Teaching our children when to eat

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DOI:
10.3945/ajcn.114.103713

Teaching our children when to eat: how parental feeding practices inform the development of emotional eating—a longitudinal experimental design[1–3]

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ABSTRACT

Background: Emotional eating in children has been related to the consumption of energy-dense foods and obesity, but the development of emotional eating in young children is poorly understood.

Objectives: We evaluated whether emotional eating can be induced in 5–7-y-old children in the laboratory and assessed whether parental use of overly controlling feeding practices at 3–5 y of age predicts a greater subsequent tendency for children to eat under conditions of mild stress at ages 5–7 y.

Design: Forty-one parent-child dyads were recruited to participate in this longitudinal study, which involved parents and children being observed consuming a standard lunch, completing questionnaire measures of parental feeding practices, participating in a research procedure to induce child emotion (or a control procedure), and observing children's consumption of snack foods.

Results: Children at ages 5–7 y who were exposed to a mild emotional stressor consumed significantly more calories from snack foods in the absence of hunger than did children in a control group. Parents who reported the use of more food as a reward and restriction of food for health reasons with their children at ages 3–5 y were more likely to have children who ate more under conditions of negative emotion at ages 5–7 y.

Conclusions: Parents who overly control children's food intake may unintentionally teach children to rely on palatable foods to cope with negative emotions. Additional research is needed to evaluate the implications of these findings for children's food intake and weight outside of the laboratory setting. This trial was registered at clinicaltrials.gov as NCT01122290. *Am J Clin Nutr* 2015;101:908–13.

Keywords: child emotional eating, child feeding, longitudinal, obesity, snack food

INTRODUCTION

Emotional eating can be defined as "eating in response to a range of negative emotions such as anxiety, depression, anger and loneliness to cope with negative affect" (1). In adults and adolescents, emotional eating has been linked to heavier weight, obesity, and greater consumption of energy-dense sweet and salty foods (2–4; see reference 5 for conflicting results). In younger children, approximately one-quarter of parents of 5-y-olds reported that their children exhibited emotional disinhibition with food (6), and 63% of children aged 5–13 y reported eating in response to mood (7). Parents of 2–6-y-olds tend to report great emotional undereating rather than overeating (8).van Strien and Oosterveld (9) suggested that young children lose their appetite as a natural response to stress associated with a loss of gut activity (10). Emotional overeating may be a learned abnormality that is likely to exacerbate ill health. Because eating behaviors track across life, understanding the development of this behavior is critical (11, 12).

Parental feeding practices have been shown to have an impact on children's developing eating behaviors (13–15). Previous research suggested that parental use of food as an emotional tool may teach children to use food to alleviate or distract from negative emotion (16, 17). Other feeding practices that overly control children's food intake have also been shown to predict unhealthy eating behaviors because they are believed to undermine children's ability to regulate their hunger and satiety. Parental use of food as a reward or for emotional reasons has been correlated with emotional undereating in 3–6-y-old children (13), and pressuring children to eat has been shown to predict greater emotional eating in 5- and 7–12-y-olds, respectively (6, 18). However, most of this research has been cross-sectional and used parent reports of feeding practices and eating behaviors (13, 15), which have made it difficult to establish causality.

Previously, Blissett et al. (16) developed a novel procedure for inducing child emotion in a laboratory setting; however, their original sample was reduced significantly because many 3–5-y-olds failed to

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Received November 19, 2014. Accepted for publication February 9, 2015.
First published online March 18, 2015; doi: 10.3945/ajcn.114.103713.

respond to the emotion manipulation. The first aim of this study was to refine this emotional manipulation to assess its efficacy in a sample of 5–7-y-olds, who may be more capable of accurately rating their mood. The second aim was to assess whether children aged 5–7 y are more prone to eat in the absence of hunger when under conditions of mild stress compared with a control group. The final aim was to ascertain whether parents who reported using high levels of controlling feeding practices with their 3–5-y-old children had children who were more likely to emotionally overeat when they experienced stress in a laboratory setting 2 y later.

