of these machines, e.g. in the analysis suite. If this comes to pass please contact Sian Worthen for arrangements.

Best wishes and good luck with your research,

Klaus (on behalf of PAC)

Klaus Kessler (Professor of Cognitive Neuroscience)
https://www2.aston.ac.uk/lhs/staff/az-index/prof-klaus-kessler Aston Brain Centre (ABC), Aston Laboratories for Immersive Virtual Environments (ALIVE)
School of Life and Health Sciences, Psychology, Aston University, Aston Triangle Birmingham, B4 7ET, Phone: +44 (0)121 204 3187

Appendix C-1: Chapter 2 and Chapter 3 - Participant information sheet

Aston University

Emotion regulation and emotional eating in children

Participant Information Sheet

Invitation
I would like to invite you to take part in a research study. Please take time to read the following information carefully and, if you wish, discuss it with others. Please contact Rebecca Stone or Claire Farrow (whose details are below) if anything is not clear or you would like more information.

What is the purpose of the study?

This study seeks to understand why some children emotionally overeat and the factors that predict a greater prevalence of emotional eating. The study explores how child factors (such as temperament and emotion regulation) and parent factors (such as feeding practices, parent emotion regulation and parental emotional eating) influence a child's emotional eating.

Why have I been chosen?

You are being invited to take part in this study because you are a parent of a child aged 3-5 years of age. You need to be able to read and write in English to understand the questionnaire.

What will happen to me if I take part?

If you do decide to take part, you will be asked to complete an online consent form and then generate your own identifying code which is unique to you (e.g., BLOGGS95). Please quote this in any future correspondence regarding your data or to withdraw from the study. Then you will complete the online questionnaire which takes around 15 minutes to complete. The questionnaire will ask questions about you and your child's demographics and your child's temperament, emotion regulation abilities, and emotional eating tendencies and will ask questions about your own parental feeding practices, emotion regulation abilities and emotional eating tendencies.

Do I have to take part?
No. It is up to you to decide whether or not you wish to take part.
If you do decide to participate, even if you agree to take part you can stop taking part at any time without giving a reason. If you change your mind and want to withdraw your data from the study at a later date you can do so up to 1 week after taking part; please email Rebecca Stone (contact details below) quoting your identification number which you chose at the beginning of the study if you wish to do this.

Will my taking part in this study be kept confidential?
Yes. A code of your choice will be attached to your data (this is entered by yourself at the start of the study) so that no one can tell who has taken part**.** Please make a note of this for your own records should you need to contact us to withdraw Analysis of your data will be undertaken using coded data. The data we collect will be stored electronically on a secure password protected computer server or secure cloud storage device.

What are the possible benefits of taking part?
While there are no direct benefits to you of taking part in this study, the data gained will be used to inform research about the development of emotional eating in children. In future these findings can be used to develop advice for families and children to help prevent emotional eating. If you decide to take part in this study you have the opportunity to enter your email address into a competition to with £50 worth of Amazon vouchers.

What are the possible risks and burdens of taking part?

There are no risks to taking part, but the questionnaires do include questions about your own eating behavior and your child's eating behavior. If these questionnaires raises any concerns about feeding or eating there are some useful online resources that you might be interested in looking at, for example: **Beat (18+) Eating Disorders Charity**, **Helpline:** 0808 801 0677, weblink: https://www.beateatingdisorders.org.uk/ and **The Child Feeding Guide** for advice and support about child eating behaviour, weblink: https://www.childfeedingguide.co.uk/

What will happen to the results of the study?
The results of this study may be published in scientific journals and/or presented at conferences. If the results of the study are published, no names will be used and your identity will remain confidential.

A lay summary of the results of the study will be available, if you would like to receive a copy please email Rebecca Stone (contact details are below). The results of the study will also be used in Rebecca Stone's PhD thesis in order for her to obtain novel data that will contribute to the global understanding of the development of obesity.

Who is funding, organising, acting as data controller and reviewing the study?
The study is being funded by Aston University as part of a funded PhD. Aston University is organising this study and acting as data controller for the study. You can find out more about how we use your information in this transparency statement, please click here to read more [on Qualtrics a new window will open with the transparency statement, Appendix A, if participants wish to read this]. This study was given a favorable ethical opinion by the Life and Health Sciences Research Ethics Committee at Aston University.

What if I have a concern about my participation in the study?
If you have any concerns about your participation in this study, please speak to Rebecca Stone (180185391@aston.ac.uk) or the research supervisor; Professor Claire Farrow (c.farrow@aston.ac.uk). If they are unable to address your concerns or you wish to make a complaint about how the study is being conducted you should contact the Aston University Director of Governance, Mr. John Walter, j.g.walter@aston.ac.uk or telephone 0121 204 4869.

Thank you for taking time to read this information sheet

Rebecca Ann Stone

Aston University

[redacted]@aston.ac.uk

Appendix C-2: Chapter 2 and Chapter 3 - Consent form

Emotion regulation and emotional eating in children

Consent Form

Project Supervisor: Prof Claire Farrow **PhD Student: Rebecca Ann Stone**

Please initial boxes

	I confirm that I have read and understand the Participant Information Sheet (V1, 10/09/19) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
	I understand that my participation is voluntary and that I am free to withdraw at any time. I can also withdraw my data up to one week after completing the study without giving any reason and without my legal rights being affected.	
	I understand that I need to generate (and remember) my own identifying code at the beginning of the study. Should I want to withdraw from the study I should quote this code in all correspondence. Example code: BLOGGS95).	
	I agree to my personal data and data relating to me collected during the study being processed as described in the Participant Information Sheet.	
	I agree to take part in this study.	

Appendix C-3: Chapter 4 - Participant information sheet

PARENT INFORMATION SHEET

Aston University

Online Childhood Mood and Appetite Study

Rebecca Stone, Professor Claire Farrow, and Professor Jacqueline Blissett

College of Health and Life Sciences, Department of Psychology

Dear Parent/Caregiver,

You and your 6-8-year-old child are invited to take part in a research study examining the relationship between appetite and mood in children. We are interested in how your child feels when watching different videos and the impact this mood has on their food choices. If you are interested in taking part in this study, please read on.

What does the study involve?

Your role in the study: We would like you to complete some questionnaires online asking questions about your attitudes towards food and eating, as well as the practices that you use when feeding and parenting your child. The questionnaire also asks about your child's eating behaviours and their temperament. After you have finished the study, we will send you a completion email asking for a brief video or audio recording of what your child thought of the video - this only needs to be very short (ideally less than 1 minute).

