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NOTE

Parental overweight is associated with less encouragement of child dietary balance and variety and involvement in meal planning and preparation

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Abstract

Little is known about how the body composition of parents of preschool-aged children is associated with their food parenting practices. In this study, we examined associations between parental body composition and food parenting practices in a sample of Canadian families with preschool-aged children. We conducted a cross-sectional analysis of 68 parents and 52 preschool-aged children. Measures included height, weight, waist circumference (WC), and percentage of fat mass (%FM) measured by BOD POD™. Parents completed an adapted version of the Comprehensive Feeding Practices Questionnaire. To account for correlated observations within families, we used generalized estimating equations with linear regression modelling to examine associations between parent body composition and food parenting practices, with child body mass index (BMI) z-score, child sex, parental sex, and family household income entered as covariates in all models. Parent BMI, WC, and %FM were each significantly and inversely associated with the encouragement of a balanced diet ($\hat{\beta} = -0.021$, $p = 0.006$; $\hat{\beta} = -0.007$, $p = 0.038$; $\hat{\beta} = -0.010$, $p = 0.034$, respectively) and child involvement in meal planning and preparation ($\hat{\beta} = -0.082$, $p = 0.002$; $\hat{\beta} = -0.025$, $p = 0.032$; $\hat{\beta} = -0.038$, $p = 0.049$, respectively). We provide preliminary evidence that overweight/obesity may be associated with select food parenting practices in Canadian families with preschool-age children. Parental body composition may be an important consideration in intervention strategies that target food parenting practices.

Key words: child, parent, food parenting practices, feeding behaviours, body composition, overweight, obesity

Introduction

The incidence of obesity in youth entering adulthood has doubled in the past 30 years (Shields 2006). This is concerning not only because of the potential negative outcomes associated with obesity (Guh et al. 2009) but also because parents who are overweight are more likely to have offspring who are overweight and who may be more likely to become obese as adults (Whitaker et al. 1997; Wang et al. 2017). Research investigating social explanations of this phenomenon is limited.

Parents exhibit specific styles and practices in the feeding of their children, termed "food parenting practices" (Vaughn et al. 2016). Mounting evidence suggests that some food parenting practices influence young children's weight status and dietary intake (Savage et al. 2007). However, this relationship is complex and bidirectional as child weight status is also observed to influence food parenting practices (Jansen et al. 2014). The impact of parents' body composition status on these food parenting practices is unclear. This relationship may be useful to know when designing interventions to address food parenting practices. The limited prior research investigating the association between parent weight status and food parenting practices has focused on coercive controlling practices such as the use of food restriction. Results of these studies are inconclusive: some studies show associations between parent body mass index (BMI) and food parenting practices (Baughcum et al. 2001; Wardle et al. 2002; Agras et al. 2004; Haycraft and Blissett 2008), whereas others do not (Lumeng and Burke 2006). This literature would benefit from a more comprehensive investigation of food parenting practice domains and parental body composition. Prior studies have relied on BMI (Baughcum et al. 2001; Agras et al. 2004; Lumeng and Burke 2006; Haycraft and Blissett 2008), which may under- or overestimate body fat and therefore misclassify participants (Burkhauser and Cawley 2008). Only one study, from the UK, investigated total body fat and found that parents who were overweight were less controlling in their food parenting practices (Wardle et al. 2002). Investigation of the influence of total body fat, as well as location of body fat (i.e., waist circumference (WC)), is needed to provide a more accurate understanding of the influence of parental adiposity on feeding practices. Finally, to our knowledge, only two Canadian studies have explored feeding practices among parents of preschool-aged children (Shea et al. 2010; Watterworth et al. 2017); however, neither investigated the association with parent body composition. As Canadian childhood obesity rates differ from those elsewhere, such as in the US, it is important to investigate factors that may contribute to these differences. Feeding and parenting norms may differ from those practiced elsewhere in the world; thus, it is important to examine these associations within a Canadian context.

Our objective was to explore associations between comprehensive measures of parental body composition and food parenting practices in a sample of Canadian parents and their preschool-aged children.

Methods

Recruitment and eligibility

Cross-sectional data were obtained from the pilot of the Guelph Family Health Study (GFHS) (clinical trial identifier: NCT02223234). Families were eligible if they had at least one child aged 1.5–5 years old and lived in the Guelph area, with no plans to relocate within the first year of the study. The GFHS pilot consisted of 44 mothers, 34 fathers, and 55 children. Due to pregnancy, breastfeeding, and (or) incomplete body composition measures, the final analytic sample for this analysis consisted of 41 families with 37 mothers, 31 fathers, and 52 children (**Table 1**). For this study, we defined "family" as parents and their children who were 18 months to 5 years of age. Families could have one or many parents and a maximum of two parents from each family could register for the study. All study procedures took place at the University of Guelph from 2014 to 2016 after the parents provided written, informed consent. The study was approved by the institution's Research Ethics Board (REB14AP008).

