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Research report

The influence of parents' dietary beliefs and behaviours on children's dietary beliefs and behaviours. The CYKIDS study

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ABSTRACT

We investigated the association between parental dietary beliefs and behaviours (DBB) and those of their children behaviours. Data were derived from a national cross-sectional study using multistage sampling design, among 1140 children (9–13 years). Principal component analysis was employed to extract the main factors out of eight variables assessing children's dietary beliefs and behaviours ($N = 991$); those eight factors were then regressed, on 16 dependent variables, describing different parental dietary beliefs and behaviours, adjusted for potential confounders. Three factors emerged as important in explaining the variance in children's dietary beliefs and behaviours: "guilty about eating" (factor 1), "concerned about own body weight" (factor 2) and "eating all my food" (factor 3). Children with types 1–3 behaviour: were 30% more likely to have parents who did not control what and how much their child ate, have parents who are 40% more likely to think that their child is overweight/obese and seem to have more availability of high fat foods, respectively. Breastfeeding was associated with the acquisition of positive dietary beliefs and behaviours by children, independently of child's age, gender, place of residence, socio-economic status, diet quality, and child's and parents' obesity status. We propose that parents are likely to exert their influence in shaping eating habits and subsequently obesity development in their children, by influencing their children's dietary beliefs and behaviours.

Introduction

Family environment and especially parents, exert important influences on the development and shaping of young children's eating habits and weight status (Clark, Goyder, Bissell, Blank, & Peters, 2007; Davison & Birch, 2001; Patrick & Nicklas, 2005). Understanding the possible mechanisms by which these influences are mediated, may give useful insights into how children's food preferences are acquired and for planning of successful public health programs related to the promotion of good dietary habits, obesity prevention and intervention among children.

Possible mechanisms that have been proposed via which parents may exert their influence on shaping their children's dietary habits are modelling, child-feeding practices such as restriction or restraint and the general parenting style (Davison & Birch, 2001; Lederman et al., 2004; Savage, Fisher, & Birch, 2007). In addition, another potential pathway by which parents may exert their influence on their children's dietary patterns, which has not been investigated, is by influencing their children's dietary beliefs and behaviours (DBB), i.e. commonly held beliefs and behaviours regarding diet, nutrition and body image.

The impact that parents might have on their children's DBB, is important since cognitive schemas are developed during childhood and social psychology places high importance to the role of cognitive schemas and ideas for the development and shaping of children's dietary preferences and habits (Loewen & Pliner, 1999), which ultimately may influence their weight status and other markers of well-being. Thus, it would be of interest to investigate this aspect of parental influence on the shaping of their children's DBB.

Subjects and methods

Study population

The study was nation-wide and covered all the freely accessed districts of the Republic of Cyprus. A total of 1589 children of 4th, 5th and 6th grade (9–13 years, $x = 11 \pm 0.98$) in 24 primary schools were randomly identified for potential inclusion; 1140 agreed to participate (72% participation rate), representing 3.7% of the total population.

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Sampling was multistage and stratified by the number of students in each of the five provinces, as provided by the Ministry of Education (data not published, printed data available on request from the Department of Primary Education) and by place of residence (place of school was used as a proxy), urban or rural, as provided by the Cyprus Statistical Service (Department of Statistics and Research, Ministry of Finance, 2000). The research and all the means used were approved by the Ministry of Education and Culture.

Informed consent was signed by the parent or the guardian of each participant.

Socio-demographic variables

Questions regarding socio-demographic characteristics such as age, gender, place of residence and size of family, were included in a section of the food frequency questionnaire (FFQ) filled out by the children. Characteristics however, which could be not answered with sufficient reliability by children, such as parents' educational level, income, and profession, were collected via the short questionnaire that was filled out by the parents. Socioeconomic status was estimated from parents' educational level and type of occupation.