Your child's role in the study: Your child will be asked to watch a short video clip from either Disney's "The Lion King" where Simba mourns the death of his father/ Disney's "The Little Mermaid" where Sebastian sings 'under the sea'/or a video clip of a bathroom tap dripping water. Please explain to your child that they will be asked to watch a video clip and then answer some questions. Please also remind them that they can stop at any time if they want to. It is best that you sit with your child or be nearby whilst they complete the tasks. Your child will be asked to show how they are feeling before and after the video using a smiley-face rating scale on the screen. Then, they will be shown some pictures of different foods on the screen and asked to choose which ones they would like to eat and how much they would like to eat if they could. Please do let them choose what they want from the pictures, even if this is not what you would want them to eat.

Can my child and I take part?
You can take part if you are a parent or caregiver and your child is aged 6-8 years old and you are using a computer or a tablet. You and your child will need to understand English so that you can complete the questionnaires and your child can understand the video. You will also need to have audio on your device so that your child can watch the video. Although we are not using real foods, we ask that you do not take part if your child cannot eat the following foods: chocolate buttons, ready salted crisps, gummy bears or carrot sticks, because we are using images of these foods in the study.

Will my taking part in this study be kept confidential?
Yes. All the information you and your child provide is anonymous and confidential. If you do decide to take part, you will be asked to make your own identifying code that is unique to you (e.g. BLOGGS95). Please quote this in any future correspondence regarding your data or to withdraw from the study. We will also ask for your email address so that we can contact you for your child's video/audio clip and send you a digital amazon voucher. Your email address will be deleted as soon as you have been paid and your video/audio clip has been renamed with your unique ID. The video/audio clip will be sent to a secure email address that automatically uploads to a secure cloud storage device where only the researchers will have access. The questionnaire data we collect will be stored electronically on a secure password protected computer server or secure cloud storage device. The data will be analysed and written up as a group so no individual can be identified and no one will know who participated in the study.

Do I have to take part?
No. Your participation in this study is voluntary and you are under no obligation to take part. You and your child are both free to withdraw from this study up to 7 days after you complete the study, and there is no penalty if you decide to do so.

What are the possible benefits of taking part?
Whilst there are no immediate benefits to you for taking part, we hope that the research will inform our understanding of how children's eating behaviour develops in the future.

Do I get paid for participating?

Yes, all participants will be emailed a £7 digital amazon voucher (one voucher per email address) so long as the following conditions are met:

1. All videos have been watched to the end
2. All attention checks have been accurately answered in the questionnaires
3. A short video or audio clip of your child's thoughts about the video has been emailed in reply to the researcher's completion email (you will receive guidance on how to do this on the completion email).

What will happen to the results of the study?
The results of this study may be published in scientific journals and/or presented at conferences. The results of the study will also be used in Rebecca Stone's PhD thesis. No names will be used and your identity will remain confidential. If you would like to receive a summary of the results, please email Rebecca Stone: 180185391@aston.ac.uk

Who is funding, organising, acting as data controller and reviewing the study?
The study is being funded by Aston University as part of a PhD. Aston University is

organising this study and acting as data controller for the study. You can find out about how we use your information in Aston's transparency statement. This study was given a favourable ethical opinion by Aston University Research Ethics Committee.

What if I have a concern about my participation in the study?
If you have any concerns about your participation in the study, please speak to the research team and they will do their best to answer your questions (contact details below). If the research team are unable to address your concerns or you wish to make a complaint about how the study is being conducted, you should contact the Aston University Research Integrity Office at research_governance@aston.ac.uk or telephone 0121 204 3000.

Research Team:

- Rebecca Stone ([redacted]aston.ac.uk)
- Professor Claire Farrow (c.farrow@aston.ac.uk)
- Professor Jacqueline Blissett (j.blissett1@aston.ac.uk)

In addition, some of the questions in this study might raise issues that you need to discuss further. If taking part raises any concerns about your child's eating behaviour, you may find it helpful to look at the Child Feeding Guide for advice.

What to do now?
The study takes about 15 minutes for your child to complete and then 25 minutes for the remaining parent questionnaires. When you are helping your child take part, please do that part of the study shortly after your child has had a meal (within 90 minutes of eating ideally), so that we know that they are not hungry when they take part. If you are happy to take part please tick the consent questions below and then you can start.

Many thanks for your help with this study.

Rebecca Stone, PhD Student ([redacted]@aston.ac.uk)

Appendix C-4: Chapter 4 - Consent form

Online Childhood Mood and Appetite Study

Consent Form

Project Supervisor: Professor Claire Farrow **PhD Student: Rebecca Ann Stone**

Please click

1.	I confirm that I have read and understand the Participant Information Sheet (V1, 23/09/2020) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	**Yes**	**No**
2.	I understand that both my child and my own participation is voluntary and that we are free to stop taking part at any time. After completing the study, I understand that my child and I can withdraw our data within 7 days from the date we completed the study. To do this I should contact Rebecca Stone using her email: 180185391@aston.ac.uk quoting my unique ID that I will create at the start of this study.	**Yes**	**No**
3.	I understand that I will generate my own unique ID at the beginning of the study. Should I want to withdraw from the study, I should quote this ID in all correspondence. Example code: BLOGGS95	**Yes**	**No**
4.	I understand that to receive participant payment, I must pass the quality checks listed on the Participant Information Sheet (V2, 01/12/2020), and send a brief video or audio recording of my child talking about his/her experience of the videos used in the study. I will send this video/audio recording in reply to the email address used to contact me after submitting my response.	**Yes**	**No**
5.	I agree to both mine and my child's personal data and data relating to me or my child collected during the study being processed as described in the Participant Information Sheet.	**Yes**	**No**
6.	I agree to take part in this study.	**Yes**	**No**
7.	I agree to my child taking part in this study.	**Yes**	**No**

Appendix C-5: Chapter 5 and Chapter 6 - Participant information sheet

PARENT INFORMATION SHEET

Aston University

Childhood Mood and Appetite Study

Rebecca Stone, Professor Claire Farrow and Professor Jacqueline Blissett

School Life and Health Sciences, Department of Psychology

Dear Parent/Caregiver,

You and your 4-5-year-old child are invited to take part in a research study examining the relationship between appetite and mood in children. If you are interested in taking part in this study, please read on.

What does the study involve?

Your role in the study: Upon arrival at the Aston Brain Centre, you and your child will begin by playing with some toys to familiarise your child with his/her new surroundings. We will then provide you and your child with a prepared lunch or dinner. The whole study takes approximately 90 minutes. After your meal, you will be asked to fill in a questionnaire about yourself and your child. The questionnaire asks about your demographics, attitudes towards food and eating as well as the practices that you use when feeding and parenting your child. It also asks about your child's eating behaviours and temperament. You will also be asked if you and your child are willing to be video recorded during the session, and if you and your child are willing to be weighed and measured as part of this study.

