

Comparing the use of food and physical activity parenting practices: Parents of children with overweight and obesity versus parents of children with a healthy weight

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ARTICLE INFO

Keywords:

Energy balance-related parenting (practices)

Food parenting

Physical activity parenting

BMI

Weight status

1. ABSTRACT

Background: Paediatric overweight and obesity are caused by a complex imbalance between energy intake and expenditure. Parents may influence this imbalance through energy balance-related parenting practices. This study aims to compare the use of energy balance-related parenting practices between parents of children with overweight and obesity and children with a healthy weight.

Methods: This study compares energy balance-related parenting practices among a group of parents with children with overweight and obesity at the start of a lifestyle intervention (N = 107) and children with a healthy weight (N = 137). Specifically, it compares the feeding practices 'overt control' (open control over eating), 'encouragement', 'instrumental feeding', 'emotional feeding', and 'covert control' (hidden control over eating), as well as the physical activity parenting practice 'promoting physical activity'. Multiple regression analyses are used to calculate associations between child weight groups and parenting practices when corrected for children's characteristics.

Results: Parents of children with overweight and obesity reported significantly different scores on control over eating practices than parents of children with a healthy weight, namely a significantly higher score on covert control (B = 0.397, S.E. 0.123, p = 0.001) and a significantly lower score for overt control (B = -0.136, S.E. 0.068, p = 0.046).

Conclusion: Covert control is reported more, while overt control is reported less in parents of children with overweight and obesity compared to parents of children with a healthy weight, even after correction for the child's, family, and maternal characteristics. Future longitudinal research and intervention trials are recommended to determine *whether* and *how* the use of control over eating practices changes.

1. Background

The increased prevalence of paediatric overweight and obesity in primary school-aged children over the last few decades has become a global problem [1]. Obesity is a complex chronic disease, in which numerous determinants related to the child, family, and societal environment (e.g. schools) have been identified and described over time [2–4]. Parents are considered important agents in influencing children's eating and physical activity behaviours, for example through the use of

parenting practices; i.e. specific (un)intentional behaviours used by parents in raising a child to influence the attitudes, behaviours or beliefs of the child [2,5]. These food and physical activity-related parenting practices that specifically influence balance-related behaviours (EBRBs i.e. dietary intake and physical activity), have been previously described as energy balance-related parenting practices [6].

Parenting practices in the field of food parenting have generally been classified into three higher-order constructs, namely coercive control (classified in, for example, *instrumental feeding* and *emotional feeding*), structure (e.g. *control over eating: covert and overt control*), and autonomy

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<https://doi.org/10.1016/j.obpill.2023.100078>

Received 8 June 2023; Received in revised form 23 June 2023; Accepted 23 June 2023

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Abbreviations:

EBRBs	Energy balance-related behaviours
BMI	Body Mass Index
CITC	Corrected Item-Total Correlation
COACH	Centre of Childhood Overweight and Obesity
MUMC+	Maastricht University Medical Centre+
PFSQ	Parental Feeding Style Questionnaire

support (e.g. *encouragement*) [5,7,8]. Inconsistencies in defining and measuring these food parenting practices however exist [9,10]. Furthermore, most studies regarding food parenting practices have focused on specific (coercive) practices [11]. As such, it is important to gain more insight into the link between children's weight status and different food parenting practices belonging to all three higher-order constructs [11]. On the contrary, physical activity parenting practices have been studied less often than food-related parenting practices and are often poorly defined [12,13]. Some studies suggest that several physical activity parenting practices are related to a child's physical activity behaviours, particularly parental role modelling and parental support [14,15]. In addition, there are indications that a child's Body Mass Index (BMI) z-score seems to mediate the link between several physical activity parenting practices (e.g., parental encouragement for physical activity) and children's physical activity, and the use of these practices may be ineffective in children with overweight [16]. Thus, promoting physical activity may be associated with a child's weight status, however, little is known about the relationship between physical activity parenting practices and a child's weight status specifically. More research in different populations is needed, especially regarding the physical activity-related parenting practices of modelling and support that seem to positively influence children's physical activity.

