RESEARCH
Research Paper

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

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ABSTRACT

Background 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. In addition, individual differences in a child's appetitive traits (ie, food approach behaviors) are related to the development of EE.

Objective The objective of this study was to examine whether or not 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.

Design A cross-sectional online questionnaire study was conducted.

Participants/setting One hundred eighty-five mothers of children aged between 3 and 5 years were recruited between January 2020 and March 2020 from advertisements placed on social media in the United Kingdom.

Main outcome measure Questionnaires assessed child EE, child food approach tendencies, maternal EE, and food parenting practices.

Statistical analyses performed Using PROCESS version 3.4, model 14, moderated mediations were employed to assess whether or not child food approach tendencies moderated the mediating effect of controlling food parenting practices between maternal EE and child EE.

Results 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 = .05, 95% CI 0.010 to 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 = .02, 95% CI 0.004 to 0.072) to high (B = .06, 95% CI 0.016 to 0.110; R^2 = 51%) food approach tendencies.

Conclusions 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 behaviors.
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WHEN CHILDREN EXPERIENCE EMOTIONS, USUally those that are negative, a common response can be to consume food regardless of their satiety (ie, emotional eating [EE]).[1] These foods are typically high in fat and sugar and provide hedonic pleasure that in turn regulates the child's experience of these emotions.[2,3] 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.[4,5] Yet, the prevalence of EE is high in children,[6] remaining stable across childhood[7] and persisting into adulthood.[8] This suggests that for some, the relationship between emotions and food is learned, most likely during early childhood. EE in children has been related to higher waist-to-height ratios in 4- to 12-year olds,[9] and EE in adults is often associated with higher body mass index (BMI) and obesity.[10] Collectively, this evidence amplifies the importance of understanding the development of EE in early life.[11]

Russell and Russell[12] proposed a biopsychosocial model to explain the development of children's eating behavior and weight from infancy to early childhood. This model posits that obesogenic eating behaviors such as EE arise from interactions between biopsychosocial factors, such as genetic susceptibility, temperament, and appetitive traits, as well as psychosocial and behavioral factors, such as food parenting practices.[12,13] Early in childhood, parents act as gatekeepers and role models with regard to food.[14] The way in which parents consume food themselves may be reflected in how their child consumes food. For example, behavioral modeling occurs through observation and imitation[15] and in the case that 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.[16,17]

Similarly, the food parenting practices parents use may inadvertently foster unhealthy eating behaviors in their children.[18] Specifically, greater parental use of food as a reward and food for emotion regulation have been associated with greater child EE in cross-sectional[19] and longitudinal studies.[20] Given that the foods used to regulate children's emotions and reward behaviors are typically energy-dense,[21] children may learn to associate these foods with pleasure and the alleviation of negative emotions,[22] promoting future consumption in response to emotional arousal regardless of satiety.[23] Similarly, parental restriction of food has been associated with child EE both cross-sectionally[24] and longitudinally.[25] Parents often restrict child food intake because of concerns about health or weight.[26] However, when children are aware that foods are restricted, they often express a greater desire for those foods and greater subsequent intake of them.[27] Indeed, these restricted foods can be used by children in situations of emotional arousal as a means of regulating their mood.[25]

The biopsychosocial model[12] also accounts for the influence of child characteristics in predicting early childhood eating behaviors, and this is supported by literature that has shown that child characteristics can shape EE. For example, the prevalence of EE is higher in female compared to male children.[28] However, less research has considered the role of child appetitive traits (ie, food approach) in the development of EE. EE is one facet of food approach behavior; other facets include food responsiveness (responding to food cues in the environment and having a greater appetite), desire to drink, and enjoyment of food.[29] Food approach behaviors are often associated with child overweight,[30] and facets of food approach are all highly correlated with, and predictive of, child EE.[20]

In Russell and Russell's reviews,[12,13] they suggest that early childhood food approach behaviors 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 behaviors and child BMI.[31] Moreover, greater parental use of restriction of food for health reasons has been associated with greater child EE and child food responsiveness.[32] These findings suggest that child food approach behaviors may shape parental feeding behaviors (or vice versa), which in turn predict children's future eating behavior and weight. However, to date there is no study that explores the interactive effects of parent EE, food parenting practices, and other child food approach behaviors on the development of early childhood EE. In this study it was hypothesized 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 behavior, such that the mediated relationships would be evident only when children score highly in food approach.

