Appetite 198 (2024) 107366

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Utilising online paradigms to explore the effect of boredom and sadness on children's snack choice: The role of parental feeding practices and child temperament

Rebecca A. Stone [a,*,1], Emma Haycraft [b], Jacqueline Blissett [a], Claire Farrow [a]

[a] School of Psychology and Institute of Health and Neurodevelopment, College of Health & Life Sciences, Aston University, Aston Triangle, Birmingham, B47 ET, UK
[b] School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, LE11 3TU, UK

ARTICLE INFO

Keywords:
Emotionality
Non-responsive feeding
Online mood manipulation
Boredom
Children

ABSTRACT

Emotional eating (EE) is defined as eating in response to negative emotions (e.g., sadness and boredom). Child temperament and parental feeding practices are predictive of child EE and may interact to shape child EE. Previous research has demonstrated that children eat more when they are experiencing sadness, however, boredom-EE (despite how common boredom is in children) has yet to be explored experimentally using remote methodologies. The current study explores whether feeding practices and child temperament interact with mood to predict children's snack selection in an online hypothetical food choice task. Using online experimental methods, children aged 6-9-years (N = 347) were randomised to watch a mood-inducing video clip (control, sadness, or boredom). Children completed a hypothetical food choice task from images of four snacks in varying portion sizes. The kilocalories in children's online snack choices were measured. Parents reported their feeding practices and child's temperament. Results indicated that the online paradigm successfully induced feelings of boredom and sadness, but these induced feelings of boredom and sadness did not significantly shape children's online food selection. Parental reports of use of restriction for health reasons ($F = 8.64$, $p = .004$, $n^2 = 0.25$) and children's negative emotionality ($F = 6.81$, $p = .009$, $n^2 = 0.020$) were significantly related to greater total kilocalorie selection by children. Three-way ANCOVAs found no evidence of any three-way interactions between temperament, feeding practices, and mood in predicting children's online snack food selection. These findings suggest that children's hypothetical snack food selection may be shaped by non-responsive feeding practices and child temperament. This study's findings also highlight different methods that can be successfully used to stimulate emotional experiences in children by using novel online paradigms, and also discusses the challenges around using online methods to measure children's intended food choice.

1. Introduction

Emotional eating (EE) is defined as eating in response to negative mood (e.g. sadness, anger, boredom) (Macht, 2008), 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). EE is considered a maladaptive response that supersedes biological predispositions. The response is maladaptive as experiences of arousal stimulate the release of cortisol which ought to reduce appetite (Heinrichs & Richard, 1999), perhaps through the release of appetite-suppressing hormones such as leptin (Michels et al., 2017), not increase appetite. There is evidence of EE in both children and adults with one study reporting that the prevalence of child EE was estimated at 63% in 5–13-year-olds (Shapiro et al., 2007). Coupled with the evidence that the heritability of EE is low (Herle et al., 2018), this suggests that EE is likely a 'learnt' eating behaviour. Additionally, EE emerges early in life (Herle et al., 2018) and remains stable across childhood (Ashcroft et al., 2008). In adults, EE has been associated with poorer mental health outcomes, such as depression (van Strien et al., 2016) and binge eating (Barnhart et al., 2020), and has been associated with higher BMI and obesity (Gibson, 2012). Likewise, in children, EE has been related to higher waist-to-height ratios (Jani et al., 2020). In sum, EE is considered an obesogenic eating behaviour, yet the aetiology of this

* Corresponding author.
E-mail addresses: ras@liverpool.ac.uk (R.A. Stone), E.Haycraft@lboro.ac.uk (E. Haycraft), j.blissett1@aston.ac.uk (J. Blissett), c.farrow@aston.ac.uk (C. Farrow).
[1] Present address: Department of Psychology, Institute of Population Health, University of Liverpool, Liverpool, L69 7 ZA.

https://doi.org/10.1016/j.appet.2024.107366
Received 8 December 2023; Received in revised form 16 April 2024; Accepted 17 April 2024
Available online 20 April 2024

behaviour remains unclear (Vervoort et al., 2020), and so it is important to explore the development of child EE to help mitigate its obesogenic consequences.

The Biopsychosocial Model (Russell & Russell, 2019) suggests that children's eating behaviour develops from parent factors (e.g., parental feeding practices), child factors (e.g., temperament), and an interaction between these. In line with this theory, previous literature exploring the development of EE in relation to negative mood has suggested that child temperament is associated with obesogenic eating behaviour (e.g., Leung et al., 2014; Steinsbekk et al., 2020). Temperament can be conceptualised as having three primary factors: negative affect (the tendency to experience heightened negative emotions), surgency (the tendency to behave impulsively), and effortful control (the degree of self-regulation) (Rothbart & Bates, 2007). Additionally, parent factors, such as non-responsive feeding practices (i.e., those that are not responsive to children's hunger and satiety signals), are often associated with EE in children. These feeding practices include using food for emotion regulation (e.g., giving sweets when a child has injured themselves), where children are believed to be conditioned to consume energy-dense food when they are experiencing a negative emotion (e.g., Blissett et al., 2010); using food as a reward (e.g., giving sweets when a child has performed well at school), where children are believed to be taught that when they experience reward, to seek out energy-dense food (e.g., Farrow et al., 2015); and restriction of food, where children are believed to have heightened preferences for overtly restricted food so that when experiencing a negative emotion, are more inclined to reach for the forbidden food (e.g., Rollins et al., 2014).