Previous literature on differences in energy balance-related parenting practices between parents of primary school-aged children with and without overweight has mainly focused on nonclinical samples [11,16]. However, various family-based interventions targeting paediatric obesity have focused on parenting practices in lifestyle interventions [17]. Therefore, it is important to gain insight into the use of parenting practices, specifically by parents of children who are about to start these interventions. It is hypothesised that parents of children with obesity who are referred for obesity treatment are more aware of the weight status of their child. This is considered important, as the perceptions and concerns regarding the weight status of the child can influence the use of parenting practices [18]. Furthermore, we hypothesised that this group of parents is more motivated to receive treatment than parents of children with overweight in the non-clinical samples. It is noteworthy that motivation is one of the core components of behavioural change [19]. Having insights into the differences in this specific group when compared with parents of children with a healthy weight can therefore provide prominent insights that can be used for future research and the development of lifestyle interventions for this group. As such, in this study, we ensured the inclusion of a group of parents waiting to receive (family) treatment for their child. The current study is unique in examining different energy balance-related parenting practices in two groups of primary-school-aged children aged 6–12 years [1]: parents of children with overweight and obesity attending an expert centre in childhood obesity, who did not receive treatment yet, and [2] parents of children with a healthy weight in the general population. The main aim of this cross-sectional study is to examine whether these two groups differ concerning a variety of energy balance-related parenting practices, and to what extent these differences are explained by sociodemographic characteristics (e.g., age, and educational level of the parents) [20–24].

2. Methods**2.1. Design and setting**

This cross-sectional study was performed on available data from parents and their children recruited from two cohorts. Data of (parents of) children with overweight and obesity was obtained from patients from the Dutch Centre for Overweight Adolescent and Children's Healthcare (COACH) of the Maastricht University Medical Centre+ (MUMC+). COACH is an expert centre that offers personalised lifestyle interventions. Detailed information about the intervention and its results have been described elsewhere [25,26]. All data used in this study were derived from pre-treatment. Data were compared with those from a cohort of parents of children with a healthy weight derived from a study performed in 14 primary schools in the southern and middle parts of the Netherlands. This study was set up by EB and JL. For an elaborate description, see Larsen/Sleddens, Vink, Van den Broek, and Kremers (2017) [27].

2.2. Participants and procedure

Data of parents of children with overweight and obesity aged 6–12 years and parents was derived from patients of the COACH. Children were referred to COACH by a youth healthcare physician, general practitioner, or paediatrician for diagnostics and lifestyle intervention. After referral, a diagnostic examination (medical and psychological) was performed at the COACH Centre. The examination results were used to tailor a lifestyle intervention to the child, in collaboration with the parents and the child. Until this first examination, no intervention was offered to the child or family. The parenting questionnaire, filled out by a parent at home or in the hospital, has been part of the diagnostic procedure at the start of the personalised lifestyle intervention since November 2014. No data of examinations performed after March 15th, 2020 were included in this study, to correct for possible bias during the Covid-19 pandemic [28].

Children with a healthy weight were selected from a longitudinal study on parenting and children's health among 14 primary schools in the southern and middle parts of the Netherlands that participated in this study between April 2014 and September 2016. For this study, data from children with under or overweight were excluded. Additionally, data from parents who mentioned that their child received guidance for gaining a healthy lifestyle were excluded to prevent possible exact matches in both groups. Invitation letters for this study were handed out to fourth-to-eighth-graders (children between the ages of seven and twelve) at schools. Enclosed was an informed consent letter through which parents could give permission to participate and the parental questionnaire. The questionnaire was filled out by parents at home.

2.3. Measures**2.3.1. Energy balance-related parenting practices**

2.3.1.1. Food-related parenting practices. Six food-related parenting practices were assessed in this study. Emotional feeding (5 items, e.g., *'I give my child something to eat to make him/her feel better when he/she is feeling upset'*), instrumental feeding (4 items, e.g., *'I reward my child with something to eat when he/she is well behaved'*), overt control (originally: control over eating) (10 items, e.g., *'I decide how many snacks my child should have'*) and encouragement (8 items, e.g., *'I encourage my child to eat a wide variety of foods'*) were assessed by the Dutch validated translation of the Parental Feeding Style Questionnaire [29,30]. The control over eating dimension of the Parental Feeding Style Questionnaire assesses overt control (defined as forms of parental control over the child's eating that can be detected by the child) [31]. The items were rated on a

