



Bi-directional associations between parental feeding practices and children's body mass in parent-child dyads

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ABSTRACT

Objective: This study investigated whether parental feeding practices, such as pressure to eat, permitting unhealthy food, and restriction of unhealthy food predict children's body mass index (BMI) percentile or if children's BMI percentiles predict parental feeding practices.

Design: Longitudinal data were collected among 526 dyads of children (6–11 years old) and one of their parents. Parents reported parental feeding practices, restriction of unhealthy food, permission of unhealthy food, and pressure to eat. Children's weight and height were assessed objectively. All measurements were conducted twice with a time lag of 10 months.

Results: Cross-lagged panel analyses demonstrated that low levels of children's BMI percentiles (measured at the baseline) predicted parental feeding practices (measured at the follow-up) but not vice versa. Only one effect suggesting bi-directionality was found, with parental restriction of unhealthy food preceding higher levels of children's BMI percentiles at the follow-up.

Conclusions: Parental feeding practices seem to be a reaction to the levels of children's BMI percentiles.

1. Introduction

Childhood obesity may have serious health, emotional, and social consequences (Freedman, Mei, Srinivasan, Berenson, & Dietz, 2007; Harriger & Thompson, 2012). Obese children are at risk for developing obesity in adulthood (Singh, Mulder, Twisk, van Mechelen, & Chinapaw, 2008). Therefore, one of the key tasks of health and social science researchers is to identify any modifiable practices or strategies that could prevent obesity or constitute risk factors of childhood obesity (Cachelin, Thompson, & Phimphasone, 2014).

Parental behaviors are assumed to have a substantial impact on children's food choices, nutritional behaviors, and body mass (Golan & Crow, 2004; Gubbels et al., 2011; Niemeier, Duan, Shang, & Yang, 2017; Sleddens, Gerards, Thijs, de Vries, & Kremers, 2011). The role of parental behaviors on the development of children's nutritional behaviors is recognized in several theories, including social cognitive theory (Bandura, 2001). Parental behaviors are also a significant constituent at the micro-environmental level in the frameworks linking environmental factors to body mass (Swinburn, Egger, & Raza, 1999). Among the

multiple ways in which parents may influence their children's body mass, parental feeding practices have received growing attention among researchers and practitioners (Birch & Davison, 2001; Clark, Goyder, Bissell, Blank, & Peters, 2007). Since parental feeding practices are modifiable, they constitute an optimal target for obesity-prevention interventions.

Parental feeding practices are defined as specific behaviors or strategies that parents use to maintain or modify children's dietary intake (Hughes et al., 2013). One of the most frequently investigated parental feeding practices is the use of parental control, such as parental restriction of unhealthy food or parental pressure to consume certain types of foods (Burrows, Warren, & Collins, 2010). Permission is yet another control-related practice that refers to leaving the control to the child and allowing children to make their own choices regarding healthy or unhealthy food intake (Musher-Einzenmann & Holub, 2007; Vereecken, Keukelier, & Maes, 2004). Parents may start using permissive practices in response to their children's rejection of healthy food (e.g., vegetables), giving the child a degree of autonomy and control over his or her eating habits (Holley, Jaycraft, & Farroe, 2018).

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Research has demonstrated significant relationships between children's body mass and parental practices based on control. For example, parental restriction of unhealthy food was positively related to children's body mass (e.g., Cardel et al., 2012; Faith et al., 2004; Francis, Hofer, & Birch, 2001). A recent systematic review confirmed this positive association (Shloim, Edelson, Martin, & Hetherington, 2015). Pressure to eat, which is another parental control strategy, was negatively related to children's body mass (e.g., Brann & Skinner, 2005; Cardel et al., 2012; Farrow & Blissett, 2008; Galloway, Fiorito, Lee, & Birch, 2005; Musher-Eizenman & Holub, 2007), and it has been confirmed in a systematic review of 10 cross-sectional studies (Shloim et al., 2015). Similar conclusions were formulated by Vollmer and Mobley (2013), who reviewed research on parental permissiveness and concluded that this type of parental practice was related to higher body mass in children. On the other hand, a number of studies found no association between these control-based parental feeding practices and indicators of children's body mass (Campbell et al., 2010; Carnell & Wardle, 2007; Johannsen, Johannsen, & Specker, 2006; Spruijt-Metz, Li, Cohen, Birch, & Goran, 2006). It is important to note that studies linking parental practices with children's body mass usually applied a cross-sectional design. Thus, it remains unclear whether parental feeding practices based on control precede or are a consequences of children's body mass.