Anthropometry and obesity definition

Children's height and weight were reported by parents. Obesity and overweight among children were calculated using the International Obesity Task Force (IOTF) age and sex-specific body mass index (BMI) cut-off criteria (Cole, Bellizzi, Flegal, & Dietz, 2000). Parents' obesity and overweight percentages were also estimated from self-reported values of body weight and height. BMI measures were used to define adult (parents) obesity (BMI $\geq$ 30 kg/m^2) and adult overweight (BMI 25–29.9 kg/m^2).

Although BMI calculated from reported values may be underestimated (Andersen et al., 2005; Boutelle, Fulkerson, Neumark-Sztainer, & Story, 2004; Jackson, Strauss, Lee, & Hunter, 1990; Jansen, van de Looij-Jansen, Ferreira, de Wilde, & Brug, 2006), this practice has been used with satisfactory results by many researchers in previous studies, both for estimating children's BMI from parental reference (Goodman, Hinden, & Khandelwal, 2000; Sekine, Yamagami, Hamanishi, & Kagamimori, 2002) and for estimating adults' BMI and obesity status from self-reference (Bolton-Smith, Woodward, Tunstall-Pedoe, & Morrison, 2000).

Assessment of diet quality

We applied the KIDMED index (Mediterranean Diet Quality Index for children and adolescents), to evaluate the quality of children's diet. KIDMED index is the only index that has specifically been developed for children in Mediterranean countries (Serra-Majem et al., 2004; Serra-Majem, Ribas, García, Pérez-Rodrigo, & Aranceta, 2003). It has been validated against diet quality as assessed by nutrient adequacy, in a sample of children from Spain of the same age-span as ours (Serra-Majem et al., 2003). Same as Cyprus, Spain is also a Mediterranean country with similar food culture. The index (Serra-Majem et al., 2004) includes 16 components, which are based on and summarize the principles of the Mediterranean diet by an arithmetic score, which ranges from 0 to 12. According to authors, a score of 0–3 reflects a poor diet in relation to the Mediterranean diet principles, whereas values 4–7 and 8–12 represent average and good adherence to the principles of the Mediterranean diet, respectively.

Dietary beliefs and behaviours assessment

A specific section, aiming at evaluating children's dietary beliefs (such as body image and quality of diet-self-perception) and dietary behaviours (such as dieting) was attached to the semi-quantitative food frequency questionnaire, consisting of 154 foods, which was used for the dietary assessment of the sample. The eight questions used to evaluate children's dietary beliefs and behaviours are presented in Table 1. Response categories, for these questions were "none", "some", "much" and "very much".

The questionnaire was administered to whole class, during school hours, from February 2005 until June of the same year, by the same person, according to a written protocol, by which it was ensured that circumstances (such as type of explanations for each question, wording for each explanation, etc.) were held constant for all participants.

Parental DBB were assessed via the short questionnaire, which was attached to the consent form and which also included questions regarding socio-demographic characteristics. Questions included cooking habits, breastfeeding, control over their children's diet and dietary behaviour and dietary practices and beliefs regarding their children (Tables 3–6).

Statistical analysis

Continuous variables are presented as mean $\pm$ S.D., whereas categorical variables are presented as absolute and relative frequencies. Normality of distribution was tested by Kolmogorov–Smirnov test. Associations between normally distributed variables were tested by Student's *t*-test, whereas Mann–Whitney *U*-test was used for non-normally distributed continuous variables. Associations between categorical variables were tested by contingency tables and Chi-square test without Yate's continuity in 2 $\times$ 2 tables.

Table 1
Factor-loading matrix and eigen vectors for the three identified factors of dietary beliefs/behaviours of the sample

	Identified factors of dietary beliefs/behaviours		
	Guilty about eating	Concerned about body weight	Eating all my food
Degree which I feel guilty when I eat something which I know is fattening	0.848		
Degree which I feel guilty when I eat something which I know is not healthy	0.825		
Degree which I think that my diet is healthy	0.207	−0.665	0.120
Degree which I think that my weight is above normal	0.420	0.647	
Degree which I have tried to be on a diet	0.420	0.575	
Degree which I eat things which I know are fattening		0.553	0.400
Degree which I eat something I like even not hungry			0.785
Degree which my parents insist eating all my food			0.741
Eigen values	2.038	1.390	1.225
Total variance explained	22.572	18.785	16.808

Extraction method: principal component analysis; rotation method: varimax with Kaiser normalization. Absolute values $\leq$0.10 are omitted. Bartlett's test of sphericity Chi-square = 917,805; d.f. = 28, $p < 0.0001$. Kaiser–Meyer–Olkin measure of sampling adequacy = 0.607.