Your child's role in the study: Your child will be asked to complete some simple tasks to look at their behaviour (e.g., asking them to trace around a circle, choosing stickers and following computer instructions). As well as this, your child will be given free access to a range of foods following a mild mood-inducing technique (e.g., playing with a jigsaw with a piece missing or being asked to 'sit and wait') which will be carried out by one of the researchers. These tasks are similar to everyday activities that your child would normally engage in. Your child will be asked to indicate how they are feeling before and after the event using a smiley-face rating scale. The researchers will ensure that your child's mood rating is as positive at the end of the study (and hopefully more positive) than it was at the start. Your child will be given a small toy to take home as part of the study.

Can my child and I take part?

You and your child can only take part in this study if you are not vegan and have no known allergies or intolerances to: gluten, dairy or nuts. This is because the meal and snack foods are provided and so you will be asked to eat some of these foods with your child. You and your child must also be fluent in English and your child must be 4-5 years old. Because the study involves the child taking part in a mealtime, this study is not suitable for children who

have medical conditions that impact their eating behaviour (e.g. chron's disease, autism, type 1 diabetes, cystic fibrosis).

Will my taking part in this study be kept confidential?

Yes. All the information you and your child provide is anonymous and confidential. The consent forms will be kept separately from the questionnaire and the video tapes. An identifier code will be used to link your questionnaire responses with the recordings from the observations. Only the researchers will have access to these and the data we collect will be stored electronically on a secure password protected computer server or secure cloud storage device. If you consent to be contacted for future studies, your identifier number will be attached to your contact detail and stored securely on a password-protected computer. The data will be analysed and written up as a group so no individual can be identified and no one will know who participated in the study.

Do I have to take part?

No. Your participation in this study is voluntary and you are under no obligation to take part. You and your child are both free to withdraw from this study up to 7 days after you completed the study, and there is no penalty if you decide to do so.
If you are willing to take part in all or some of this study, please inform the researcher and sign the relevant consent form(s).

What are the possible benefits of taking part?

Whilst there are no immediate benefits to you for taking part, we hope that the research will inform our understanding of how children's eating behavior develops in the future. All participants will be given a £30 Amazon voucher in recognition of the time needed to travel and take part in the study.

What will happen to the results of the study?

The results of this study may be published in scientific journals and/or presented at conferences. The results of the study will also be used in Rebecca Stone's PhD thesis. No names will be used and your identity will remain confidential. If you would like to receive a summary of the results, please email Rebecca Stone (contact details are below).

Who is funding, organising, acting as data controller and reviewing the study?

The study is being funded by Aston University as part of a PhD. Aston University is organising this study and acting as data controller for the study. You can find out about how we use your information in the transparency statement in Appendix A. This study was given a favorable ethical opinion by the Life and Health Sciences Research Ethics Committee at Aston University.

What if I have a concern about my participation in the study?

If you have any concerns about your participation in this study, please speak to the research team and they will do their best to answer your questions (contact details below). If the research team are unable to address your concerns or you wish to make a complaint about how the study is being conducted you should contact the Aston University Research Integrity Office at research_governance@aston.ac.uk or telephone 0121 204 3000.

Research Team:

- Rebecca Stone ([redacted]@aston.ac.uk)
- Professor Claire Farrow (c.farrow@aston.ac.uk)
- Professor Jacqueline Blissett (j.blissett1@aston.ac.uk)

Additionally, some of the questions may raise issues that you need to discuss further. If you have concerns following the study please feel free to contact one of the researchers (contact details above) or you may prefer to contact one of the following:

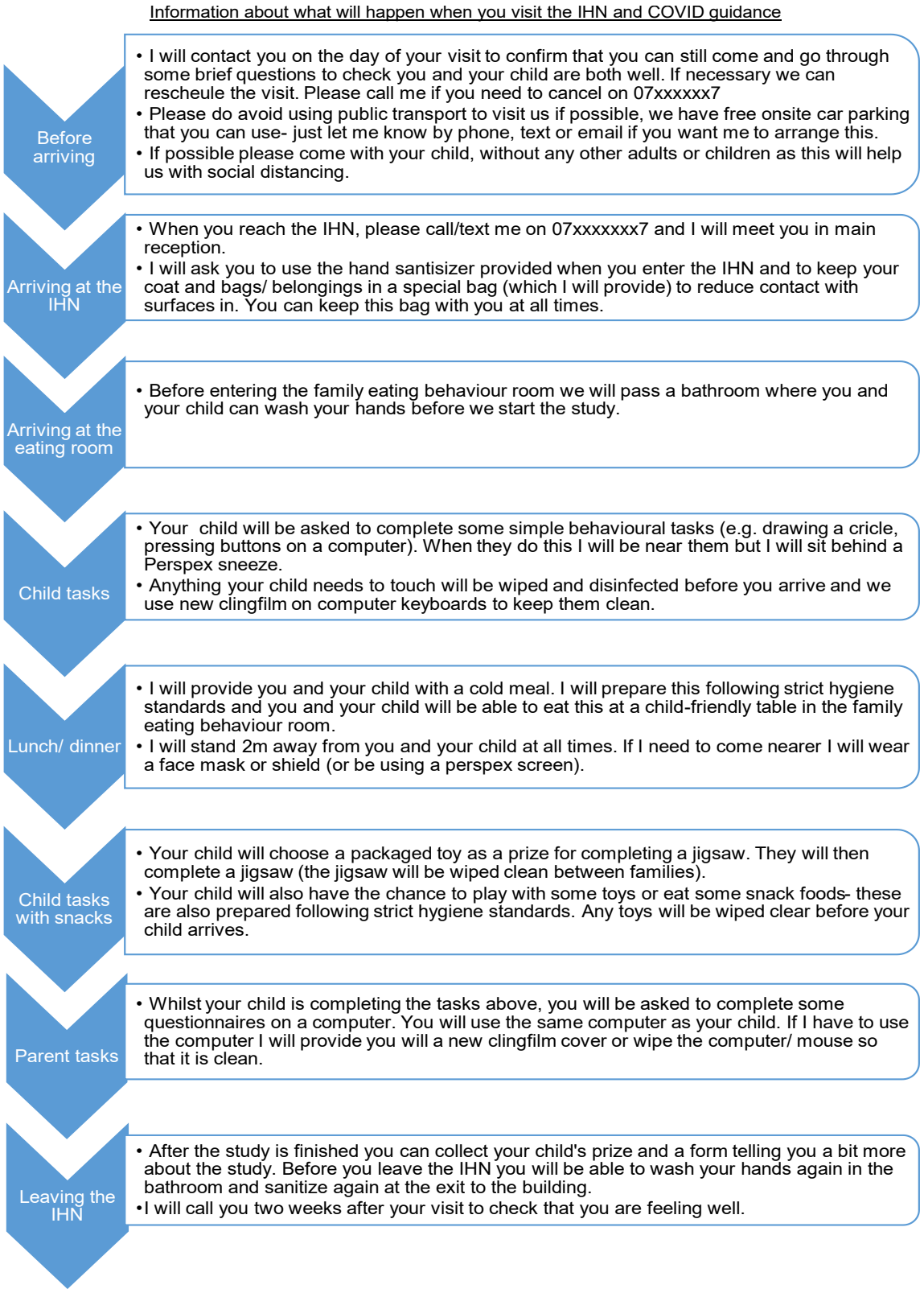
- Your G.P.
- BEAT (for concerns about eating disorders) - Tel: 0845 634 1414
- Family Lives (a free national helpline for parents and step-parents) - https://www.familylives.org.uk/

Many thanks for your help with this study.