Until now, there have been only a few longitudinal studies done that also indicate equivocal results (Birch, Fisher, & Davison, 2003; Derks et al., 2017; Fisher & Birch, 2002; Tschann et al., 2015). On the one hand, it was shown that parental feeding practices precede children's BMI (e.g., Birch et al., 2003; Fisher & Birch, 2002). Several mediating mechanisms that might explain this relationship have been suggested. According to Fisher and Birch (2002), parental feeding practices interfere with the development of children's self-regulatory skills for food consumption in response to hunger and satiety cues. As a consequence, children eat in the absence of hunger, which may prompt an increase in body mass. One parental control feeding practice, namely restriction of eating, may especially increase the desirability of particular foods and, in turn, may promote eating in the absence of hunger (Birch & Fisher, 2000; Fisher & Birch, 2002). Other parental feeding practices, such as pressure to eat, seem to reduce the desirability of the food (Galloway et al., 2005). On the other hand, it has been shown that the use of parental feeding practices may be a reaction to parental recognition of their children's excessive body mass, rather than being a proactive strategy (Brann & Skinner, 2005). A recent longitudinal study also showed that the use of restrictive feeding practices was a parental response to the children's unhealthy diet rather than as a result of the children's obesity (Derks et al., 2017). Despite this first longitudinal evidence, it still remains unclear whether parental feeding practices based on control precede or are a consequences of children's body mass. The investigation of such bi-directional associations between parental feeding practices and BMI is considered a crucial challenge in current research (Brann & Skinner, 2005; Cardel et al., 2012; Farrow & Blissett, 2008).

As mentioned above, the key shortcoming of previous studies is a lack of longitudinal and cross-lagged approaches, which would allow for the verification of bi-directional associations between parental feeding practices and children's body mass. A further limitation of previous studies is the small sample sizes, resulting in a limited generalizability of the results. In addition, most studies are based on self-reports from parents only or children only, instead of a dyadic approach, and body mass was usually self-reported. The present study aims to overcome these shortcomings.

1.1. The aims

This study aimed to explore the bi-directional relationship between the three parental feeding practices (pressure to eat, restriction of unhealthy food, permission for unhealthy food) and children's body mass.

A longitudinal design (2 measurement points, the baseline and the 10-month follow-up) objectively measured body weight and height, and self-report data from both children and parents would allow determining if high (or low) BMI percentile in children is a result of parental feeding practices or if high (or low) BMI percentile in children preceded parental feeding practices. To our knowledge, this is one of the first studies to investigate the bi-directional relationships between children's BMI percentiles and parental feeding practices. In particular, our research questions were: (1) what is the direction of the relationship between pressure to eat (measured in parents Time 1 and Time 2) and children's BMI percentiles (measured in children at Time 1 and Time 2); (2) what is the direction of the relationship between restriction of unhealthy food (measured in parents in Time 1 and Time 2) and children's BMI percentiles (measured in children at Time 1 and Time 2); and (3) what is the direction of the relationship between permission for unhealthy food (measured in parents in Time 1 and Time 2) and children's BMI percentiles (measured in children at Time 1 and Time 2).

2. Material and methods

2.1. Participants: parents and children

At Time 1 (T1), 859 parents and children participated in the study; 526 completed the measurement at the 10-month follow-up, Time 2 (T2). The data obtained from completers were analyzed. Children (Ch) who participated at both waves of data collection were 6–11 years old ($M = 8.16$, $SD = 1.37$); 43.2% of them were boys. After adjusting for age and gender in relation to IOTF cut-offs (Cole, Lobstein, 2012), 17.5% of the children were overweight, 6.3% were obese, and 13.5% had a BMI below the cut-off point for being underweight.

Participating parents (P) were 20–49 years old ($M = 35.93$, $SD = 5.47$); 91.6% of them were women. The majority had a BA or MA degree (42.3%); 42.6% had a secondary education, whereas 15% only had a primary education. Data were collected among inhabitants of rural areas (30.5%), towns up to 10,000 inhabitants (28%), and larger cities (41.5%).

Attrition analyses indicated that parents who dropped out of the study (39%) did not differ significantly from the parents who remained in the study with regard to age, $F(1, 856) = 1.08$, $p = .31$, BMI, $F(1, 856) = 1.76$, $p = .19$ or parental feeding practices: restriction of unhealthy food, $F(1, 858) = 1.00$, $p = .46$, pressure to eat, $F(1, 858) = 0.77$, $p = .76$, and permission for unhealthy food, $F(1, 855) = 0.98$, $p = .45$. There was, however, a difference in gender, with fathers being more likely to drop out, $\chi^2(1, 856) = 7.29$, $p = .007$ (fathers constituted only 8% of the completers, whereas they constituted 14% of the initial sample). Children who did not participate in the follow-up measurement did not differ from completers in gender, $\chi^2(1, 856) = 4.02$, $p = .05$ or BMI percentiles, $F(1, 856) = 0.95$, $p = .33$.

Respondents were provided with an official certificate of participation in the research. The study was approved by the Internal Review Board at the first author's institution.

2.2. Procedure

There were two measurement points, the baseline (T1) and a 10-month follow-up (T2). The experimenters (13 women with MA degrees in psychology) participated in an intensive training session to assure consistency of the study procedures. Participants were recruited among children from primary schools and kindergartens in rural and urban areas. The parent who was the main caretaker (in terms of cooking and child nutrition) was invited to participate. There were no additional inclusion criteria.

Children and parents were provided with information about the planned research schedule a week before the study; they were asked to consider participation and provide their informed consent. Informed consents were collected from parents (for their own and their child's

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