RESEARCH SNAPSHOT

Research Question: Do children's food approach behaviors (ie, behaviors linked to a drive to eat food) moderate the mediating relationship between maternal emotional eating (EE) and child EE via maternal use of food for emotion regulation, food as a reward, or restriction of food for health reasons?

Key Findings: In this cross-sectional questionnaire study, 185 mothers of children aged 3 to 5 years self-reported their children's food approach, EE, maternal EE, and food parenting practices. The mediating relationship between maternal and child EE via maternal use of food as a reward and restriction of food for health reasons was moderated by children's food approach behaviors.

METHODS

Design

This cross-sectional online questionnaire study recruited participants from January 2020 to 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. Several sources of social media were used to reduce selection bias.

Participants

Participants were parents of children aged between 3 and 5 years. Two hundred 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; eight 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;[33] and six mothers who reported that they rarely ate with their child, which cast doubt over the validity of their responses. Sample size calculations ($\alpha = .05$, power $= 0.8$) recommended 115 participants to detect medium effect sizes, making the sample adequately powered.

Procedure and Measures

After providing informed consent electronically, participants completed a 20-minute questionnaire via Qualtrics (https://www.qualtrics.com). 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 nonresponse bias. The study was approved by Aston University's Health and Life Sciences Ethics Committee. All procedures were conducted in

accordance with the Declaration of Helsinki as revised in 1983. The survey included a battery of questionnaires, detailed below.

Participant Characteristics Questionnaire. Information was collected about maternal age, sex, ethnicity,[34] education level, height, and weight, and child age, sex, height, and weight. The questionnaire also asked about weekly hours of nursery/school attendance, number of siblings, and how often the mother ate with the child. The MacArthur Scale of Subjective Social Status was used to measure perception of social status relative to others using a visual ladder where higher ladder rungs indicate high perceived social status.[35]

Dutch Eating Behaviour Questionnaire. The Dutch Eating Behaviour Questionnaire[36] contains three subscales that measure aspects of mothers' own eating behavior. One subscale, emotional eating (13 items), was used as the antecedent variable (eg, "Do you have a desire to eat when you are anxious, worried, or tense?"). This was scored using a 5-point Likert scale ranging from 1 = "Never" to 5 = "Very Often" where higher mean scores were indicative of greater EE. The Dutch Eating Behaviour Questionnaire has demonstrated good internal validity in the past[37] and in the current sample Cronbach's $\alpha = .95$, indicating acceptable reliability.

Comprehensive Feeding Practices Questionnaire. The Comprehensive Feeding Practices Questionnaire (CFPQ)[38] contains 12 subscales that measure parents' food parenting practices. For the current study, only three subscales were used: use of food as a reward (three items) (eg, "I withhold sweets/dessert from my child in response to bad behavior"), use of food for emotion regulation (three items) (eg, "When this child gets fussy, is giving him/her something to eat or drink the first thing you do?"), and restriction of food for health reasons (four items) (eg, "I have to be sure my child does not eat too much of his/her favorite foods"). These subscales operate using a 5-point Likert scale ranging from 1 = "Never" to 5 = "Always" (for food for emotion regulation) and 1 = "Disagree" to 5 = "Agree" (for food as a reward and restriction for health reasons). These subscales were chosen because previous research has implicated them in the development of child EE.[25,39] The CFPQ is a widely used measure and has demonstrated good validity.[38] In the current study, alpha value was acceptable at .75 for use of food for emotion regulation, but for restriction of food for health reasons and use of food as a reward, alpha value was moderate (.65 and .52). Due to the small number of items in each food parenting practice of the CFPQ, mean interitem 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.[40] For use of food for emotion regulation, mean interitem correlation coefficient was 0.50, for restriction of food for health reasons was 0.32, and for use of food as a reward was 0.26; all within the acceptable range of 0.15 to 0.50.

Children's Eating Behaviour Questionnaire. The Children's Eating Behaviour Questionnaire (CEBQ)[41] contains eight subscales measuring different aspects of children's appetitive traits; four subscales measure food approach behaviors, and 4 subscales measure food avoidant behavior. For the current study, the four food approach subscales were used: emotional overeating (four items) (eg, "My child eats more when worried"), child food responsiveness (five items) (eg, "My child is always asking for food"), enjoyment of food (four items) (eg, "My child is interested in food"), and desire to drink (three items) (eg, "My child is always asking for a drink"). Child emotional overeating was used as the outcome variable. Food responsiveness, enjoyment of food, and desire to drink were averaged to create a moderating variable: "food approach"[42] (12 items). Items were scored using a 5-point Likert scale ("Never" to "Always") where higher mean scores were indicative of higher levels of the eating behaviors. The CEBQ has demonstrated good internal reliability and validity.[43] In the current sample, alpha value was acceptable for emotional eating (.84), food responsiveness (.83), enjoyment of food (.90), and desire to drink (.87). Overall, alpha value was acceptable for food approach composite (.85).