five-point Likert scale ranging from 0 (*never*) to 4 (*always*). In this study, Cronbach's alpha was 0.82 for emotional feeding, 0.63 for instrumental feeding, 0.75 for overt control (control over eating), and 0.71 for encouragement. Covert control (defined as forms of parental control over children's eating that are not perceived by the child) was assessed using three items from the 5-item covert control scale developed by Ogden et al. [32] The items, with a five-point Likert scale ranging from 0 (*never*) to 4 (*always*), were: 'I try not to eat unhealthy food when my child is around', 'I avoid buying unhealthy foods at grocery stores', and 'I try not to buy foods that I would like because I do not want my child to eat these products'. The Cronbach's alpha was 0.59.

2.3.1.2. Physical activity-related parenting practice. Physical activity-related parenting practice promoting physical activity combined questions regarding physical activity support (e.g. 'How often do you encourage your child to be physically active?') and modelling (e.g. 'How often does your child see you be physically active (e.g. walking, cycling, playing sports)?' [33] The items were rated on a five-point Likert scale ranging from 0 (*never*) to 4 (*always*). The practice of promoting physical activity originally consisted of ten items. Due to a low Cronbach's alpha for the original practice, one item ('How often does your child see you doing moderately strenuous housework (such as vacuuming, shopping, cleaning windows) or gardening?') was excluded because of a low corrected item-total correlation (CITC) of 0.053. Ferketich (1991) recommended that corrected item-total correlations range from 0.30 to 0.70 for a good scale [34]. Therefore, in the current study, the practice of promoting physical activity consisted of nine items, with a Cronbach's alpha of 0.67.

2.3.2. Anthropometric measures

In the COACH cohort, anthropometric data were extracted from children's medical records. The weight of the children at COACH was measured at the diagnostic examination in the BodPod system or with an electric scale (Seca® 877, Seca, Hamburg, Germany) [35]. The height of each child was measured using a portable stadiometer (Seca® 213 stadiometer, Seca, Hamburg, Germany). All measurements at COACH were performed by medical master's students or physicians. For participants in the study of Dutch primary schools, trained students and research assistants visited the schools to measure children's weight (Seca 803) and height (Seca Leicester 213).

The BMI z-score for all children was calculated using the actual national references. [36,37] To define the 'weight status' of the child, the IOTF classes and cut-off points of Cole et al. (2012) were used [38]. In this study, we used "healthy weight" to refer to the weight class "normal weight" of Cole et al. to use people-first language [39].

2.3.3. Child and parental sociodemographics

We included several sociodemographic characteristics possibly associated with the use of energy balance-related parenting and children's BMI, namely respondent (*mother or father*), sex of the child (*boy or girl*), age of the child, family composition (*parent living or not living together*), educational level of mother and father (*defined into three categories: low, medium, high*, based on the classification of Statistics Netherlands¹ So far there is no consensus on the preferred terminology used. The authors have chosen to use the commonly used format in this article to facilitate comparison with international literature. However, we would like to mention this, in order to stimulate this discussion to contribute to

¹ It should be noted that the terminology classification used is currently a point of discussion in the Netherlands, because it is based on a hierarchical classification. ¹

¹ de Vries, R., & Pleijers, A. (2021, December 14). 3. Indeling van Opleidingen op basis van niveau en oriëntatie. Centraal Bureau voor de Statistiek. Retrieved November 16, 2022, from <https://www.cbs.nl/nl-nl/longread/discussion-papers/2021/invulling-praktisch-en-theoretisch-opgeleiden/3-indeling-van-opleidingen-op-basis-van-niveau-en-oriëntatie>.

inclusive, non-judgmental science.), ethnicity of the mother and father ('Dutch background' - parents born in the Netherlands - or 'migration background' - one or both parents born outside the Netherlands), and the BMI (kg/m²) of mother and father, based on self-reported height and weight [18, 40,41].

In the COACH cohort, these sociodemographic characteristics were assessed during the diagnostic examination. Medical students collected information from electronic patient files, and coded the data into a database that was used for this study. Child and family characteristics were obtained using a questionnaire completed by the parents for the group of parents of children with a healthy weight.

2.4. Statistical analyses

Participants who missed >10% of the parenting practice items were excluded from the analysis. Thereafter, the mean scores for each parenting practice were calculated for each respondent. Missing data on single items were imputed using mean imputation for each scale.

