



# Maternal behavior as a predictor of sibling interactions during mealtimes



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## ABSTRACT

Children who frequently experience encouragement or pressure to eat are more likely to exhibit less favorable eating behaviors and dietary outcomes. Siblings can encourage or pressure each other to eat during mealtimes, but the role of mothers in shaping sibling mealtime interactions is not understood. The objective of this study was to examine the association between the behavior of mothers and siblings during mealtimes. The associations of maternal presence and maternal engagement with children during mealtimes with encouragements to eat delivered by the child to his/her sibling were examined. Children aged 4–8 years ( $n = 73$ ) were videotaped while eating a routine evening meal at home with one sibling present. Encouragement to eat delivered by the index child to the sibling, maternal presence, and non-food-related and food-related maternal engagement were coded from the videotapes. Poisson regression showed that maternal presence was associated with fewer encouragements to eat from the index child to the sibling (rate ratio (RR): 0.40, 95% confidence interval (CI): 0.26, 0.62). Each type of maternal engagement was independently associated with the number of encouragements to eat from the index child to the sibling: maternal engagement that was not food-related was associated with fewer encouragements to eat (RR: 0.62, 95% CI: 0.53, 0.73), while maternal engagement that was food-related was associated with more encouragements to eat (RR: 1.49, 95% CI: 1.22, 1.81). Future studies may explore how sibling interactions may mediate links between maternal behavior during mealtimes and children's health-related outcomes.

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## 1. Background

Family and social influences help shape children's food preferences and eating behaviors at an early age (Birch & Fisher, 1998; Patrick & Nicklas, 2005). Children who frequently experience pressure to eat by their parents are more likely to be picky eaters and have poorer diet quality (Galloway, Fiorito, Lee, & Birch, 2005). Although parental pressure to eat may be a reaction to the child's weight status or dietary intake (Powers, Chamberlin, Schaick, Sherman, & Whitaker, 2006), evidence from longitudinal and experimental studies suggests that pressure to eat may exacerbate negative affect towards the target food and may lead to long term food dislike and rejection (Batsell, Brown, Ansfield, & Paschall, 2002; Galloway, Fiorito, Francis, & Birch, 2006; Ventura & Birch, 2008). Furthermore, some studies have found that

pressure to eat is cross-sectionally associated with greater caloric intake, decreased vegetable intake, and higher weight status among children (Birch & Fisher, 1998; Campbell, Crawford, & Ball, 2006; Klesges et al., 1983).

In addition to mothers, other family members may also pressure children to eat; siblings often act as caregivers (Brody, 2004) and deliver many of the encouragements to eat that occur during mealtimes (Mosli, Miller, Kaciroti, et al., 2015). Since children who frequently experience pressure to eat are more likely to exhibit negative outcomes, identifying features of the mealtime environment that are associated with encouragements to eat from siblings can help inform novel mealtime recommendations aiming to improve child eating behaviors and dietary outcomes. Given that it is well recognized that mothers influence the level and type of sibling interactions in other domains (Cortez, Abramovitch, & Pepler, 1983), one approach to optimizing family mealtimes is to examine how mothers help shape sibling food-related interactions. We were unable to identify studies that examined how mothers shape sibling food-related interactions at mealtimes.

In the present study we conceptualized maternal behavior during mealtime in three ways; first, we considered whether the mother sat

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with the children or not. Secondly, we considered the degree to which the mother engaged with the children about topics not related to food. Thirdly, we considered the degree to which the mother engaged with the children about topics related to food. Given prior literature indicating that there is less sibling interaction when mothers are present (Cortner et al., 1983), we hypothesized that the mother sitting with the children during mealtime would be associated with fewer encouragements to eat delivered by one sibling to another. In addition, given that mothers shape the content of sibling conversations (Howe, Fiorentino, & Gariépy, 2003), we hypothesized that mother–child engagement that was not food-related would be associated with fewer encouragements to eat delivered by one sibling to another. Conversely, we hypothesized that mother–child engagement that was food-related would be associated with more encouragements to eat delivered by one sibling to another.