METHODS

Participants

A small sample of 41 parent-child dyads participated in this longitudinal study, which was part of a larger study described elsewhere (16). Participants were recruited to this study via advertisements to parents in the East Midlands area of the United Kingdom. Families were eligible to participate if they had a child aged between 2 and 5 y old with no medical conditions that affected eating or feeding. Families were followed up 2 y later (time point 2). After data screening, we removed 6 families from the original data set for a variety of reasons (see Data analysis), which left a final sample of 35 children (16 boys and 19 girls). Children's ages ranged from 34 to 59 mo at time point 1 (mean ± SD: 46 ± 7.18 mo). The mean child age at time point 2 was 6.15 ± 0.56 y; range: 5–7 y). Most (91%) of the sample described their ethnicity as white British. This study was approved by the ethics committee at Loughborough University and was registered at clinicaltrials.gov as NCT01122290. All procedures were conducted in accordance with the Declaration of Helsinki as revised in 1983.

Procedure

Time point 1

At time point 1, families were welcomed to the laboratory and mothers completed a battery of self-report questionnaires. These questionnaires included a demographics questionnaire and the following subscales from the Comprehensive Feeding Practices Questionnaire (CFPQ) (19): use of food as a reward, use of food for emotion regulation, restriction for weight, restriction for health, and pressure to eat. Questions were answered by using a Likert scale that ranged from 1 (never or disagree) to 5 (always or agree) with higher scores indicating greater use of the particular feeding practice. Full details of the other measures completed at time point 1, which are not used within this article, and the baseline procedure are described elsewhere (16).

Time point 2

At time point 2, children were welcomed to the laboratory with their mothers and given an opportunity to familiarize themselves with the room and play with the age-appropriate toys available within the laboratory. All mother-child dyads were given a standardized lunch. The child's lunch consisted of one white-bread roll, one slice of chicken, one slice of cheese, 4 cheese crackers, 3 pieces of chopped apple, 5 carrot sticks, and 2 chocolate chip cookies. Mothers' lunches were the same as children's lunches but slightly larger because they included 2 bread rolls, 2 slices of chicken, and 2 slices of cheese. When mothers indicated that they or their children were vegetarian, chicken was not offered and was replaced with additional cheese. Mothers and children were each provided with a drink of water with their meals. Mothers and children were asked to eat from their own plates until they felt full and could ask for additional food if they wished (no families requested more food). Once they had finished eating, mothers and children each took part in separate procedures within the same room. Mothers were asked to complete a series of questionnaires while the children engaged in a task with the researcher. Children were randomly allocated to either the experimental mood-manipulation group or control group, with children being in the same group that they had been involved in at time point 1. Children could not see their mothers, but mothers could watch their children through a screen if they wanted to. After the procedures had finished, all mothers and children were weighed and measured in light indoor clothes without shoes. Weight and height scores were converted to BMI scores for mothers and age- and sex-adjusted BMI SD scores (SDSs) for children (20).

Experimental group

Children were shown a 5-point smiley-face rating scale to measure their baseline mood according to pictures. Responses were coded on a 5-point Likert scale where 5 denoted very happy, 3 denoted neutral, and 1 denoted very sad; this method has been previously shown to discriminate mood in children in this age range (16, 21). Children were shown a selection of small toys and invited to choose one that they were told they would receive on completion of a coloring task. The toy was placed in sight but out of reach. Children took part in an age-appropriate mood-induction task whereby they were asked to color in a drawing. Sections of the drawing were numbered, and a set color was assigned to each number (e.g., red for all the sections marked with the number 1). The color key was visible to children, and the researcher went through this with them such that the child knew which color crayon was to be used in each area before beginning coloring. The children colored in the drawing, but when they got to the final number (i.e., number 6), they realized that the required purple crayon was missing. The researcher told the child that, because they had not completed the coloring, they could not have their chosen toy. The experimenter presented children with the smiley-face rating scale and asked them to indicate their mood now that they could not have their toy. The researcher stated that she would look for the missing crayon and placed 6 bowls of snack foods in front of the child, which had each been preweighed and were presented in separate bowls. Manufacturer nutritional labels were used to calculate kilocalories for each snack food; these foods included 6 g salted crisps (~32 kcal), 2 chocolate chip cookies (~115 kcal), 21 chocolate buttons (~115 kcal), 3 small breadsticks (~31 kcal), 2 carrot sticks (~6 kcal), and 9 green grapes (~32 kcal). Children were told that they could eat any of the snacks or play with nearby toys while the researcher looked around for the crayon. After 4 min, the researcher found the missing crayon and handed it to the child. The child completed the coloring task, received their chosen toy, and rerated their mood by using the smiley face scale as a check that all children's moods had returned to the premanipulation standard or above (in all cases, mood returned to baseline or a happier mood).