Rebecca Stone, PhD Student
[redacted]@aston.ac.uk

Please keep this information sheet and keep for your records

Appendix C-6: Chapter 5 and Chapter 6 - COVID procedure given to parents



Appendix C-7: Chapter 5 and Chapter 6 - Consent form

Childhood Mood and Appetite Study

Consent Form

Project Supervisor: Professor Claire Farrow **PhD Student: Rebecca Ann Stone**

Please initial boxes

1.	I confirm that I have read and understand the Participant Information Sheet (V3, 20/04/2021) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
2.	I understand that both my child and my own participation is voluntary and that we are free to stop taking part at any time. After completing the study, I understand that my child and I can withdraw our data within 7 days from the date we completed the study. To do this I should contact Rebecca Stone using details provided on the Participant Information Sheet.	
3.	I agree to the study being audio and video recorded and anonymised data being used in publications that may result from the study.	
4.	I confirm that my child and I are not vegan and have no known allergies or intolerances to the food provided in this study.	
5.	I am happy for my child and I to be weighed and measured as part of this study (I understand this is optional).	
6.	I agree to both mine and my child's personal data and data relating to me or my child collected during the study being processed as described in the Participant Information Sheet.	
7.	I agree to take part in this study.	
8.	I agree to my child taking part in this study.	

Appendix C-8: Chapter 5 and Chapter 6 - Consent form (imagery)

Research investigating "Mealtime interactions between parents and young children"

Researcher: Rebecca Stone

Supervisor: Professor Claire Farrow

I consent for images, videos and audio recordings taken of my child (participant number …) taken on … during the video recording of the Research investigating mealtime interaction between parents and young children to be used EXCLUSIVELY for research purposes which may include presentations to academic audiences**.**

Signed

---------- (Parent/guardian)

----------(Date)

Appendix D: Questionnaires and measures

Appendix D-1: Chapter 2 and Chapter 3 - Demographic questionnaire

1) Please fill in the appropriate information for yourself.

Age:	_____ (years)		Gender:	_____ (m/f)
Height:	_____ (cm)	OR	Height:	_____ (inches)
Weight	___,__ (lbs, St)	OR	Weight:	_____ (Kg)

2) Which option best describes your ethnic group or background? Please SELECT one option:

White:

1. English / Welsh / Scottish / Northern Irish / British
2. Irish
3. Gypsy or Irish Traveller
4. Any other White background, please describe

Mixed / Multiple ethnic groups:

5. White and Black Caribbean
6. White and Black African
7. White and Asian
8. Any other Mixed / Multiple ethnic background, please describe

Asian / Asian British:

9. Indian
10. Pakistani
11. Bangladeshi
12. Chinese
13. Any other Asian background, please describe:

Black / African / Caribbean / Black British:

14. African
15. Caribbean
16. Any other Black / African / Caribbean background, please describe

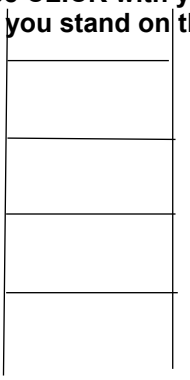
Other ethnic group:

17. Arab

18. Any other ethnic group, please describe:

3) At the top of the ladder are the people who are the best off, those who have the most money, most education, and best jobs. At the bottom are the people who are the worst off, those who have the least money, least education, worst jobs, or no job.

Please CLICK with your mousepad on the ladder the rung which best represents where you think you stand on the ladder.



4) What is your highest level of education? Please SELECT one option:

1. High school
2. Sixth Form
3. Undergraduate Degree
4. Postgraduate Education
5. Other, please specify _____

6) Please fill in the appropriate information for your child. If more than one child, please use eldest child to answer (between 3-5years). Please write 'N/A' if you are unsure of your child's height or weight.

Age:	___,___ (years, months)		Gender:	_____ (m/f)
Height:	_____ (cm)	OR	Height:	_____ (inches)
Weight	___,___ (lbs, St)	OR	Weight:	_____ (Kg)

7) How many children do you have? Please TYPE in the box below.

☐ Children

8) On average, how often are you with your child when he/she eats per week at any meal? Please SELECT one answer.

1. I'm never with my child when he/she eats
2. I'm rarely with my child when he/she eats
3. I'm with my child for half of the meals he/she eats
4. I'm mostly with my child when he/she eats
5. I'm always with my child when he/she eats

Appendix D-2: Chapter 4 - Demographic questionnaire

1) What is your **child's** date of birth? Please SELECT from the dropdown menus:

	Month	Year
Please Select:	▼ January (1 ... December (12)	▼ 1900 (1 ... 2049 (2049)

2) What is your **child's** sex? Please SELECT from below:
   - ❍ Male
   - ❍ Female

3) What is your date of birth? Please SELECT from the dropdown menus:

	Month	Year
Please Select:	▼ January (1 ... December (12)	▼ 1900 (1 ... 2049 (2049)

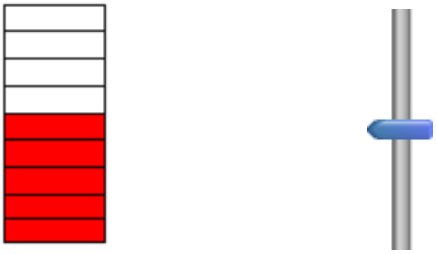
4) What is **your** sex? Please SELECT an option below.
   - ❍ Male
   - ❍ Female

5) Which option best describes your ethnic group or background? Please SELECT an option below.
   - ❍ English/ Welsh/ Scottish/ Northern Irish/ British
   - ❍ Irish
   - ❍ Gypsy or Irish Traveller
   - ❍ White and Black Caribbean
   - ❍ White and Black African
   - ❍ White and Asian
   - ❍ African
   - ❍ Caribbean
   - ❍ Arab
   - ❍ Other, please state: _____
   - ❍ Indian

- ❍ Pakistani
- ❍ Bangladeshi
- ❍ Chinese

6) At the top of the ladder are the people who are the best off, those who have the most money, most education, and best jobs. At the bottom are the people who are the worst off, those who have the least money, least education, worst jobs, or no job.

Please SELECT and DRAG the slider with your mousepad to the ladder rung which best represents where you think you stand on the ladder.



7) What is your highest level of education? Please SELECT an option below.

