Inducing preschool children’s emotional eating: relations with parental feeding practices

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ABSTRACT
Background: Children’s emotional eating is related to greater body mass index and a less-healthy diet, but little is known about the early development of this behavior.

Objective: This study aimed to examine the relations between preschool children’s emotional eating and parental feeding practices by using experimental manipulation of child mood and food intake in a laboratory setting.

Design: Twenty-five 3–5-y-old children and their mothers sat together and ate a standard meal to satiety. Mothers completed questionnaires regarding their feeding practices. Children were assigned to a control or negative mood condition, and their consumption of snack foods in the absence of hunger was measured.

Results: Children whose mothers often used food to regulate emotions ate more cookies in the absence of hunger than did children whose mothers used this feeding practice infrequently, regardless of condition. Children whose mothers often used food for emotion regulation purposes ate more chocolate in the experimental condition than in the control condition. The pattern was reversed for children of mothers who did not tend to use food for emotion regulation. There were no significant effects of maternal use of restriction, pressure to eat, and use of foods as a reward on children’s snack food consumption.

Conclusions: Children of mothers who use food for emotion regulation consume more sweet palatable foods in the absence of hunger than do children of mothers who use this feeding practice infrequently. Emotional overeating behavior may occur in the context of negative mood in children whose mothers use food for emotion regulation purposes. This trial was registered at clinicaltrials.gov as NCT01122290. Am J Clin Nutr doi: 10.3945/ajcn.2010.29375.

INTRODUCTION
Emotional eating (defined as “Eating in response to a range of negative emotions . . . to cope with negative affect”) (1) occurs regardless of internal state of hunger or satiety and is associated with higher body mass index (BMI; in kg/m²) in adults (2). Schoolchildren’s emotional overeating is also associated with greater energy intake (3), particularly from sweet/salty energy-dense foods and sugary drinks in adolescents (4). Emotional eating is prevalent in obese children and shows a linear association with children’s BMI (3, 5).

Emotional overeating in children is not uncommon and occurs early in life. Emotional overeating was reported by 27% of 5-y-old girls (6), and 7–12-y-old children self-reported similar rates (7). However, 7–12-y-old children are more likely to report external and restrained eating than emotional overeating (7). Parents report that emotional undereating is a more frequent response to emotional distress than overeating in 2–6-y-old children (8), van Strien and Oosterveld (7) proposed that most young children maintain a natural reaction to emotional stressors (a reduction in appetite associated with loss of gut activity), and that early emotional overeating is a significant abnormality. Emotional overeating is likely to be a learned response to stress by the time children reach adolescence (9). Emotional overeating increases and emotional undereating decreases between 4 and 10 y of age (10). Children who showed high levels of emotional overeating at 4 y also showed high levels at 10 y, suggesting considerable continuity in emotional overeating. Similar levels of continuity are not observed for emotional undereating (10).

Parents’ feeding practices may “teach” children to use food to address emotional arousal. For example, emotional eating in 5-y-old girls and in 7–12-y old boys has been linked to perceptions of parents’ use of pressure to eat (6, 11), which is a feeding practice associated with greater negativity and higher parental control during mealtimes (12, 13). The negative emotional associations of parental control with food intake may interfere with interoceptive awareness (14): if the child comes to inappropriately identify discomfort as hunger, then his or her response to any negative arousal state is more likely to include food intake. Emotional overeating in 7–12-y-olds has also been negatively related to perceived parental restriction (11). However, restrictive feeding practices also appear to focus children’s attention on restricted foods, making them more desirable (15), which could result in subsequent weight gain (16). Research has not examined how practices such as the use of food for emotion regulation or reward may be related to emotional eating.

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In summary, although many parents report that their child engages in emotional over- and undereating from a young age (2 y, by using the Child Eating Behavior Questionnaire) (8, 17), no study has assessed the relations between observed, experimentally induced, emotional eating in preschool children and parents’ feeding practices. We hypothesized that 3–5-y-old children would consume more calories after a negative mood induction than would control group children if their parents used food for emotion regulation, food as a reward, or pressure to eat. Given equivocal findings of the effects of restriction on eating behavior (6, 18), we made the nondirectional hypothesis that restriction would be related to emotional eating. Finally, we hypothesized that the effects of emotional overeating would be specific to palatable snacks in line with previous research (19).