Control group

The procedure was identical for children in the control group except that there was no missing crayon for these children, and they received their chosen toy after completing the coloring task. Children in the control group rated their mood before and after the coloring task and were given the option to help themselves to the same range of snack foods (as previously noted) or play with toys in the laboratory while the experimenter tidied up. As before, the bowls of snack food were removed after 4 min and reweighed.

Data analysis

Six parent-child dyads were removed from the data set for the following reasons: child showed an incongruous mood shift (e.g., mood did not deteriorate in the experimental condition, or mood deteriorated in the control group), child attended with a grandparent, or child was deemed to be an outlier according to their BMI SDS, which left a final sample of 35 children. Independent sample *t* tests were used to examine whether there were any differences between control and experimental groups according to child age, maternal education, child BMI SDS, maternal BMI, or parental reported feeding practices. Pearson correlations were used to explore whether these demographic variables were related to children's snack-food–consumption data at time point 2. Independent sample *t* tests were used to explore whether there were sex differences for children on parental reports of feeding practices or child consumption data.

For the first aim, to explore the efficacy of the emotion manipulation at inducing negative emotion, paired *t* tests were used to examine whether experimental group children reported significant differences in their mood before and after the emotion-induction procedure. Independent sample *t* tests were used to examine whether experimental group children differed in mood from that of control group children. For the second aim, to assess whether children ate more under conditions of stress, we used an ANCOVA. An ANCOVA was also used to explore whether parental feeding practices at time point 1 (high or low scores on feeding practices) predicted greater consumption of snack foods at time point 2. For each ANCOVA, there were 2 fixed factors of group (experimental or control) and feeding practice measured at time point 1 (high or low according to the group mean for each feeding practice) with maternal BMI and child BMI SDS as covariates. The dependent variable was total kilocalories consumed from all snack foods in the absence of hunger.

RESULTS

Screening for confounding variables

Independent sample *t* tests indicated that there were no significant differences between children in the control or experimental group according to maternal education, maternal BMI, child age, or parentally reported child feeding practices at time point 1 (**Table 1**). However, there were significant differences between children in the control and experimental groups according to child BMI SDSs (Table 1). Two-tailed Pearson correlations were run to ascertain whether maternal education, maternal BMI, child age, or child BMI SDS was related to child consumption of different foods. There were no significant relations with the exception of maternal BMI, which was significantly correlated with child consumption of calories from cookies at time point 2 ($r = 0.46$, $P < 0.05$). Therefore, in all subsequent analyses, effects of child BMI SDS and maternal BMI were controlled for. Independent sample *t* tests indicated that there were no significant differences between girls and boys according to parent reports of feeding practices or child consumption data; therefore, child sex was not controlled for in the analyses.

Differences between the control and experimental groups

Paired sample *t* tests suggested that the emotion-induction procedure had been successful at altering child emotion with significant differences between child mood before and after the emotion induction in the experimental group. In comparison, in control group children, there was no significant difference in mood ratings before and after completing the task (**Table 2**). Moreover, independent sample *t* tests indicated that there were significant differences in child-reported mood after the mood-induction or control task when mood for children in the experimental group after the mood induction was compared with baseline mood for children in the control group [$t(26) = -10.27$,

TABLE 1
Descriptive statistics for sample characteristics, feeding practices, and children's food intake between children in the control and experimental groups[1]

	Control group (n = 18)	Experimental group (n = 17)	P
Maternal years of education after age 16 y[2]	4.03 ± 3.33	4.94 ± 2.22	0.35
Maternal BMI,[2] kg/m^2	25.21 ± 4.91	25.03 ± 4.97	0.92
Child age,[2] mo	74.20 ± 5.69	74.15 ± 7.01	0.054
Child BMI SD score[2]	−0.45 ± 0.67	0.32 ± 0.74	0.003
Use of food as a reward[3]	2.39 ± 1.10	2.41 ± 1.14	0.97
Use of food for emotion regulation[3]	1.92 ± 0.62	1.92 ± 0.69	0.98
Restriction for weight[3]	1.81 ± 0.52	1.80 ± 0.54	0.97
Restriction for health[3]	3.27 ± 0.70	3.15 ± 1.13	0.67
Pressure to eat[3]	3.17 ± 1.02	2.62 ± 0.84	0.10
Energy consumed from foods,[2] kcal	30.17 ± 48.97	109.27 ± 123.70	0.02

[1]All values are means ± SDs. Independent sample *t* tests were used to compare the two groups.
[2]Measurement taken at time point 2.
[3]Measurement taken at time point 1, answered according to a Likert scale that ranged from 1 (never or disagree) to 5 (always or agree), with higher scores indicating greater use of the particular feeding practice.

