


SPECIAL ISSUE ARTICLE

Phenotypes of controlling feeding behaviours in mothers of toddlers: A mixed methods study

Megan H. Pesch^{1,2}  | Megan M. Julian^{2,3} | Sharon L. Lo^{2,3} | Yue Wu⁴ |
Alison L. Miller^{2,5} | Danielle Appugliese⁶ | Julie C. Lumeng^{1,2}

¹Division of Developmental and Behavioral Pediatrics, Department of Pediatrics, University of Michigan, Ann Arbor, Michigan

²Center for Human Growth and Development, University of Michigan, Ann Arbor, Michigan

³Department of Psychiatry, University of Michigan, Ann Arbor, Michigan

⁴Department of Nutritional Sciences, School of Public Health, University of Michigan, Ann Arbor, Michigan

⁵Department of Health Behavior and Health Education, School of Public Health, University of Michigan, Ann Arbor, Michigan

⁶Appugliese Professional Advisors, North Easton, Massachusetts

Correspondence

Megan H. Pesch, Division of Developmental and Behavioral Pediatrics, Department of Pediatrics, University of Michigan, 300 N. Ingalls Street 1109SE, Ann Arbor, MI 48109-5406.

Email: pesch@umich.edu

Funding information

American Heart Association, Grant/Award Number: 17FTF33630183

Summary

Background: Maternal feeding behaviours, in particular controlling behaviours, are associated with risk of childhood obesity.

Objectives: To qualitatively examine patterns of mothers' beliefs and behaviours around controlling feeding through a semi-structured interview and to examine associations of those patterns with participant demographic characteristics and classical child feeding instruments.

Methods: A convenience sample of mothers (N = 35) of toddlers (mean age 25 months) participated in a semi-structured interview about their child feeding beliefs and behaviours. Anthropometrics were measured. Transcripts were analyzed using narrative analysis for patterns from which two emerged, known as phenotypes. A coding scheme was created and reliably applied. Bivariate correlates of the phenotypes with participant child characteristics and mother self-reported feeding behaviours were examined.

Results: The phenotypes were High Covert Control (n = 12) and Shared Control (n = 23). High Covert Control phenotype membership was correlated with higher child and mother BMI (body mass index) and child female sex. Shared Control phenotype membership was correlated with lower child and mother BMI and greater pressure to eat.

Conclusions: Two controlling feeding phenotypes emerged among mothers of toddlers, which were associated with participant characteristics including BMI, but did not map onto classical child feeding instruments.

KEYWORDS

control, eating, feeding, feeding behaviours, mother child relations, paediatric obesity, toddler

1 | INTRODUCTION

Maternal feeding behaviours, defined as how a mother interacts with her child around food and eating, are thought to contribute to a child's risk of obesity through shaping children's food preferences and eating behaviours.¹ The toddler years, around 18–24 months of age, are thought to be a critical time in the establishment of food preferences and eating behaviours, which have been found to track into later childhood and adulthood.^{2,3} During this developmental period, the

balance of control over food and eating begins to shift. In infancy, parents assume almost all control over feeding in terms of the provision of food. However, in toddlerhood children have stronger preferences and increasing autonomy, with parents relinquishing various degrees of control over feeding to the child.⁴ Overly controlling maternal feeding behaviours have been hypothesized to overwhelm a child's internal cues of satiety, leading to overeating and weight gain.⁵ On the other hand, low control or “indulgent/ permissive” child feeding has also been shown to be associated with lower intake of fruits and

vegetables, higher intake of “unhealthy” foods and risk of excessive weight gain.^{6,7} Understanding the nuanced ways in which mothers and children balance control over child feeding at this age is important for identifying whether maternal feeding behaviours are risk factors for child obesity.⁸

To date, the majority of research on maternal controlling feeding behaviours has utilized questionnaires.^{5,6,9} The instruments most often used in the literature are the Child Feeding Questionnaire (CFQ)⁹ in older children, and the Infant Feeding Styles Questionnaire in infants and toddlers.¹⁰ Both self-report instruments generate subscales of maternal controlling feeding behaviours including restriction and pressure to eat. However, the associations of these behaviours with child risk factors for obesity or higher body mass index (BMI) have been mixed.^{10,11} Work by Birch et al concluded that effects of maternal control over child feeding on children's weight and eating behaviours may differ based on the type of control practice used.¹¹ Maternal control over feeding has been conceptualized as overt control and covert control.¹² Overt control is defined as a mother's direct and explicit control over what a child should eat, which may be perceptible to the child, whereas covert control is defined as the extent to which a mother manages her child's food environment and restricts access to moderation foods, which may not be perceptible to the child.¹³ For example, a mother telling her child to stop eating a cupcake would be considered overt control, whereas a mother not purchasing cupcakes to have in the home such that her child would not have access to them would be considered covert control. However, to date the associations of overt and covert control with child weight status and eating behaviours have also been mixed.^{12,14,15}

There are several potential reasons for the conflicting literature around maternal controlling feeding behaviours and child outcomes. First, almost all prior work in maternal controlling feeding behaviours has used maternal self-report questionnaires^{5,9,12} or standardised video-recorded eating interactions,¹⁶ which are vulnerable to the social desirability bias and Hawthorne effect, respectively.^{17,18} Questionnaires are additionally limited as they impart a presupposed framework on the respondent, assuming that the question is interpreted uniformly.¹⁶ Maternal semi-structured interviews can be used to better understand a mother's motivations, beliefs and nuances behind behaviours, such as feeding.¹⁹ Second, prior work has dichotomised the concept of control into either overt and covert or restriction and pressure to eat, which may be an over simplification of a nuanced behaviour. As Birch and colleagues proposed,¹¹ there may be differing levels of control types that overlay specific feeding behaviours such as restriction, pressuring and monitoring. These feeding behaviours may also be in reaction to her child's eating behaviour, food preferences and weight status.²⁰ Third, most work around maternal controlling feeding behaviours has focused on early infancy^{10,21,22} or later childhood,^{1,11,23} with few studies^{24,25} examining the critical developmental period of toddlerhood. During this stage when parents are gradually ceding autonomy over feeding to their children, they may use different approaches of control which do not map on the traditional domains of restriction and pressure to eat. Finally, prior work using self-report questionnaires and video-recorded feeding observations has not tapped into specific insights, motivations, and beliefs that mothers use to inform their feeding behaviours. A better understanding

of mothers' motivations and beliefs around child feeding in toddlerhood may be an important first step to enhancing engagement in obesity prevention efforts targeting child feeding.^{19,26}

Therefore, the objectives of this study were to qualitatively examine patterns of mothers' beliefs and behaviours around controlling feeding through a semi-structured interview, to examine associations of those patterns with participant demographic characteristics and to exam whether they map onto classical child feeding instruments.