**SUBJECTS AND METHODS**

**Participants**

Our original sample consisted of an experimental group of 31 mother-child dyads and a control group of 33 dyads. Initial data screening was carried out, and a large number of participants were eliminated for a variety of reasons (see Figure 1 and Data analysis for details). The remaining sample consisted of 12 mother-child dyads in the experimental group and 13 mother-child dyads in the control group. The children’s ages ranged from 35 to 59 mo in the experimental group and from 34 to 55 mo in the control group. Within the experimental group, there were 7 boys and 5 girls of whom 83% were white British. The control group consisted of 6 boys and 7 girls of whom 92% were white British. The study was approved by the institutional review board at Loughborough University (Leicestershire, United Kingdom).

**Procedure**

The experimental flowchart in Figure 1 describes the participants’ experience of the study. Mothers and their children were welcomed to the laboratory and familiarized with the setting and layout of the room. Attractive and age-appropriate toys were present at all times within the laboratory. Mothers and their children, irrespective of group, were given a standardized lunch. Each child’s lunch comprised one white bread roll, one slice of chicken, one slice of cheese, 4 cheese crackers, 5 carrot sticks, 2 chocolate chip cookies, and 3 pieces of chopped apple. Maternal lunches were identical except mothers were given 2 bread rolls, 2 slices of chicken, and 2 slices of cheese. Vegetarian diets were accommodated with additional cheese instead of chicken. All children were asked to eat until they were satiated. No child asked for more food, and only one child consumed all the food available on his or her plate. The children and their parents were weighed and measured in light indoor clothes with shoes removed at the end of the session. Children’s BMI data were converted to appropriate age- and sex-adjusted SD scores (20).

After the mealtime was over, the mothers and their children were separated and taken to 2 different sectioned-off areas within the same laboratory space. Mothers were asked to sit and complete a series of questionnaires while the children engaged in the mood manipulation or control condition and eating test. Children could not see their mothers during this time, but mothers could hear their children.

Mothers completed a descriptive demographic questionnaire that assessed maternal age, child’s age, and maternal education after age 16 y. Mothers then completed 5 subscales from the Comprehensive Feeding Practices Questionnaire (CFPQ) (21), which included the following criteria: 1) food as a reward, 2) emotion regulation, 3) restriction for weight, 4) restriction for health, and 5) pressure to eat. Mothers responded to statements...
about feeding practices on a scale of 1–5 where 1 = never/disagree and 5 = always/agree. Higher scores indicated greater use of the particular feeding practice. The CFPQ has been shown to be reliable and valid for use with this age group (21). Children were randomly allocated to the experimental or control condition.

Experimental group

A detailed pilot study of 17 children provided assurance that 3–5-y-olds could use the emotion rating scale and that the mood induction procedure would typically be effective (E Haycraft, J Blissett, and C Farrow, unpublished observations, 2008). The emotion rating scale consists of a series of 5 stylized, non–sex-specific faces ranging from very smiley (to indicate happiness) to an extreme down-turned mouth (to indicate unhappiness). This scale is widely used with 3–5-y-old children in other developmental psychology studies (22). Two emotion induction procedures were used during this pilot: a story with a sad theme and a jigsaw puzzle task with a missing piece. Pilot data suggested that the 3–5-y-olds showed the greatest negative mood shift in the missing jigsaw puzzle piece condition, so this was chosen as the procedure for this study.

There were no prior studies of young children’s consumption of food after emotion induction upon which we could base a priori power calculations. However, previous studies of children’s eating in the absence of hunger have indicated large effect sizes (eg, sex differences in kilocalories consumed in the absence of hunger by 4–5-y-old girls compared with boys, effect size = 0.77) (23). Post hoc power calculations were conducted after data collection and data trimming.

All children were familiarized with the 5-point smiley-face rating scale and then rated their mood. All children in the experimental group then underwent the mood induction task and were asked to complete a jigsaw puzzle to attain a sticker of their choice. During the task it became apparent to the child that a jigsaw puzzle piece was missing, and the child was told that he or she could not have a sticker because he or she had not completed the task. Children rated their mood again at this stage. The experimenter stated that she would look for the missing jigsaw puzzle piece for 4 min. Immediately, 6 bowls of snack foods were put on the table where the jigsaw puzzle was laid out (see jigsaw puzzle piece. Again, children were told they could have any of the foods if they wished and there were attractive toys within the laboratory space that the children were free to access. After 4 min, the snack foods were removed.

Snack foods

All children, regardless of group, were provided with snacks totaling ~331 kcal. These consisted of 6 g of salted crisps (potato chips) (~32 kcal), 2 chocolate-chip cookies (~115 kcal), 21 chocolate buttons (~115 kcal), 9 green grapes (~32 kcal), 2 carrot sticks (~6 kcal), and 3 mini breadsticks (~31 kcal). Each snack was presented in a separate bowl. The amounts were weighed before presentation of the snack foods and after consumption. Manufacturers’ nutritional information was used to calculate total kilocalories consumed from each food.