In this cross-sectional study, two-tailed independent t-tests were used to compare the mean scores on the parenting practices scales between parents of children with overweight or obesity and of children with a healthy weight.

A linear regression model was created for every parenting practice, using complete cases for all variables. This model included the following variables, using forced entry: group (*having or not having overweight*), the respondent, sex and age of the child, family composition, and maternal characteristics (education level of the mother, ethnicity of the mother, BMI score of the mother). Because more data were missing on paternal demographics (>10% of the cases with missing paternal variables), these paternal variables (*BMI of the father, educational level of the father, and ethnicity of the father*) were separately added to the model for sensitivity analysis and performed in a subgroup of cases in which both maternal and paternal variables were complete (N = 177, supplementary material). A model was reported in the manuscript if it significantly predicted the dependent variable (mean score on separate parenting practices). Beta values, standard errors, and p-values are presented. Unless stated otherwise, two-sided p-values ≤0.05 were considered statistically significant.

3. Results

3.1. Response rate

In the COACH cohort, 188 parents of children aged 6 to 12 having overweight or obesity received the parenting practices questionnaire. In total, 137 parents completed the questionnaire (response rate: 72.87%). Nineteen questionnaires were excluded because the respondent was not a father or mother, or because parents reported that they completed the questionnaire together, and eleven questionnaires were excluded based on > 10% missing items. The total group of included participants consisted of 107 parents (56.91%).

In the group of children with a healthy weight, all 137 parents of children who met the inclusion criteria were selected for this study. The response rate of this group was estimated to be approximately 20–25% [27]. One questionnaire was excluded from the analysis of the parenting practices questionnaire based on more than 10% of the missing items.

A total of 244 parents of children were included in the analysis.

3.2. Sociodemographic characteristics

The mean age of the children in the total group was 9.62 years, and the distribution of boys and girls was almost equal (49.6% girls). For the majority of the questionnaires, the mother completed the questionnaire (86.9%). Children in the healthy weight category (mean BMI z-

score = 0.04, SD = 0.66) and overweight/obesity group (mean BMI z-score 3.18 SD 0.69) were comparable in age, sex, and respondent who completed the questionnaire (mother or father).

Significant differences were observed between the two groups in the family composition, and educational level, ethnicity and BMI scores of the mother and father (Table 1).

3.3. The use of parenting practices between parents of children with and without overweight

A significantly higher mean score was found in the group of parents of children with overweight and obesity (mean = 2.27, SD = 0.79) when compared with parents of children with a healthy weight (mean = 1.89, SD = 0.70) for the parenting scale covert control ($p < 0.001$).

The mean score on overt control (control over eating) was significantly lower in the group of parents of children with overweight and obesity (mean = 3.01, SD = 0.49) than in the group of children with a healthy weight (mean = 3.25, SD = 0.44) ($p < 0.001$). Furthermore, parents of children with overweight and obesity (mean = 2.48, SD = 0.50) reported significantly lower scores on promoting physical activity than parents of children with a healthy weight (mean = 2.76, SD = 0.46) ($p < 0.001$).

No significant differences were observed in the other parenting practices of encouragement, emotional feeding, or instrumental feeding (Fig. 1).

3.4. Comparing the mean score of energy balance-related parenting practices for parents of children with and without overweight, when corrected for sociodemographic characteristics

Multiple regression models were significant for predicting the mean scores for covert control ($F(9, 206) = 3.809, p < 0.001, R^2 = 0.143$), overt control ($F(9, 206) = 5.562, p < 0.01, R^2 = 0.195$) and promoting physical activity ($F(9, 206) = 4.255, p < 0.001, R^2 = 0.157$). No significant models were obtained for instrumental feeding, emotional feeding, and encouragement.

After controlling for covariates, the group of children with overweight and obesity had parents who reported more use of covert control ($B = 0.397, S.E. 0.123, p = 0.001$), and less use of overt control ($B = -0.136, S.E. 0.068, p = 0.046$) than parents of children with a healthy weight. Furthermore, the following factors were associated with the use of covert control: being a boy ($B = -0.206, S.E. 0.101, p = 0.042$), having parents who are not living together ($B = 0.359, S.E. 0.135, p = 0.008$), and having a mother with a medium ($B = 0.317, S.E. 0.146, p = 0.031$) and higher education level ($B = 0.425, S.E. 0.154, p = 0.006$). For overt control, only having a mother with a migration background explained the mean score beside the group ($B = -0.360, S.E. 0.083, p < 0.001$) (Models A and B in Table 2).