TABLE 2
Comparisons of children's moods within and between groups at different time points across the procedure[1]

	Mood 1	Mood 2	Mood 3	Moods 1 and 2 *t* score[2]	Moods 2 and 3 *t* score[2]	Moods 1–3 *t* score[2]
Control group (n = 18)	4.72 ± 0.57	Not taken	4.83 ± 0.38	Not applicable	Not applicable	−1.00
Experimental group (n = 17)	5 ± 0.00	1.94 ± 0.97	4.94 ± 0.24	13.05*	−12.37*	1.00
Test of difference between groups[3]	2.05	−10.27[4,*]	1.00	Not applicable	Not applicable	Not applicable

[1]Mood 1 denotes the baseline mood; mood 2 denotes the mood after emotion induction (not taken for control children); and mood 3 denotes the mood after completing the procedure. *$P < 0.001$.
[2]A paired sample *t* test was used to compare within a group over time.
[3]Independent sample *t* tests were used to compare the 2 groups.
[4]A *t* test was used to compare control-group children's baseline moods with experimental-group children's moods after the emotion induction.

$P < 0.001$]. The experimental group's mood ratings returned to baseline after completing the procedure (Table 2). There was a significant difference in terms of kilocalories consumed from snack foods between children in the experimental group and those in the control group (Table 1).

ANCOVAs

There were no significant main effects or interaction effects in the ANCOVAs when using parental use of food for emotion regulation, pressure to eat, or restriction of food for weight reasons, with the exception of the effect of the test group, which significantly predicted child snack food intake as described in the next paragraph.

Food as a reward

In an ANCOVA that explored differences in energy intake according to parental use of food as a reward at time point 1 (high or low) and group (experimental or control), with the covariates of child BMI SDS and maternal BMI controlled for, the effect of the test group was significant ($F_{[1,29]} = 10.36$, $P < 0.05$) with children in the experimental group consuming significantly more calories than did those in the control group. The range of total kilocalories consumed during the 4-min testing period ranged from 0 to 141.73 kcal in the control group and from 0 to 512.15 kcal in the experimental group (Table 1). There was no significant main effect for the use of food as a reward, but there was a significant interaction between group and use of food as a reward in predicting calorie intake ($F_{[1,29]} = 6.01$, $P < 0.05$). Children in the control group ate fewer calories when exposed to the high use of food as a reward (n = 8) than did children exposed to low use of food as a reward (n = 10). In contrast, children in the experimental group ate more calories when exposed to high use of food as a reward (n = 5) than to low use of food as a reward (n = 12) (**Figure 1**).

Restriction of food for health reasons

In an ANCOVA that explored differences in energy intake according to parental use of restriction for health reasons at time point 1 (high or low) and group (experimental or control), with the covariates of child BMI SDS and maternal BMI controlled for, there was again a significant effect of the test group and also a significant interaction between the experimental group and maternal use of restriction for health reasons ($F_{[1,29]} = 5.48$, $P < 0.05$). When decomposed further, results indicated that children in the control group who were exposed to high levels of restriction for health reasons (n = 8) ate fewer calories than did those exposed to low restriction (n = 10), whereas children exposed to high levels of restriction for health reasons who were also exposed to stress (n = 8) ate more total calories than did those exposed to low restriction (n = 9) (**Figure 2**).