Research that has explored child EE has mostly used parentally reported questionnaires to assess child EE, for example, the Children's Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001). Experimental studies that seek to induce a specific emotion in children are rare. To date one longitudinal study has looked at the impact of negative mood (Farrow et al., 2015); finding that children do display EE in response to a negative mood induction (compared to control conditions) and consume more chocolate in a negative mood condition if their mothers reported using food for emotion regulation. Tan and Holub (2018) also experimentally manipulated happiness and sadness and found that children consumed more snacks when feeling sadness compared to happiness. In the first study to explore the impact of boredom on children's eating behaviour, Stone et al. (2023) found that preschool children who had very recently eaten to satiety, consumed more kilocalories when they were experiencing feelings of boredom compared to a neutral mood. Stone et al. also found children with negative affect whose parents used emotional feeding consumed more kilocalories when experiencing boredom than a neutral mood. Boredom is a common emotion in children (Westgate & Steidle, 2020), and further research is needed to understand how boredom may relate to children's food intake.

However, despite the rigour of laboratory studies, they are expensive and time consuming to conduct. Virtual measurements of children's food selection have been developed as hypothetical food choice tasks are thought to act as a proxy for children's actual food consumption. These virtual methods have been validated and 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). Similarly, images of foods chosen on a computer predicted 9-year-old children's actual product purchases (Olsen et al., 2012). Additionally, Tan and Holub (2018) established that is possible to induce different emotions in children using online methods by viewing age-appropriate video clips. What remains to be seen is whether using these alternate, online experimental methodologies, can effectively induce emotional eating in children in response to different emotions, and whether the results reflect that of laboratory studies.

The aim of the current study was to explore children's food selection in response to online, experimentally induced sadness and boredom (compared to a control condition) and to explore how food selection under these emotional conditions relates to parents' feeding practices and child temperament. It was hypothesised that there would be a main effect of mood condition, where children would select more kilocalories from food in the boredom and sadness conditions, compared to the control condition. It was also hypothesised that parents who reported often using non-responsive feeding practices would have children who selected more kilocalories from snacks compared to children of parents who reported low use of these practices. Additionally, it was hypothesised that children who were rated by their parents as high in negative affect or surgency, or low in effortful control, would select more kilocalories from snacks compared to children whose parents reported low ratings of these temperamental traits. Finally, 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 parent used more non-responsive feeding practices and children were described as higher in negative affect or surgency.

Data were collected during February and March 2021. This study was designed in response to the COVID-19 pandemic, which did not permit face-to-face laboratory testing and so the use of an online paradigm was a practical and safe alternative to the laboratory. The online methodology offers promise because of the potential wide reach, and presents an alternative option for recruitment at scale, in a home setting.

2. Methods

2.1. Participants

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). The inclusion criteria stipulated that participants were parents who had a child aged 6-9-years-old, and their child. This age range was chosen 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. To take part, children had to have no allergies to any of the study foods; although images were used and not actual foods, allergies were expected to negatively impact food choices.

2.2. Design

Using a between-subjects design, dyads were randomly allocated to one of three conditions: control, sadness, or boredom. The study consisted of two phases. 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. Mood condition consisted of three levels (control/sadness/boredom). Three types of parental feeding practices were measured (use of restriction for health reasons, use of food as a reward, and use of food for emotion regulation), and three aspects of child temperament were measured (negative affect, surgency, and effortful control). Therefore, there were three independent variables: mood condition, parental feeding practices, and child temperament. Feeding practice and temperament scores were dichotomised using median splits into high vs. low. Overall, the study operated as a 2 x 2 x 3 design (high/low per feeding practice x high/low per temperament x control/sadness/boredom 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, and effortful control – split into high/low for each trait) by mood condition (control, sadness or boredom) were assessed in turn.

2.3. Procedure

The study was approved by Aston University Health and Life Sciences Ethics Committee (#1646). All procedures were conducted in accordance with the Declaration of Helsinki as revised in 1983. The participant information sheet contained information about what the study involved, the eligibility criteria, confidentiality assurance, participants' right to withdraw, the benefits to taking part, details of compensation for taking part, any funding information and information on the data controller, where to contact should the participant have any concerns about the study, contact details of the research team, and what the participant should do now if they wish to proceed with the study. Parents were asked to explain to the child that they were "going to watch some videos and choose from some pictures of food on the computer". At home/in a place of their choosing, using Qualtrics, parents provided consent for themselves and for their child to participate electronically before taking part in the study.