After controlling for covariates, no significant difference in the mean score for promoting physical activity was observed between the two weight groups ($B = -0.128, S.E. 0.077, p = 0.101$). The mother's BMI score ($B = -0.014, S.E. 0.006, p = 0.018$) was negatively associated with the mean score for promoting physical activity, and having a mother with a medium educational level ($B = 0.190, S.E. 0.092, p = 0.040$) was positively associated with this practice (Model C, Table 2).

As a sensitivity analysis, another model was created with added variables regarding paternal sociodemographic characteristics (*BMI of the father, educational level, and migration background*). This model was performed on a subgroup of children for whom paternal demographics were available ($N = 177$; results are shown in the supplementary material).

4. Discussion

The current study is unique since it compared the energy balance-related parenting practices (i.e. mostly food-related) of a group of

Table 1
Sociodemographic characteristics of the study population.

	Total (N = 244)	Healthy weight group N = 137	Overweight/obesity group N = 107	P value
Sex, girl (%)	49.6% (N = 121)	N = 68 (49.6%)	N = 53 (49.5%)	0.987
Age, mean	9.62 SD 1.41 Range [6.27–12.00]	9.55 SD 1.26	9.71 SD 1.58	0.412
BMI-z score child, mean	1.41 SD 1.70 Range [-1.08–5.13]	0.04 SD 0.66	3.18 SD 0.69	^a <0.001
Respondent, Mothers, % (N)	86.9% (N = 212)	89.8% (N = 123)	83.2% (N = 89)	0.129
Family composition	N = 237	N = 133	N = 104	^a <0.001
<i>Parents living together</i>	77.6% (N = 184)	91.0% (N = 121)	60.6% (N = 63)	
<i>Parents not living together</i>	22.4% (N = 53)	9.0% (N = 12)	39.4% (N = 41)	
Ethnicity mother	N = 240	N = 133	N = 107	^a 0.030
<i>Dutch background</i>	85.8% (N = 206)	90.2% (N = 120)	80.4% (N = 86)	
<i>Migration-background</i>	14.2% (N = 34)	9.8% (N = 13)	19.6% (N = 21)	
BMI score mother	N = 229 26.64 SD 5.88 Range [18.42–61.17]	N = 129 24.39 SD 3.82	N = 100 29.54 SD 6.77	^a <0.001
Educational level mother	N = 234	N = 134	N = 100	^a <0.001
<i>Lower</i>	23.9% (N = 56)	13.4% (N = 18)	38.0% (N = 38)	
<i>Medium</i>	43.6% (N = 102)	44.0% (N = 59)	43.0% (N = 43)	
<i>Higher</i>	32.5% (N = 76)	42.5% (N = 57)	19.0% (N = 19)	
Educational level father	N = 206	N = 112	N = 94	^a <0.001
<i>Lower</i>	26.7% (N = 55)	18.8% (N = 21)	36.2% (N = 34)	
<i>Medium</i>	39.8% (N = 82)	34.8% (N = 39)	45.7% (N = 43)	
<i>Higher</i>	33.5% (N = 69)	46.4% (N = 52)	18.1% (N = 17)	
Ethnicity father	N = 218	N = 112	N = 106	^a <0.001
<i>Dutch background</i>	84.4% (N = 184)	93.8% (N = 105)	74.5% (N = 79)	
<i>Migration-background</i>	15.6% (N = 34)	6.3% (N = 7)	25.5% (N = 27)	
BMI score father	N = 195 27.68 SD 5.11 [19.11–54.05]	N = 106 25.88 SD 3.13	N = 89 29.83 SD 6.11	^a <0.001

BMI: Body mass index.