Data analysis

We removed all children who showed incongruous mood shift to condition [ie, any child who failed to respond to the emotional manipulation in the experimental group, any child whose mood deteriorated in the control group, any child brought in by a (nonprimary caregiving) grandparent rather than his or her mother (because of the need to relate regular feeding practice to behavior), any child with missing data for mood shift (because of unwillingness to cooperate with the experimenter when mood ratings were required), and any child with age or BMI as an outlier that skewed the mean age or BMI of either the control or experimental groups (see Figure 1 for details). Kolmogorov-Smirnov tests showed that demographic data, feeding practices, children’s mood ratings before eating, kilocalories consumed from chocolate, and total kilocalories consumed in the test period were all normally distributed. Kilocalorie intake from other individual foods showed evidence of deviation from the normal distribution. Given that the data were predominantly normally distributed, parametric tests were conducted. The most robust multivariate analysis of variance (MANOVA) statistic, Pillai’s Trace, was used within outcome analyses. Independent-samples t tests were used to examine any baseline differences between the control and experimental groups. Paired samples t tests were used to examine changes in mood within subjects across the session. Independent-samples t tests showed that there were no significant differences between boys and girls in any parental report measure or consumption measure, so sex differences were not examined further in the study. Two-tailed Pearson’s correlations were used to examine whether there were any relations between child’s age, child BMI SD score, parental BMI, and parental education with maternal reports of feeding practices or children’s consumption of snack food. No significant correlations were reported, so these factors were not controlled for in further analyses.

To test the hypothesis that children’s consumption under negative emotion conditions would be higher only in cases in which parental feeding practices were less adaptive, we ran a series of 5 MANOVAs. Group (experimental or control) and 1 of each of the 5 feeding practices (high or low) were the 2 fixed factors within each MANOVA. High or low scores on each feeding practice were assigned depending on whether the
individual’s score was above or below the overall group mean for each separate feeding practice. We used energy consumption from each snack food individually and the total kilocalories consumed in the absence of hunger as the dependent variables in each multivariate analysis.

Post hoc effect size calculations yielded effect sizes ranging from extremely small (eg, differences between groups in carrot consumption; effect size = 0.01) to large (eg, differences between groups in breadstick consumption; effect size = 1.07). Power varied accordingly. Observed power within MANOVA ranged from significantly underpowered (to examine basic experimental group differences in consumption, power = 0.499) to high power (to examine differences between children of parents who did and did not use food for emotion regulation, power = 0.910).

RESULTS

Differences between experimental and control groups

The data presented in Table 1 show that the experimental group and the control group were not significantly different in any factor of interest, with the notable exception of children’s mood before being offered the snack foods (ie, after the jigsaw puzzle). Children in the experimental group had significantly lower mood ratings than did children in the control group after the mood manipulation (see Table 1). In addition, 2 within-subject t tests confirmed that the experimental group’s mood before being offered snack foods (ie, after the negative mood induction) was significantly lower than their baseline mood, dropping from a mean of 4.83–2.0 during mood induction (t = 10.47, df = 11, P < 0.0001). The control group’s mood before eating the snack foods did not differ significantly from baseline mood: 4.25–4.31 (t = −1.48, df = 12, P = 0.165). The experimental group’s mood ratings also returned to baseline after procedure (from 2.0 to 4.8; t = −10.47, df = 11, P < 0.0001).

There were no significant differences between the control and experimental groups in parental reports of feeding practices (Table 1). Scores for parental reporting of feeding practices were similar to reports from mothers in other studies that used the CFPQ (21).

The range of total kilocalories consumed during the 4-min testing phase varied from 0 to 115.4 in the experimental group and from 0 to 152.6 in the control group. There was no evidence to suggest that children consumed more kilocalories under conditions of negative emotion than did children who were not under such conditions. However, children in the experimental group consumed considerably more breadsticks than did children in the control group (≈8 kcal more; see Table 2).