DISCUSSION

This study aimed to assess the efficacy of a refined age-appropriate emotion manipulation to establish whether emotional eating could be observed in a group of 5–7-y-old children. In addition, the study aimed to evaluate whether parents who reported the use of more-controlling feeding practices with their 3–5-y-old children were subsequently more likely to find that their children were prone to emotionally overeat 2 y later. The findings of this small-scale study indicate that 5–7-y-old children exposed to an emotion-induction procedure consumed significantly more calories than did children in the control group. Moreover, greater maternal use of food as a reward and restriction of food for health reasons at ages 3–5 y was

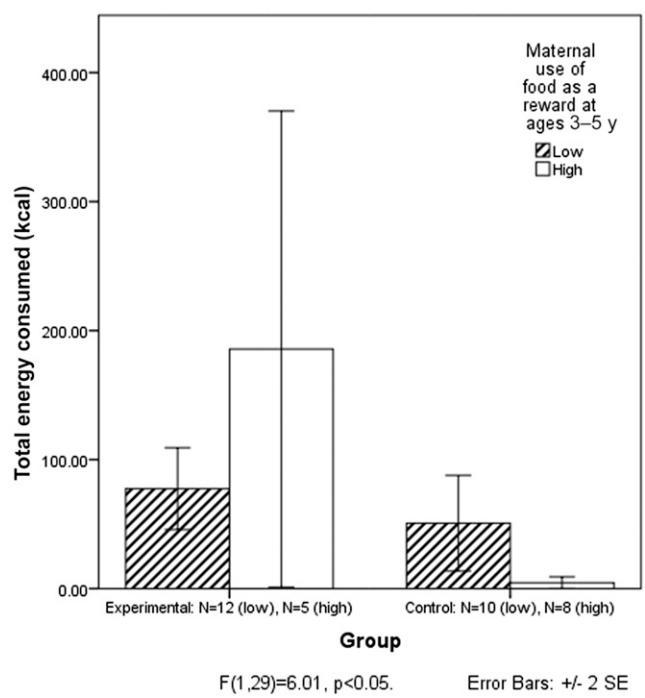

FIGURE 1 Intake of calories at 5–7 y of age under conditions of stress or control for children exposed to high or low use of food as a reward. An ANCOVA was used to analyze data.

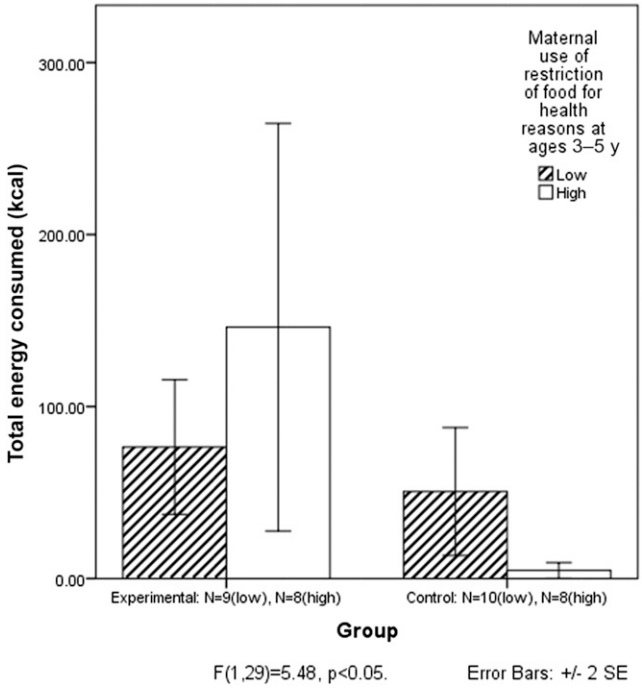

FIGURE 2 Intake of calories at 5–7 y of age under conditions of stress or control for children exposed to high or low restriction of food for health reasons. An ANCOVA was used to analyze data.

associated with greater child food intake in the absence of hunger 2 y subsequently.

In our previously published work with these children at ages 3–5 y (16), there were no meaningful differences between children in the experimental or control groups in terms of the kilocalories that they consumed, which suggested that emotional overeating is not a common response in children as young as 3–5 y. However, when we observed these children 2 y subsequently, we found a significant effect of the emotion manipulation on snack food intake in the absence of hunger. At ages 5–7 y, children in the experimental group ate more calories in the 4-min testing window than did children in the control group. The range of total kilocalories consumed in this 4-min period was 0–512 kcal in the experimental group compared with 0–142 kcal in the control group. Although this difference was striking, the real-life implications of this outcome are potentially more profound given that children may face a number of emotional stressors during their everyday lives, and as children age, they are likely to have longer periods to freely access food. Previously, it has been suggested that emotional overeating is a learned and abnormal response to stress in young children, and stress should naturally inhibit the tendency to eat (10). These findings support this suggestion, and it may be that, at some point between the ages of 4 and 6 y, the tendency, and perhaps opportunity, to emotionally overeat increases in many children. Our findings suggest that one factor that may contribute to this tendency is the feeding practices to which young children are exposed.

