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**Maternal feeding practices and children's eating behaviours:
A comparison of mothers with healthy weight versus overweight/obesity**

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Conflict of interest: None.

Running head: Mothers with healthy weight Vs. overweight/obesity.

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27

Abstract

28 This study aimed to explore differences between mothers with healthy weight versus
29 overweight/obesity in a wide range of their reported child feeding practices and their reports
30 of their children's eating behaviours. Mothers (N=437) with a 2-6-year-old child participated.
31 They comprised two groups, based on their BMI: healthy weight (BMI of 18.0 to 24.9,
32 inclusive) or overweight/obese (BMI of 25.0 or more). All mothers provided demographic
33 information and completed self-report measures of their child feeding practices and their
34 child's eating behaviour. In comparison to mothers with healthy weight, mothers who were
35 overweight/obese reported giving their child *more control* around eating ($p<.001$), but
36 encouraged *less balance and variety* around food ($p=.029$). They also had a less healthy
37 home food environment ($p=.021$) and demonstrated less modelling of healthy eating in front
38 of their children ($p<.001$). There were no significant differences in mothers' use of
39 controlling feeding practices, such as pressure to eat or restriction, based on their own
40 weight status. Mothers with overweight/obesity reported their children to have a greater
41 desire for drinks ($p=.003$), be more responsive to satiety ($p=.007$), and be slower eaters
42 ($p=.034$). Mothers with overweight/obesity appear to engage in generally less healthy
43 feeding practices with their children than mothers with healthy weight, and mothers with
44 overweight/obesity perceive their children as more avoidant about food but not drinks. Such
45 findings are likely to inform future intervention developments and help health workers and
46 clinicians to better support mothers with overweight/obesity with implementing healthful
47 feeding practices and promoting healthy eating habits in their children.

48

49 **Keywords:** overweight; healthy eating; feeding practices; parenting; children's eating; BMI

50 Maternal feeding practices and child eating behaviours:**51 A comparison of mothers with healthy weight versus overweight/obesity**

52

53 Parents are known to have a key influence on their children's eating behaviours (e.g.,
54 Anzman, Rollins & Birch, 2010; Savage, Fisher & Birch, 2007). One important determinant
55 of children's eating behaviours is the feeding practices parents use (e.g., Faith, Scanlon,
56 Birch, Francis & Sherry, 2004; Gregory, Paxton & Brozovic, 2010). These have been shown
57 to be influenced by both parent and child factors (e.g., Haycraft & Blissett, 2012). Feeding
58 practices fall broadly into two main types; controlling feeding practices (such as pressure to
59 eat and restriction of foods; e.g., Birch et al., 2001), and non-controlling feeding practices
60 (such as modelling and teaching children about nutrition; e.g., Musher-Eizenman & Holub,
61 2007). The use of controlling feeding practices has been associated with less healthy child
62 eating behaviours (Bergmeier, Skouteris, Haycraft, Haines & Hooley, 2015; Birch & Fisher,
63 2000). In contrast, non-controlling feeding practices, such as having home environments
64 that provide healthy foods (Melbye, Øgaard, & Øverby, 2013) and involving children in the
65 preparation of meals (Russell, Worsley, & Campbell, 2015), alongside healthy modelling of
66 eating behaviour (Palfreyman, Haycraft & Meyer, 2014, 2015; Thompson, 2013) and
67 providing nutrition education (Russell et al., 2015), have been found to promote healthy child
68 eating behaviours and relationships with food. Despite this evidence, gaining a better
69 understanding of why some parents use controlling feeding practices yet other parents use
70 non-controlling ones is vital for developing effective interventions aimed at promoting healthy
71 child eating behaviours and preventing obesity and disordered eating.

72

73 Parents have been found to be particularly controlling in areas of children's development in
74 which they are either highly invested themselves, or in which they perceive an element of
75 risk for their children (Costanzo & Woody, 1985). It is well established that parents who
76 have their own eating or weight concerns are likely to be more controlling in their child
77 feeding interactions (e.g., Blissett & Haycraft, 2011; Blissett, Meyer & Haycraft, 2006; Stein,

78 Woolley, Cooper & Fairburn, 1994). However, these controlling feeding practices have been
79 associated with less healthy child eating behaviours (e.g., Galloway, Fiorito, Francis & Birch,
80 2006) and later disordered eating (e.g., Marchi & Cohen, 1990). Fewer studies have
81 explored the use of feeding practices which are not seen to be controlling in mothers with
82 eating or weight concerns. Extrapolating from past research conducted with mothers with
83 eating disorders and concerns, it seems logical that parents' weight status will impact their
84 child feeding behaviours. Better understanding the potential role of parent weight status in
85 child feeding interactions will be useful for elucidating potential contributory mechanisms
86 behind the well-established relationship between parent and child weight/body mass index
87 (BMI) (e.g., Cutting, Fisher, Grimm-Thomas & Birch, 1999).