## 2. Methods

### 2.1. Participants and procedures

The original cohort included 301 mother–child dyads recruited through Head Start programs to participate in a study about feeding behaviors. At the time of this follow-up study, the children included in these dyads (i.e., index children) were between the ages of 4 and 8 years. Inclusion and exclusion criteria were described elsewhere (Mosli, Miller, Peterson, et al., 2015). Mothers reported index child, age, sex and race/ethnicity, and family composition, including the age and sex of each individual living in the household and their relationship to the index child. Mothers were asked to video record 3 of the index child's routine evening meals within a single week. These mealtime observations followed standardized procedures that have been described previously (Goulding et al., 2014).

For this analysis, we included only index children who had complete data on all variables; who were living with their biological mothers; who were living with only one sibling; whose siblings were at least 12 months old; and who had at least one mealtime observation video on which they were eating with their sibling without the presence of any additional children.

Only one mealtime observation video per index child was selected to code mealtime behaviors. The second mealtime observation was chosen preferentially on the premise that families may be more acclimated to the camera by the second observation. If the second mealtime observation video did not meet inclusion criteria (i.e., the index child was not eating with the sibling or additional children were present), the third and then first videos were considered. Therefore, of the videos selected, 53 were of the first mealtime observation, 12 were of the third, and 8 were of the first.

The final sample included in this analysis ( $n = 73$ ) did not differ from the sample not included ( $n = 228$ ) with regard to child sex, child race/ethnicity, and maternal age. The University of Michigan Institutional Review Board approved this study.

### 2.2. Measures

#### 2.2.1. Encouragement to eat

The number of encouragements to eat, including direct prompts and positive statements about food, delivered from the index child to his/her sibling (Klesges et al., 1983), were counted in 5-min intervals. Inter-rater reliability was high for the subsample of 10% of videos that were double coded (intraclass correlation coefficient (ICC) > 0.80).

#### 2.2.2. Maternal presence and engagement

Whether or not the mother sat with the siblings during the meal was coded in each 5-min interval (yes vs. no for each interval; inter-rater reliability by Cohen's  $\kappa = 1.00$ ). The variable “maternal presence” was

defined as the proportion of the mealtime during which the mother sat with the siblings (potential range 0 to 1).

Two types of mother's engagement with the index child during the meal (non-food-related and food-related engagement) were rated on a scale from 0 (the mother was not seen or heard on the video) to 5 (the mother was deeply engaged) for each 5-min interval (inter-rater reliability ICC > 0.80 for each). Non-food-related engagement was defined as the intensity of mother's engagement with the child in general throughout the meal. This included any positive or negative, verbal or non-verbal interaction that was not related to the food being served or the child's eating behavior (e.g., discussing daily activities, hugging, eye contact). Food-related engagement was defined as the intensity of mother's engagement with the child's eating behavior throughout the meal (e.g., discussing what or how the child is eating). This included any positive or negative, verbal or non-verbal interaction that was related only to the food being served or the child's eating behavior. The variables “maternal engagement with index child: not food-related” and “maternal engagement with index child: food-related” were each calculated as the mean of the ratings across time intervals during the meal.

### 2.3. Statistical analysis

Analyses were conducted using IBM SPSS Statistics 21.0 (Armonk, NY, USA). Descriptive statistics were calculated to assess sample characteristics. Poisson regression was used to test two models: (1) “maternal presence” as the predictor of “total encouragements from the index child to the sibling” and (2) “maternal engagement with index child: not food-related” and “maternal engagement with index child: food-related” as predictors of “total encouragements from the index child to the sibling”. In both models “number of intervals” was set as the offset variable in Poisson regression to account for variations in length of the meal. Since preliminary analyses did not reveal any evidence of confounding, and given our small sample size, regression models were not adjusted for any covariates. Specifically, analyses showed that maternal presence and maternal engagement were not associated with index child age, index child race/ethnicity, and sibling age.

## 3. Results

Characteristics of the total sample are shown in Table 1. As shown in Table 2, each unit increase in maternal presence was associated with a 60% decrease in the number of encouragements to eat from the index child to the sibling (rate ratio (RR): 0.40, 95% confidence interval (CI): 0.26, 0.62). Each unit increase in maternal engagement with the index child that was not food-related was associated with a 38% decrease in the number of encouragements to eat from the index child to the sibling (RR: 0.62, 95% CI: 0.53, 0.73). Conversely, each unit increase in maternal