^a Statistically significant at p -value < 0.05 .

parents waiting to receive (family) treatment for their child and parents of children with a healthy weight in the general population. This contributes to understanding how these groups differ in terms of energy balance-related parenting practices, and enhances insight into how we can specifically help the parents of children with overweight and obesity improve their parenting practices during the treatment that follows. As these groups differ in terms of background demographic variables, it is important to understand whether differences remain after controlling for these characteristics. This study showed that parents in the group of children with overweight and obesity reported significantly different scores on control over eating practices when compared with parents of children with a healthy weight. Specifically, parents with children with overweight or obesity waiting for treatment showed a significantly higher score on covert control and a significantly lower score on overt

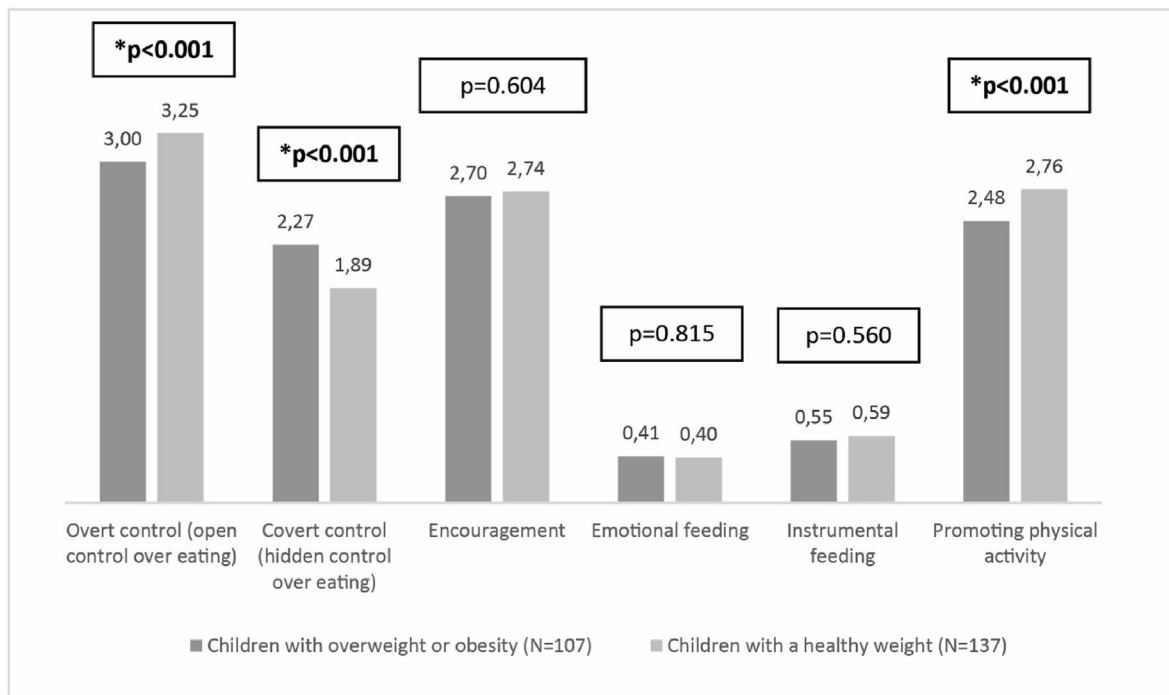


Fig. 1. Mean scores of parenting practices in parents of children with overweight or obesity and healthy weight. Note: Parenting practice scales: Mean scores range from 0 to 4.

Table 2

Differences in the use of energy balance-related parenting practices between parents of children with and without overweight corrected for sociodemographic characteristics.

	A. Covert control (hidden control over eating)			B. Overt control (open control over eating)			C. Promoting physical activity		
	B	S.E.	Sig. level	B	S.E.	Sig. level	B	S.E.	Sig. level
Group: Having overweight	0.397	0.123	0.001*	-0.136	0.068	0.046*	-0.128	0.077	0.101
Sex: Being a boy	-.206	0.101	0.042*	-0.079	0.056	0.154	-0.035	0.064	0.582
Age	0.000	0.036	0.996	-0.029	0.020	0.150	0.022	0.023	0.337
Parent filling out the questionnaire: Mother	0.309	0.175	0.079	-0.065	0.097	0.499	0.190	0.110	0.087
Having parents not living together	0.359	0.135	0.008*	-0.064	0.074	0.388	-0.157	0.085	0.066
BMI score of the mother	-0.005	0.009	0.629	-0.009	0.005	0.079	-0.014	0.006	0.018*
The educational level of the mother, medium	0.317	0.146	0.031*	0.074	0.080	0.362	0.190	0.092	0.040*
The educational level of the mother, high	0.425	0.154	0.006*	0.046	0.085	0.591	0.170	0.097	0.080
Having a mother with a migration background	-0.117	0.151	0.440	-0.360	0.083	<0.001*	-0.181	0.095	0.058

Model A: covert control (hidden control over eating); Model B: Overt control (open control over eating); Model C: Promoting physical activity. All models were corrected for several sociodemographic characteristics using forced entry.