2 | METHODS

Overall study design. Toddlers and their mothers were recruited from a longitudinal cohort. Mothers completed a semi-structured interview (mean length = 22:10 minutes, SD = 9:11, range = 10:50–47:33 minutes) about toddler feeding and completed questionnaires. Both toddler and mother anthropometrics were measured.

Participants. Mother-toddler dyads (mean child age = 25.50 months, range = 24.21–27.73) were recruited from a longitudinal cohort which had evaluated infant eating behaviours from 2 weeks to 1 year of age. Infant-mother dyads for the parent study were recruited from the community; participants were informed that the study sought to learn about infant eating behaviour and interactions between mothers and babies the 1st year after the baby's birth. Inclusion criteria for the parent study were (a) child was born at 37.0–42.0 weeks of gestation, with weight appropriate for gestational age and no significant perinatal or neonatal complications. Exclusions were (a) non-fluency in English in the parent; (b) foster child; (c) mother <18 years old; (d) medical problems or known diagnosis affecting current or future eating, growth or development; (e) infant does not consume at least 2 oz in one feeding from an artificial nipple and bottle at least once per week, which was part of a protocol from the parent study. A year after completion of the initial study, mothers were asked if they were interested in participating in a follow-up study on understanding mothers' beliefs about feeding their now toddlers. Additional inclusion criteria for the present study included that the toddler be between 24 and 28 months of age and that the child did not have any medical problems or known diagnosis affecting current or future eating, growth or development. For the present study, all families from the parent study cohort who had a child aged 24–28 months during the four-month data collection window for this study were invited to participate. Participants were compensated \$60 for completion of the study visit. Mothers provided written informed consent for themselves and their child. The University of Michigan Institutional Review Board approved this study.

2.1 | Measures

Maternal controlling feeding beliefs and behaviours. Mothers participated in a semi-structured interview in their home. Interviews were conducted privately while the child was occupied by playing with a research assistant. The interviewer administered a structured interview guide. The semi-structured interview (Table 1) consisted of 18 questions with additional prompts and was developed by two developmental and behavioural paediatricians (MP and JL) and a

TABLE 1 Semi-structured interview questions**Interview questions:**

- 1 A) Tell me about the types of foods that [child] enjoys in general.
B) Tell me about [child]'s favourite foods.
C) Are these different than the foods you'd like him/her to prefer?
[Prompt] Tell me more about that.
- 2 A) Let's talk a little bit about snacks. Can you tell me about [child's] snacking?
[Prompt] Like for instance, what kind of snacks, how often, how much, things like that?
B) Tell me about the types of snacks that you prefer [child] to have?
C) What types of snacks does [child] enjoy?
D) How do you feel about the snacks that [child] eats?
- 3 A) Let's talk a little bit about eating out at a restaurant. When you take [child] to eat at a restaurant or buy food "on the go," how do you determine what to order for him/her?
B) How does having [child] with you influence where you chose to eat?
C) Are there certain restaurants you avoid going to with him/her because of the type of food that is served? Is this driven by [child's] food preferences?
- 4 A) I've heard from some moms that their children will sometime tantrum for food. Can you tell me about a time when this happened with [child]?
B) Tell me how you felt in that moment.
C) Compared to other children his/her age, do you think that [child] tantrums for food more often, less often, or about the same?
D) What do you think may be driving [child's] tantruming for food?
E) What helps in that moment?
- 5 Shifting gears a bit, how do you know when [child] has had enough to eat?
- 6 And how do you know when [child] is full?
- 7 Do you ever think that [child] is full but keeps eating? Tell me about that.
- 8 A) Tell me about when [child] may eat too much in general. Can you give me an example?
B) Is there anything that you do to help make sure that [child] does not eat too much?
C) What about eating too much of a certain type of food? Or having a certain type of food too often?
- 9 Is there anything about [child's] eating that worries or concerns you?
- 10 Are there any kinds of foods that you try not to let [child] have very often or at all?
- 11 What about certain food ingredients? Tell me about the food ingredients that you try not to let [child] have?
- 12 Are you concerned about [child's] weight or growth? Tell me more about what concerns you.
- 13 What is the most challenging thing about [child's] eating?
- 14 What is the most challenging thing for you about feeding [child's]?
- 15 How do you think you would feed [child] differently if he/she were a [opposite gender - boy or girl]?
- 16 We are trying to learn from moms what they do to help their kids eat healthily. What are some of the things that you do to help [child] eat healthily?
- 17 What advice would you give to another mother of a toddler who was struggling to get her toddler to eat well?
- 18 Thank you for your time and thoughts. Is there anything else you would like to share with us today?

psychologist (AM) to elicit mothers' beliefs, concerns, behaviours and motivations with regard to feeding of two-year old children. The interviewer was trained to administer the interview in a standardised way, as in prior work.^{19,27} Data collection was stopped after saturation was achieved. Interviews were digitally audio-recorded and later transcribed verbatim with identifiers removed. All transcripts were reviewed for accuracy by a second reader.