- ❍ High School
- ❍ Sixth Form
- ❍ Undergraduate Degree
- ❍ Postgraduate Degree
- ❍ Other, please specify: _____

8) Children How many children do you have? Please SELECT from the dropdown menu:

Number of children:

▼ 1 (1) ... 11+ (11)

9) Thinking about the average week, how often are you usually with your child when s/he eats meals? Please SELECT an option below.

- ❍ I'm **never** with my child when he/she eats
- ❍ I'm **rarely** with my child when he/she eats
- ❍ I'm with my child for **half** of the meals he/she eats
- ❍ I'm **mostly** with my child when he/she eats
- ❍ I'm **always** with my child when he/she eats

10) Has your child watched Disney's *"The Lion King"* before? Please SELECT an option below.

- ❍ Yes
- ❍ No
- ❍ Don't know

11) Has your child watched Disney's *"The Little Mermaid"* before? Please SELECT an option below.

- ❍ Yes
- ❍ No
- ❍ Don't know

12) Please select your **child's** height from the dropdown menu below (feet and inches / centimeters).
If you are unsure of your height, please select the nearest value.

▼ 2' 5" (feet and inches) / 74 (centimeters) (.74) ... 5' 0" (feet and inches) / 152 (centimeters) (1.52)

13) If none of these are appropriate, please enter your child's height into the text box below (stating the units of measurement, e.g., feet and inches or centimeters):

_____

14) Please select your **child's** weight from the dropdown menu below (stones and pounds / kilograms).
If you are unsure of your weight, please select the nearest value.

▼ 1st 8lb / 10 (Kg) (10) ... 7st 12lb / 50 (Kg) (50)

15) If none of these are appropriate, please enter your child's weight into the text box below (stating the units of measurement, e.g., feet and inches or centimeters).

_____

16) Please select your **height** from the dropdown menu below (feet and inches / centimetres).
If you are unsure of your height, please select the nearest value.

▼ 3' 0" (feet and inches) / 91 (centimeters) (.91) ... 6' 11" (feet and inches) / 211 (centimeters) (2.11)

17) If none of these are appropriate, please enter your height into the text box below (stating the units of measurement, e.g., feet and inches or centimeters):

_____

18) Parent weight Please select your **weight** from the dropdown menu below (stones and pounds / kilograms).
If you are unsure of your weight, please select the nearest value.

▼ 6st 4.2lb / 40 (Kg) (40) ... 31st 6.9lb / 200 (Kg) (200)

19) If none of these are appropriate, please enter your weight into the text box below (stating the units of measurement, e.g., feet and inches or centimeters)

_____

Appendix D-3: Chapter 5 and Chapter 6 - Demographic questionnaire

1) What is your **child's** date of birth? Please SELECT from the dropdown menus:

	Month	Year
Please Select:	▼ January (1 ... December (12)	▼ 1900 (1 ... 2049 (2049)

2) What is your **child's** sex? Please SELECT from below:
   - ❍ Male
   - ❍ Female

3) What is your date of birth? Please SELECT from the dropdown menus:

	Month	Year
Please Select:	▼ January (1 ... December (12)	▼ 1900 (1 ... 2049 (2049)

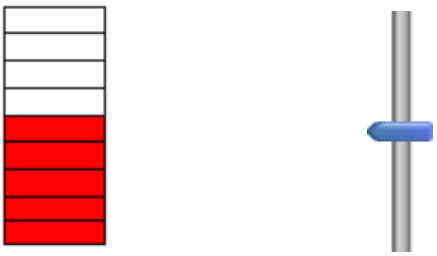
4) What is **your** sex? Please SELECT an option below.
   - ❍ Male
   - ❍ Female

5) Which option best describes your ethnic group or background? Please SELECT an option below.
   - ❍ English/ Welsh/ Scottish/ Northern Irish/ British
   - ❍ Irish
   - ❍ Gypsy or Irish Traveller
   - ❍ White and Black Caribbean
   - ❍ White and Black African
   - ❍ White and Asian
   - ❍ African
   - ❍ Caribbean
   - ❍ Arab
   - ❍ Other, please state: _____
   - ❍ Indian
   - ❍ Pakistani

- ❍ Bangladeshi
- ❍ Chinese

6) At the top of the ladder are the people who are the best off, those who have the most money, most education, and best jobs. At the bottom are the people who are the worst off, those who have the least money, least education, worst jobs, or no job.

Please SELECT and DRAG the slider with your mousepad to the ladder rung which best represents where you think you stand on the ladder.



7) What is your highest level of education? Please SELECT an option below.

- ❍ High School
- ❍ Sixth Form
- ❍ Undergraduate Degree
- ❍ Postgraduate Degree
- ❍ Other, please specify: _____

8) Children How many children do you have? Please SELECT from the dropdown menu:

Number of children:

▼ 1 (1) ... 11+ (11)

9) Please select your **height** from the dropdown menu below (feet and inches / centimetres).
If you are unsure of your height, please select the nearest value.

▼ 3' 0" (feet and inches) / 91 (centimeters) (.91) ... 6' 11" (feet and inches) / 211 (centimeters) (2.11)

10) If none of these are appropriate, please enter your height into the text box below (stating the units of measurement, e.g., feet and inches or centimeters):

_____

11) Parent weight Please select your **weight** from the dropdown menu below (stones and pounds / kilograms).
If you are unsure of your weight, please select the nearest value.

▼ 6st 4.2lb / 40 (Kg) (40) ... 31st 6.9lb / 200 (Kg) (200)

12) If none of these are appropriate, please enter your weight into the text box below (stating the units of measurement, e.g., feet and inches or centimeters)

_____

Appendix D-4: The Comprehensive Feeding Practices Questionnaire (CFPQ) (Musher-Eizenman & Holub, 2007)

Please answer **ALL** questions. **TICK** the box by clicking with your mousepad. Tick the box relevant to your child and your parenting.

		Never	**Rarely**	**Sometimes**	**Mostly**	**Always**
1.	When your child gets fussy, is giving him/her something to eat or drink the first thing you do?					
2.	Do you give your child something to eat/drink if s/he is bored even if you think s/he is not hungry?					
3.	Do you give your child something to eat/drink if s/he is upset even if you think s/he is not hungry?					
		Disagree	**Strongly Disagree**	**Neutral**	**Slightly Agree**	**Agree**
4.	I have to be sure my child does not eat too many high-fat foods					
5.	I offer my child his/her favourite foods in exchange for good behaviour					
6.	If I did not guide or regulate my child's eating, s/he would eat too much of his/her favourite foods.					
7.	I offer sweets (sweets, ice-cream, cakes, pies) to my child as a reward for good behaviour.					
8.	I encourage my child to eat less so he/she won't get fat.					
9.	If I did not guide or regulate my child's eating, he/she would eat too many junk foods					
10.	If my child eats more than usual at one meal, I try to restrict his/her eating at the next meal.					
11.	I restrict the food my child eats that might make him/her fat					

12.	There are certain foods my child shouldn't eat because they will make him/her fat					
13.	I withhold sweets/dessert from my child in response to bad behaviour.					
14.	I give my child small helpings at meals to control his/her weight.					
15.	I have to be sure my child does not eat too much of his/her favourite foods.					
16.	I don't allow my child to eat between meals because I don't want him/her to get fat.					
17.	I have to be sure that my child does not eat too many sweets (sweets, ice cream, cakes or pastries).					
18.	I often put my child on a diet to control his/her weight.					