Measures

Anthropometry

Parent height was measured using a wall-mounted stadiometer (Medical Scales and Measuring Devices; Seca Corp., Ontario, California, USA), with participants barefoot or in sock feet, heels

Table 1. Demographic characteristics of 41 families in the Guelph Family Health Study pilot.

Parental characteristics	*N*	%	SD
Parent age, mean (years)	35.1	—	3.3
Child age, mean (years)	3.6	—	1.2
Number of children	52	—	—
Number of families with one parent in the analysis	14	34.1	—
Number of families with two parents in the analysis	27	65.9	—
Number of families with one child in the analysis	30	73.2	—
Number of families with two children in the analysis	11	26.8	—
Parental sex			
Mothers	37	54.4	—
Fathers	31	45.6	—
Child sex			
Male	25	48.1	—
Female	27	51.9	—
Family household income (CAD)[a]			
$20 000–$49 999	9	21.9	—
$50 000–$99 999	17	41.5	—
$100 000–$149 999	11	26.8	—
$150 000 or more	4	9.8	—
Ethnicity			
Caucasian	57	83.8	—
Other	11	16.2	—

[a]Categories have been condensed to protect family identities.

together, arms to the side, legs straight, shoulders relaxed, and head in the Frankfort horizontal plane. For children with a height <130 cm and (or) who were <2 years old, length was measured using a pediatric length board (Weigh and Measure, LLC; ShorrBoard®, Olney, Maryland, USA), on which children were required to lay straight with feet flat against the base.

Parent and child weight were measured using the BOD POD™ digital scale (Cosmed Inc., Concord, California, USA), with participants barefoot or in sock feet. Due to the BOD POD's high validity and reliability, only one weight measure was recorded (Fields et al. 2002). BMI was calculated as weight (kg)/height (m^2). Child BMI values were converted to BMI z-scores to capture overall weight status while controlling for age and sex using WHO Anthro 3.2.2. Software (2011).

Parent WC was measured in duplicate using a non-elastic measuring tape (Gulick II, Country Technology Inc., Gay Mills, Wisconsin, USA), per the protocol from Statistics Canada and the Canadian Health Measures Survey (Patry-Parisien et al. 2012). Measurements were recorded to the nearest 0.1 cm.

Body composition

Parent body composition was measured using air displacement plethysmography (ADP) with a BOD POD. ADP measures total body volume, from which whole-body density and, subsequently, percentage of fat mass (%FM) are calculated (Lee and Gallagher 2008). Thoracic gas volume, required to accurately measure body density, was measured using a single-use tube attached to the rear of the BOD POD chamber, as per manufacturer protocol.

Food parenting practices

Food parenting practices were assessed using an adapted version of the Comprehensive Feeding Practices Questionnaire (CFPQ) (Mucher-Eizenman and Holub 2007). Both mothers and fathers completed 31 of the 49 items of the original CFPQ for each child they had, resulting in maternal and (or) paternal scores for each child (i.e., in a family with one mother, one father, and two children, the mother completed a survey for both child one and two and the father would complete a survey for the same, resulting in four recorded observations). We assessed 11 practices: *child control*, *emotion regulation*, *encourage balance and variety*, *environment*, *food as reward*, *involvement*, *modelling*, *monitoring*, *pressure*, *restriction for health*, and *restriction for weight control*. To reduce participant burden, similarly worded questions contributing to the same food parenting practice were excluded (e.g., "Do you let your child eat whatever s/he wants?" was included, whereas "Do you allow this child to eat snacks whenever s/he wants?" was not). The section "teaching for nutrition" was also excluded as overlapping questions addressed this topic. In addition, this measure has not been shown to be associated with obesity risk among young children (Musher-Eizenman et al. 2009). Each item of the CFPQ was answered on a five-point Likert response scale, using one of two sets of anchors ("never" to "always", "disagree" to "agree"). Responses were converted into a numerical score from one (low engagement in the practice) to five (high engagement). Across each feeding practice, scores were summed, and a mean was calculated.

To measure the reliability of the adapted questionnaire, Cronbach's α scores for each food parenting practice were compared with the scores of the original version. The scores of the adapted and original versions were comparable (Watterworth et al. 2017). For the full CFPQ, scores ranged from 0.58 to 0.81; those of the adapted CFPQ ranged from 0.43 to 0.91 (Mucher-Eizenman and Holub 2007).