Principal component analysis (PCA) with varimax rotation was employed to extract the main factors from the eight variables assessing children's DBB (Table 1), after collapsing originally four response categories into two categories (''none/some'', ''much/very much''). Extracted factors were used as independent variables in 16 separate logistic regression models-backward stepwise (conditional) method (using $p < 5\%$ as the threshold for removing a variable from the models), with 16 dependent variables describing DBB (Tables 3–6), to determine the degree of prediction of the certain children's DBB by parental DBB.

We controlled for the potential confounders of age, gender, place of residence (urban/rural) children's BMI class (NW vs. OW/OB), parental BMI class (both lean, father lean/mother obese, father obese/mother lean, both obese), SES level (an index that incorporated educational level, type of occupation and income) and diet quality (as assessed by the KIDMED score). Diet quality was controlled for its plausible association with the DBB, as it is widely known that dietary behaviour is closely related to quality of the diet. Correlation analysis showed no excessive correlation between the variables used in regression analyses (all correlations were below 0.15).

All reported p values are based on two-tailed tests and compared to a significance level of 5%. SPSS 13.0 software (Statistical Package for Social Sciences, Chicago, IL, USA) was used for all statistical calculations.

Results

Factors of children's dietary beliefs and behaviours

Table 1 presents the factor loading matrixes for the three major identified factors of DBB. The first two factors are mostly related to dietary beliefs, whereas the third factor refers to a certain type of dietary behaviour. Type 1 behaviour, ''Guilty about eating'', is mainly characterized by feelings of guilt when eating certain foods, which the child knows are fattening or not healthy, whereas type 2 behaviour, ''Concerned about body weight'', refers to concerns about one's own body-weight and includes certain behaviours, such as eating fattening foods and dieting, that are closely related to body weight status. Type 3 behaviour, ''Eating all my food'', is mostly related to reasons for eating, e.g. taste and parental insistence.

Characteristics of the sample

Since DBB are strongly related to gender, we report descriptive and lifestyle characteristics of the sample in Table 2, by gender.

Overall, girls seem to have more negative feelings about eating than boys, whereas boys reported a greater quantity of food consumed. The sample's distribution with respect to the other characteristics is similar across the two groups.

Table 2
Descriptive characteristics of the sample

	Boys	Girls	p
Age	10.68 (0.96)	10.67 (0.99)	0.827
Grade			0.705
4th	183 (34.5)	195 (32.1)	
5th	174 (32.8)	206 (33.9)	
6th	174 (32.8)	206 (33.9)	
Place of living			0.602
Urban	291 (54.8)	342 (56.3)	
Rural	240 (45.2)	265 (43.7)	
Socioeconomic level			0.772
High	87 (21.2)	111 (21.9)	
Average	171 (41.7)	219 (43.3)	
Low	152 (37.1)	34.8 (176)	
Ethnicity			0.667
Greek	377 (88.7)	461 (88.5)	
Foreigners	14 (3.3)	13 (2.5)	
Mixed	34 (8.0)	47 (9.0)	
Factors of children's dietary beliefs and behaviours			
Factor 1: guilty about eating	−0.072 (0.98)	0.067 (1.02)	0.030
Factor 2: concerned about body weight	−0.02 (0.97)	0.01 (1.03)	0.647
Factor 3: eating all my food	0.14 (1.04)	−0.12 (0.95)	<0.0001
Obesity status of children			0.198
Normal weight (NW)	277 (75.1)	358 (78.9)	
Overweight/obese (OW/OB)	92 (24.9)	96 (21.1)	
Obesity status of parents			0.085
Both lean	131 (33.3)	137 (29.2)	
Father lean/mother obese	26 (6.6)	42 (9.0)	
Father obese/mother lean	146 (37.2)	203 (43.3)	
Both obese	90 (22.9)	87 (18.6)	
Quality of diet (as assessed by KIDMED score)			0.097
Poor quality diet: score 0–3	138 (44.8)	170 (55.2)	
Average quality diet: score 4–7	189 (40.9)	273 (59.1)	
Good quality diet: score 8–12	31 (55.4)	25 (44.6)	
Parental relationship			0.981
Married/together	416 (91.0)	510 (91.1)	
Separated/divorced/dead	41 (9.0)	50 (8.9)	