Appendix D-5: The Dutch Eating Behaviour Questionnaire (DEBQ; van Strien et al., 1986)

Please answer **ALL** questions. **TICK** the box by clicking with your mousepad. Tick the box relevant to your eating behaviour.

		Not Relevant	Never	Seldom	Sometimes	Often	Very Often
1.	When you have put on weight do you eat less than you usually do?						
2.	Do you try to eat less at mealtimes than you would like to eat?						
3.	How often do you refuse food or drink offered to you because you are concerned about your weight?						
4.	Do you watch exactly what you eat?						
5.	Do you deliberately eat foods that are slimming?						
6.	When you have eaten too much, do you eat less than usual the following day?						
7.	Do you deliberately eat less in order not to become heavier?						
8.	How often do you try not to eat between meals because you are watching your weight?						
9.	How often in the evenings do you try not to eat because you are watching your weight?						
10.	Do you take your weight into account with what you eat?						
11.	Do you have a desire to eat when you are irritated?						
12.	Do you have a desire to eat when you have nothing to do?						
13.	Do you have a desire to eat when you are depressed or discouraged?						

14.	Do you have a desire to eat when you are feeling lonely?						
		Not Relevant	**Never**	**Seldom**	**Sometimes**	**Often**	**Very Often**
15.	Do you have a desire to eat when you somebody lets you down?						
16.	Do you have a desire to eat when you are cross?						
17.	Do you have a desire to eat when you are something unpleasant is about to happen?						
18.	Do you get the desire to eat when you are anxious, worried or tense?						
19.	Do you have a desire to eat when things are going against you and when things have gone wrong?						
20.	Do you have a desire to eat when you are frightened?						
21.	Do you have a desire to eat when you are disappointed?						
22.	Do you have a desire to eat when you are emotionally upset?						
23.	Do you have a desire to eat when you are bored or restless?						

Appendix D-6: The Children's Behaviour Questionnaire – Very Short Form (CBQ-VSF; Putnam & Rothbart, 2006)

Please read each statement and decide whether it is a "**true**" or "**untrue**" description of your child's reaction within the past **six** months to a situation.

Please answer **ALL** questions. **TICK** the box by clicking with your mousepad.

If you cannot answer one of the items because you have never seen your child in that situation then tick **NA** (not applicable).

		Extremely Untrue	**Quite Untrue**	**Slightly Untrue**	**Neither True not Untrue**	**Slightly True**	**Quite True**	**Extremely True**	**NA**
1.	Seems always in a big hurry to get from one place to another								
2.	Gets quite frustrated when prevented from doing something s/he wants to do								
3.	When drawing or colouring in a book, shows strong concentration								
4.	Likes going down high slides or other adventurous activities								
5.	Is quite upset by a little cut or bruise								
6.	Prepares for trips and outings by planning things s/he will needs.								
7.	Often rushes into new situations								

8.	Tends to become sad if the family's plans don't work out								
9.	Likes being sung to								
		Extremely Untrue	**Quite Untrue**	**Slightly Untrue**	**Neither True not Untrue**	**Slightly True**	**Quite True**	**Extremely True**	**NA**
10.	Seems to be at ease with almost any person								
11.	Is afraid of burglars or the "boogie man".								
12.	Notices it when parents are wearing new clothing.								
13.	Prefers quiet activities to active games.								
14.	When angry about something, s/he tends to stay upset for ten minutes or longer								
15.	When building or putting something together, becomes involved in what s/he is doing, and works for long periods								
16.	Likes to go high and fast when pushed on a swing								

17.	Seems to feel depressed when unable to accomplish some task								
18.	Is good at following instructions								
19.	Takes a long time in approaching new situations								
20.	Hardly ever complains when ill with a cold								
		Extremely Untrue	**Quite Untrue**	**Slightly Untrue**	**Neither True not Untrue**	**Slightly True**	**Quite True**	**Extremely True**	**NA**
21.	Likes the sounds of words, such as nursery rhymes								
22.	Is sometimes shy even around people s/he has known a long time								
23.	Is very difficult to soothe when s/he has become upset								
24.	Is quickly aware of some new item in the living room								
25.	Is full of energy, even in the evening								
26.	Is not afraid of the dark								
27.	Sometimes becomes absorbed in a picture book and looks at it for a long time								
28.	Likes rough and rowdy games								

29.	Is not very upset at minor cuts or bruises								
30.	Approaches places s/he has been told are dangerous slowly and cautiously								
31.	Is slow and unhurried in deciding what to do next.								
32.	Gets angry when s/he can't find something s/he wants to play with								
33.	Enjoys gentle rhythmic activities such as rocking or swaying								
		Extremely Untrue	**Quite Untrue**	**Slightly Untrue**	**Neither True not Untrue**	**Slightly True**	**Quite True**	**Extremely True**	**NA**
34.	Sometimes turns away shyly from new acquaintances								
35.	Becomes upset when loved relatives or friends are getting ready to leave following a visit								
36.	Comments when a parent has changed his/her appearance.								

Appendix D-7: Children's Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001)

Please answer **ALL** questions. **TICK** the box by clicking with your mousepad. Tick the box most appropriate to your child's eating behaviour.

		Never	**Rarely**	**Sometimes**	**Often**	**Always**
1.	My child loves food					
2.	My child eats more when worried					
3.	My child is interested in food					
4.	My child is always asking for a drink					
5.	My child eats less when angry					
6.	My child eats less when s/he is tired					
7.	My child is always asking for food					
8.	My child eats more when annoyed					
9.	If allowed to, my child would eat too much					
10.	My child eats more when anxious					
11.	Given the choice, my child would eat most of the time					
12.	My child looks forward to mealtimes					
13.	My child enjoys eating					
14.	My child eats more when she is happy					
15.	My child eats less when upset					
16.	My child eats more when s/he has nothing else to do					
17.	Even if my child is full up s/he finds room to eat his/her favourite food					
18.	If given the chance, my child would drink continuously throughout the day					

19.	If given the chance, my child would always be having a drink					
20.	If given the chance, my child would always have food in his/her mouth					

Appendix E: Additional tables and statistics

Appendix E-1: Chapter 2 - Moderated mediation analysis: non-significant models

Regression coefficients for *a, c', b_1, b_2* and *b_3* pathways of models of non-significant indices of moderated mediation.