Data Analysis

Normality and Confounding Variables. Data were analyzed using IBM SPSS Statistics version 26.[44] To examine the distribution of study variables, Kolmogorov-Smirnov tests were used and revealed that most variables were skewed. As a result, nonparametric 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 showed that greater maternal BMI was significantly correlated with greater antecedent variable maternal EE ($r_s = 0.35$; $P < 0.01$) and outcome variable child EE ($r_s = 0.18$; $P < 0.05$). Mann-Whitney *U* tests indicated that there were no significant differences in maternal EE or child EE based on child sex or maternal ethnicity (analysis not shown). Kruskal-Wallis tests revealed there were no significant differences in maternal EE or child EE based on maternal education level (analysis not shown). As a result, only maternal BMI was controlled for in the main analyses.

Main Analysis. For the main analysis, moderated mediations were employed using the PROCESS version 3.4 plugin, model 14.[45] 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 (ie, 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.[45] Model 14 provides evidence of moderated mediation using Hayes' index of moderated mediation,[46] 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 1 unit on X, are estimated to differ on Y through X's indirect effect on Y via M.[45] The index of moderated mediation uses CIs to indicate significance and when a 95% bootstrapped CI does not include zero, this indicates the moderated mediation is statistically significant. See Figure 1 for an example of model 14 using the study variables.

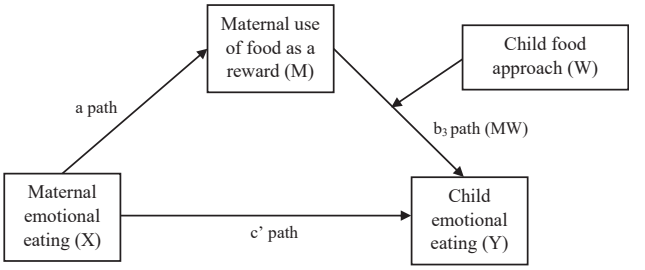

Figure 1. Conceptual moderated mediation model (PROCESS #14[45]) of the relationship between maternal emotional eating (EE) (X) and child EE (Y) using mediator: Food as a reward (M) and moderator: Child food approach (W). c' = direct effect of maternal EE (X) on child EE (Y) holding use of food as a reward (M) and child food approach (W) constant, a = unconditional effect of maternal EE (X) on use of food as a reward (M), b_3 = conditional effect of use of food as a reward (M) on child EE (Y).

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,[47] but because the study design is cross-sectional, its use should be interpreted as associations. To reduce multicollinearity (ie, strong correlations between variables), mean-centering was used for all variables. 95% bootstrap CIs at 5,000 samples were used, and child food approach values (M) were conditioned at −1 standard deviation below the mean to indicate "low," mean to indicate "medium," and +1 standard deviation 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.[45] "Low" reflects a score of 2.3 on the CEBQ[40] (ie, "my child is rarely interested in food), "medium" reflects a score of 2.9 on the CEBQ (ie, "my child is sometimes interested in food"), and "high" reflects a score of 3.5 on the CEBQ (ie, "my child is often interested in food").

RESULTS

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 Tables 1 and 2. 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 aged 3.8 years with 52% girls and 48% boys. The majority of children attended nursery or school for an average of 26 hours per week.

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 are presented in Table 3 and conceptualized in Figures 1 and 2. The first and second models yielded significant indexes for moderated mediation and so individual pathways are described, a conceptual diagram is used to illustrate the interaction, 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 nonsignificant index of moderated mediation and so is reported only briefly.

Table 1. 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 (y)	36 ± 4.0	27	47
Maternal BMI[b]	25.9 ± 6.9	15.9	45.9
Number of children	2 ± 0.7	1	5
Child age (y)	3.8 ± 0.7	3	5
Subject social status[c]	5.0 ± 1.6	1	9
Maternal emotional eating: DEBQ[d]	2.60 ± 1.01	2.00	5.00
Child emotional eating: CEBQ[e]	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[f]	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

[a]All questionnaires use a 5-point Likert scale with lower scores reflecting a lower use of this behavior, and higher scores reflecting a greater use of this behavior.
[b]BMI = body mass index.
[c]MacArthur's Scale of Subject Social Status[35] uses ladder rungs to metaphorically represent perceived social status relative to others. Higher rungs indicate high perceived social status.[34]
[d]DEBQ = Dutch Eating Behaviour Questionnaire.[36]
[e]CEBQ = Children's Eating Behaviour Questionnaire.[41]
[f]CFPQ = Comprehensive Feeding Practices Questionnaire.[38]

Mediator: Food as a Reward, Moderator: Food Approach

Taking each path in Figure 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 nonsignificant 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

Table 2. Participant demographic characteristics

Measure	n (%)
Maternal ethnicity[a]	
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]Maternal ethnicity determined using the UK Government's list of ethnic groups.[34]

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).