Parental use of food for emotion regulation

A MANOVA examining differences in energy consumption and eating in the absence of hunger by parental consumption of food for emotion regulation (high compared with low) and group (experimental compared with control) was significant (Pillai’s trace = 0.621, \(F_{(6,16)} = 4.367, P = 0.008\)). There was a main effect of high- compared with low- use of food for emotion

### Table 1

<table>
<thead>
<tr>
<th>Characteristics of the experimental and control groups</th>
<th>Experimental group</th>
<th>Control group</th>
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<tbody>
<tr>
<td>(n = 12)</td>
<td>(n = 13)</td>
<td></td>
</tr>
<tr>
<td>Child’s age (mo)</td>
<td>51.1 ± 6.31</td>
<td>46.4 ± 6.65</td>
</tr>
<tr>
<td>Child BMI SDS</td>
<td>0.31 ± 0.72</td>
<td>−0.03 ± 0.91</td>
</tr>
<tr>
<td>Maternal age (y)</td>
<td>32.8 ± 6.61</td>
<td>31.8 ± 5.05</td>
</tr>
<tr>
<td>Maternal education (&gt;16 y)</td>
<td>3.6 ± 3.6</td>
<td>3.8 ± 2.4</td>
</tr>
<tr>
<td>Maternal BMI (kg/m²)</td>
<td>24.1 ± 3.36</td>
<td>24.3 ± 6.49</td>
</tr>
</tbody>
</table>
| Mood score before jigsaw puzzle (baseline)

### Table 2

<table>
<thead>
<tr>
<th>Summary of differences in consumption of energy from snack foods between groups</th>
<th>Experimental group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n = 12)</td>
<td>(n = 13)</td>
<td></td>
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</tbody>
</table>
| Energy from
| Breadsticks                                                                    | 8.1 ± 10.1         | 0.4 ± 1.1\(^{2}\) |
| Carrots                                                                         | 0.4 ± 1.0          | 0.4 ± 0.8    |
| Grapes                                                                          | 3.6 ± 5.2          | 2.3 ± 4.7    |
| Crisps                                                                          | 3.6 ± 4.5          | 5.4 ± 10.9   |
| Cookies                                                                         | 15.9 ± 24.4        | 14.1 ± 26.1  |
| Chocolate                                                                       | 23.2 ± 20.4        | 31.8 ± 39.0  |
| Total energy consumed                                                           | 54.8 ± 34.0        | 54.3 ± 47.2  |

\(^{1}\) All values are means ± SDs.

\(^{2}\) \(P < 0.05\) (independent-samples t test).
regulation on consumption of cookies. Tests of between-subject effects showed that children whose parents used food for emotion regulation purposes consumed more cookies than did those whose parents reported lower ratings of this practice, irrespective of experimental group ($F_{1,23} = 11.29, P = 0.003$). The children whose parents used food for emotion regulation consumed a mean of 29 kcal more from cookies than did children whose parents tended not to use food for emotion regulation ($P = 0.003$). In line with the $t$ test results, tests of between-subject effects showed that there was an effect of experimental group on breadstick consumption ($F_{1,23} = 7.229, P = 0.014$), with the experimental group consuming more breadsticks than the control group. Between-subject tests also showed that there was one significant interaction of experimental group and use of food for emotion regulation classification. Children of parents who were high in use of food for emotion regulation consumed more calories from chocolate in the experimental than in the control condition and vice versa: children whose parents did not tend to use food for emotion regulation consumed more in the control group than in the experimental group ($F_{1,23} = 4.91, P < 0.038$) (see Figure 2). There were no other significant main or interaction effects of the use of food for emotion regulation on intake of any other food or total calories consumed. There were no significant main effects of any other feeding practice, or interactions between group and any feeding practice classification, on consumption of calories from any snack food on the basis of other CFPQ criteria (restriction for health, restriction for weight, use of food as a reward, and pressure to eat).

**DISCUSSION**

This study aimed to explore the associations between parental feeding practices and children’s early emotional eating. In summary, our findings suggest that parental use of foods for emotion regulation is associated with higher consumption of sweet, fatty foods in the absence of hunger and that this effect may be exaggerated in the context of negative emotion. This suggests that either these feeding practices may be teaching children to deal with negative emotional states by ingesting palatable foods or that parents learn to use these practices with children for whom eating is fundamentally more rewarding or comforting. Individual differences in children’s appetite, or preference for sweet foods, may encourage these feeding practices. The adult literature suggests that sweet palatable foods (particularly chocolate) have an immediate short-term remedial effect on negative emotion (19) and that repeated experience of this short-term effect predicts the use of such foods to attenuate negative emotion. Direct teaching of this effect by parents who use foods to comfort their children may encourage this learning.

It could be argued that the statistically significant differences in food intake between those children whose parents tended to use food for emotion regulation purposes and those who did not tend to use this practice reflect small, potentially clinically insignificant, differences in energy intake. However, it is important to note that the measurements taken within this study reflect very young children’s eating behavior within minutes of eating to satiety in a 4-min period of free access to food. If, on average, a child in a mildly negative emotional state consumed 29 kcal in 4 min, then free access to foods for longer duration, such as typically happens in home environments, could cause the energy intake for that child to become clinically significant. Although further research is required to establish the degree to which emotional overeating continues in a longer duration of free access, given the evidence that emotional overeating increases with the child’s age (10), these early differences may develop into clinically significant differences later in life.