**Table 1**  
\*Sample characteristics ( $n = 73$ ).

Variable	
Index child age in years, M (SD)	5.33 (0.80)
Index child sex, n (%)	
Male	37 (50.7)
Female	36 (49.3)
Index child race/ethnicity, n (%)	
Non-Hispanic white	43 (58.9)
Hispanic or not white	30 (41.1)
Sibling age in years, M(SD)	6.17 (3.50)
Sibling sex, n (%)	
Male	36 (49.3)
Female	37 (50.7)
Total encouragements from the index child to the sibling, M (SD)	3.23 (3.89)
Maternal presence, M (SD)	0.86 (0.30)
Maternal engagement with index child: not food-related, M (SD)	3.00 (1.00)
Maternal engagement with index child: food-related, M (SD)	2.75 (0.98)

\* Table showing means (M) and standard deviations (SD) or counts (n) and percentages (%).

**Table 2**

Associations of maternal presence and maternal engagement with total encouragements from the index child to the sibling (n = 73).

	Total encouragements delivered by the index child to the sibling RR (95% CI)
Maternal presence	0.40 (0.26, 0.62)**
Maternal engagement with index child: not food-related	0.62 (0.53, 0.73)**
Maternal engagement with index child: food-related	1.49 (1.22, 1.81)**

\*\* P-value < 0.01.

engagement with the index child that was food-related was associated with a 49% increase in the number of encouragements to eat from the index child to the sibling (RR: 1.49, 95% CI: 1.22, 1.81).

#### 4. Discussion

This study found that maternal presence, as well as maternal engagement with the index child that was not food-related, were each associated with fewer encouragements to eat from the index child to the sibling. In contrast, maternal engagement with the index child that was food-related was associated with more encouragements to eat from the index child to the sibling. These findings are of interest in the context of prior work reporting that children who experience frequent encouragements to eat are more likely to have a poor diet quality and higher weight status (Batsell et al., 2002; Birch & Fisher, 1998; Campbell et al., 2006; Galloway et al., 2006; Klesges et al., 1983; Ventura & Birch, 2008). This study further highlights the role of mothers during mealtimes by suggesting that mothers may influence children indirectly by shaping the behavior of other family members. Since mothers are key participants in interventions aimed at improving family functioning (Kramer, 2004), future studies might examine the role of mothers in driving family mealtime conversations and interactions.

Findings from this study suggest the need for future work aiming to examine how specific maternal feeding practices relate to different types of sibling food-related interactions. Specific maternal feeding practices have been associated with various child behaviors and outcomes (Birch & Fisher, 1998; Fisher & Birch, 2002; Patrick, Nicklas, Hughes, & Morales, 2005). For example, excessive maternal restriction of food has been associated with higher caloric intake and weight status, while the use of reasoning and support has been linked to improved diet quality among children (Fisher & Birch, 2002; Patrick et al., 2005). Therefore, specific types of maternal food-related engagement may relate differently to various types of sibling food-related interactions, including encouragements to eat between siblings. Furthermore, modeling of healthy eating behaviors is an indirect strategy by which parents may influence eating behaviors of children (Golan & Crow, 2004). However, it is unknown how maternal modeling of healthy eating behaviors influences sibling food-related interactions. Future studies may aim to better understand how different types of maternal food-related engagement and behavior relate to sibling interactions during mealtimes.

Strengths of this study include our use of observational assessment during a naturalistic mealtime. Limitations include the cross-sectional design, which limits the ability to infer causality. The small sample size may also have limited the power to detect associations. In addition, we did not adjust for potential confounders in our analysis, and we cannot rule out residual confounding by characteristics that were not accounted for, such as the weight status of the siblings and the mother. The study findings may not be generalizable to families who are not low-income or children who are not Head Start graduates. Finally, our study did not include a direct measure of the amount of food eaten by children during

mealtime. Future studies may examine changes in the child's eating behavior in response to maternal and sibling behavior.

In conclusion, these findings may provide a novel strategy for future interventions examining family mealtimes as a venue for improving child eating behaviors and dietary outcomes. Specifically, studies may explore how mothers may affect children's nutritional outcomes indirectly through effects on sibling behavior.

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#### Contributors

RM designed the study, analyzed the data, and drafted the initial manuscript. JL and AM designed the data collection instruments, coordinated and supervised data collection, and critically reviewed the manuscript. JL, AM, AG, and KP provided input on the analysis plan and critically reviewed the manuscript. All authors have approved the final manuscript as submitted.

#### Conflicts of interest

No conflict of interest was declared.

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