The result from the index for moderated mediation was significant and positive, B = .06, standard error 0.03, 95% CI 0.010 to 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 4). Therefore, mothers who had a greater tendency to emotionally eat (eg, 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.

Mediator: Restriction of Food for Health Reasons, Moderator: Food Approach

Taking each path in Figure 2 individually, there was a nonsignificant 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).

The result from the index for moderated mediation was significant and positive (B = .04, standard error = 0.02, 95% CI 0.004 to 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 5). Therefore, mothers who had a greater tendency to emotionally eat (eg, 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 to 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.

Mediator: Food for Emotion Regulation, Moderator: Food Approach

The index for moderated mediation was nonsignificant (B = .04, standard error = 0.03, 95% CI −0.022 to 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.

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 behaviors being the most influenced by food parenting practices that use high reward or restriction of food.

This study's findings concur with previous work that has shown that parent EE is linked to higher use of food as a reward,[48] and that greater use of food as a reward[49] and restriction for health reasons[31] independently predict child EE and are associated with greater child food approach tendencies.[50] They also replicate previous research showing

Table 3. Moderated mediation models testing the mediating role of food parenting practices in the association between maternal emotional eating (EE) and child EE, and the moderating role of child food approach on this association[a]

		Food as a reward (M[b])					Child EE (Y[c])					
Antecedent		***B***[d]	***SE***[e]	***t***	***P***	**df**[f]		***B***	***SE***	***t***	***P***	**df**
Maternal EE (X)[g]	**a**[h]	.24	.07	3.36	0.001	182	**c′**[i]	.09	.04	2.30	0.023	179
Food as a reward (M)		—	—	—	—		$\mathbf{b_1}$[j]	.07	.04	1.69	0.093	179
Food approach (W)		—	—	—	—		$\mathbf{b_2}$[k]	.53	.07	8.09	< 0.001	179
M × W		—	—	—	—		$\mathbf{b_3}$[l]	.23	.05	4.24	< 0.001	179
Food as a reward, R^2[m] = 0.06, $F(2, 182) = 5.67$; $P = 0.004$							Child EE, $R^2 = 0.48$, $F(5, 179) = 33.48$; $P < 0.001$					

		Restriction for health (M)					Child EE (Y)					
Antecedent		***B***	***SE***	***t***	***P***	**df**		***B***	***SE***	***t***	***P***	**df**
Maternal EE (X)	a	.24	.06	4.17	0.004	182	c′	.07	.04	1.68	0.095	179
Restriction for health (M)		—	—	—	—		$\mathbf{b_1}$	.15	.06	2.59	0.010	179
Food approach (W)		—	—	—	—		$\mathbf{b_2}$	.50	.06	7.78	<.001	179
M × W		—	—	—	—		$\mathbf{b_3}$	.19	.05	3.64	<.001	179
Restriction for health, $R^2 = 0.10$, $F(2, 182) = 10.13$; $P < 0.001$							Child EE, $R^2 = 0.51$, $F(5, 179) = 37.33$; $P < 0.001$					

		Food for emotion regulation (M)					Child EE (Y)					
Antecedent		***B***	***SE***	***t***	***P***	**df**		***B***	***SE***	***t***	***P***	**df**
Maternal EE (X)	a	.24	.05	5.23	< .001	182	c′	.07	.04	1.75	0.082	179
Food for emotion regulation (M)		—	—	—	—		$\mathbf{b_1}$	.20	.07	2.86	0.005	179
Food approach (W)		—	—	—	—		$\mathbf{b_2}$	.49	.07	7.12	< 0.001	179
M × W		—	—	—	—		$\mathbf{b_3}$	.17	.06	2.99	0.003	179
Food for emotion regulation, $R^2 = 0.14$, $F(2, 182) = 14.76$; $P < 0.001$							Child EE, $R^2 = 0.48$, $F(5, 179) = 34.03$; $P < 0.001$					