88
89 To date, we are aware of just two studies which have explored maternal weight status in
90 relation to their child feeding practices. Early research by Wardle, Sanderson, Guthrie,
91 Rapoport and Plomin (2002) compared four types of feeding style; emotional feeding,
92 instrumental feeding (using food as a reward), prompting/encouragement to eat, and control
93 over eating, among a sample of mothers with either obesity or a healthy weight. They found
94 that mothers with obesity were no more likely than mothers with a healthy weight to use food
95 as a reward, use food to deal with emotional distress, or pressure their child to eat. However,
96 the mothers with obesity reported less control over their child's food intake than mothers with
97 a healthy weight (Wardle et al., 2002). A limitation of this work is that it only considered four
98 feeding style constructs rather than a wider range of feeding practices, which have been
99 shown to be important. More recently, Musher-Eizenman, de Lauzon-Guillain, Holub,
100 Leporc and Charles (2009) found that French (n=72) and American (n=59) mothers with
101 higher BMIs reported less modelling of healthy eating, less teaching about nutrition, and less
102 encouragement of balance and variety with their children. Their findings, while limited by
103 relatively small sample sizes, suggest that there is value in further exploring the role of
104 maternal weight in a larger sample of mothers who are a healthy weight compared with

105 mothers with overweight/obesity, whilst considering a broad array of maternal feeding
106 practices.

107
108 In addition to determining links between maternal weight status and feeding practices, it is
109 also necessary to extend those links to maternal perceptions of their child's eating behaviour.
110 Parents are the gatekeepers of their children's diets (Savage et al., 2007) and so their
111 perceptions of their children's eating behaviours, for example whether their child is fussy, is
112 responsive to satiety, or enjoys food, will likely impact on children's mealtime experiences,
113 food and meals served, and potentially impact indirectly on child weight status too. It seems
114 likely that mothers' perceptions of their children's eating behaviour might differ as a function
115 of their own weight status and eating behaviours given that mothers with their own weight
116 concerns tend to have more concerns about their child's eating and weight (Baughcum et al.,
117 2001; Francis, Hofer & Birch, 2001). Moreover, children of mothers with obesity have been
118 found in previous research to be more likely to eat in the absence of hunger (Faith et al.,
119 2006) and to have a lower preference for vegetables (Wardle, Guthrie, Sanderson, Birch &
120 Plomin, 2001); both behaviours which can contribute to the development of child overweight.
121 Given evidence for the intergenerational transmission of eating and weight between parent
122 and child (e.g., Kroller, Jahnke & Warschburger, 2013; Whitehouse & Harris, 1998) and the
123 fact that maternal weight is a strong predictor of child weight (Cutting et al., 1999), better
124 understanding whether children's eating behaviour might differ as a function of mothers' own
125 weight status and eating behaviours would be beneficial for child health promotion efforts.

126
127 The present study therefore aims to build on existing work (Musher-Eizenman et al., 2009;
128 Wardle et al., 2002) by examining differences between mothers who are a healthy weight
129 and those who are overweight/obese on a wide variety of child feeding practices. Further, it
130 aims to extend past work by exploring how perceptions of child eating behaviours might
131 differ in mothers with healthy weight versus overweight/obesity. Given established
132 differences between mothers' and fathers' feeding practices, and the fact that mothers tend

133 to report spending more time in mealtime interactions with young children than fathers
134 (Haycraft & Blissett, 2008; Lloyd et al., 2014), only mothers' feeding practices will be
135 explored. It was predicted that there would be differences between these two groups of
136 mothers in relation to both their feeding practices and their children's eating behaviours.

137

138

Method

Participants

140 Five hundred and fifty parents with a child aged 2-6 years participated. Parents were
141 excluded if they had not provided details of their child's age (n=36), if they were the child's
142 father (n=26), or if their self-reported BMI was missing (n=43) or under 18, indicating that
143 they were 'underweight' (n=8). This left a total sample of 437 mothers with a mean age of 34
144 years (SD 5.7; range 21 to 52 years). Most mothers reported their ethnicity as White British
145 (76%), 26% were educated to university degree level and 25% had a post-graduate
146 qualification. The mean child age was 4.21 years (SD 1.35), 49% were boys and the mean
147 age- and sex-adjusted BMI z-score was -0.60 (SD 2.66) (Child Growth Foundation, 1996).