		Food for Emotion Regulation (M)						Child EE (Y)				
Antecedent		*B*	*SE*	*t*	*p*	df		*B*	*SE*	*t*	*p*	df
Parent EE (X)	*a*	0.24	*0.05*	*5.23*	*<.001*	182	*c'*	0.09	*0.05*	*1.85*	*.065*	179
Food for Emotion Regulation (M)		-	-	-	-	-	b_1	0.37	*0.07*	*5.12*	*<.001*	179
Negative Affect (W)		-	-	-	-	-	b_2	0.16	*0.05*	*3.21*	*.002*	179
M x W		-	-	-	-	-	b_3	0.16	*0.06*	*2.63*	*.009*	179
		Index of moderated mediation: B = 0.04, *SE* = 0.03, 95% CI [-0.007, 0.091]										
Parent EE	*a*	0.24	*0.05*	*5.23*	*<.001*	182	*c'*	0.10	*0.05*	*2.05*	*.042*	179
Food for Emotion Regulation (M)		-	-	-	-	-	b_1	0.41	*0.07*	*5.74*	*<.001*	179
Surgency (W)		-	-	-	-	-	b_2	0.05	*0.05*	*0.11*	*.914*	179
M x W		-	-	-	-	-	b_3	0.15	*0.06*	*2.70*	*.008*	179
		Index of moderated mediation: B = 0.04, *SE* = 0.03, 95% CI [-0.022, 0.081]										
Parent EE	*a*	0.24	*0.05*	*5.23*	*<.001*	182	*c'*	0.13	*0.05*	*2.76*	*.006*	179
Food for Emotion Regulation (M)		-	-	-	-	-	b_1	0.41	*0.07*	*5.53*	*<.001*	179
Effortful Control (W)		-	-	-	-	-	b_2	-0.08	*0.07*	*-1.16*	*.248*	179
M x W		-	-	-	-	-	b_3	-0.16	*0.09*	*-1.86*	*.065*	179
		Index of moderated mediation: B = -0.04, *SE* = 0.04, 95% CI [-0.112, 0.020]										
		Food as a Reward (M)						Child EE (Y)				
Parent EE	***a***	0.24	*0.07*	*3.36*	*.001*	182	*c'*	0.18	*0.05*	*3.82*	*<.001*	179
Food as a Reward (M)		-	-	-	-	-	b_1	0.17	*0.05*	*3.59*	*<.001*	179
Surgency (W)		-	-	-	-	-	b_2	0.06	*0.05*	*1.21*	*.225*	179
M x W		-	-	-	-	-	b_3	0.10	*0.05*	*2.10*	*.036*	179
		Index of moderated mediation: B = 0.02, *SE* = 0.02, 95% CI [-0.013, 0.068]										

Parent EE	***a***	0.24	*0.07*	*3.36*	*<.001*	182	*c'*	0.19	*0.05*	*4.08*	*<.001*	179
Food as a Reward (M)		-	-	-	-	-	b_1	0.18	*0.05*	*3.80*	*<.001*	179
Effortful Control (W)		-	-	-	-	-	b_2	-0.14	*0.07*	*-2.03*	*.044*	179
M x W		-	-	-	-	-	b_3	-0.14	*0.06*	*-2.21*	*.028*	179
		Index of moderated mediation: B = -0.03, *SE* = 0.03, 95% CI [-0.091, 0.004]										
		Restriction for Health (M)						Child EE (Y)				
Parent EE	***a***	0.23	*0.06*	*4.17*	*<.001*	182	*c'*	0.13	*0.05*	*2.84*	*.005*	179
Restriction for Health (M)		-	-	-	-	-	b_1	0.32	*0.06*	*5.18*	*<.001*	179
Surgency (W)		-	-	-	-	-	b_2	0.02	*0.05*	*0.30*	*.762*	179
M x W		-	-	-	-	-	b_3	0.14	*0.05*	*2.84*	*.005*	179
		Index of moderated mediation: B = 0.03, *SE* = 0.02, 95% CI [-0.017, 0.078]										
Parent EE	*a*	0.23	*0.06*	*4.17*	*<.001*	182	*c'*	0.15	*0.05*	*3.29*	*.001*	179
Restriction for Health (M)		-	-	-	-	-	b_1	0.35	*0.06*	*5.78*	*.<.001*	179
Effortful Control (W)		-	-	-	-	-	b_2	-0.10	*0.06*	*-1.56*	*.120*	179
M x W		-	-	-	-	-	b_3	-0.15	*0.09*	*-1.08*	*.089*	179
		Index of moderated mediation: B = -0.04, *SE* = 0.04, 95% CI [-0.106, 0.039]										

X = antecedent variable, Y = dependent variable, M = mediator variable, W = moderator variable, *B* = unstandardized beta coefficient, *SE* = standard error, df = degrees of freedom.

Appendix E-2: Chapter 4 - One-way ANOVA exploring differences between mood conditions for any continuous parent or child demographic variables

Means (±*SD*) of parent and child continuous demographic variables between mood condition (N = 347)

Measure	Sadness (*n* = 123)	Control (*n* = 122)	Boredom (*n* =102)	F	*p*
Child Age (years)	7.08 (0.85)	7.07 (0.95)	7.02 (0.93)	.135	.873
Hunger Scale	2.91 (1.07)	2.84 (1.09)	3.06 (1.08)	1.13	.325
Child BMI z-score[a]	0.99 (1.88)	0.79 (1.93)	0.52 (2.21)	1.60	.204
Parent Age (years)	35.78 (5.26)	35.30 (4.68)	36.85 (5.20)	1.98	.052
Parent BMI[c]	28.99 (8.69)	28.32 (7.95)	27.03 (6.24)	1.77	.171
Number of Children	2.08 (1.00)	2.24 (1.17)	2.23 (1.17)	.734	.481
SSS[d]	5.07 (1.76)	5.16 (1.69)	5.27 (1.70)	.415	.661

[a] Sadness (*n* = 118), control (*n* = 117), boredom (*n* = 99). [b] sadness (*n* = 120), control (*n* = 115), boredom (*n* = 101), [c] MacArthur's Scale of Subjective Social Status (SSS).

Appendix E-3: Chapter 4 - Chi-squared tests exploring differences between mood conditions for any categorical parent or child demographic variables

Child variables:

- Child sex did not differ significantly between conditions ($X^2(2, N = 347) = 5.17$, $p = .076$).
- Whether the child had watched Disney's "*The Lion King*" before did not differ significantly between conditions ($X^2(3, N = 347) = 6.83$, $p = .145$).
- Whether the child had watched Disney's "*The Little Mermaid*" before did not differ significantly between conditions ($X^2(3, N = 347) = 6.27$, $p = .180$).