Parents were first asked to indicate their child's age and sex so that if randomised to the boredom condition, sex-specific Likert scales could be used to measure boredom, 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 their online section of the study, which lasted approximately 10-min. Children were first asked to indicate their hunger levels using the Teddy Bear Hunger Scale (Bennett & Blissett, 2014). After indicating their hunger, children were randomly allocated to one of three mood conditions (control/sadness/boredom) using Qualtrics's randomisation procedure. This procedure operates using pre-determined counts where Qualtrics assigns participants to each condition sequentially so that there are equal numbers in each condition (prior to data cleaning). Prior to the mood induction, children were asked to use a Likert scale to indicate their current mood. Children then watched one of three video clips and then their mood was re-assessed. 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 each of the foods right now. After this, children in the sadness and boredom conditions were shown the control condition video clip. Finally, children re-rated their mood. 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-min based on pilot testing. Within these questionnaires there were attention checks. Parents were compensated with a £7 Amazon voucher for their time.

2.4. Measurements

To best protect against bots and malicious programs, a reCAPTCHA was used at the start of the study. Additionally, within the parent measures (excluding the demographics questionnaire), there were built-in attention checks such as "*It is important that I pay attention. Please select 'Strongly Disagree'*". Individuals who made errors on two or more of the four attention check questions were excluded. Moreover, the duration of the parent section of the study was recorded to ascertain the likelihood that the parent had completed the questionnaires properly (excluded if completed <20 min).

Measures completed by adults and children are described below.

2.4.1. Child measures

2.4.1.1. 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*". Children are asked to select the image which best reflects how hungry or full they are feeling right now. The Teddy Bear Hunger Scale has been validated in 5-9-year-olds (Bennett & Blissett, 2014).

2.4.1.2. Sadness and control condition Likert scale. The Smiley Face Likert Scale was used to assess children's mood from happy to sad. This measure used yellow emoticons that are widely recognised by children and has been successfully used with children aged 3-5-years (Blissett et al., 2010) and 5-7-years (Farrow et al., 2015) to indicate mood. This measure operated as a five-point Likert scale ranging from "*Really sad*" (1), to "*Ok*" (3), to "*Really happy*" (5). An audio description of each Likert-scale point was automatically played when the child reached this part of the online survey and children selected the image which best represented how they were feeling.

2.4.1.3. Boredom mood Likert scale. Boredom was captured by using a pictorial Likert scale that was used by the authors in a previous paper (Stone et al., 2023). The measure operated as a five-point scale ranging from 1 ("*really bored*") to 5 ("*really interested*"). Separate scales were developed for boys and girls. Children who were "*really bored*" were shown with their head on the table, whereas children who were "*really interested*" were shown sat upright, with their eyes wide. An audio description of each Likert-scale point was automatically played when the child reached this part of the online survey and children were asked to select the image that they felt best reflected how they were feeling. 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 ($M = 6.32, \pm SD = 1.44$) 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.

2.4.1.4. 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 may have induced 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-min 30-s 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.

2.4.1.5. Hypothetical food choice task. Children were presented with images of the four snack foods on screen and asked "*If you could have as much of everything as you want, how much would you eat right now?*". Children could choose as much as they wanted of each of the 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.

Each snack was presented using six photographed images of varying

portion sizes, based on an approximation of each snack's recommended portion size for children (RPSc) (Infant and Toddler Forum, 2014). Kilocalories of each snack were estimated using manufacturers' nutritional information and the USDA (USDA, n. d.) (see Table 1). 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 and the order that the snacks were presented were randomised for each participant. 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 RPSc, image two showed 50% of the RPSc, image three showed the RPSc of the snack (100%), image four showed 200% of the RPSc, image five showed 400% of the RPSc, and image six showed 800% of the RPSc.

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 Supplementary Fig. 1. Based on children's selected portion size, the corresponding kilocalories per chosen snack portion were subsequently summed to determine the overall total calories selected.

2.4.2. Parent measures

Parents completed a variety of questionnaire measures, which are detailed below.

2.4.2.1. Demographics questionnaire. Parents self-reported their age, sex, height, weight (to be converted to BMI), education level, ethnicity, their child's age, sex, height and weight (to be converted to BMI z-scores). Parents indicated how may children they had, and if this child had watched Disney's "*The Lion King*" or Disney's "*The Little Mermaid*" before. Parents also reported their perceived subjective social 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).

2.4.2.2. Comprehensive feeding practices questionnaire (CFPQ; Musher--Eizenman & Holub, 2007). This scale was used to assess parents' use of feeding practices. The scale comprises 12 subscales, but only three were used in the current study. The three subscales that were used were: restriction for health reasons (4 items), food as a reward (3 items), and food for emotion regulation (3 items). Restriction for health reasons and food as a reward were rated on five-point Likert scale (1 = disagree, 2 = slightly disagree, 3 = neutral, 4 = slightly agree, 5 = agree), and food for emotion regulation was rated on a different 5-point Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = mostly, 5 = always). The CFPQ showed good reliability for all three subscales in the current study (restriction for health reasons (α = 0.83), food as a reward (α = 0.71) and emotion regulation (α = 0.69)).