148

Measures and procedure

150 Following institutional review board ethical approval, participants were recruited via nurseries,
151 schools and playgroups from across the UK, and via social media (e.g. Twitter, Facebook).
152 They provided demographic information (including age, self-reported height and weight,
153 ethnicity, education level, child age, gender, height and weight) and then completed a series
154 of validated self-report questionnaires, as described below.

155

156 *Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman &*
157 *Holub, 2007)*

158 The CFPQ is a 49 item self-report measure of various child feeding practices. It has 12
159 subscales: Child control ("At dinner, do you let this child choose the foods s/he wants from
160 what is served?"); Encourage balance and variety ("I encourage my child to try new foods");

161 Environment (*"Most of the food in the house is healthy"*); Involvement (*"I involve my child in*
162 *planning family meals"*); Teaching about nutrition (*"I discuss with my child why it's important*
163 *to eat healthy foods"*); Modelling (*"I try to show enthusiasm about eating healthy foods"*);
164 Monitoring (*"How much do you keep track of the high-fat foods that your child eats?"*);
165 Pressure (*"My child should always eat all of the food on his/her plate"*); Restriction for health
166 (*"If I did not guide or regulate my child's eating, he/she would eat too many junk foods"*);
167 Restriction for weight control (*"There are certain foods my child shouldn't eat because they*
168 *will make him/her fat"*); Food as reward (*"I withhold sweets/dessert from my child in*
169 *response to bad behaviour"*); and, Emotion regulation (*"Do you give this child something to*
170 *eat or drink if s/he is upset even if you think s/he is not hungry?"*). Responses are made on
171 a 5-point Likert scale (anchored from 1=Disagree, 5=Agree or 1=Never, 5=Always) and
172 mean scores are calculated for each subscale. Higher scores suggest greater use of each
173 feeding practice. Cronbach's alpha values for the CFPQ with the current sample ranged
174 from 0.49 to 0.84. The value for CFPQ Teaching about nutrition is low at 0.49 and, while this
175 is consistent with previous data (e.g., Musher-Eizenman et al., 2009), we chose to exclude
176 this subscale from our analyses.

177
178 *Children's Eating Behaviour Questionnaire (CEBQ; Wardle, Guthrie, Sanderson, & Rapoport,*
179 *2001)*

180 The CEBQ is a 35-item self-report measure of parents' perceptions of their child's eating and
181 drinking behaviour. It has 8 subscales, assessing food approach and avoidance behaviours.
182 The four 'food approach' behaviours are: Food responsiveness (*"My child's always asking*
183 *for food"*); Enjoyment of food (*"My child loves food"*); Emotional over-eating (*"My child eats*
184 *more when annoyed"*); and, Desire to drink (*"My child is always asking for a drink"*). The four
185 'food avoidant' behaviours are: Satiety responsiveness (*"My child leaves food on his/her*
186 *plate at the end of a meal"*); Food fussiness (*"My child refuses new foods at first"*); Slowness
187 in eating (*"My child eats more and more slowly during the course of a meal"*); and, Emotional
188 under-eating (*"My child eats less when s/he is upset"*). Questions are measured on a 5-point

189 Likert scale (1=never, 5=agree) and mean scores are calculated for each subscale, with
190 higher scores indicating greater reports of children exhibiting that characteristic. In the
191 current sample, Cronbach's alpha values for the CEBQ ranged from 0.74 to 0.88.

192

193 *Data analysis*

194 Normality tests indicated that all CFPQ and CEBQ variables were not normally distributed
195 and so non-parametric tests were used. Mothers were split into two groups, based on their
196 BMI: healthy weight (BMI of 18.0 to 24.9, inclusive) or overweight/obese (BMI of 25.0 or
197 more). Preliminary analyses confirmed no significant differences between mothers with
198 healthy weight or overweight/obesity in terms of their own or their child's age, their education
199 level, or their ethnicity. Moreover, child BMI z-score was not significantly correlated with
200 maternal BMI ($r = .034, p=.53$) and so was not considered in any further analyses. Mann-
201 Whitney U tests were run to test the study's hypotheses. A significance level of $p<.05$ was
202 adopted for all analyses.