Continuous variables are presented as mean (±S.D.), and categorical variables as frequencies and percentages in parentheses. p of categorical variables from Chi-square.

Table 3
Odds ratios (ORs) and 95% CIs, derived from logistic regression analysis showing the association between parental dietary behaviours with their children's dietary behaviours and beliefs

Parental behaviours aimed at shaping and modifying children's diet[a]	Unadjusted model OR (95% CI)	Adjusted model[b] OR (95% CI)
Model 1	*N* = 881	*N* = 527
Control what and how much our child eats (yes/no)	Factor 1: 1.10 (0.91–1.33)	Factor 1: 1.28 (0.98–1.66)
	Factor 2: 1.29 (1.07–1.55)	Factor 2: 1.12 (0.86–1.45)
	Factor 3: 0.95 (0.77–1.17)	–
Model 2	*N* = 879	*N* = 528
We insist until our child eat all his/her food (yes/no)	Factor 1: 1.14 (0.98–1.33)	Factor 2: 1.33 (1.08–1.65)
	Factor 2: 1.28 (1.10–1.50)	Factor 3: 0.56 (0.46–0.69)
	Factor 3: 0.53 (0.46–0.62)	–
Model 3	*N* = 872	*N* = 526
We have restrictions on our child's food and delicacies/treaties (yes/no)	Factor 1: 0.88 (0.76–1.03)	–
	Factor 2: 1.11 (0.96–1.28)	–
	Factor 3: 0.97 (0.83–1.12)	–
Model 4	*N* = 871	*N* = 525
Degree we let our child free to choose what and how much will eat (some/enough)	Factor 1: 1.02 (0.89–1.16)	–
	Factor 2: 1.11 (0.97–1.27)	–
	Factor 3: 0.96 (0.84–1.10)	–
Model 5	*N* = 873	*N* = 523
We use chocolates/sweets as reward (yes/no)	Factor 1: 1.37 (1.11–1.68)	Factor 1: 1.43 (1.07–1.91)
	Factor 2: 1.04 (0.86–1.26)	–
	Factor 3: 0.77 (0.65–0.92)	–

[a] Reference category for all dependent variables is the first category.
[b] Adjusted model includes only independent variables from factor analysis, regarding children's dietary beliefs and behaviours, retained in the final model after applying backward stepwise (conditional) method.

Association between parental to children's dietary beliefs and behaviours

Tables 3–6 present results of logistic regression analyses. Analyses refer to the total sample, since there were inadequate cases, when we performed the analyses by gender.

All dependent variables that refer to parental DBB, were placed in four groups: "Parental behaviours aimed at shaping and modifying children's diet", "Parental beliefs", "Parental dietary behaviours regarding preparation of food" and "Other parental dietary behaviours (breastfeeding)". After adjusting for potential confounds, we observed that children with type 1 behaviour ("Guilty about eating"): were almost 30% more likely to have parents who did not control what and how much their child eats, their parents were 40% more likely not to use chocolates or sweets as reward and almost 40% more likely to think that their child is overweight/obese.