Parent variables:

- Parent sex did not differ significantly between conditions ($X^2(2, N = 347) = 1.33$, $p = .515$).
- Parent education did not differ significantly between conditions ($X^2(6, N = 347) = 3.70$, $p = .717$).
- Parent ethnicity did not differ significantly between conditions ($X^2(30, N = 347) = 26.43$, $p = .653$).

Appendix E-4: Chapter 5 - One-way ANOVA exploring differences between mood conditions for any continuous parent or child demographic variables

Means (±*SD*) of parent and child continuous demographic variables between mood condition (N = 119, one-way ANOVA).

Measure	Control (*n* = 40)	Sadness (*n* = 40)	Boredom (*n* = 39)	F	*p*
Parent Age (years)	33.03 (5.08)	35.72 (4.80)	34.13 (5.37)	2.85	.062
Child Age (years)	4.49 (0.64)	4.48 (0.64)	4.28 (0.51)	1.43	.243
SSS[a]	5.10 (1.48)	5.63 (1.46)	5.38 (1.12)	1.48	.231
Parent BMI[b,c]	30.42 (5.64)	29.02 (7.40)	29.14 (4.75)	.380	.685
Child BMI z-score	0.04 (1.68)	0.28 (0.97)	0.11 (1.17)	.331	.719
Number of Children	2.17 (.90)	2.50 (1.13)	2.10 (1.07)	1.65	.197

[a] MacArthur's Scale of Subjective Social Status (SSS), [b] control (*n* = 36), sadness (*n* = 32), boredom (*n* = 36), [c] control (*n* = 39), sadness (*n* = 37), boredom (*n* = 39).

Appendix E-5: Chapter 5 - Chi-squared tests exploring differences between mood conditions for any categorical parent or child demographic variables

- Child sex did not differ significantly between conditions ($X^2(2, N = 119) = 1.86, p = .396$).
- Parent sex did not differ significantly between conditions ($X^2(2, N = 119) = 2.79, p = .248$).
- Parent education (degree or no degree) did not differ significantly between conditions ($X^2(2, N = 119) = 1.40, p = .496$).
- Parent ethnicity did not differ significantly between conditions ($X^2(20, N = 119) = 16.16, p = .707$).

Appendix E-6: Chapter 6 - Moderation analyses: non-significant models

Regression coefficients for the b_3, b_1, b_2, b_{3b}, b_{1b}, b_4, b_5, and b_{4b} pathways for the non-significant indices of moderated mediation.

		Total Sweet Kcal (Y)[a]			
Circle Drawing Task		*B*[b]	*SE*	*t*	*p*
X (CDT)[c]	b_3[d]	.23	.43	.52	.600
Control vs Sadness (W_1)[e]	b_1[f]	10.67	13.32	.80	.420
Control vs Boredom (W_2)[e]	b_2[g]	39.10	13.48	2.90	.005
X	b_{3b}[h]	-.19	.54	-.35	.730
Sadness vs Boredom (W_3)[i]	b_{1b}[j]	28.43	13.49	2.11	.037
XW_1	b_4[k]	-.41	.69	-.60	.552
XW_2	b_5[l]	1.40	.90	1.56	.122
XW_3	b_{4b}[m]	1.81	.95	1.90	.060
		Total Savoury kcal (Y)			
Circle Drawing Task		*B*	*SE*	*t*	*p*
X (CDT)	b_3	-.02	.09	-.17	.864
Control vs Sadness (W_1)	b_1	4.63	2.73	1.69	.093
Control vs Boredom (W_2)	b_2	6.72	2.76	2.43	.017
X	b_{3b}	.08	.11	.72	.475
Sadness vs Boredom (W_3)	b_{1b}	2.09	2.77	.75	.508
XW_1	b_4	.09	.14	.66	.508
XW_2	b_5	.49	.18	1.64	.130
XW_3	b_{4b}	.39	.20	2.00	.051
		Overall Total Kcal (Y)			
Delay Gratification Task		*B*	*SE*	*t*	*p*
X (DGT)[n]	b_3	-6.94	8.92	-.78	.439
Control vs Sadness (W_1)	b_1	17.13	14.05	1.22	.225
Control vs Boredom (W_2)	b_2	42.40	14.27	2.97	.004
X	b_{3b}	-2.15	8.70	-.25	.805
Sadness vs Boredom (W_3)	b_{1b}	25.27	14.24	1.77	.079
XW_1	b_4	4.78	12.46	.38	.702
XW_2	b_5	19.81	12.40	1.60	.113
XW_3	b_{4b}	15.03	12.24	1.23	.222
		Total Sweet Kcal (Y)			
		B	*SE*	*t*	*p*
X (DGT)	b_3	-4.44	8.44	-.53	.600
Control vs Sadness (W_1)	b_1	11.86	13.28	.89	.374
Control vs Boredom (W_2)	b_2	36.37	13.49	2.70	.008
X	b_{3b}	-1.65	8.22	-.20	.841
Sadness vs Boredom (W_3)	b_{1b}	24.51	13.46	1.82	.071
XW_1	b_4	2.79	11.78	.24	.813
XW_2	b_5	16.45	11.72	1.40	.163
XW_3	b_{4b}	13.68	11.57	1.18	.240
		Total Savoury Kcal (Y)			
		B	*SE*	*t*	*p*
X (DGT)	b_3	-2.49	1.76	-1.42	.159
Control vs Sadness (W_1)	b_1	5.27	2.77	1.90	.060
Control vs Boredom (W_2)	b_2	6.03	2.81	2.14	.034

X	b_{3b}	-.50	1.72	-.29	.772
Sadness vs Boredom (W_3)	b_{1b}	.76	2.81	.27	.788
XW_1	b_4	2.00	2.46	.81	.418
XW_2	b_5	3.36	2.44	1.37	.172
XW_3	b_{4b}	1.36	.56	.56	.573

Note. Degrees of freedom = 112. [a] Y = outcome variables. [b] B = unstandardised beta. [c] CDT = Circle Drawing Task, X variable. [d] b_3 = The conditional effect of X on Y when the reference condition is A (control). [e] Indicator coding dummy variables (A vs. B = W_1, A vs. C = $W_{2,}$). [f] b_1 = The estimated difference in Y between W_1 when X = 0. [g] b_2 = The estimated difference in Y between W_2 when X = 0. [h] b_{3b} = the conditional effect of X on Y when the reference condition is B (sadness). [i] Indicator coding dummy variables (B vs. C = W_3). [j] b_{1b} = the estimated difference in Y between W_3 when X = 0. [k] b_4 = The difference in the relationship between X on Y in the A condition and the relationship between X on Y in the B condition. [l] b_5 = the difference in the relationship between X on Y in the A condition and the relationship between X on Y in C condition. [m] b_{4b} = The difference in the relationship between X on Y in the B condition and the relationship between X on Y in the C condition. [n] DGT = Delay Gratification Task, X variable.