2.4.2.3. Children's behaviour questionnaire – very short form (CBQ-VSF; Putnam & Rothbart, 2006). This scale was used to assess children's temperament and is comprised of three temperamental dispositions: negative affect (12 items), surgency (12 items), and effortful control (12 items). The CBQ-VSF is assessed using a seven-point Likert-type scale (1 = extremely untrue of my child, to 7 = extremely true of my child). In the current study, the CBQ-VSF had good reliability for the negative affect (α = 0.76), surgency (α = 0.76) and effortful control (α = 0.71) subscales.

2.4.2.4. Children's Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001). This scale was used to assess children's eating behaviour. One of its eight subscales was used to measure children's emotional over eating (EOE; 4 items). This subscale was assessed using a five-point Likert scale (1 = never, to 5 = always). In the current study, this subscale had good reliability for child EOE (α = 0.81).

2.5. Data analysis

There was one dependent variable: overall total kilocalories selected.

IBM SPSS Statistics 26 was used for all data analyses. A power calculation (G*Power for ANOVA) indicated that 93 parent-child dyads were required per condition (large effect size ($f = 0.40$), 80% power, α = 0.05).

2.5.1. Normality and confounding variable analyses

Kolmogorov-Smirnov (KS) tests were used to assess the normality of the dependent variable. These tests revealed that the dependent variable was right skewed (overall total kilocalories selected (KS = 0.110, $p < .001$). To assess for confounding variables, Spearman's Rho correlations were used for continuous variables, and Mann-Whitney U tests or Kruskal-Wallis H tests for categorical variables (listed in Section 2.4.2) with the dependent variable. If any variable had a significant result, it was added in the main analysis as a covariate. Only parent BMI and children's hunger scores were significant covariates.

2.5.2. Comparison of experimental groups on parent and child characteristics

One-way analysis of variance (ANOVA) was used to assess differences between mood conditions in parent and child continuous demographic variables. Chi-squared tests were used to assess differences in parent categorical variables and child categorical variables between mood conditions. One-way ANOVAs were used to assess differences between mood conditions in parents' feeding practices and in children's temperament and eating behaviour.

2.5.3. Baseline differences and mood change analysis

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's baseline mood after watching the control video compared to post-induction mood. 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.

Table 1
The estimated number of calories and number of units per snack food split by differing percentages of Recommended Portion Size for Children (100%) to reflect the images presented to the child during the online hypothetical food choice task.

	Estimated number of kilocalories (number of units in brackets)					
	0%	50%	100% (RPSc)	200%	400%	800%
Chocolate buttons	0 (0)	22 (4)	44 (8)	88 (16)	176 (32)	352 (64)
Gummy bears	0 (0)	33 (4)	66 (8)	132 (16)	264 (32)	528 (64)
Carrot batons	0 (0)	9 (3)	18 (6)	36 (12)	72 (24)	144 (48)
Crisps	0 (0)	13 (3)	26 (6)	52 (12)	104 (24)	208 (48)

Note. RPSc = Recommended Portion Size for Children. Kilocalories are estimations, not exact values, based on manufacturers' information and the USDA (USDA, n.d.).

2.5.4. Main analysis: effect of mood, parental feeding practices and child temperament

Analysis of covariance (ANCOVA) was used for the main data analyses. See section 2.5.1. for how covariates were determined.

2.5.4.1. Main effects of independent variables. Main effects of mood condition (control/sadness/boredom), 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 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 for the grouped participants per interaction.

2.5.4.2. 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, a series of three-way ANCOVAs were run controlling for covariates (parent BMI and children's hunger score; determined as outlined in section 2.5.1). The independent fixed variables were mood condition, 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, where one ANCOVA considered the interaction between mood condition (three levels), one of the three parental feeding practices (two levels per feeding practice), and one of the three children's temperaments (two levels per temperament). The three-way interactions assessed the two-way interactions of parental feeding practice x child temperament moderated by mood condition. The dependent variable was explored for evidence of three-way interactions. If the dependent variable presented a significant three-way interaction ($p < .05$), the interaction was explored further to understand its nature (see Supplementary Material 1.1).

3. Results

3.1. Sample characteristics

After data cleaning, 10 parents were excluded because they reported that they 'rarely ate' with their child and thus could not report on regular experiences of feeding, two parents were excluded due to completing the parent section of the online questionnaire unusually quickly, suggesting a lack of attention was being paid to items (cut off: <20 min), and seven participants were excluded due to failing two or more attention checks. Overall, 347 parent-child dyads were included for data analyses. Of these 347 parents, 17.3% were fathers (n = 60) and 82.7% were mothers (n = 287). Parents had a mean age of 35.6-years (range 24–49, *SD* ± 5.1), 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 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* = 28.2, *SD* ± 7.8). The children who took part were 53.3% male and 46.70% female and their mean age was 7.1 years (range: 6-9-years, *SD* ± 1.0). 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 using reference curves for the UK (Child Growth Foundation, 1996) and reflected a healthy weight (*M* = 0.8, *SD* ± 2.0).