Statistical analysis

Analyses were conducted using SAS® University Edition for Windows (2015; SAS Institute Inc.). A generalized estimating equation (GEE) approach was used with linear regression modelling to control for correlated family values (Zeger and Liang 1986). Analyses explored associations between parent BMI, WC, or %FM as the predictor variable and each of the 11 food parenting practices as the response variable. Separate linear regression models were investigated for each measure of body composition. Parents with multiple children completed food parenting practice observations for each child, contributing more than one observation towards the overall mean feeding practice scores. Child BMI z-score and sex were entered as covariates, as parents may alter their feeding practices based on the child's body composition and sex (Jansen et al. 2014). Parent sex and family income were also included in each model to control for possible confounding. Significance was identified at $p < 0.05$.

Results

Participant demographic information and body-composition data are presented in **Tables 1** and **2**, respectively. The mean age of the parents was 35.1 ± 3.3 years. The sample was predominately Caucasian (83.8%, $N = 57$). Forty-three percent ($N = 29$) of the parents were classified as normal

Table 2. Body composition characteristics of parents and children.

Measure of body composition	*N*	%	Mean	SD
Parental waist circumference (cm)	—	—	96.6	16.7
Parental % fat mass	—	—	31.4	10.9
Parental BMI	—	—	28.1	6.8
Normal weight	29	42.6	—	—
Overweight	21	30.9	—	—
Obese	18	26.5	—	—
Child BMI z-score classification	—	—	0.47	0.94
Normal weight	36	69.2	—	—
Risk of overweight	13	25.0	—	—
Overweight	3	5.8	—	—

Note: BMI, body mass index.

weight (BMI = 18.5–24.9 kg/m^2), 30.9% ($N = 21$) as overweight (BMI = 25.0–29.9 kg/m^2), and 26.5% ($N = 18$) as obese (BMI ≥30 kg/m^2, Table 1). The mean BMI was 28.1 ± 6.8 kg/m^2, the mean WC was 96.6 ± 16.7 cm ($N = 67$), and the mean %FM was 31.4% ± 10.9% (Table 2). The majority of participating families had only one child enrolled in the study (73.2%; $N = 30$). Of the 52 children in the sample, 69.2% ($N = 36$) were classified as normal weight and 25.0% ($N = 13$) were classified as risk of overweight (Table 2).

Table 3 displays the results of separate linear regression models that included each measure of body composition while also controlling for child BMI z-score, child sex, parent sex, and family income. Parent BMI, WC, and %FM were each inversely associated with *encouragement of balance and variety* ($\hat{\beta} = -0.021$, $p = 0.006$; $\hat{\beta} = -0.007$, $p = 0.038$; $\hat{\beta} = -0.010$, $p = 0.034$, respectively) and *child involvement in meal planning and preparation* ($\hat{\beta} = -0.082$, $p = 0.002$; $\hat{\beta} = -0.025$, $p = 0.032$; $\hat{\beta} = -0.038$, $p = 0.049$, respectively). An inverse association between BMI and *actively modelling healthy eating to the child* approached significance ($\hat{\beta} = -0.034$, $p = 0.083$). No other significant associations between parental body composition and parental feeding practices were identified. Results from unadjusted models did not differ from adjusted models (data not shown).

Table 3. Linear regression model estimation results based on generalized estimating equations exploring the associations between parental body composition and food parenting practices.

	BMI (kg/m^2)			Waist circumference (cm)			% Body fat		
CFPQ subscale item[a]	Adjusted[b] estimate	Standard error	*p*	Adjusted estimate	Standard error	*p*	Adjusted estimate	Standard error	*p*
Encouragement of balance and variety	−0.021	0.008	0.006	−0.007	0.003	0.038	−0.010	0.005	0.034
Child involvement in meal planning and preparation	−0.082	0.027	0.002	−0.025	0.012	0.032	−0.038	0.020	0.049

Note: CFPQ, Comprehensive Feeding Practices Questionnaire; BMI, body mass index.
[a]CFPQ items can each have a value from 1.0 to 5.0.
[b]Models adjusted for child BMI z-score, child sex, parental sex, and family household income.

Discussion

This research provides preliminary evidence that, independent of parental or child sex, family income, and child BMI z-score, various measures of parental body fat (BMI, WC, %FM) are inversely associated with encouraging child dietary balance and variety and child involvement in meal planning and preparation.

