



Research report

Maternal feeding practices predict fruit and vegetable consumption in young children. Results of a 12-month longitudinal study

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ABSTRACT

This study aimed to explore the prospective relationship between maternal feeding practices and young children's frequency of consumption of fruits, vegetables and sweets, and also child weight-for-height z-scores. Participants were 60 mothers who completed questionnaires when their children were 1 year old and again when their children were 2 years old. Regression analyses were performed. After controlling for availability and prior child consumption of the target food, maternal use of pressure to eat at 1 year predicted lower child frequency of fruit consumption at 2 years and approached significance for lower vegetable consumption. Maternal modelling of healthy eating at 1 year predicted higher child frequency of vegetable consumption at 2 years. Restriction did not significantly predict child frequency of consumption of fruits, vegetables or sweets over time. Child weight-for-height scores at 2 years were predicted by weight-for-height at 1 year but not by feeding practices. The findings suggest that maternal feeding practices can influence child eating at a very young age. Interventions should focus on encouraging parents to model healthy eating to promote healthy eating in children.

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Introduction

Food preferences and eating patterns developed in early childhood appear to continue into adolescence and adulthood (Mikkilä, Räsänen, Raitakari, Pietinen, & Viikari, 2005; Nicklaus, Boggio, Chabanet, & Issanchou, 2004; Northstone & Emmett, 2008; Rozin, 1990; Unusan, 2006). In the early years in particular, parents play an important role in shaping children's food preferences and intake. As gatekeepers of the household food supply, parents are, to a certain extent, able to control which foods are accessible to their children. Additionally, parents use feeding strategies which may influence children's food preferences and intake (Jansen, Mulken, & Jansen, 2007; Vereecken, Legiest, De Bourdeaudhuij, & Maes, 2009). This study focuses on three such feeding practices: pressuring children to eat more healthy foods; restriction of unhealthy foods; and modelling of healthy eating.

Research suggests that despite positive intentions some parental feeding practices may not achieve the desired effect of promoting healthful eating. For example, in cross-sectional studies, pressuring children to eat more healthy foods has been associated with lower child consumption of fruit (Fisher, Mitchell, Smiciklas-Wright, & Birch, 2002; Vereecken et al., 2009) and vegetables (Fisher et al., 2002), and with higher child consumption

of unhealthy foods (Campbell, Crawford, & Ball, 2006; Vereecken et al., 2009). Similarly, restriction of unhealthy foods is used by parents in an attempt to improve children's diets, but experimental studies have found that restriction of a particular food may result in increased preference for (Jansen et al., 2007) and intake of the restricted food (Fisher & Birch, 1999).

There is also a limited amount of research available regarding relationships between these feeding strategies and child weight in early childhood. In one prospective study, it was found that maternal use of pressure to eat and restriction with 1-year-old children significantly predicted lower child weight at 2 years, after controlling for the child's initial weight (Farrow & Blissett, 2008). In older samples, pressure to eat has been consistently associated with lower child weight status (Birch et al., 2001; Carnell & Wardle, 2007; Powers, Chamberlin, van Schaick, Sherman, & Whitaker, 2006; Robinson, Kiernan, Matheson, & Haydel, 2001; Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002), while restriction has been related to higher child weight in some studies (Birch et al., 2001; Francis, Hofer, & Birch, 2001; Moens, Braet, & Soetens, 2007) and not associated with weight in others (Carnell & Wardle, 2007; Kröller & Warschburger, 2008). One 3-year prospective study found that restriction at baseline was associated with lower BMI z-score in 5- to 6-year-old children but not in 10- to 12-year-old children (Campbell et al., 2010). Inconsistent findings and a limited number of longitudinal studies with regards to feeding practices and weight have highlighted the need for additional research in this area.

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Another parental feeding strategy, modelling of healthy eating, is thought to promote healthful child eating behaviour. Research has consistently found that parents' food consumption is positively related to their children's food consumption (De Bourdeaudhuij et al., 2008; Vereecken, Keukelier, & Maes, 2004; Wardle, Carnell, & Cooke, 2005). Rozin and Millman (1987) proposed that environment was more likely than heredity to explain familial similarities in food preferences. One environmental influence on child food intake may be the availability of those foods in the home (Cullen et al., 2003; Jago, Baranowski, & Baranowski, 2007; Koui & Jago, 2008). One study found that children who eat meals with their family more regularly tend to consume more vegetables, after taking into account the availability of fresh food in the area and the extent to which parents do not buy fruit and vegetables due to a perception of high cost and low preference in the family of these foods (Campbell et al., 2006). It is possible that parental modelling of healthy eating may have a positive influence on children's eating, distinct from the potential impact of availability of healthy foods in these households.