3.2. Covariate variable selection

Spearman's Rho correlations suggested that children's ratings of being hungrier (less full) significantly correlated with more overall total kilocalories selected by children (see Supplementary Table 1). Additionally, parent BMI positively and significantly correlated with overall total kilocalories selected by children. No other parent or child continuous demographic variables were significantly correlated with the dependent variable. Mann-Whitney U tests and Kruskal-Wallis H tests indicated that there were no significant differences in the dependent variables based on any categorical demographic variables (all $p > .05$, see Supplementary Material 1.2.). As a result, only parent BMI and children's hunger scale scores were controlled for in the main analyses.

3.3. Comparison of parent and child characteristics between experimental groups

One-way ANOVAs and Chi-squared tests indicated that there were no significant differences between mood conditions for any continuous or categorical parent or child demographic variables (all *p's* > .05, see Supplementary Table 3 and Supplementary Material 1.3.). One-way ANOVAs also revealed that there were no significant differences between mood conditions for parent-reported CEBQ, CFPQ and CBQ-VSF subscales (all *p's* > .05) (see Table 2). The purpose of collecting the child EOE variable was to ensure that the sample did not vary on this eating behaviour trait between conditions as this may have confounded study findings.

3.4. Baseline differences and mood change analysis

Mood ratings in all conditions significantly changed from pre-mood induction to post-mood induction in the expected direction. 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 children in the sadness condition became significantly less happy after watching a clip of Disney's "*The Lion King*". Those in the boredom condition became significantly more bored after watching a clip of a dripping tap (see Supplementary Table 2).

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

Table 2
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*	Min/ Max
Child EOE	2.27 (0.78)	2.43 (0.94)	2.37 (0.72)	1.18	.309	1/5
Child Negative Affect	4.36 (0.88)	4.32 (0.95)	4.25 (0.85)	0.434	.648	1.67/ 6.92
Child Surgency	4.51 (0.86)	4.48 (0.93)	4.60 (0.80)	0.581	.560	1.75/ 6.67
Child Effortful Control	4.94 (0.85)	4.85 (0.71)	4.81 (0.69)	0.852	.428	1/ 6.92
Restriction for Health Reasons	3.57 (1.01)	3.52 (1.00)	3.66 (0.98)	0.508	.602	1/5
Food as a Reward	3.02 (1.08)	3.06 (0.98)	3.09 (1.00)	0.101	.904	1/5
Food for Emotion Regulation	2.30 (0.64)	2.28 (0.71)	2.29 (0.63)	0.042	.959	1/5

and bored and bored and control conditions were not assessed as they utilised different Likert scales. As seen in Supplementary Table 2, children's mood ratings returned to baseline when watching the control video in the sadness condition, indicating that they returned to feeling 'happy'. However, children's mood ratings did not return to baseline when watching the control video in the boredom condition, indicating that they were 'bored' compared to 'ok' at baseline.

3.5. Analysis of covariance (ANCOVA)

3.5.1. Main effects

The means and standard deviations of the main effects for the dependent variable are presented in Table 3. As shown in Table 4, 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 the 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 (see Fig. 1). 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 (see Fig. 2).

3.5.2. Three-way interaction

As seen in Table 5, three-way ANCOVAs suggested that there were no significant three-way interactions identified for the dependent variable.

Table 3
Means (±*SD*) of kilocalories consumed by children for each main effect of mood condition, child temperament, and parental feeding practices on the dependent variable (N = 347).

Main Effect	Overall Total Kcal
Mood Condition:	
Control[a]	523.5 (326.1)
Sadness[b]	528.1 (347.7)
Boredom[c]	572.9 (368.1)
Negative Affect:	
High[d] (≥ Mdn 4.25)	567.5 (348.3)
Low[e] (≤ Mdn 4.25)	455.1 (327.1)
Surgency:	
High[f] (≥ Mdn 4.50)	545.0 (341.8)
Low[g] (≤ Mdn 4.50)	534.1 (351.4)
Effortful Control:	
High[h] (≥ Mdn 4.92)	526.5 (354.4)
Low[i] (≤ Mdn 4.92)	550.6 (339.6)
Restriction for health reasons:	
High[j] (≥ Mdn 3.75)	589.6 (355.2)
Low[k] (≤ Mdn 3.75)	481.9 (327.0)
Food as a reward:	
High[l] (≥ Mdn 3.00)	535.5 (342.1)
Low[m] (≤ Mdn 3.00)	546.3 (353.7)
Food for emotion regulation:	
High[n] (≥ Mdn 2.33)	553.4 (347.6)
Low[o] (≤ Mdn 2.33)	520.3 (344.4)

[a] $n = 122$.
[b] $n = 123$.
[c] $n = 102$.
[d] $n = 183$.
[e] $n = 164$.
[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
Main effects of parental feeding practices, child temperament, and mood condition on the dependent variable (one-way ANCOVA)[a] [b] (N = 336)[c].