The interview transcripts were then systematically analyzed using paradigmatic narrative analysis, including the constant comparative method,²⁸ by four study team members who did not participate in data collection. The paradigmatic approach to semi-structured interview analysis seeks to identify common conceptual manifestations among interview data. The four readers were a developmental paediatrician and researcher, a research psychologist, a clinical psychologist and a doctoral-level dietitian. Readers remained blind to mother and child characteristics, such as weight status or race/ethnicity, to reduce

bias related to identification or interpretation of responses. All readers, with the exception of one (MP) were blinded to any pre-existing hypotheses. The readers independently read and annotated the corpus of transcripts, generating patterns and focal topics around maternal feeding beliefs, behaviours and identifying supporting quotes. The four readers met and discussed their identified focal topics. Readers generated initial focal topics including degree of covert control of food type, degree of control over food amount, pressure-to-eat, confidence in feeding approach, concern for child weight and intake, as well as emotional investment in child feeding. Collaborative discussion allowed evaluation of possible biases among readers, as perceptions and interpretations of interviews were checked and alternative approaches to interpreting and grouping the data were considered. Through a series of recursive discussions, definitions of the focal topics were refined and revised to achieve the best fit ordering for the data. Two distinct focal topics of maternal

controlling feeding beliefs and behaviours were found, which we will henceforth refer to as phenotypes of controlling feeding. The basis of this typification was the mother's narrative description of her use of covert control, confidence in her feeding strategy, concern for her child being underweight and emotional investment in child feeding. A refined coding scheme to capture the two phenotypes was created and applied to interview transcripts by two coders who double coded 20% of the interviews (inter-rater reliability by Cohen's kappa >0.7). After reliability was established, the remainder of the interviews was coded by a single coder.

Child Feeding Questionnaire. Mothers completed the CFQ,⁹ a commonly used instrument to measure maternal feeding behaviours and beliefs. The CFQ has established reliability and validity⁹ and has been previously used in children as young as 24 months.²⁹ The instrument is composed of 25 items which generate 6 subscales. Four subscales of controlling feeding behaviour were used in this study: Perceived responsibility (3 questions, $\alpha = 0.86$); Pressure to eat (4 questions, $\alpha = 0.76$); Restriction (8 questions, $\alpha = 0.81$) and Monitoring (3 questions, $\alpha = 0.88$). The range of each item in the scale is 1 to 5, with higher scores reflecting more of the identified characteristic. The other subscales (Concern for Child Weight and Perceived Child Weight) were not used in this analysis due to poor internal reliability in this sample.

Anthropometry. Mother and child weight and height were obtained using standardised procedures.³⁰ BMI was calculated, and child BMI was converted to z-scores using the United States Centers for Disease Control growth charts. Maternal obese weight status was defined as BMI ≥ 30 , overweight as BMI ≥ 25 -<30 and healthy/normal weight as >18 -<25. Child obese weight status was defined as BMI ≥ 95 th percentile, overweight as BMI ≥ 85 th percentile and <95th percentile, healthy/normal weight as >5th percentile to <85th percentile the same age and sex and underweight as <5 percentile for age and sex.

Covariates. Mothers completed basic demographic questionnaires reporting child's sex, child date of birth, maternal date of birth, maternal race/ethnicity, highest level of maternal education, hours the child spent each week in the care of anyone other than the mother and household income level. Mothers also completed the Center for Epidemiologic Control Depression scale which was scored continuously due to low variability.

2.2 | Analysis

Semi-structured interviews were qualitatively analyzed and coded as described above. Univariate statistics were calculated for each of the two identified phenotypes. Bivariate statistics were calculated comparing presence or absence of each of the two phenotypes with child and mother characteristics. Given the small sample size of <50, effect sizes were calculated using Cohen's *d* for continuous variables, also known as Hedge's *g* and Φ for categorical variables,³¹⁻³³ in lieu of significance calculated by *P*-values, as *P*-values rely on the sample size and may underestimate associations. A Hedges' *g* of <.50 is considered small, .51-<.80 is considered

TABLE 2 Participant characteristics (N = 35)

	Mean (SD) or n (%)
Child characteristics	
Child sex (male); n (%)	18 (51.43%)
Age (mo); mean (SD)	25.50 (1.00)
Child weight status; n (%)	
Underweight	1 (2.86%)
Normal/Healthy weight	28 (80.00%)
Overweight	4 (11.43%)
Obese	2 (5.71%)
Maternal characteristics	
Maternal age in y; mean (SD)	35.19 (3.49)
Race/ethnicity; n (%)	
White non-Hispanic	27 (77.15%)
Other	8 (22.85%)
Maternal level of education; n (%)	
High school diploma or less	0 (0%)
Some college	3 (8.57%)
Associate degree/Bachelor's	15 (42.86%)
>Bachelor's	17 (48.57%)
Mother works outside the home; n (%)	
0-2 h/wk	12 (34.4%)
3-20 h/wk	10 (28.5%)
21-39 h/wk	3 (8.6%)
40+ h/wk	10 (28.5%)
Maternal weight status; n (%)	
Underweight	0 (0%)
Normal weight	16 (45.71%)
Overweight	11 (31.43%)
Obese	8 (22.86%)

medium, ≥ 0.80 is considered a large effect size.³³ For Φ , a value of 0.0-<0.1 is considered a negligible association, 0.10-<0.2 a weak association, 0.2-<0.4 a moderate association, 0.4-<0.6 a relatively strong association, 0.6-<0.8 a strong association and 0.8-<1.0 a very strong association.

3 | RESULTS

Demographic information and characteristics of the sample are presented in Table 2. The toddlers were on average 25 months old and half were male. Most children (80%) had a healthy/normal weight status, whereas 16% had an overweight or obese weight status. One child had an underweight weight status. Mothers were on average 35 years old, and most were of white/non-Hispanic race/ethnicity (77%). Mothers were highly educated with >90% having obtained at least a college degree. The majority of mothers had an overweight or obese BMI (53%).

TABLE 3 Illustrative quotes of each phenotype of maternal controlling feeding behaviours**Illustrative quotes****High Covert Control**

"We really are conscious in his eating well and we try not to let him eat mindlessly. I feel pretty confident in it...He is not in control of [choosing foods]. It's my job as [a] parent to offer him choices and it's his job to eat. So if I don't offer then it's not a choice at that meal. So he doesn't get it necessarily what he wants at every single meal...we want [our children] to have good eating habits for a lifetime so that they don't have to deal with some of the same issues that I and my husband have."