BMI: Body mass index.

*Statistically significant at p < 0.05.

control, even after correction for the child's, family, and maternal characteristics. These findings will be further discussed.

This study highlights the importance of studying the parental use of controlling feeding practices in family-based lifestyle interventions for their child with overweight or obesity. Previous studies have reported associations between higher covert control scores and perceived overweight, concerns about child weight, and desire for a thinner child [18, 32]. The parents in our group of children with overweight are probably aware of the weight status of their child because they were referred by a healthcare professional to a lifestyle intervention. Therefore, the results of the current study strengthen the findings of previous studies that covert control is more frequently used by parents of children who are perceived by their parents as having overweight. Furthermore, our study found that parents of children with overweight reported significantly less overt control than parents of children with a healthy weight. Although the findings for covert control were similar when paternal demographics were also included in the model, for overt control no significant differences remained after controlling for paternal demographics, possibly

because of the small sample size (see supplementary file). It should be mentioned that previous literature regarding controlling feeding parenting practices showed heterogeneous results and prospective literature is limited [11]. Controlling feeding practices could be distinguished between controlling with negative consequences (such as promoting overeating and pressure to eat in the absence of hunger) and controlling with positive consequences (encouragement to eat healthy foods and appropriate portion sizes). Since previous literature has indicated associations between higher use of both covert and overt control and a healthier diet in children, both control over eating practices in this study (covert and overt control) can be seen as controlling practices with positive consequences [42]. While parents of children with overweight in this study already seem to use more covert control than parents of children with a healthy weight, the opposite is shown for overt control. We hypothesised that parents perceive covert control as an easy tool for obesity treatment, which is supported by previous qualitative research [43]. It is important to determine how parents of children with overweight or obesity can be additionally supported during family-based lifestyle interventions in the

use of more overt controlling parenting practices. Longitudinal research is recommended to further explore *whether*, *which*, and *how* these 'control over eating' practices change over time, also during lifestyle interventions or other paediatric overweight treatments.

In our study, the use of emotional and instrumental feeding, encouragement, and promoting physical activity did not significantly differ between our groups of parents (i.e. between parents of children with and without overweight and obesity) after correcting for socio-demographic characteristics. Previous studies found that instrumental feeding, but not emotional feeding, preceded higher weight outcomes; however, more high-quality research is needed to confirm this link [11]. Encouragement (regarding feeding) and promoting physical activity are regarded as healthy practices, but more research is needed to confirm the link with the BMI z-score of the child [11,14–16]. The fact that we did not find any evidence of differences between our 'weight status' groups regarding these parenting practices may be explained by the specific (pre-intervention) setting of the group of children with overweight in our study. This group of parents was waiting for treatment for their child and was thus probably more engaged in performing healthy practices. Taking this into account, it appears to be extra informative that differences between our groups were found regarding the other healthy controlling practices, and possible future help that these parents might need.

Including sociodemographic characteristics is important while researching parenting practices and children's weight status [44]. In the current study, maternal, but not paternal, migration background was significantly associated with less overt control. A previous Dutch study, which did not differentiate between parents (father or mother), also found that parents of children from Dutch backgrounds reported the highest scores for control over eating [45]. In line with previous literature, our study found that mothers with a higher educational level reported more use of covert control [18,42,46]. To gain further insights into the relationship between economic differences and the use of parenting practices, it is recommended to repeat this study across diverse communities. Furthermore, parents of girls with overweight reported a higher score on covert control than boys, contrary to previous studies where children's sex was not associated with parental use of covert control [11]. A possible moderator for this - which was not part of this study - could be the concern about the weight of the child, which is previously described to be greater for parents of girls than boys, and is associated with more use of covert control [18,45]. In addition, this study highlights the importance of including family composition in parenting practice-related research, since parents not living together reported higher scores of covert control. To the best of our knowledge, no studies have examined the effect of parental marital status on the use of covert control or other food parenting practices. Finally, our study showed that mothers with a medium educational level reported higher scores on promoting physical activity than mothers with a low educational level. This is in line with the findings of Gubbels et al. In contrast, no association was observed between maternal BMI and physical activity stimulation in their study, whereas in the current study, maternal BMI was negatively associated with the use of promoting physical activity [47].