	Overall Total Kcal		
Main Effects	*F*	*p*	η_p^2[d]
Mood condition	0.89	.413	0.005
Negative affect	6.81	.009	0.020
Surgency	0.18	.668	0.001
Effortful control	0.02	.902	0.000
Restriction for health reasons	8.64	.004	0.025
Food as a reward	0.09	.764	0.000
Food for emotion regulation	1.55	.214	0.005

[a] Mood degree of freedom (df) = 2, error df = 331, feeding practices and temperaments df = 1, error df = 332.
[b] Controlling for parent body mass index and children's hunger.
[c] N = 336 when accounting for parent BMI.
[d] η_p^2 = partial eta squared.

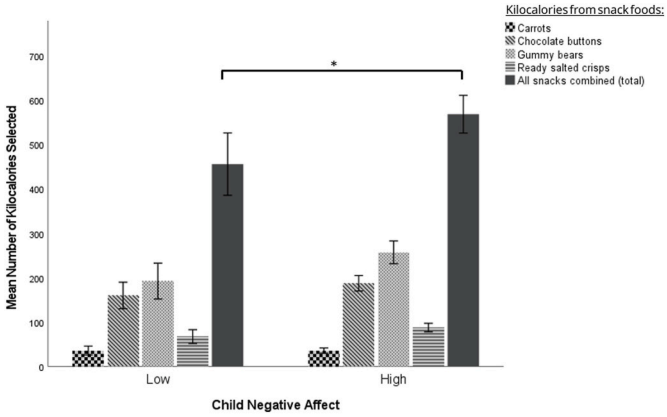

Fig. 1. Bar chart illustrating post-hoc analyses to compare the mean number of kilocalories selected (for the individual snacks and a combined total) between children with high and low negative affect. *$p = .009$. Error bars show 95% confidence intervals.

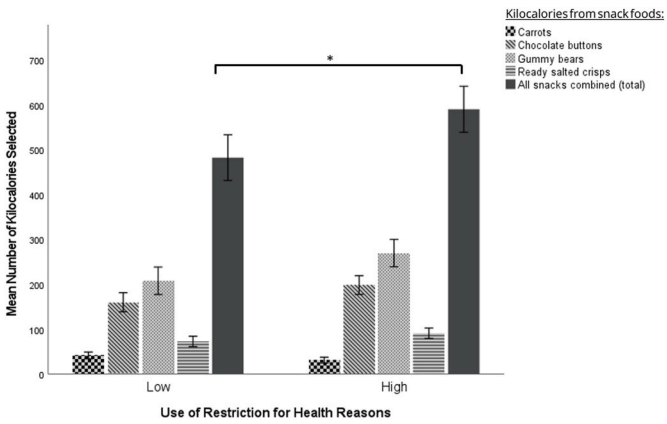

Fig. 2. Bar chart illustrating post-hoc analyses to compare the mean number of kilocalories selected (for the individual snacks and a combined total) between parents who reported using high and low levels of restriction for health reasons. *$p = .004$. Error bars show 95% confidence intervals.

3.5.3. Exploratory analyses: two-way interaction between parental feeding practices and mood condition, and children's temperament and mood condition

As seen in Table 6, exploratory two-way ANCOVAs (controlling for parent BMI and children's hunger score) indicated that there was also no evidence of any two-way interactions between parental feeding

Table 5
Three-way interactions between each parental feeding practice (high/low), child temperament (high/low) and mood condition (control/sadness/boredom) on the dependent variable.[a b]

	Overall Total Kcal		
ANCOVA	*F*	*p*	η_p^2
RfHR[c] x NA[d] x Mood	1.62	.202	0.010
RfHR x S[e] x Mood	2.10	.124	0.013
RfHR x EC[f] x Mood	0.05	.948	0.000
FaR[g] x NA x Mood	1.09	.340	0.007
FaR x S x Mood	0.02	.978	0.000
FaR x EC x Mood	0.30	.742	0.002
FER[h] x NA x Mood	1.46	.234	0.009
FER x S x Mood	1.92	.150	0.012
FER x EC x Mood	0.10	.904	0.001

i ηp2 = partial eta squared.
[a] For all analyses, degrees of freedom (df) = 2 and df 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.

Table 6
Two-way interactions between each parental feeding practice (high/low) and mood condition (control/sadness/boredom), and each child temperament (high/low) and mood condition (control/sadness/boredom) on outcome variable.[a b]

	Overall Total Kcal		
ANCOVA	*F*	*p*	η_p^2
RfHR[c] x Mood	2.40	.093	0.014
FAR[e] x Mood	0.14	.874	0.001
FER[d] x Mood	0.14	.873	0.001
NA[f] x Mood	0.74	.480	0.004
S[g] x Mood	2.16	.117	0.013
EC[h] x Mood	1.93	.147	0.012

[a] For all analyses, degrees of freedom (df) = 2 and error df = 328.
[b] Controlling for parent BMI and children's hunger.
[c] RFHR = restriction for health reasons.
[d] FaR = use of food as a reward regulation.
[e] FER = use of food for emotion regulation.
[f] η_p^2 = partial eta squared.

practices and children's temperament with mood condition on overall total kilocalories selected by children.