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

that food parenting practices mediate the relationships between maternal and child EE.[51] 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 behavior tendencies interact with maternal feeding behaviors to predict EE, suggesting that children with high food approach tendencies may be the most susceptible to the maladaptive influences of maternal modeling 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,[42] it may be that there is a more direct relationship between use of food for emotion

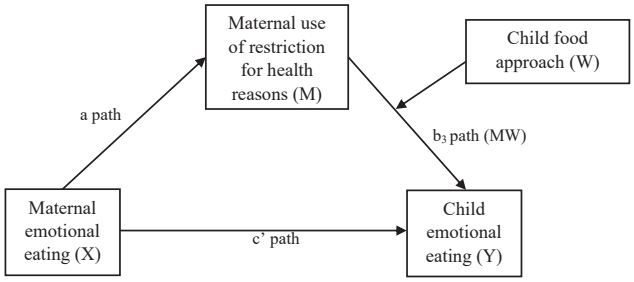

Figure 2. Conceptual moderated mediation model (PROCESS #14[45]) of the relationship between maternal emotional eating (EE) (X) and child EE (Y) using mediator: Restriction for health reasons (M) and moderator: Child food approach (W). c' = direct effect of maternal EE (X) on child EE (Y) holding use of restriction for health reasons (M) and child food approach (W) constant, a = unconditional effect of maternal EE (X) on use of restriction for health reasons (M), b_3 = conditional effect of use of restriction for health reasons (M) on child EE (Y).

regulation and child EE, irrespective of the child's food approach tendencies.[39]

The findings are consistent with the biopsychosocial model of overweight and obesity[13] 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,[52,53] and that food approach behaviors such as EE may be strongly influenced by behavioral and environmental experiences. Interventions that target these experiences may hold promise for reducing EE in children and interventions that 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.[54] 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 behaviors effectively and children are at the greatest risk of future overweight and obesity.[30] Given that eating behaviors track across childhood,[1] interventions would be best delivered early in life, before food parenting practices become engrained and the counterproductive consequences for children have already occurred.

Table 4. Relationships between maternal emotional eating (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]	95% CI
−0.64 (Low)[c]	−0.02	0.02	−0.053 to 0.005
0.00 (Medium)[d]	0.02	0.01	−0.003 to 0.041
0.64 (High)[e]	0.05	0.02	0.010* to 0.101*

[a]The Children's Eating Behaviour Questionnaire (CEBQ)[41] uses a 5-point Likert scale. Child food approach values are mean centered.
[b]*SE* = standard error.
[c]Low = −1 SD below the mean and reflects a score of 2.3 on the CEBQ (eg, "my child is rarely interested in food").
[d]Medium = the mean food approach score of the sample and reflects a score of 2.9 on the CEBQ (eg, "my child is sometimes interested in food").
[e]High = +1 SD above the mean and reflects a score of 3.5 on the CEBQ (eg, "my child is often interested in food").
*$P < 0.05$.

Table 5. Relationships between maternal emotional eating (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]	95% CI
−0.64 (Low)[c]	0.06	0.02	−0.037 to 0.045
0.00 (Medium)[d]	0.03	0.02	0.004* to 0.072*
0.64 (High)[e]	0.06	0.02	0.016* to 0.110*

[a]The Children's Eating Behaviour Questionnaire (CEBQ)[41] uses a 5-point Likert scale. Child food approach values are mean centered.
[b]SE = standard error.
[c]Low = −1 SD below the mean and reflects a score of 2.3 on the CEBQ (eg, "my child is rarely interested in food").
[d]Medium = the mean food approach score of the sample and reflects a score of 2.9 on the CEBQ (eg, "my child is sometimes interested in food").
[e]High = +1 SD above the mean and reflects a score of 3.5 on the CEBQ (eg, "my child is often interested in food").
*$P < 0.05$.

Strengths, Limitations, and Future Directions

Although 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 behavior, 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.[55] This study was based on a well-educated sample of middle-class White mothers and given the socioeconomic differences in eating behavior and weight,[56] further research is needed with more diverse samples, including male and nonbinary 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 emotional eating. However, these results do provide a starting point to consider the combined relationships between maternal and child factors and how they interact to predict child eating behavior, especially because the moderated mediation models conferred large effect sizes.[57]

CONCLUSIONS

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 behaviors in children, but this study shows that the influence 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.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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R. A. Stone oversaw data collection, analyzed 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. R. A. Stone was supervised by C. Farrow, J. Blissett, and E. Haycraft.