The evidence described here indicates that there is a relationship between child food consumption patterns and parental feeding practices. However, the literature lacks longitudinal evidence that could provide an indication of causality in these relationships. It is possible that pressuring children to eat, for example, could lower children's consumption of healthy foods; it is also possible that this strategy is used in response to the child's reluctance to eat these foods. Another gap in the literature is an examination of these relationships in children aged 1–2 years. This age may be a particularly important period in the development of child eating behaviour, with evidence suggesting that early food experiences shape children's later food preferences and intake (Nicklaus et al., 2004; Skinner, Carruth, Bounds, Ziegler, & Reidy, 2002).

The primary aim of the present study was to examine prospective relationships between maternal use of pressure to eat, restriction, modelling and food availability with 1-year-old children, and children's frequency of consumption of fruits, vegetables and sweets 1 year later. A further aim of this study was to test whether maternal feeding practices at 1 year were associated with child weight-for-height z-scores (WFH_z) at 2 years.

Methods

Participants

Participants were mothers of 1-year-old children from The Child and Family Health Study conducted through La Trobe University, Australia. Recruitment was conducted through community notices in local newspapers and via playgroup coordinators who invited mothers in their groups to participate. Participants were excluded if they reported that their child had a physical illness that severely impacted on their eating behaviour. Seventy-eight mothers returned questionnaires during the initial phase, and 63 of these mothers also returned the follow-up questionnaire 12 months later. For the final analyses, data from 3 participants were removed due to missing subscales, leaving a final sample of 60 (77% of those who participated initially). This study was approved by the Human Research Ethics Committee at La Trobe University. Participants received a \$10 supermarket gift voucher for their participation at each time point.

Measures

A self-report questionnaire was used for mothers to record demographic and anthropometric information, as well as measures of maternal feeding practices, child food consumption, and food availability.

Maternal feeding practices

All of the parental feeding items were measured on a five point Likert scale, and scores for each feeding practice were calculated using the mean of all items in the subscale. Feeding variable scores ranged from 1 to 5, with a higher score indicating more frequent use of that practice.

Two parental feeding subscales were taken from the Child Feeding Questionnaire (CFQ) (Birch et al., 2001), a widely used instrument in the child feeding literature (Ventura & Birch, 2008). The subscale "pressure to eat" contains four items, asking parents the degree to which they pressure their child to eat more food (e.g. "If my child says 'I'm not hungry,' I try to get him/her to eat anyway", $\alpha = .61$). The "restriction" subscale measures how much parents attempt to control their child's eating by restricting access to food (e.g. "I intentionally keep some foods out of my child's reach" and "If I did not guide or regulate my child's eating s/he would eat too many junk foods"). The original scale is comprised of eight items; however, recent research has questioned the inclusion of two of these on both theoretical and statistical grounds (Anderson, Hughes, Fisher, & Nicklas, 2005; Corsini, Danthiir, Kettler, & Wilsona, 2008). These two items, regarding the use of food as a reward for good behaviour, were excluded from our measure, resulting in a six-item scale ($\alpha = .79$). Modelling of healthy eating was measured using three items ($\alpha = .75$) written for the purposes of this study: "I try to eat only healthy foods in front of my child"; "My child sees me eating fast food" (reversed item), and; "My child sees me eating healthy snacks (e.g. fruit, yoghurt, nuts, toast)."

Child frequency of food consumption and food availability

The child's consumption of fruits, vegetables and sweet foods was measured with the Child Food Frequency Questionnaire. This scale was developed by Campbell and colleagues (Campbell et al., 2006), and was based on data from the 1995 Australian National Nutrition Survey. On a 7-point scale from "not eaten" to "4 times a day", mothers were asked to record how often their child ate each of the listed fruits (14 items), vegetables (13 items) and sweets (13 items, e.g. ice-cream, chocolate biscuits) over the past week. The authors of the scale listed more common food items separately (e.g. "banana" or "chocolate"), while grouping other foods together (e.g. "honeydew/watermelon/rockmelon"). Individual items were recoded to represent an average daily frequency of consumption for that item (e.g. 4 times a day = 4, once a day = 1, once a week = 1/7 = .14), then the items in each food group were added together for each case, with the final frequency scores indicating the average number of times per day that the participant's child ate fruits, vegetables and sweets.

Additionally, parents were asked for each food listed: "If this food was NOT eaten, was this food available in your house last week (yes/no)?" Each food listing was then given a "food availability" score. If the food was eaten by the child at all during the week (and therefore was available to him or her), or not eaten but available in the house, then that food was given an availability score of 1. If it was neither eaten nor available, it was given a score of zero. The overall availability for fruits, vegetables and sweets was then calculated by summing together the availability scores within each food group. The scores therefore reflected the variety of fruits, vegetables and sweets that were available to the child over the week, rather than the total volume of food. It should be noted that the measure did not account for food which was made available to the child (but was not eaten) outside the home.

Statistical analyses

Body mass index (BMI) was calculated for the mothers. Age- and gender-adjusted weight-for-height z-scores (WFH_z) were

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