4.1. Strengths and limitations

Our study describes a broad set of parenting practices of all three higher constructs of food parenting practices, in response to the call for further research on structure and autonomy scales [11]. In addition, the broad variety of determinants in this study, as well as the unique clinical, pre-intervention, setting of the sample of parents of children with overweight and obesity, are the strengths of this study.

However, the data were derived from two cohorts with different methodological designs/purposes (clinical cohort versus research cohort), while measuring demographics in different ways. This may have decreased the validity of the measurements. Furthermore, it was not possible to calculate the exact response rate in the school cohort. Therefore, it is unclear if this sample was representative of the general

population; that is, if this has led to a selection bias. Furthermore, the BMI scores of the parents in this study were calculated from self-reported weight and height data for both cohorts. This is considered a limitation of the study's variables because self-reported measures tend to underestimate higher (>28) BMI values [48].

4.2. Conclusion

Our findings have shown that parents of children with overweight and obesity report a different use of control over eating parenting practices when compared to parents of children with a healthy weight. Specifically, covert control is used more, whereas overt control is used less in parents of children with overweight and obesity than in parents of children with a healthy weight, even after including child and family characteristics in the models. Having a child with overweight or obesity does not seem to be related to the other energy balance-related parenting practices, instrumental feeding, emotional feeding, encouragement, and promoting physical activity, after correcting for several child and family characteristics.

4.3. Future research

The current study's findings lead to novel directions for future research on the differences in energy balance-related parenting practices. For future research, it is recommended to perform longitudinal research with a special focus on the positive and negative consequences of the use of controlling parenting practices in children with overweight and obesity. There are indications that the effect of the use of energy balance-related parenting practices on the child's behaviour is (also) influenced by the child's BMI z-score, indicating that energy balance-related parenting practices are a reaction to children's weight status (rather than vice versa) [16,49,50]. Also, other child's biological foundations influencing eating behaviour of the child (such as hunger, self-regulation, and satiety) could possibly lead to a different use of parental feeding practices, although research on this topic is mainly performed in younger children, and results in relation to controlling feeding practices are still inconclusive [51–55]. As such, future longitudinal research should focus on the bi-directional links between physical activity, eating behaviour, and energy balance-related parenting practices and child-weight outcomes, especially for the control over eating parenting practices. Ideally, it would be worthwhile to include a third group of parents, namely parents of children with overweight in the general population, to identify differences in the use of covert control between parents of children referred to or not referred to lifestyle interventions. Furthermore, we recommend to observe whether the use of energy balance-related parenting practices can explain which families are more successful in a lifestyle intervention, and to objectify the changeability of parenting practices for parents of children with overweight and obesity in a family based lifestyle intervention, while identifying the factors and interactions influencing these practices.

Author contributions

The concept and methodology of the submission were by LA, SG, JL, EBS and ACEV. Statistical analysis was performed by LA, and LA wrote the first draft. LA, SG, JL, EBS and ACEV all reviewed, edited and approved the final submission and publication.

Ethics

Studies for the two samples were reviewed by an independent ethics committee. The sample of parents of children with overweight and obesity was reviewed by the Medical Ethical Committee (METC) of the MUMC+ in Maastricht, the Netherlands ("Over Gewicht & Opvoeding", reference number: METC 2022–3149). This sample used clinically available, coded data that was derived retrospectively using an opt-out

procedure, following national and local (hospital) regulations. The METC stated that this research did not fall under the scope of the Medical Research Involving Human Subjects Act (WMO), and therefore no ethical approval was required.

The study for the sample of children with healthy weight was approved by the IRB of Radboud University, reference number ECSV2013-1811-143. All parents provided informed consent.

Source of funding

This research was partially funded by the Dutch Heart Foundation (project number 2014T037), awarded to Ester van der Borgh-Sleddens.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We would like to thank all the children and parents involved in this study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.obpill.2023.100078>.

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