"His favorite food is probably corn or yogurt, um I guess he also likes cookies but I don't care what he prefers... I try and follow something called a division of responsibility in feeding. Like as a parent you come up with what you are going to feed them and then they can choose whether they want to eat it, and how much they want to eat and then, that's it. Like there's not 'I want something else'. It's just kind of 'this is what we have today'. So it makes it easy."

"I think the theory that we use where you basically divide what you're giving them and then let them make up their mind whether or not they want to eat it or how much they want to eat it, really works out if you can do it. Because it takes away a lot of the power struggles, and negotiation with a toddler which I think is where the hardest things are if you're going back and forth and trying to please someone. And I think since we started from the beginning like it's just not really an expectation that he gets to make a million requests."

"She snacks far more than my first child I think because we have her more mobile and on the go. I bring more snacks...Well I mean I'm controlling it all right now. So I put what's in front of her so I determined the quantity and what it is."

"You know your kid is not starving, you know missing a meal is not a big deal, so you don't cave in and you don't make them whatever they want every night. We just make one family meal for dinner. We don't make separate meals. They just know that's what we're making for dinner and that's what you get to eat and if you don't want to eat it then we're not going to make a separate meal for you. It's hard but I think appropriate feeding is partially learned and therefore you let the children know the expectations you have and sticking to them, even when it's difficult."

"I always thought she was chunky but we really put our foot down about the snacks. I thought she was just like a big rolly polly thing. But she wasn't I mean she's never really gone above the 50th percentile in anything and at her appointment that we just had when she turned two she was in like the 20th or 25th percentile for her weight so. And it was proportionate with her height. So she's um- I'm not concerned now I think we need to just- I think we're on the right track, just keeping consistent with what we're doing so."

Shared Control

"It usually is going to be what you know she'll eat over trying new foods or trying to be healthy."

"(Child's name) is pretty tiny. So we are trying to get her to eat more food. Especially more food that's higher in fat and more protein, so you know whatever she wants I pretty much give it to her at this point."

"I would like for him to have more fruits and vegetables. I would like for him to wean down on the sugar, but it's had to get him to eat anything else otherwise. I wish he was more open to trying new things...Most of (the snacks he eats) are garbage. Um to be fair our eating habits aren't that great either. But it's more about getting him to eat anything as opposed to nothing."

"I try to give her what I want her to eat when she's the hungriest and then give her what she wants to eat later on."

"Knowing when he's full is kind of a judgement... we kind of expect him to eat most of his plate. If he only has a couple bites then we usually try to say, 'Ok, three more bites and you get dessert.'"

"I wish he ate healthier food. I offer him everything that we eat. And he - most of the time won't eat it. We do a lot of rice and beans and things like that and lately he hasn't wanted anything like he used to...it's challenging to try to find something he'll [eat], that I can actually get him to eat. If I knew what he would eat immediately then that would be helpful... I wish he would eat more fruits and vegetables especially. And I don't know how to get him to eat those... I try to steer him away from things that are not as healthy, but recently it's been a lot harder."

"Uh really the most challenging thing (about child feeding) is probably feeling like a short order cook. Like we just made a really nice dinner and she didn't like- we thought she'd like it but she didn't. So quick (I've got to) make something else. (laughs)... it's not a super worry it's just more like 'oh okay'. Sometimes we make two dinners (laughs). Which isn't the end of the world."

"Just, I just worry about her being so little. And I can't help it because like she's so thin. So naturally I'm gonna just be thinking about how much she eats all the time. You know it's just like- where I think it's probably the same if you ask somebody whose kid is in the 99th percentile. Like they're probably thinking about like how to make sure that their kid doesn't become obese right so I just want- I just want her to gain weight, and be healthy. I think it's just my natural instinct. My relationship with food with her is, like, it's never enough. I always want her to eat more."

3.1 | Phenotypes of controlling feeding behavior

Two phenotypes of controlling feeding behaviour emerged from the qualitative analysis which we called High Covert Control (n = 12, 35%)

and Shared Control (n = 23, 66%). Illustrative quotes for each phenotype are presented in Table 3.

High Covert Control. These mothers had a clear set of feeding rules in place that were described as being consistently implemented. High

Covert Control mothers described exerting full control over their child's food environment, including access to food, making the majority of decisions about what, when and where their child was fed. They described a division of responsibility in which the mother exerted a high degree of covert control over the child's food environment, including choosing what foods were served, and the child made the choice of whether to eat it or not. These mothers stated that their child most often ate what was served and if the child refused, they were not worried about the child's intake as they would likely eat at the next meal.

These mothers described their child as eating diets high in fruits, vegetables, dairy and protein, with little exposure to candies, pastries or processed foods. Mothers prepared snacks at home, such as celery sticks, rather than providing convenience foods such as crackers. These mothers often had a very set time schedule for when their child was fed each snack and meal.

These mothers spoke confidently and with low levels of stress about their feeding approach. They also ascribed their child's healthy eating behaviours to their feeding approach. While these mothers did describe their toddlers as picky, they did not express concern about their selective eating and were able to "brush it off". Overall, these mothers described their children as being relatively undemanding and easy to feed.

High Covert Control mothers' responses were unelaborated, and the interviews were quite short, answering questions in a matter-of-fact way. They responded that many of the questions did not apply to their child, such as questions about food tantrums, as their child never had the option of choosing their own food since the mother highly controlled their food environments. These mothers also did not speak at length about the child's perspective on eating or the child's food preferences. They used few emotional words to describe the feeding experience and overall seemed to approach feeding in a straightforward way with lower emotional investment.

