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Research Brief

Family Eating Behavior and Child Eating Patterns Differences Between Children With and Without Siblings

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ABSTRACT

Objective: To examine the differences in family eating behaviors and child eating patterns in children with siblings (nonsingletons) and without siblings (singletons).

Methods: Cross-sectional analysis of mother−child dyads of 5−7-year-old children, (nonsingletons with a 2-to-4-year-old sibling) was conducted. Anthropometrics were measured. Mothers completed questionnaires and a child dietary log. Healthy Eating Index 2010 (HEI) score was calculated. Linear regression models adjusting for child age, child sex, maternal body mass index, and hours-away-from-home were conducted, with a revised $P < .021$.

Results: Sixty-eight mother−child dyads (27 singletons, 41 nonsingletons) participated. Singletons exhibited less healthy family eating behaviors ($\beta = -4.98$, $SE = 1.88$, $P = .003$), and lower total HEI scores than did nonsingletons (average: $\beta = -8.91$, $SE = 2.40$, $P = .001$). On average, singletons had lower scores in 3 HEI components compared with nonsingletons ($P < .021$ for all).

Conclusion: In this sample, singleton children exhibited less healthy eating behaviors. Additional investigation into parent-level differences is warranted.

Key Words: siblings, eating behavior, family, household, children, obesity (*J Nutr Educ Behav.* 2019; 51:1188−1193.)

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INTRODUCTION

Childhood obesity is a prominent health concern, with 1 in 5 school-age children considered to have obesity.[1] Childhood obesity can persist into adult obesity.[2] Family, peers, and siblings are important influences on a child's dietary preferences,[3] that can influence early growth and development. Unhealthy family eating behaviors, including the provision of low nutrient and high energy food options, are associated with a higher intake of unhealthy foods in children.[4] Siblings are a unique influence on early behavior as they can serve as both family and peer influences for eating habits.[5]

Growing evidence suggests that children without siblings (singletons) have higher rates of obesity than do children with siblings (nonsingletons),[6,7] with these differences observed as early as 8 years of age.[8] These findings are counterintuitive to the notion that singletons would have lower rates of obesity as they have less competition for parental care and higher household income per capita.[9] However, singletons may experience more monitoring and restrictive parental feeding habits.[10] There is limited evidence examining family eating behaviors and child eating patterns between singletons and nonsingletons before the 8 years of age when weight differences first emerge.[11] The purpose of this study was to determine if family eating behaviors and child eating patterns differed between singletons and nonsingletons. It was hypothesized that nonsingletons would have healthier family eating behaviors and child eating patterns than singletons.

METHODS

Participants and Setting

Sibling's Influence on Subsiding Behaviors Related to Obesity, with the hypothesis that nonsingletons may exhibit healthier behaviors compared

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with singletons, was a cross-sectional study that investigated differences in child and family behaviors between nonsingletons and singletons. Mother−child dyads of children ages 5.0−7.9 years old, including singletons and nonsingletons with a younger 2.0- to 4.9-year-old sibling living in the household at least 50% of the time, were recruited between April and December 2017. Singletons were defined as having no siblings between 0 and 18 years of age, as there would be no expected sibling influence within the household.[12] As children with a sibling born within 6 years have lower rates of obesity,[12] the age 2.0−4.9 years was chosen to keep all siblings within 6 years of the 5.0−7.9-year-old child. Youngest-born children were not included as the primary participating 5.0−7.9-year old child, as they may have dietary behaviors similar to singletons.[13] Typically developing children who were not twins were included. The study was carried out in accordance with the Declaration of Helsinki and approved by the University of Oklahoma Health Sciences Center's Institutional Review Board.

Demographics and Anthropometrics

After obtaining maternal informed consent and child assent, mothers completed a demographic questionnaire addressing mother, child, and family characteristics. A trained researcher used standard procedures for adults[14] and children to measure height, weight, and waist circumference (WC) with a stadiometer (Invicta Height Measure; Bicester, UK), digital scale (Health O Meter 349KLX Digital Scale; McCook, IL), and tape measure (Seca; Chino, CA) respectively. One singleton and 2 nonsingleton mothers were pregnant; for these mothers, height was measured, and prepregnancy weight was self-reported, but WC was not measured. Body mass index (BMI) of mother and child were calculated using the standard formula (weight [kg]/height [m^2]). Children's WC and BMI percentiles were calculated for age and sex, and obesity was defined as ≥ 95th BMI percentile.[15,16] Mother's BMI was classified using standard adult classifications.[14]

Family Eating Behaviors

Mothers completed the Family Nutrition and Physical Activity questionnaire (FNPA) to evaluate family eating behaviors. The FNPA has been previously validated in this age group.[17] This 20-item questionnaire includes 10 components and an overall total score. The total score and 4 eating-related components were used for the current study (family meals, family eating practices, family food choices, and beverage choices). Every question had 4 response options (almost never, sometimes, usually, almost always), with the healthier practice receiving the highest scoring of 4 points per question. The total score comprises the sum of all 10 components, with a maximum score of 80 points.