4. Discussion

The current study 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 online food choice task, examining how parent-reported child temperament and parental feeding practices interacted with children's mood state to predict overall total kilocalories selected. Boredom and sadness were successfully induced, but there were no main effects of mood condition on kilocalories selected. There were main effects of children's negative affect and parents' use of restriction for health reasons, where more overall total kilocalories were selected by children when they scored high in negative affect rather than low, or when parents used more restriction of food for health reasons rather than when parents reported low use of this practice. However, contrary to the hypotheses, there were no significant two-way or 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 more negative affect in children (e.g., Steinsbekk et al., 2020) and greater parental use of restrictive feeding practices (e.g., Fisher & Birch, 1999) as independent predictors of children's overeating. The use of restriction for health reasons corresponds to limiting access to unhealthy foods and, in the current study, this was the parental feeding practice used most often (as shown in Tables 2 and in comparison to use of food as a reward or food for emotion regulation). Therefore, our findings suggest that parents who often use restriction for health reasons tended to have children who chose larger snack portions. However, this is caveated in that directionality or causality cannot be inferred. It is equally as possible that children's historic eating behaviour may have predicted parents' reported use of restriction for health reasons.

In relation to negative affect, our findings suggest that parents' ratings of negative affect are associated with children's selection of snack foods, irrespective of current mood induction. Given that existing literature has established a robust association between negative affect in children and obesogenic eating (e.g., Steinsbekk et al., 2020), it is unsurprising that this was the only temperament trait to be significantly associated with kilocalorie selection. Moreover, as it believed that negative affect confers differential susceptibility to environmental influence in the long term, high negative affectivity may place children at greater risk for developing obesity over time (Stifter & Moding, 2019), and so is an important temperamental trait to consider with regard to obesogenic eating in children. However, it is not clear which aspect of negative affect is driving the association with kilocalories selected and so it is necessary to consider the lower order factors that constitute negative affectivity (i.e., fear, anger, sadness, discomfort) as these can vary greatly between children and differentially predict obesity. It is possible that this reasoning may help to explain why surgency and effortful control were not significantly associated with total kilocalories selected as it may be that individual lower order factors are better predictors of eating behaviour than higher order factors (Stifter & Moding, 2019). Nevertheless, our results uniquely extend previous research (e.g., Fisher & Birch, 1999; Steinsbekk et al., 2020) to suggest that negative affect and restrictive feeding practices are also related to children's online portion size selection, which may help to explain children's overconsumption given the robust portion size effect on children's food consumption (Hetherington & Blundell-Birtill, 2018). However, caution should be exercised when interpreting these main effects as the effect sizes were small (Cohen, 2013).

This study is the first 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, 2019) and previous research depicting a relationship between parental feeding practices and mood in children's kilocalorie consumption in the laboratory (Blissett et al., 2010; Farrow et al., 2015), the current study found no evidence of such an interaction. This lack of any significant three-way interactions in the current study could perhaps reflect the use of a hypothetical food choice task. 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 study 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.[2]

In the current study, the hypothetical food choice task used six images of 0%, 50%, 100%, 200% and 400%, 800% of the recommended portion size for children. This approach may not have been effective as

[2] There was no evidence of a significant correlation between EOE (as measured using the CEBQ) and kilocalories selected for the boredom and sadness group (sadness: $r_s = 0.10$, $p = .287$; boredom: $r_s = 0.15$, $p = .152$).

research suggests more than six images of portion sizes are required to ensure portion size variability (Embling et al., 2021). Additionally, the current hypothetical food choice task used only four snack foods (crisps, chocolate buttons, carrot batons and gummy bears), whereas others such as Pink and Cheon (2021) have used 25 snack food options. Therefore, a larger variety of snacks may have maximised the chances of familiarity or liking by the child, thus being more reflective of the usual snacks chosen to be consumed during emotional arousal. 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.

Another issue with using the hypothetical food choice task might be related to the fact that parents were instructed to sit next to or nearby their child whilst their child completed the child section of the study. Although this instruction was well-intentioned (i.e., supporting the child with the computer use and for safeguarding whilst using the internet), this could have resulted in unintended consequences. Previous research with children aged 5-7-years found that children consumed significantly less energy from unhealthy food when in the presence of their mother compared to if children had a meal with their peers (Salvy et al., 2011). Therefore, in the current study, children may have selected portion sizes of snacks that they thought their parent would find acceptable, such as fewer chocolate buttons, which could impact the validity of the findings. However, considering the relatively large size of the chosen portions in the current study, only a few children may have been impacted.