Shared Control. These mothers described using joint decision making with the child regarding what the child ate and how much. These mothers often described giving their toddler two options, either of two healthy foods that the mother selected or two preferred foods that the mother knew the child would enjoy. Mothers in this group placed a high priority on getting the child to eat in general, but especially at dinner time. Many mothers described using food bribes or the "one bite rule" before being allowed to leave the table. They also described more behavioural challenges around eating such as getting the child to sit still or stay at the table and the child making a mess.

Mothers in this group expressed more concern about their child not eating enough or being too thin. They described selecting snack

TABLE 4 Bivariate analyses of phenotypes of control with participant characteristics and reported feeding behaviours

Continuous variables	Total sample (N = 35)		High Covert control (N = 12)		Shared Control (N = 23)		Effect size ^a Hedge's g
	Mean	SD	Mean	SD	Mean	SD	
Child BMI Z score*	0.46	1.22	1.00	1.68	0.18	0.81	.70
CFQ monitoring*	3.91	1.00	3.96	1.13	3.89	0.96	.07
CFQ perceived responsibility	4.17	0.61	4.31	0.52	4.10	0.65	.34
CFQ pressure to eat*	2.26	0.96	1.71	0.87	2.55	0.89	.95
CFQ restriction	3.10	0.85	2.97	0.50	3.17	0.98	.24
H/wk in care of anyone besides mother*	30.82	38.13	34.25	43.27	28.95	35.96	.14
Maternal age (y)*	35.19	3.49	35.66	3.09	34.95	3.73	.20
Maternal BMI	27.88	8.24	31.74	12.36	25.87	4.03	.75
Maternal depression (CESD)	5.53	3.79	6.00	3.74	5.30	3.87	.18
Categorical variables	freq	%	freq	%	freq	%	Φ
Child sex							-.26
Male	18	51.43	4	33.33	14	60.87	
Female	17	48.57	8	66.67	9	39.13	
Maternal race/ethnicity**							-.19
Not White non-Hispanic	6	18.18	1	8.33	11	47.83	
White, non-Hispanic	27	81.82	11	91.67	12	52.17	
Highest level of maternal education							-.14
Some college, bachelors or associate degree	18	51.43	5	41.67	13	56.52	
>Bachelor's degree	17	78.57	7	58.33	10	43.48	

Abbreviations: BMI, body mass index; CESD, Center for Epidemiologic Studies Depression Scale; CFQ, child feeding questionnaire; SD, standard deviation.

^aEffect size was calculated by Hedges' g for continuous variables and Φ statistic for categorical variables. A Hedges' g < .50 = small, .51-<.80 = medium, \geq 0.80 = large. For Φ , 0.0-<0.1 = negligible, 0.10-<0.2 = weak, 0.2-<0.4 = moderate, 0.4-<0.6 = relatively strong, 0.6-<0.8 = strong 0.8-<1.0 = very strong.

*Non-parametric Wilcoxon test used due to not normal distribution.

**Fisher's exact P value was used due to small expected cell size.

foods considering the child's preferences in addition to their own determination of the healthfulness of the snack. Other influences on snack selection in this group included convenience, the likelihood the child would eat that type of food and the mess it could potentially make.

Mothers in this group spoke with more positive- and negative-valenced emotions and more introspection about child feeding. The mothers of more demanding children seemed distraught and conflicted about child feeding. Mothers in this group often questioned their feeding approach or expressed being unsure or ineffective in improving the quality of their child's diet.

3.2 | Correlates of maternal control phenotypes and participant characteristics

The bivariate analysis examining phenotype membership with characteristics of the mother and child (Table 4) found that mothers of girls (vs boys) were more likely to be in the High Covert Control phenotype (67% vs 39%), with a moderate effect size of 0.26. Children of mothers in the High Covert Control group was more likely to be heavier (mean BMIz = 1.00, SD = 1.68) than children in the Shared Control group (mean BMIz = 0.18, SD = 0.81), with medium effect size (Hedges' g = .68). There were no differences in number of hours spent in childcare per week between phenotypes. With regard to the mothers, heavier mothers were more likely to be in the High Covert Control phenotype (mean BMI = 31.74, SD = 12.36) vs the Shared Control phenotype (mean BMI = 25.87, SD = 4.03, g = .75). Mothers in the High Covert Control groups were also slightly more likely to be white, non-Hispanic with a weak effect size (92% vs 52%, with a Φ = .19). With regard to maternal education, mothers in the High Covert Control group were slightly more likely to have greater educational attainment, with a weak effect size (58% vs 44%, Φ = 0.14). There was no difference in maternal symptoms of depression between the groups. Of the feeding behaviours from the CFQ, mothers in the High Covert Control group had lower pressure to eat than those in the Shared Control group (mean = 1.71, SD = 0.87, g = .95 vs mean = 2.55, SD = 0.89). There were no correlations between monitoring, perceived responsibility or restriction on the CFQ between phenotypes.

4 | DISCUSSION

This mixed-method study of maternal beliefs and behaviours around controlling feeding behaviours in mothers of toddlers adds several new findings to the literature. First, this study described two phenotypes of controlling feeding approaches: High Covert Control, defined by high covert restriction reported in the interview, low pressure-to-eat, low concern about child underweight and high confidence in feeding approach, and Shared Control, defined by moderate covert restriction with joint decision-making about child intake, moderate pressure-to-eat, higher concern about child underweight and

uncertainty about feeding approach. To our knowledge, this is the first study to qualitatively identify these phenotypes of controlling feeding behaviours during toddlerhood as described by mothers. Furthermore, these phenotypes of controlling feeding behaviours were correlated with characteristics of the mother and child. Specifically, mothers in the High Covert Control group were more likely to have girls, children with higher BMIz, be heavier themselves and engage in lower self-reported pressure-to-eat behaviour. Conversely, mothers in the Shared Control group were more likely to have boys, children with lower BMIz, have lower BMI themselves and report engaging in more pressure-to-eat behaviour.