Child Eating Pattern

Mothers completed a 3-day dietary log for their child. A tutorial utilizing food models, and a handout on measuring common food items were provided to mothers similar to other research.[18] An additional dietary log was provided for teachers to note food type, size served, and amount eaten while the child was at school. Proxy reports from teachers have been previously used to estimate daily intake.[18] Dietary logs were analyzed using FoodWorks 17 software (Long Valley, NJ) and the US Department of Agriculture Food Patterns equivalent database of 2011−2012.[19] Dietary information was used to calculate the Healthy Eating Index 2010 (HEI).[20] Total HEI score and its 12 individual components were calculated for individual days using an SAS Macro written by the National Cancer Institute.[21]Weekend and weekday components were averaged. Total HEI scores were computed as an average of all 3 days. Fast food meals were defined as meals from fast food or pizza restaurants, and restaurant meals were defined as meals from restaurants with a waiter/waitress, similar to other research.[22]

Statistical Analysis

Only those who had complete data that included anthropometrics, demographics, FNPA, and dietary logs were included in the analysis (n = 68). Linear and logistic regression models evaluating singleton status (1 = singleton, 0 = not singleton) and weight status (child BMI and WC percentile, or obesity status) were conducted with adjustment for maternal BMI and hours at away-from-home care. Linear regression models between singleton status and eating outcomes (restaurant/fast food, FNPA scores, and HEI scores) were conducted with additional adjustment for child age (months) and child sex. There was no difference in total HEI score by weekend/weekdays tracked ($P > .05$), or interaction with singleton status and weekend/weekdays tracked ($P > .10$). The Benjamini−Hochberg procedure for false discovery rates for multiple regression analysis was applied with a revised $P = .021$.[23] A sensitivity analysis of the adjusted models was conducted with only the participants who contributed a 3-day dietary log with 2 weekdays and 1 weekend day (ideal protocol compliance), and results were compared. All analyses were conducted with SAS 9.4 software (Cary, NC).

RESULTS

Seventy-four mother−child dyads (29 singletons, 45 nonsingletons) consented. All 74 dyads participated in the study, with 68 dyads providing complete measures (92%) and 6 dyads (8%) excluded for missing data. There was no measurable difference between those who did (n = 68) or did not complete the study (n = 6) or in completion rates between groups (93% singleton, 91% nonsingleton). Demographic and anthropometric characteristics are presented in Table 1. Across both groups, most mothers had a college degree or higher (80%), were married (79%), and white (75%). Singleton children spent significantly more hours in away-from-home care than nonsingleton children (Table 1; $P = .01$). Singleton mothers and children had a higher WC percentile, and more singleton mothers were classified as overweight or obese compared with nonsingleton mothers ($P = .02$).

Maternal BMI, rather than singleton status, was significantly related to child BMI percentile, and WC percentile (Table 2; $P < .021$). Singleton children had lower scores on family eating practices (5.9 ± 1.0 singletons,

Table 1. Demographic and Anthropometric Characteristics of Singleton and Nonsingleton Mother–Child Dyads (n = 68)

	Singleton (n = 27)				Nonsingleton (n = 41)				
Characteristics	**Mean**	**SD**	**n**	**%**	**Mean**	**SD**	**n**	**%**	***P* Value**
Maternal									
Age (y)	35.6	6.5	–	–	34.3	3.7	–	–	.35
Adults in household	1.9	0.6	–	–	2.0	0.5	–	–	.23
Children in household	1.0	NA	–	–	2.4	0.8	–	–	.001*
Household income (thousands)	87.5	67.2	–	–	115.8	95.0	–	–	.15
Employment	–	–	–	–	–	–	–	–	.01*
Full-time	–	–	19	70	–	–	22	54	–
Part-time	–	–	3	11	–	–	11	27	–
Student	–	–	5	19	–	–	1	2	–
Unemployed, seeking work	–	–	0	0	–	–	1	2	–
Unemployed, not seeking work	–	–	0	0	–	–	6	15	–
BMI (kg/m^2)	29.4	8.8	–	–	25.5	5.0	–	–	.04
BMI classification	–	–	–	–	–	–	–	–	.02*
Normal	–	–	10	37	–	–	23	56	–
Overweight	–	–	7	26	–	–	14	34	–
Obese	–	–	10	37	–	–	4	10	–
WC (cm)[a]	98.8	17.0	–	–	90.3	12.4	–	–	.02*
Child									
Age (mo)	73.5	9.0	–	–	73.6	9.7	–	–	.97
Male	–	–	12	44	–	–	21	51	.58
Away-from-home care (h/wk)	42.3	10.2	–	–	35.8	9.6	–	–	.01*
Race	–	–	–	–	–	–	–	–	.05
African American	–	–	1	3	–	–	1	2	–
White	–	–	12	44	–	–	31	76	–
Hispanic	–	–	1	3	–	–	1	3	–
American Indian	–	–	1	3	–	–	1	3	–
Other/mixed	–	–	11	41	–	–	7	17	–
BMI classification	–	–			–	–			.001*
Underweight	–	–	1	3	–	–	1	3	–
Normal	–	–	13	48	–	–	33	81	–
Overweight	–	–	4	11	–	–	5	11	–
Obese	–	–	9	37	–	–	2	5	–
BMI percentile	72.3	30.0	–	–	53.0	28.8	–	–	.001*
WC percentile	66.0	27.5	–	–	51.2	24.3	–	–	.02*