Children with type 2 behaviour ("'Concerned about body weight") seem to have parents who are 12% more likely not to control what and how much their child eats, 30% more likely not to insist until their child eats all his/her food and are almost 40% more likely to think that their child is overweight/obese. Moreover, there was a significant relationship between self-rated quality of parental dietary habits and behaviours and feelings represented by type 2 behaviour. Children with this type of (negative) behaviour have parents who are 20% more likely to rate their own dietary habits as mediocre.

Finally, children with type 3 behaviour ("Eating all my food") seem to have more access to high fat foods and their parents use cooking techniques that require considerable amounts of fat. More specifically, these children have parents who are 30% more likely to prepare fried food frequently ($\geq$3 times/week) and about 80% less likely to take off poultry skin or meat visible fat before cooking compared to children without type 3 behaviour. Additionally, children with this type of behaviour have parents who are almost 80% more likely to insist until their child eats all his/her food.

Interestingly, breastfeeding is independently associated with the acquisition of positive DBB by children. Children who have been breastfed are 20% less likely (independently of BMI) to feel over-concerned about their body weight or to consume unhealthy foods, whereas these children are almost 40% more likely to eat all their food, which may suggest that they are eating "proper meals" and not snacking on junk food.

Table 4
Odds ratios (ORs) and 95% CIs, derived from logistic regression analysis showing the association between parental dietary beliefs with their children's dietary behaviours and beliefs

Parental beliefs[a]	Unadjusted model OR (95% CI)	Adjusted model[b] OR (95% CI)
Model 1	*N* = 873	*N* = 523
I think that my child is overweight/obese (yes/no)	Factor 1: 0.73 (0.62–0.87)	Factor 1: 0.74 (0.55–0.98)
	Factor 2: 0.56 (0.47– 0.67)	Factor 2: 0.72 (0.55–0.93)
	Factor 3: 1.38 (1.11–1.71)	–
Model 2	*N* = 866	*N* = 521
How parents rate their own dietary habits (good/mediocre)	Factor 1: 0.92 (0.80–1.06)	Factor 2: 1.20 (0.99–1.46)
	Factor 2: 1.23 (1.08–1.42)	–
	Factor 3: 1.01 (0.87–1.15)	–

[a] Reference category for all dependent variables is the first category.
[b] Adjusted model includes only independent variables from factor analysis, regarding children's dietary beliefs and behaviours, retained in the final model after applying backward stepwise (conditional) method.

Table 5
Odds ratios (ORs) and 95% CIs, derived from logistic regression analysis showing the association between parental dietary behaviours regarding preparation of food with their children's dietary behaviours and beliefs

Parental dietary behaviours regarding preparation of food[a]	Unadjusted model OR (95% CI)	Adjusted model[b] OR (95% CI)
Model 1	*N* = 933	*N* = 524
Eating fried food: frequently (≥3 times/week) vs. rarely (≤1 times/week)	Factor 1: 1.01 (0.89–1.16)	Factor 3: 0.77 (0.64–0.93)
	Factor 2: 0.87 (0.76–0.99)	–
	Factor 3: 0.85 (0.74–0.97)	–
Model 2	*N* = 937	*N* = 522
Eating grilled food: frequently (≥3 times/week) vs. rarely (≤1 times/week)	Factor 1: 1.06 (0.90–1.24)	Factor 1: 1.27 (0.98–1.64)
	Factor 2: 1.04 (0.89–1.22)	–
	Factor 3: 0.87 (0.75–1.01)	–
Model 3	*N* = 844	*N* = 516
Frying with olive oil: seldom/most times	Factor 1: 0.84 (0.73–0.98)	–
	Factor 2: 1.01 (0.87–1.17)	–
	Factor 3: 0.92 (0.79–1.06)	–
Model 4	*N* = 831	*N* = 510
Cooking with olive oil: seldom/most times	Factor 1: 0.94 (0.82–1.07)	–
	Factor 2: 0.88 (0.77–1.01)	–
	Factor 3: 0.97 (0.85–1.12)	–
Model 5	*N* = 843	*N* = 514
Frying with seed oil: seldom/most times	Factor 1: 0.90 (0.79–1.04)	Factor 1: 0.83 (0.68–0.99)
	Factor 2: 1.18 (1.03–1.35)	Factor 2: 1.21 (1.01–1.46)
	Factor 3: 1.16 (1.01–1.34)	–
Model 4	*N* = 816	*N* = *501*
Cooking with seed oil: seldom/most times	Factor 1: 0.97 (0.84–1.12)	Factor 2: 1.26 (1.04–1.52)
	Factor 2: 1.19 (1.03–1.37)	–
	Factor 3: 1.12 (0.96–1.29)	–
Model 6	*N* = 859	*N* = 519
Taking off poultry skin before cooking: seldom/most times	Factor 1: 1.03 (0.90–1.18)	Factor 3: 0.82 (0.68–0.98)
	Factor 2: 0.92 (0.81–1.06)	–
	Factor 3: 0.95 (0.83–1.09)	–
Model 7	*N* = 864	*N* = 521
Taking off meat visible fat before cooking: seldom/most times	Factor 1: 1.02 (0.88–1.18)	Factor 3: 0.77 (0.64–0.94)
	Factor 2: 0.92 (0.80–1.06)	–
	Factor 3: 0.96 (0.83–1.11)	–