Mothers in the High Covert Control group described a feeding approach that overlaps with the concept of covert control as previously described by Ogden et al. It also shared similarities with the Division of Responsibility approach described by Dr. Ellyn Satter.³⁴ Mothers with High Covert Control described assuming responsibility for the selection of food type and food environment, and the child assumed responsibility for whether to eat the food or not. These mothers described firm boundaries around feeding that guided their daily practices, through which they expressed satisfaction, low stress and confidence. Furthermore, they credited their child's healthy diet and eating behaviours to this approach. It is unknown whether this feeding approach creates mothers who are confident, satisfied and unstressed by child feeding with children who are flexible eaters, or whether certain mother-child dyads gravitate more to this approach given their own temperamental characteristics (eg, a mother who likes rules, is less introspective and reflective, is less anxious about feeding and a child who has a more easy-going temperament) or parenting style (eg, authoritarian or authoritative). Further longitudinal research on the mother-child characteristics, including satisfaction, persistence and overall confidence associated with this feeding approach are necessary to shape future interventions.

Compared to the Shared Control phenotype, the High Covert Control phenotype included more mothers of daughters and heavier children, similar to prior work.¹² It may be that mothers of girls feed their daughters with higher covert control due to greater societal pressure for females to be slender,³⁵ despite their stated lack of concern and greater confidence in feeding. It is also possible that mothers of heavier children are placing greater covert restriction around their choices and food access, as has been previously found,¹² with hopes of them developing greater self-regulation around food. These children may also be genetically predisposed for obesity as mothers in this group were heavier, therefore these mothers may view their children as at greater risk for obesity (in terms of the child's current weight status and genetic loading) as well as having greater potential social repercussions for being heavier (ie, being female).³⁶ These motivations may be entirely subconscious and influenced by the societal stigmatisation of obesity.^{36,37} It may also be that this feeding style is a response to their child's weight status, with the mother becoming more controlling in their feeding style by managing what is offered and worrying less about whether this child is getting enough to eat.

It is also notable that while these mothers described high covert restriction, they also described low-to-no pressure-to-eat and

expressed the belief that their child would appropriately self-regulate intake if provided with appropriate boundaries. The belief that children would appropriately compensate for a missed meal at a later opportunity to eat is supported by work focusing on infancy and preschool years.³⁸ However, other work has found that older children were less able to appropriately compensate their caloric intake.^{39,40} Children's poorer ability to calorically compensate has been associated with greater maternal restriction.³⁸ It has been hypothesized that some infants are born with the innate ability to self-regulate; however, individual differences in self-regulation may be shaped by maternal feeding behaviours in early childhood.⁴¹ Eating behaviours in toddlerhood begin to be shaped by maternal feeding behaviours, and this developmental period coincides with shift from co-regulation to self-regulation and increased autonomy.

The approach to feeding in the High Covert Control group mirrors parenting in other domains that involve scaffolding of tasks for the child and internalization such that the child moves from co-regulation to self-regulation.⁴² The feeding context provides multiple opportunities for the child to learn self-regulatory skills. For example, parents may teach children self-regulation by modelling certain skills (eg, a specific type of control over feeding). However, in the feeding context, it also is important for parents to set rules, with consistent consequences, so that the child understands parental expectations. Effective boundaries and limit-setting generally reduce likelihood of parent-child conflict.⁴³

Mothers in the Shared Control phenotype described moderate covert restriction, in that many described trying to only bring "healthy food" into the house; however, they also described strongly considering the child's preferences and thus likelihood of eating certain foods. These mothers seemed to be striving for a balance between their goal of providing well-balanced nutrition to the child with their desire for the child to consume adequate calories. They often focused on trying to find a compromise between mother and child food preferences. Generally, parents who attempt to compromise with their toddlers and provide them with explanations for their decisions have children who go on to have better perspective-taking ability and more advanced social-emotional development.⁴⁴ Mothers in this phenotype did not have a firm set of rules to guide their feeding decisions, tending to question themselves more about their feeding decisions, possibly reflecting a struggle to find a balance. Their responses were often elaborative and suggested that they have invested substantial energy into thinking about their child's preferences and reactions with regard to food and feeding. This more reflective parenting style has previously been linked to more sensitive parenting behaviour^{45,46} and is thought to be a key promotor of children's self-regulation.

The mothers in this phenotype had children with lower BMIz and had lower BMI themselves. Therefore, they may feel that they can be a bit more lenient in terms of types of foods offered (due to perceived lower risk of obesity) but may also feel worried that their child was not growing well. This phenotype shares similarities with the Indulgent feeding style, in which mothers place few demands on their children with regard to eating and are responsive to children's requests.⁶ The Indulgent feeding style has been associated with higher weight

status in children,⁴⁷ unlike the findings of the present study as children in this phenotype had lower BMIz. Much of the research in Indulgent feeding has been done in lower income and minority populations.^{6,47} It may be that effects of a more permissive approach to feeding on child weight status may differ in accordance with socioeconomic status, education and race/ethnicity. Future work should examine controlling phenotypes in lower socio-economic and minority cohorts, in which maternal feeding motivations may differ and interact with social determinants of health, such as food insecurity.

Mothers in the Shared Control phenotype may benefit from reassurance from their child's health care provider about the child's growth trajectory and weight status, as only one child in this phenotype was found to be underweight. They described both restrictive and pressuring behaviours as well as bribing their child with food. Mothers in this group used greater pressure to eat as measured by the CFQ and were thinner. Prior work has identified greater pressure to eat in thinner mothers,⁴⁸ and those with thinner children.⁴⁸ It is unknown if the children of mothers with the Shared Control phenotype have more challenging feeding temperaments from a young age, which may have shaped the mothers' feeding approach. Prior work has identified correlations between pressure-to-eat, greater child food responsiveness,⁴⁹ satiety responsiveness⁴⁸ and selective eating behaviour.⁵⁰ It is also unknown whether mothers' feeding behaviours shift over time from one phenotype to another, possibly driven by child characteristics or psychosocial stressors. Future work should investigate controlling feeding phenotypes longitudinally, in addition to the associations with children's eating behaviours and temperament qualities.