Nevertheless, this methodology was employed during a lockdown resulting from the COVID-19 pandemic and so was a practical and safe alternative to laboratory research, which also had a wide reach. Consequently, this study was the first to successfully induce boredom and sadness in children using a video remotely, extending the existing literature on the use of video stimuli to induce target emotions in children (Karim & Perlman, 2017; Siedlecka & Denson, 2018). Additionally, this study tested whether a tool that measured boredom in a laboratory could also be used online to measure boredom remotely, which is another important advancement for this field. These findings provide future researchers with two key tools to investigate boredom and sadness in children which can be administered online. Our findings also align with a wealth of previous literature indicating that restrictive feeding practices and negative affect are important factors in predicting aspects of children's eating behaviour. Despite this methodology being potentially less effective at capturing EE behaviour than in-person paradigms, it instead proved to be highly effective at inducing mood states.

To conclude, the current study provides evidence that child negative affect and parental use of restrictive feeding are related to children's online hypothetical food choice, where greater negative affect or greater restrictive feeding practices predict a greater number of kilocalories selected to be consumed from snack foods.

Authors' contributions

The authors' responsibilities were as follows—CF and JB obtained funding for the research. CF, JB and EH supervised RAS who oversaw data collection, analysed the data and had primary responsibility for the final content of the manuscript. All authors contributed to the design of the study, supervision of analysis, and the writing of the manuscript.

Ethical statement

Ethical approval for the involvement of human subjects in this study was granted by Aston University's Health and Life Sciences Ethics Committee, Reference number 1646 (as an amendment), Dated December 11, 2020.

CRediT authorship contribution statement

Rebecca A. Stone: Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Emma Haycraft:** Writing – review & editing, Supervision, Conceptualization. **Jacqueline Blissett:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Claire Farrow:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2024.107366.

References

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

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

Barnhart, W. R., Braden, A. L., & Jordan, A. K. (2020). Negative and positive emotional eating uniquely interact with ease of activation, intensity, and duration of emotional reactivity to predict increased binge eating. *Appetite, 151*, Article 104688. https://doi.org/10.1016/j.appet.2020.104688

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

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

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

Brytek-Matera, A. (2021). Negative affect and maladaptive eating behavior as a regulation strategy in normal-weight individuals: A narrative review. *Sustainability, 13*(24), Article 13704. https://doi.org/10.3390/su132413704

Child Growth Foundation. (1996). *Cross sectional stature and weight reference curves for the UK*.

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.

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

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*. https://doi.org/10.1093/jn/nxac162. nxac162.

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

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

Fisher, J. O., & Birch, L. L. (1999). Restricting access to foods and children's eating. *Appetite, 32*(3), 405–419. https://doi.org/10.1006/appe.1999.0231

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

Heinrichs, S. C., & 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

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

Infant and Toddler Forum. (2014). *Portion sizes for children*. https://infantandtoddlerforum.org/media/upload/pdf-downloads/1.3_-_Portion_Sizes_for_Children_1-4_Years.pdf.

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

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

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

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

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

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

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

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

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

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

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

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.

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

Salvy, S.-J., Elmo, A., Nitecki, L. A., Kluczynski, M. A., & Roemmich, J. N. (2011). Influence of parents and friends on children's and adolescents' food intake and food selection123. *The American Journal of Clinical Nutrition, 93*(1), 87–92. https://doi.org/10.3945/ajcn.110.002097

Shapiro, J. R., Woolson, S. L., Hamer, R. M., Kalarchian, M. A., Marcus, M. D., & Bulik, C. M. (2007). Evaluating binge eating disorder in children: Development of the children's binge eating disorder scale (C-BEDS). *International Journal of Eating Disorders, 40*(1), 82–89. https://doi.org/10.1002/eat.20318

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

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*, Article 104640. https://doi.org/10.1016/j.appet.2020.104640

Stifter, C. A., & Moding, K. J. (2019). Temperament in obesity-related research: Concepts, challenges, and considerations for future research. *Appetite, 141*, Article 104308. https://doi.org/10.1016/j.appet.2019.05.039

Stone, R. A., Blissett, J., Haycraft, E., & Farrow, C. (2023). Emotional eating following a laboratory mood induction: The interaction between parental feeding practices and child temperament. *Food Quality and Preference, 112*, Article 105008. https://doi.org/10.1016/j.foodqual.2023.105008

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

United States Department of Agriculture. (nd.). FoodData Central. https://fdc.nal.usda.gov/fdc-app.html#/food-details/2345919/nutrients.

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*, Article 112671. https://doi.org/10.1016/j.physbeh.2019.112671

van Strien, T., Konttinen, H., Homberg, J. R., Engels, R. C. M. E., & Winkens, L. H. H. (2016). Emotional eating as a mediator between depression and weight gain. *Appetite, 100*, 216–224. https://doi.org/10.1016/j.appet.2016.02.034

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*, Article 104676. https://doi.org/10.1016/j.appet.2020.104676

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

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), Article e12562. https://doi.org/10.1111/spc3.12562