



Research report

Drivers of overweight mothers' food choice behaviors depend on child gender ☆

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ABSTRACT

Background: National data suggest a higher prevalence of obesity among boys. One possible cause could be the food choices made by parents on behalf of their children. **Objectives:** This study sought to determine whether and how mothers' food choices for their children differ by child gender and to understand the drivers of these differences. **Design:** Data were analyzed from a randomized controlled trial conducted using a virtual reality-based buffet restaurant. Overweight mothers filled out questionnaires and received an information module. They were then immersed in a virtual buffet restaurant to select a lunch for their 4- to 5-year-old child. **Results:** Of the 221 overweight mothers recruited, 55% identified their daughters as the child for whom they would be choosing the food. The caloric content of boys' meals was 43 calories higher than girls' ($p = .015$). This difference was due to extra calories from the less healthy food category ($p = .04$). Multivariate analyses identified more predictors of calorie choices for daughters' than sons' meals. Predictors of calories chosen for girls included: having both biological parents overweight ($\beta = 0.26$; $p = .003$), mother's weight ($\beta = 0.17$; $p = .05$), mother's education ($\beta = -0.28$; $p = .001$), her restriction of her child's food intake ($\beta = -0.20$; $p = .02$), and her beliefs about the importance of genetics in causing obesity ($\beta = 0.19$; $p = .03$). Mother's weight was the sole predictor of boys' meal calories ($\beta = 0.20$; $p = .04$). **Conclusions:** Differences in dietary choices made for young girls and boys may contribute to lifelong gender differences in eating patterns. A better understanding of differences in feeding choices made for girls versus boys could improve the design of childhood obesity prevention interventions.

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Introduction

Data from the National Health and Nutrition Examination Survey (NHANES) show that in 2009–2010, almost 17% of American children aged 2 to 19 years old were obese, with a Body Mass Index (BMI) greater than or equal to the 95th percentile on the BMI-for-age growth charts (Ogden, Carroll, Kit, & Flegal, 2012). However, boys and girls are not affected equally by the obesity epidemic. For all age groups, the prevalence of obesity among males is significantly higher compared to females (18.6% and 15.0%, respectively). For the

youngest age group of 2–5 year olds in particular, obesity prevalence reaches 12%, with 9.6% of girls and 14.4% of boys being obese. Although recently there are indications that the obesity prevalence is plateauing, more detailed analyses of the overall trends over 12 years (1999–2010) show a significant increase in obesity prevalence among 2- to 19-year-old boys (Ogden et al., 2012). These trends seem to track into adulthood, as over the same 12-year time period, obesity increased significantly among adult men compared to women (Flegal, Carroll, Kit, & Ogden, 2012). Obesity itself, and eating behavior more specifically, are complex and are influenced by myriad factors including those stemming from genetics, environment, behavior, and their interactions (Kral & Faith, 2009). Literature investigating gender differences in the underlying mechanisms leading to childhood obesity is scarce (Wisniewski & Chernausk, 2009). There is some evidence of gender differences in food preferences among school-aged children, with girls reporting a stronger preference for fruits and vegetables, whereas boys report a stronger preference for meat, fish and poultry products (Caine-Bish & Scheule, 2009; Cooke & Wardle, 2005). Compared to their male peers, girls have healthier food choices in general (Liem, Bogers, Dagnelie, & de Graaf, 2006; Robinson & Thomas, 2004; Sweeting, 2008). Differences in diets are likely due to a diverse set

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of causal processes (Liem et al., 2006; Vollrath, Hampson, & Juliusson, 2012). However, for very young children, feeding decisions that parents make may be most relevant.

Little attention has been given to the food choices that adults make on behalf of children during early life stages and to the origins of calories that comprise children's meals. Most importantly for the current discussion, it is unknown how parental choices differ when they are made for young girls versus young boys, and what factors drive parents to make food choices for each. Parents are the primary gatekeepers when it comes to providing a healthy eating environment for their young children (Kral & Faith, 2009; Wardle, 1995). These eating experiences set the foundation for eating behavior and weight control as children grow. This is of importance especially for children who are at a high risk of developing overweight/obesity, such as those for whom overweight runs in the family (Berkowitz et al., 2010). Therefore, a key first step is to examine the feeding choices of parents who are themselves overweight as their children are at increased risk for obesity in later life. One way to better understand the reasons for the different food choices that mothers might make for their boys versus girls is to consider their individual characteristics, their beliefs, as well as their risk perceptions and attitudes.