BMI indicates body mass index; WC, waist circumference; NA, not available.
*$P < .021$ (between groups using Benjamini–Hochberg adjustment); [a]Missing values on 1 singleton and 2 nonsingleton mothers who were pregnant.
Note: Comparisons made by independent t test (continuous variables) or chi-square and Fisher exact test (categorical).

6.6 ± 0.8 nonsingletons), beverage choices (5.6 ± 0.9 singletons, 6.2 ± 1.2 nonsingletons) and total FNPA score than did nonsingleton children (61.9 ± 6.6 singletons, 70.0 ± 7.0 nonsingletons; $P < .021$). On average, singleton children scored lower on 3 of the 12 components and had significantly lower total HEI scores across weekdays, weekend and on average ($P < .021$), indicating that there are individual and collective differences in eating patterns between these groups. All results for family behavior and child eating patterns held in the sensitivity analysis of 2 weekdays and 1 weekend day (n = 58; 22 singletons, 36 nonsingletons); including total HEI score across weekdays ($P = .003$), weekends ($P = .001$), and on average ($P = .001$).

DISCUSSION

In this sample, children in singleton families had less healthful family eating behaviors and child eating patterns than did nonsingleton families. The contribution of maternal weight, sibling status, and away-from-home care to these findings are explored in this discussion.

As for maternal weight, a higher amount of singleton mothers had overweight or obesity compared with nonsingleton mothers, and maternal BMI contributed to child weight beyond singleton status. More singleton mothers were employed full-time, which has been associated with child

Table 2. Adjusted Regression Models of Singleton Status on Weight Status, Eating Behavior and Pattern Outcomes (n = 68)

	BMI Percentile				WC Percentile				Obesity		
Weight Status	**Beta**	**SE**	***P* Value**	**R^2**	**Beta**	**SE**	***P* Value**	**R^2**	**Odds Ratio**	**95% CI**	***P* Value**
Singleton status	14.12	7.70	.07	.17	10.55	6.75	0.12	.16	6.79	(1.16, 39.58)	.03
Maternal BMI	1.22	0.51	.02*		1.14	0.45	0.01*		1.11	(1.01, 1.22)	.03
Hours away	0.07	0.35	.84		−0.01	0.31	0.96		1.00	(0.93, 1.08)	.89

	Family Eating Practices				Beverage Choices				Total FNPA			
Family Eating Patterns	**Beta**	**SE**	***P* Value**	**R^2**	**Beta**	**SE**	***P* Value**	**R^2**	**Beta**	**SE**	***P* Value**	**R^2**
Singleton status	−0.76	0.23	.004*	.14	−0.70	0.28	.01*	.17	−4.97	1.90	.01*	.12
Child age (mo)	0.008	0.01	.51		−0.03	0.01	.01*		−0.07	0.09	.41	
Child sex (male)	0.20	0.23	.38		−0.08	0.25	.73		0.45	1.71	.77	
Maternal BMI	−0.30	0.01	.83		0.01	0.01	.36		−0.01	0.12	.92	
Hours away	0.009	0.01	.43		0.01	0.01	.23		−0.008	0.08	.92	

	Weekday				Weekend				Average			
Total HEI Score	**Beta**	**SE**	***P* Value**	**R^2**	**Beta**	**SE**	***P* Value**	**R^2**	**Beta**	**SE**	***P* Value**	**R^2**
Singleton status	−7.49	2.79	.009*	.12	−13.16	2.67	.001*	.37	−8.91	2.40	.005*	0.21
Child age (months)	−0.13	0.13	.30		−0.32	0.12	.01*		−0.18	0.11	.11	
Child sex (male)	−0.53	2.50	.83		−0.85	2.35	.71		−0.60	2.15	.78	
Maternal BMI	0.15	0.18	.41		0.39	0.17	.06		0.26	0.16	.11	
Hours away	0.11	0.12	.36		0.10	0.13	.45		0.09	0.11	.41	