The findings indicated that, compared with a control group, under conditions of negative emotion, children were significantly more likely to consume food at ages 5–7 y if their parents reported greater use of food as a reward or use of restriction of food for health reasons 2 y previously. Overly controlling feeding practices such as these are likely to be associated with presenting and forbidding foods in situations that override children's natural signals of hunger and satiety. It may be that these more-controlling feeding practices that restrict and reward children with food are teaching children to see palatable foods as a tool that can be used to alleviate distress (16). By exploring these relations longitudinally over time, we have attempted to tease apart causality in these relations, but of course, it is possible that parents use these more-controlling feeding practices with children who are already highly responsive to the rewarding properties of food or have a tendency to overeat (22–24). Children's eating behaviors are highly complex and multifaceted, and it is likely that several other factors, not least a parent's own tendency to emotionally eat, also have an impact on the child's tendency to eat in the context of negative emotion (25, 26).

Contrary to our hypotheses, there was no effect over time of parental pressure to eat, use of food for emotion regulation, or restriction of food for weight reasons on child subsequent emotional eating. Previous research has shown that pressure to eat is associated with fussier eating and lower child consumption of pressured foods (which are often healthy foods such as fruit and vegetables) (27). Although the use of pressure may not be conducive to encouraging greater subsequent intake of pressured foods, it may be that pressure to eat has no particular detrimental effect on the tendency to overeat in the context of stress because the foods chosen in such contexts are not often those associated with pressuring feeding practices. The findings regarding the use of food for emotion regulation are more puzzling, and of all of the feeding practices assessed, we would have expected that higher use of food to regulate child emotion should have been linked with greater subsequent food intake in the context of a mild stressor. It is possible that the effects of the use of food for emotion regulation may become more powerful predictors of emotional eating behavior with increasing child age, and future research is needed with larger samples to fully explore these relations.

To our knowledge, the findings of this research are novel and unique, and this is the first study to explore the impact of parental feeding practices over time on experimentally observed emotional eating in young children. However, we stress that these findings were limited to a very small sample. The longitudinal- and laboratory-based nature of this study meant that the sample size was limited, and it is essential that these findings are replicated in larger samples with greater statistical power. Such replication should seek to recruit families from more diverse social and ethnic backgrounds to allow for generalization to more varied participant groups and also to increase our understanding of how ethnic and social factors and broader indexes of family food environments may affect these relations. Compared with our previously published work, the emotion manipulation procedure was much more successful at altering children's moods; this result may have been an effect of the specific emotion manipulation procedure used or a consequence of the sample of older children understanding the methods and measures more clearly. Additional novel developments are required to allow for the study of emotional eating in young children, but these developments must strike a careful balance between the efficacy of such methods and ethics of altering child mood to measurable degrees. Additional research is also required to explore how parental feeding practices may have an impact on children's

food consumption in the context of a wider variety of different emotional experiences. For example, Tanofsky-Kraff et al. (28) reported that eating in response to being happy (followed by boredom) is the most commonly endorsed reason for emotional eating in older children and adolescents, and these more varied emotions warrant exploration.

In conclusion, the findings of this research indicate that emotional eating can be observed in children as young as 5–7 y of age, and previous exposure to more controlling parental feeding practices can exacerbate the tendency to emotionally overeat in children of this age. Because emotional overeating tends to increase as children age (12), research is needed to understand the implications of these finding in the context of everyday life where children have free access to food, to inform the development of tailored prevention and intervention guidelines for families.

We thank Laura Houldcroft, Faye Powell, Hannah White, Radhika Kotak, Laura Richards, Adele Phillips, Priti Modhwadia, and Jodie Hallett for their help with data collection and coding.

The authors' responsibilities were as follows—CVF and EH: oversaw the data collection; CVF: analyzed data and had primary responsibility for the final content of the manuscript; and all authors: contributed to the design of the study and the writing of the manuscript. None of the authors reported a conflict of interest related to the study.

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