This analysis is unique as we investigated associations between multiple measures of body composition in parents and a wide range of feeding practice domains. Our findings are important given that encouraging child dietary balance and variety and child involvement in meal planning and preparation support healthful eating behaviours in children. Parental promotion of healthy food intake has been positively associated with fruit and vegetable consumption in children (Melbye et al. 2013), and the involvement of children in meal planning and preparation has been shown to increase children's diet quality (Larson et al. 2006). Our findings that parents who are overweight may be less likely to encourage balance and variety in their children's diets supports prior research that low diet quality in Canadian adults is associated with a higher BMI (Sundararajan et al. 2014). This suggests a potential "trickle-down" effect from parents who are overweight and obese to their children. Frequent meals away from home are also associated with a higher risk of obesity (Ma et al. 2003), suggesting that adults who are overweight may be less involved in their own meal planning and preparation. We extend these findings by providing preliminary evidence that parents who are overweight and obese may also be less likely to involve their children in meal planning and preparation.

We found no association between parental body composition and coercive controlling feeding practices, which is inconsistent with prior research (Baughcum et al. 2001; Wardle et al. 2002; Agras et al. 2004; Haycraft and Blissett 2008). None of the controlling feeding practices measured in the CFPQ (*restriction for health*, *restriction for weight*, *parent pressure on the child to consume more food at meals*, or *use of food to regulate child's emotions*) were significantly associated with parent body composition. The inconsistent results across different studies could be due to the geographical, socioeconomic, and cultural/ethnic variations in sample populations. Additionally, the CFPQ captures a more comprehensive picture of the parent–child feeding relationship that exists beyond controlling feeding practices. For our analyses, we used an adapted version of the CFPQ. We acknowledge that although most domains were reliable, with some having greater reliability, *restriction for weight* and *restriction for health* had a lower reliability relative to the original CFPQ. It is possible that the low reliability of these scales may have contributed to the inconsistencies with past results concerning controlling feeding practices.

Our results, which elucidate a possible contributing factor to the intergenerational transmission of obesity, may have important implications for family-based obesity-prevention interventions. Generally, these interventions function in much the same way regardless of parents' weight status. Our results suggest that future consideration be given to overweight parent participants of such interventions to address possible differences in selected food parenting practices that may exist between parents of different weight status. The observed associations represent small changes in food parenting practices between parents who are overweight versus those who are not. We acknowledge that the factors influencing food parenting practices are many and complex and that body composition may be only one contributing factor.

Strengths and limitations

Feeding practices of young children are important to consider as they help to establish lifelong dietary habits. Despite literature demonstrating that dietary habits track into adolescence and adulthood (Savage et al. 2007), limited research has explored factors that may influence the food parenting practices of parents of young children. We used a comprehensive measure of food parenting practices to ensure that several practices important in the parent–child feeding relationship were assessed. These practices were evaluated by mothers and fathers, the latter being underrepresented in the literature,

and for each child. Having included child sex and BMI z-scores as covariates, we accounted for the fact that parents may modify their feeding practices based on the child's sex and weight. We also controlled for similarities that may exist between siblings by using GEE analysis.

Despite the strengths, some limitations bear mentioning. Given the small sample and risk of Type 2 error, we did not adjust for multiple comparisons. The sample was primarily Caucasian and of middle socioeconomic status; thus, results cannot be generalized to the ethnically and socioeconomically diverse Canadian population. As with all such studies, this cross-sectional analysis cannot infer causation. It is possible that food parenting practices impact adult body composition, perhaps, for example, through poorer food choices. We also acknowledge that the relationship between parental body composition and food parenting practices is a complex one. Many factors beyond parental body composition, such as parental perception of child's weight status, may influence food parenting practices (Eckstein et al. 2006). Future research is needed to address these associations.

Conclusions and next steps

We provide preliminary evidence that parental body composition may be associated with select food parenting practices in Canadian families with preschool-aged children. Inverse associations were found between markers of overweight/obesity and child involvement in meal planning and preparation and encouragement of balance and variety, suggesting that parents who are overweight or obese may engage in food parenting practices that may promote obesogenic family environments. These associations may have important public health implications in family-based obesity-prevention interventions. In families with parents who are overweight or obese, targeted interventions can be used to mediate the obesogenic environment that may be promoted by these possible associations. We recommend that future research consider parental body composition as a factor influencing food parenting practices in a larger, more diverse sample of Canadian families.

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Author contributions

OK and ACB conceived and designed the study. OK, JH, DWLM, and ACB performed the experiments/collected the data. OK, GD, JH, DWLM, and ACB analyzed and interpreted the data. OK, GD, JH, DWLM, and ACB contributed resources. OK, GD, JH, DWLM, and ACB drafted or revised the manuscript.

Competing interests

The authors have declared that no competing interests exist.

Data accessibility statement

All relevant data are within the paper.

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