Many of the maternal feeding beliefs and behaviours as reported on the CFQ did not correlate with the phenotypes of control, with the exception of pressure to eat. The construct of restriction on the CFQ has several items that may align more closely to overt restrictive behaviours, rather than covert restrictive behaviours. For instance, "I have to be sure that my child does not eat too much of his/her favourite foods" and "If I did not guide or regulate my child's eating, he/she would eat too many junk foods." These constructs of overt restriction may appear more distinctly in older children who have greater autonomy over their food choices, and thereby may prompt the mother to become more restrictive. In addition, the perceived responsibility mean score was high across both groups. Again, it may be that mothers of children at this developmental period need to assume higher levels of responsibility over her child's eating and food environment, as the child is not yet able to assert solitary control over portion sizes, what is served and for feeding him or herself.

Results of this study are limited by the relatively small sample size as is typical of qualitative work, and may not be applicable to other populations including fathers and other caregivers. Furthermore, the study population was largely white/non-Hispanic and highly educated, with low depressive symptoms which may bias results. For instance, mothers in families with food insecurity may take the child's preferences into consideration more, given a concern over wasting food, or mothers with more depressive symptoms may engage in a different form of control altogether, with an overlay of harshness and negative

affect. Future work should investigate these and other controlling feeding phenotypes in mothers of other demographics. As with all interviews, the data may be limited by social desirability bias, and mothers' reported behaviours may not align with their observed behaviour.

5 | CONCLUSION

This study identified two phenotypes of controlling feeding in mothers of toddlers, one that was high in covert restriction but low in pressure, concern for child intake and child preferences, and the other which was characterized by low covert restriction, high pressuring and greater concern for child intake and child preferences. High Covert Control was associated with higher child BMI_z and was more common among mothers of girls, whereas Shared Control was associated with lower child BMI_z and was more common among mothers of boys. Future work should conceptualize feeding behaviours in this age group as being nuanced and not necessarily mapping onto classical measures in terms of control, restriction, pressure and concern for child underweight.

CONFLICT OF INTEREST

No conflict of interest was declared.

ORCID

Megan H. Pesch  <https://orcid.org/0000-0002-8212-2241>

REFERENCES

- Loth KA, MacLehose RF, Fulkerson JA, Crow S, Neumark-Sztainer D. Food-related parenting practices and adolescent weight status: a population-based study. *Pediatrics*. 2013;131(5):e1443-e1450.
- Skinner JD, Carruth BR, Bounds W, Ziegler P, Reidy K. Do food-related experiences in the first 2 years of life predict dietary variety in school-aged children? *J Nutr Educ Behav*. 2002;34(6):310-315.
- Nicklaus S, Boggio V, Chabanet C, Issanchou S. A prospective study of food preferences in childhood. *Food Qual Prefer*. 2004;15(7-8):805-818.
- Fisher JO, Birch LL, Smiciklas-Wright H, Picciano MF. Breast-feeding through the first year predicts maternal control in feeding and subsequent toddler energy intakes. *J Am Diet Assoc*. 2000;100(6):641-646.
- Faith MS, Scanlon KS, Birch LL, Francis LA, Sherry B. Parent-child feeding strategies and their relationships to child eating and weight status. *Obes Res*. 2004;12(11):1711-1722.
- Hughes SO, Power TG, Orlet Fisher J, Mueller S, Nicklas TA. Revisiting a neglected construct: parenting styles in a child-feeding context. *Appetite*. 2005;44(1):83-92.
- Haszard JJ, Skidmore PM, Williams SM, Taylor RW. Associations between parental feeding practices, problem food behaviours and dietary intake in New Zealand overweight children aged 4-8 years. *Public Health Nutr*. 2014;18(6):1-8.
- Kopp CB. Antecedents of self-regulation: a developmental perspective. *Dev Psychol*. 1982;18(2):199-214.
- Birch L, Fisher J, Grimm-Thomas K, Markey C, Sawyer R, Johnson S. Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite*. 2001;36(3):201-210.
- Thompson AL, Adair LS, Bentley ME. Pressuring and restrictive feeding styles influence infant feeding and size among a low-income African-American sample. *Obesity (Silver Spring)*. 2013;21(3):562-571.
- Rollins BY, Loken E, Savage JS, Birch LL. Maternal controlling feeding practices and girls' inhibitory control interact to predict changes in BMI and eating in the absence of hunger from 5 to 7 y. *Am J Clin Nutr*. 2014;99(2):249-257.
- Ogden J, Reynolds R, Smith A. Expanding the concept of parental control: a role for overt and covert control in children's snacking behaviour? *Appetite*. 2006;47(1):100-106.
- Nowicka P, Flodmark C-E, Hales D, Faith MS. Assessment of parental overt and covert control of child's food intake: a population-based validation study with mothers of preschoolers. *Eat Behav*. 2014;15(4):673-678.
- Loth K, Friend S, Horning M, Neumark-Sztainer D, Fulkerson J. Directive and non-directive food-related parenting practices: associations between an expanded conceptualization of food-related parenting practices and child dietary intake and weight outcomes. *Appetite*. 2016;107:188-195.
- Murashima M, Hoerr SL, Hughes SO, Kaplowitz SA. Feeding behaviors of low-income mothers: directive control relates to a lower BMI in children, and a nondirective control relates to a healthier diet in preschoolers. *Am J Clin Nutr*. 2012;95(5):1031-1037.
- Pesch MH, Lumeng JC. Methodological considerations for observational coding of eating and feeding behaviors in children and their families. *Int J Behav Nutr Phys Act*. 2017;14:170.
- Klesges LM, Baranowski T, Beech B, et al. Social desirability bias in self-reported dietary, physical activity and weight concerns measures in 8-to 10-year-old African-American girls: results from the Girls Health Enrichment Multisite Studies (GEMS). *Prev Med*. 2004;38:78-87.
- McCarney R, Warner J, Iliffe S, Van Haselen R, Griffin M, Fisher P. The Hawthorne Effect: a randomised, controlled trial. *BMC Med Res Methodol*. 2007;7(1):30.
- Pesch MH, Harrell KJ, Kaciroti N, Rosenblum KL, Lumeng JC. Maternal styles of talking about child feeding across sociodemographic groups. *J Am Diet Assoc*. 2011;111(12):1861-1867.
- Spill MK, Callahan EH, Shapiro MJ, et al. Caregiver feeding practices and child weight outcomes: a systematic review. 2019;109(suppl 1):990S-1002S.
- Llewellyn CH, van Jaarsveld CH, Johnson L, Carnell S, Wardle J. Development and factor structure of the Baby Eating Behaviour Questionnaire in the Gemini birth cohort. *Appetite*. 2011;57(2):388-396.
- Farrow C, Blissett J. Does maternal control during feeding moderate early infant weight gain? *Pediatrics*. 2006;118(2):e293-e298.
- Hurley KM, Cross MB, Hughes SO. A systematic review of responsive feeding and child obesity in high-income countries. *J Nutr*. 2011;141(3):495-501.
- Bauer KW, Haines J, Miller AL, et al. Maternal restrictive feeding and eating in the absence of hunger among toddlers: a cohort study. *Int J Behav Nutr Phys Act*. 2017;14:172.
- Hurley KM, Pepper MR, Candelaria M, et al. Systematic development and validation of a theory-based questionnaire to assess toddler feeding. *J Nutr*. 2013;143(12):2044-2049.
- Kalinowski A, Krause K, Berdejo C, Harrell K, Rosenblum K, Lumeng JC. Beliefs about the role of parenting in feeding and childhood obesity among mothers of lower socioeconomic status. *J Nutr Educ Behav*. 2012;44(5):432-437.
- Pesch MH, Meixner K, Appugliese DP, Miller AL, Rosenblum K, Lumeng J. The evolution of mothers' beliefs about overweight and obesity in their early school age children. *Acad Pediatr*. 2016;16(6):565-570.
- Glaser BG, Strauss AL. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. New Brunswick, Aldine: Transaction Publishers; 2009.