One interesting question highlighted by the significant interaction between group and parental use of food for emotion regulation is why children in the control group ate more chocolate when their parents did not use food for emotion regulation than when their parents did. Although this finding requires replication, it is possible that when parents did use food to regulate emotion, the children were consuming more of the other foods in addition to chocolate. Within the 4-min window of opportunity for eating, this other eating behavior may have had an effect on the consumption of chocolate. Evidence to support this interpretation comes from the fact that more cookies were eaten by those children whose parents used foods to regulate emotion than those in the control group consumed significantly more chocolate ($\approx 6$ kcal), whereas those in the control group consumed significantly more energy from chocolate ($\approx 43$ kcal). This is consistent with the proposal that children’s early emotional overeating is an abnormality (7) that may be a learned response to stress (9).

Despite evidence for some trends in the remaining analyses, there was no statistically significant evidence in this study that restrictive feeding practices that are motivated by child weight or health reasons, the use of pressure to eat, or the use of foods as a reward were associated with emotional overeating behavior in
this group. It is important to note that this small study was underpowered to detect small effect sizes.

Interestingly, there was no effect of group or parental feeding practices on total energy intake from snack foods in the context of negative emotion in this study, with the exception that children in the experimental condition consumed ~8 kcal more from breadsticks than did children in the control condition. Although this was a statistically significant difference ($P < 0.05$), it is unlikely to be clinically significant. It is likely to be a spurious finding that may indeed be below the level of measurement precision afforded by this study and has little implication for overall energy intake. However, given that the children of parents who used food for emotion regulation purposes did consume more calories from less healthy foods during negative emotional states, it is possible that dietary balance, rather than overall energy intake, may be affected by emotional overeating of less healthy foods in young children in the short term. The long-term effect of emotional eating on energy intake or dietary quality was impossible to assess in this study. Indeed, this study was only able to examine the very short term effects of negative emotion on children’s intake, and these may be very different from the effects of chronic experience of negative emotion on consumption behavior.

There were no significant effects for child’s age, BMI, or sex in this study. We included a narrow age range in this study, and evidence suggests that emotional overeating becomes more common in older children (10). We did not have extremes of child BMI in this sample; therefore, it was impossible for us to assess any interactions with child BMI in this data set and we cannot extrapolate these findings to children with significant weight concerns at either end of the spectrum. It is possible that emotional overeating does not have a demonstrable relation with child BMI until later in childhood. Power to detect such a relation was lacking in this sample.

The findings of this study present interesting and unique relations between the consumption of palatable foods in the context of negative emotion for the children of parents who use for emotion regulation. These findings are both novel and timely but require replication, and this study is not without its limitations. For example, there was large data loss from the study, primarily because of the range of individual differences in children’s reaction to the mood manipulation, and further research is required with larger populations. However, the mood manipulation implemented in this study appeared to successfully induce a negative shift in emotion in those remaining in the experimental group, as evidenced by the significant difference in mood ratings made by the children in the 2 groups before the snack foods were offered. We attempted to strike a balance between the efficacy of a negative mood induction and the ethical acceptability of causing negative mood in children, and it is possible that a slightly stronger mood manipulation may still be ethically acceptable but show a more consistent effect on children’s mood ratings. We also had limited demographic variation in the sample, so results cannot be generalized to other ethnic, cultural, or socioeconomic groups without further research. Because of the data loss, we have limited power for some of our analyses. Post hoc power calculations suggest that the effect sizes we have in this study are highly variable, with large, medium, and small effect sizes being apparent for the different foods. Therefore, some of the trends that were observed within the data may have become significant with a larger sample size.

In summary, this is the first study, to our knowledge, that documents a relation between parental use of food for emotion regulation purposes and the amount of food eaten in a brief period in the absence of hunger by preschool children. These data suggest that parental practices that specifically teach the consumption of sweet palatable foods for regulation of emotion are explicitly linked to children’s intake of those foods when experiencing negative mood in a laboratory setting.

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The authors’ responsibilities were as follows—CF and EH: carried out and oversaw data collection and contributed to the writing of the manuscript and its editing; and JB: analyzed and drafted the primary manuscript. All the authors contributed to the design of the study. The authors had no conflicts of interest to declare.

REFERENCES