[a] Reference category for all dependent variables is the first category.
[b] Adjusted model includes only independent variables from factor analysis, regarding children's dietary beliefs and behaviours, retained in the final model after applying backward stepwise (conditional) method.

Detailed results including other important associations observed in adjusted models, the observed associations in unadjusted models, other important variables that were retained in the final model, and the percentage of variance explained in each model are provided in Tables 3–6.

Discussion

This study is the first to report on relationships between parental DBB and children's DBB, and provides evidence that a significant association exists.

Parents, who are characterized by behaviours such as not controlling what and how much their child eats or not insisting until their child eats all her food, seem more likely to have children who feel guilty about eating (Table 3). Possible explanation of factors responsible for the expression of such behaviours on behalf of parents may be associated with the type of parenting style; such behaviours may be indicative of indulgent or indifferent parenting style. This explanation is further strengthen by the observation in the 2nd model, presented in Table 5, that less frequent preparation of grilled food by parents is associated with type 1 behaviour in their children. This observation may suggest that such parents may be indifferent or not bothering about principles of healthy eating, and as such they are modelling "unhealthy food habits" as they rarely prepare grilled food. Expression of guilt on behalf of children whose parents express such types of child-feeding behaviours may be due to the fact that these parental behaviours leave children the freedom to eat what they like (such as junk food), irrespectively of its quality. Consequently because children acknowledge the fact that they eat "unhealthy foods", this may lead them to experience negative feelings about eating.

Table 6
Odds ratios (ORs) and 95% CIs, derived from logistic regression analysis showing the association between breastfeeding with their children's dietary behaviours and beliefs

Other parental dietary behaviours[a]	Unadjusted model OR (95% CI) (*N* = 859)	Adjusted model[b] (*N* = 520)
Breastfeed (no/yes)	Factor 1: 1.04 (0.88–1.23)	Factor 2: 0.79 (0.64–0.98)
	Factor 2: 0.824 (0.70–0.97)	Factor 3: 1.37 (1.07–1.76)
	Factor 3: 0.99 (0.84–1.18)	

[a] Reference category for all dependent variables is the first category.
[b] Adjusted model includes only independent variables from factor analysis, regarding children's dietary beliefs and behaviours, retained in the final model after applying backward stepwise (conditional) method.

An opposite parenting style of demanding or perfectionist parents may be associated with the parental attitude or belief of consideration of their children as overweight regardless of their real weight observed in model 1 in Table 4. This parental belief is associated with an increased likelihood that children of those parents be over-concerned and feel guilty about their eating behaviours and their body weight (Table 4, factors 1 and 2).