29. Crouch P, O'dea JA, Battisti R. Child feeding practices and perceptions of childhood overweight and childhood obesity risk among mothers of preschool children. *Nutr Diet*. 2007;64(3):151-158.
30. Shorr I. *How to Weight and Measure Children*. New York: United Nations; 1986.
31. Cohen J. A coefficient of agreement for nominal scales. *Educ Psychol Meas*. 1960;20(1):37-46.
32. Hedges LV, Olkin I. *Statistical Methods for Meta-Analysis*. Orlando, Florida: Academic Press; 2014.
33. Rosenthal R, Cooper H, Hedges L. Parametric measures of effect size. *The Handbook of Research Synthesis*. New York: Russel Sage Foundation; 1994.
34. Kessler DB, Dawson PE. *Failure to Thrive and Pediatric Undernutrition: A Transdisciplinary Approach*. Baltimore: Paul H Brookes Publishing; 1999.
35. Garner DM, Garfinkel PE, Schwartz D, Thompson M. Cultural expectations of thinness in women. *Psychol Rep*. 1980;47(2):483-491.
36. Puhl RM, Heuer CA. Obesity stigma: important considerations for public health. *Health (N Y)*. 2010;24:252.
37. Puhl RM, Latner JD. Stigma, obesity, and the health of the nation's children. *Psychol Bull*. 2007;133(4):557-580.
38. Savage JS, Fisher JO, Birch LL. Parental influence on eating behavior: conception to adolescence. *J Law Med Ethics*. 2007;35(1):22-34.
39. Cecil JE, Palmer CN, Wrieden W, et al. Energy intakes of children after preloads: adjustment, not compensation. *Am J Clin Nutr*. 2005; 82(2):302-308.
40. Johnson SL, Taylor-Holloway LA. Non-Hispanic white and Hispanic elementary school children's self-regulation of energy intake. *Am J Clin Nutr*. 2006;83(6):1276-1282.
41. Wright P. Learning experiences in feeding behaviour during infancy. *J Psychosom Res*. 1988;32(6):613-619.
42. Wertsch JV. From social interaction to higher psychological processes. A clarification and application of Vygotsky's theory. *Hum Dev*. 1979;22(1):1-22.
43. Straus MA. Corporal punishment and primary prevention of physical abuse. *Child Abuse Negl*. 2000;24(9):1109-1114.
44. Laible DJ, Thompson RA. Mother-child conflict in the toddler years: lessons in emotion, morality, and relationships. *Child Dev*. 2002;73(4): 1187-1203.
45. Rosenblum KL, Mcdonough SC, Sameroff AJ, Muzik M. Reflection in thought and action: maternal parenting reflectivity predicts mind-minded comments and interactive behavior. *Infant Ment Health J*. 2008;29(4):362-376.
46. Fonagy P. *Affect Regulation, Mentalization and the Development of the Self*. New York: Routledge; 2018.
47. Hughes SO, Power TG, O'Connor TM, Orlet Fisher J, Chen T-A. Maternal feeding styles and food parenting practices as predictors of longitudinal changes in weight status in Hispanic preschoolers from low-income families. *J Obes*. 2016;2016:1-9.
48. Cross MB, Hallett AM, Ledoux TA, O'Connor DP, Hughes SO. Effects of children's self-regulation of eating on parental feeding practices and child weight. *Appetite*. 2014;81:76-83.
49. Berge JM, Meyer CS, Loth K, MacLehose R, Neumark-Sztainer D. Parent/adolescent weight status concordance and parent feeding practices. *Pediatrics*. 2015;136(3):e591-e598.
50. Jansen PW, de Barse LM, Jaddoe VW, Verhulst FC, Franco OH, Tiemeier H. Bi-directional associations between child fussy eating and parents' pressure to eat: who influences whom? *Physiol Behav*. 2017;176:101-106.

How to cite this article: Pesch MH, Julian MM, Lo SL, et al. Phenotypes of controlling feeding behaviours in mothers of toddlers: A mixed methods study. *Pediatric Obesity*. 2020;15: e12639. <https://doi.org/10.1111/ijpo.12639>