	Seafood and Plant Protein				Refined Grains				Empty Calories			
Average HEI Components	**Beta**	**SE**	***P* Value**	**R^2**	**Beta**	**SE**	***P* Value**	**R^2**	**Beta**	**SE**	***P* Value**	**R^2**
Singleton status	−1.03	0.42	.01*	.14	−1.75	0.65	.009*	.15	−2.54	0.96	.01*	.19
Child Age (months)	−0.001	0.02	.96		−0.04	0.03	.16		−0.06	0.04	.19	
Child Sex (male)	−0.52	0.38	.17		−0.03	0.58	.95		0.30	0.86	.72	
Maternal BMI	−0.01	0.02	.49		−0.01	0.04	.72		0.18	0.06	.004*	
Hours away	0.01	0.01	.31		0.004	0.03	.88		0.05	0.04	.20	

BMI indicates body mass index; HEI, Healthy Eating Index; WC, waist circumference; FNPA, Family Nutrition and Physical Activity questionnaire.

*$P < .021$ (Benjamini–Hochberg adjustment). Note: Obesity defined as age- and sex-adjusted BMI percentile greater than or equal; WC, waist circumference to the 95th percentile.

Note: R^2 indicates the percentage of variance in the dependent variable that the independent variables explain as a collective.

Note: Assessed using general linear regression models or logistic regression for obesity model.

Note. All HEI components for weekdays, weekends, and on average were explored, and significant associations on for average HEI components are presented. Weekday and weekend days was an average of those included. Five participants did not record any weekend dietary intake (n = 63).

weight gain before the age of 5 years, namely in white children as found in a recent longitudinal study.[24] Maternal weight may influence eating outcomes, as mothers with overweight or obesity may have more restrictive feeding practices compared with mothers with normal weight.[25] A recent systematic review found evidence on parental weight on family nutrition practices is still mixed.[26] In the current study, maternal BMI did not significantly contribute to total eating patterns but did contribute to empty calories.

Regarding sibling status, singleton children had less healthy child eating patterns than did nonsingletons on weekdays, weekends, and on average. Singleton children also differed in multiple components of dietary quality, including refined grains and empty calories. The effect size of the adjusted average total HEI score difference is 0.71, indicating a medium effect size between groups. Consistent differences in child eating patterns may affect child development.[27]

Singletons spent more time at away-from-home care (such as childcare or school), similar to other samples,[28] but this time was not related to eating outcomes. This finding points to potential differences in the household,[28] including less eating in front of the television

(family eating practices score) and sugary drinks consumption (beverage choices score), which differed between groups in the current study. Healthier eating behaviors and patterns may result from household-level changes rather than peer exposure, as peer exposure is also present in away-from-home care.

A discussion of strengths and limitations is warranted. A strength of the study is the use of a widespread and validated technique (HEI) to measure dietary quality.[20] Total HEI scores reported in this study were similar to those reported for similar age range.[20] Assessment of children's eating patterns was adapted from other preschool-age studies[18], but accurate measurement in this age range is a constant challenge. This study was specifically designed to assess the sibling influence; thus, youngest-born were not included, and the sibling influence was adequately addressed by controlling age and birth order effects.[7] Including health behaviors of only, the middle, and older sibling may limit our understanding of the sibling influence on eating behavior and patterns. Lastly, it must be considered that the individual constructs of FNPA are assessed through 2 questions, which may not adequately address the context and frequency of family behaviors. However, the total FNPA score, which includes 20 items, was different between groups, suggesting systematic differences. Individual family behaviors require further inquiry.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Future research can consider including the youngest-born and other sibling relationships (ie, twins, 5−7-year-olds with an adult sibling) to investigate the effects of the family eating behavior because of the presence of additional children in the household, or whether the age range is significant in family eating behaviors and child eating patterns. In addition, the influence of maternal weight on child obesity and eating patterns requires further exploration.

The authors acknowledge that obesity is a complex process, and other behaviors may contribute to excess weight gain. The predominantly white (63%) and not low-income sample may have healthier eating behaviors and patterns than more diverse and lower-income samples[29] and limit generalizability. An investigation into other samples, including diverse economic and cultural backgrounds, may help clarify differences between singleton and nonsingleton families. Finally, longer-term and diverse studies are needed to assess the influence of families and siblings on a child's eating patterns, and weight gain as the current study only includes a cross-sectional examination.

Overall, this study found evidence that singleton families exhibited less healthy family eating behaviors and child eating patterns than did nonsingleton families. Singleton and nonsingleton mothers differed in obesity measures and specific demographic characteristics that may be indirectly contributing to family and child eating behaviors. Nutrition professionals must consider the influence of family and siblings to provide appropriate and tailored nutrition education for families of young children. Efforts to help all children and families establish eating healthy habits and practices must be encouraged.

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