Even though we did not locate any studies that examined the relationship between parental DBB to children's DBB, it seems that these results are in line with previous research on child-feeding practices and parenting styles, in which it was demonstrated that the best predictor of children's ability to regulate food was parental control (Hood et al., 2000; Johnson & Birch, 1994; Lederman et al., 2004).

We have also shown that parental own quality of diet seems to influence their children's dietary behaviours, because children whose parents have mediocre dietary habits, seem to be more prone to type 2 behaviour, which includes frequent consumption of unhealthy and fattening foods (Table 1). These findings are consistent with a growing body of research, which demonstrates that parents may influence their children's dietary habits through modelling of their own dietary practices (Hood et al., 2000; Johnson & Birch, 1994; Patrick & Nicklas, 2005).

Another noteworthy finding of this study is that high fat preparation practices (such as not taking off poultry skin or meat visible fat before cooking—Table 5) in the home seem to be related with higher consumption of food (factor type 3 behaviour), which suggests and confirms conclusions from the literature that taste and palatability are major criteria children use for food selection (Lederman et al., 2004; Resnicow et al., 1997). It has been demonstrated that greater high-fat food preparation practices in the home were related to higher total energy intake in children, which suggests choice of food based on availability and accessibility and also higher food consumption (Cullen et al., 2004). Moreover, this finding is supportive of the literature which proposes that kind of food consumed is positively related to the availability and accessibility of such food (Patrick & Nicklas, 2005). For instance in a study by Fisher and Birch (2002) among 192 5–7-year-old girls and their parents, showed girls' eating was positively correlated with exposure to palatable foods.

Finally, it should be noted that an independent association was observed between breastfeeding and the acquisition of positive DBB in children, such as less likelihood of expressing type 2 behaviour, by children has been revealed (Table 6). Given that this association was independent of weight status, it could be attributed to the positive effects of breastfeeding on food acceptance and the development of a more efficient ability to self-regulate energy intake by breastfed children (Savage et al., 2007).

Implications

Our findings support the position that the home food environment is central to the development of healthy eating behaviours in children. A common problem often encountered even in the most successful interventions, is that significant effects disappear after a relatively short period of time (usually not more than 12 months). Persistence of child's food habits into adulthood may be due to the development and establishment of certain DBB. We suggest a plausible mechanism of parental influence on diet practices of children. Therefore, because parental DBB seem to influence those of their children, diet modification and interventions in children should also target parental DBB. Similarly, because general parenting style and style specific to parental child-feeding behaviours seems to be influential on children, successful interventions regarding children's eating habits should guide parents about child-feeding behaviours.

Subsequently, measured outcomes in diet and obesity interventions should include children's (and parents) DBB.

Limitations and strengths

Some limitations of the present study must be acknowledged. The present study is cross-sectional. Bi-directionality is likely for all observed associations. Nevertheless, the study highlights a number of parental DBB that may influence child DBB, and thus diet composition and obesity status, which can be valuable for future investigations.

No distinctions were made between mothers and fathers given that the parental questionnaire was indented to be filled in by both parents. Research has pointed to significant differences between mothers and fathers regarding child-feeding practices, child dietary behaviours, and the weight status of children (Johannsen, Johannsen, & Specker, 2006). Such a distinction would allow us to determine the influence of parental gender.

Conclusions

In conclusion, we have shown that children's DBB are associated with what their parents' model, with parental eating behaviours and the quality of their parents' diet. Additionally, our results suggest that parental styles seem to be associated with the development of children's DBB.

Thus, we propose that parents are likely to exert their influence in shaping eating habits and subsequently obesity development in their children, by influencing their children's DBB.

Our findings provide suggestions for future investigations, includes further and more detailed research of which parental DBB are more influential, how they exert their influence and they are moderated by parental and child gender and age.

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Authors' contributions: The contributions of the authors were as follows: CL was responsible for the study design, collection of data, performed the data analysis and prepared the manuscript; TK and A-LM aided in the presentation and interpretation of results and critically reviewed the paper. All authors contributed to the final form of the manuscript.

Conflict of interest

None.

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