Models such as the Risk Information Seeking and Processing Model (Griffin, Dunwoody, & Neuwirth, 1999) and the Social Cognitive Model (Bandura, 1977), posit a cascade of factors that can be applied to predicting child feeding behaviors. On the one hand, there are individual characteristics that might correlate with child feeding practices. The family's socioeconomic status not only influences foods available in the home (Hupkens, Knibbe, van Otterloo, & Drop, 1998), but mothers in higher social classes are more likely to exert control over food or restrict their children's access to unhealthy foods (Brown, Ogden, Vögele, & Gibson, 2008). In addition, biological parents' weight status has a recognized effect on the intergenerational transmission of obesity and obesity risk, which might shape the family feeding environment and contribute to obesity (Hecker, Martin, & Martin, 1986; Wardle, Sanderson, Guthrie, Rapoport, & Plomin, 2002). On the other hand, theoretical models also suggest that beliefs, perceptions and attitudes influence behaviors. In the feeding domain for instance, parents' concern about and perception of their children's weight is an important factor in understanding child feeding practices (Faith, Scanlon, Birch, Francis, & Sherry, 2004; Francis, Hofer, & Birch, 2001). Mothers who are concerned about their children's weight tend to have restrictive feeding practices in an attempt to reduce calories and control the child's weight (Webber, Hill, Cooke, Carnell, & Wardle, 2010). However, restriction is associated with a higher risk of overweight (Faith et al., 2004) as well as disturbances in later eating patterns (Birch & Fisher, 2000). Food restriction behaviors represent a key example of a process where mothers' feeding decisions vary by the child's gender. In this case, restriction is much more common for girls (Birch, 1998).

It may be helpful to consider using different approaches for parents of boys versus those of girls in childhood obesity interventions. Currently, pediatric health-related or obesity-related interventions typically do not consider the child's gender in their design. In order to do so, research first needs to fill the considerable gap in the literature concerning the drivers of mothers' food choices for their young girls versus young boys. One obstacle to this goal is the identification of accurate and innovative measurement methods to collect information about mothers' behavior. To this end, immersive virtual reality is a technology that goes beyond self-report measures and allows researchers to explore mothers' engagement with food in a naturalistic, but controlled manner (McBride, Persky, Wagner, Faith, & Ward, 2013; Persky, 2011). In this study we developed a virtual buffet restaurant where mothers could choose a meal for their young child, allowing a direct observation of their feeding behavior. Specific research questions in the current

analysis included: (1) Does the number of calories mothers choose for a boy differ from those chosen for a girl? (2) Does the source of calories differ for boys and girls? And (3) What background, cognitive, and attitudinal factors predict mothers' food choices for girls versus boys? To answer these questions, we analyzed data from an experimental study that tested the effect of family health history-based (FHH) risk information provision on overweight mothers' food choices for their 4- to 5-year-old child (McBride et al., 2013).

Methods

Participants

Participants were enrolled in a randomized controlled experiment (the Mothers' TAKE study) that assessed mothers' feeding behavior in response to family health history-based (FHH) feedback regarding their child's risk of obesity. The study design is described in detail elsewhere (McBride et al., 2013). Briefly, 221 participants were randomly assigned to one of three groups: food safety information control ($n = 73$), behavioral risk information alone ($n = 73$), and behavioral risk information plus FHH-based obesity risk feedback for the child ($n = 75$). Participants from all three conditions of the trial are included in the present analyses. The activities were approved by the Institutional Review Board of the National Human Genome Research Institute.

Procedure

Participants (121 mothers of girls and 100 mothers of boys) were told that they were participating in a study investigating the impact of health information on food choices that mothers make for their children using a new technology called virtual reality. Inclusion criteria included: (1) being the mother of a biological child between the ages of 4 and 5, (2) the child having no major food allergies or diet-related health conditions; and (3) mothers having a self-reported body mass index of greater than or equal to 25 kg/m². The exhaustive list of inclusion and exclusion criteria is available elsewhere (McBride et al., 2013). During the initial telephone screening call, eligible mothers identified a 4- to 5-year-old son or daughter as the 'index child' they would consider while completing study tasks. After the screening, mothers logged into the study website, provided their informed consent, and completed an online survey. As part of the survey, they provided the child's weight and height either by measuring the child or by reporting the measure from the last doctor's appointment. Participants then came to the Immersive Virtual Environment Testing Area at the NIH clinical center where they again indicated consent to participate. They were given instructions and had a training session on how to use the virtual buffet. Mothers then received the information corresponding to one of the three experimental groups (McBride et al., 2013). Food safety group (control) received general information about food-borne illness and techniques to safely prepare foods. The behavioral risk information group received information about childhood obesity trends, behavioral risk factors associated with obesity, and the importance of the family in implementing health behavior change. The last group received the same information as the behavioral risk information group plus FHH-based obesity risk feedback for their child. Using the parents' weight status, this group received a risk estimate for their child i.e., if one parent is overweight, it increases the child's risk of becoming overweight as an adult from 13% to 28%, and if both parents are overweight from 13% to 58%. A second short survey followed information provision. Mothers then completed the virtual buffet measure. They were instructed to choose foods and a beverage for a hypothetical lunch for the index child. In order to complete the virtual reality task, participants wore a head mounted display connected to computer equipment and used a pointing device

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