203

204

204 **Results**

205

206 *Descriptive statistics*

207 Descriptive statistics (means and standard deviations (SD)) are presented in Table 1 for
208 mothers with healthy weight and mothers with overweight/obesity. In general, the scores on
209 the CFPQ and CEBQ are broadly comparable with those from other studies using similar
210 samples of mothers of young children (e.g., Haycraft, Farrow, Meyer, Powell, & Blissett,
211 2011; Musher-Eizenman et al., 2009).

212

213

Insert Table 1 about here

214

215 To test the first hypothesis, that there would be differences between mothers with healthy
216 weight and mothers with overweight/obesity in their child feeding practices, a Mann Whitney

217 U test was run (see Table 1). In comparison to mothers with healthy weight, mothers with
218 overweight/obesity reported higher levels of CFPQ child control, but lower levels of CFPQ
219 encourage balance and variety, CFPQ environment, and CFPQ modelling. There were no
220 significant differences between mothers with healthy weight and mothers with
221 overweight/obesity on any of the other CFPQ subscales.

222
223 To test the second hypothesis, that there would be differences between mothers with healthy
224 weight and mothers with overweight/obesity in their reports of their child's eating behaviours,
225 another Mann Whitney U test was run (see Table 1). In comparison to mothers with healthy
226 weight, mothers with overweight/obesity reported greater CEBQ desire to drink, CEBQ
227 satiety responsiveness and CEBQ slowness in eating in their children. There were no
228 significant differences between mothers with healthy weight and mothers with
229 overweight/obesity on any of the other CEBQ variables.

230

231 **Discussion**

232 The aim of this study was to explore differences between mothers with healthy weight and
233 mothers with overweight/obesity in their reports of a wide array of their child feeding
234 practices and their children's eating behaviours. It was predicted that there would be
235 differences between these groups of mothers in relation to both their feeding practices and
236 their children's eating behaviours. These hypotheses were supported.

237

238 In comparison to mothers with healthy weight, mothers with overweight/obesity reported
239 giving their child more control around eating, but encouraged less balance and variety
240 around food, had a less healthy home food environment, and demonstrated less modelling
241 of healthy eating. These findings suggest that mothers with overweight/obesity generally
242 engage in fewer of the healthier child feeding practices than healthy weight mothers. The
243 finding that mothers with overweight/obesity give more control around eating to their children
244 aligns with past research from Wardle et al. (2002). While control around eating is important

245 for children's autonomy-development, given the age of the children in our sample (2-6 years),
246 too much control over eating and food choice could result in unhealthy food preferences,
247 particularly if this occurs alongside a less healthy home food environment. This combination
248 might be especially problematic as children would have the freedom to choose what to eat
249 from a less healthy selection. Most young children in the UK tend to eat too few fruits and
250 vegetables and, as these foods are often disliked by young children (Dovey, Staples, Gibson
251 & Halford, 2008), giving a child too much control over food choices might result in less
252 healthy food choices. Given that eating behaviours tend to track throughout childhood and
253 into adulthood (Emmett, Jones, & Northstone, 2015), the importance of establishing healthy
254 eating early on cannot be underestimated.

255

256 Our results also support (Musher-Eizenman et al., 2009) and extend past work by
257 highlighting that mothers with overweight/obesity report using lower levels of non-controlling,
258 health-promoting feeding practices with their children than do mothers with healthy weight.
259 These feeding practices have previously been found to promote healthy child eating
260 behaviour and healthy relationships with food (e.g., Melbye et al., 2013; Palfreyman et al.,
261 2014, 2015; Russell et al., 2015) and so the lower use of these practices by mothers with
262 overweight/obesity is likely to relate to less healthy eating and weight outcomes for their
263 children. These results are concerning as they highlight another potential pathway through
264 which the intergenerational transmission of obesity from parent to child could occur. In this
265 instance, mothers with overweight/obesity are employing less healthful feeding practices
266 with their children which have been shown to be associated with less healthy eating habits in
267 children (Bergmeier et al., 2015).

268

269 Interestingly, there were no significant differences between mothers with healthy weight or
270 overweight/obesity in their use of overly controlling feeding practices, such as pressure to
271 eat, restriction, or using food for emotion regulation, which aligns with Wardle et al.'s (2002)
272 early work. These results suggest that the use of more controlling feeding practices may be

273 more strongly linked to child factors, such as fussy or over-eating behaviours (Webber,
274 Cooke, Hill & Wardle, 2010), and that the use – or not – of non-controlling practices might be
275 driven more by parental factors, such as *concern* about their own or their child's weight.

276

277 In comparison to mothers with healthy weight, mothers with overweight/obesity reported that
278 their children had a strong desire to drink, were more responsive to satiety, and were slower
279 eaters. These findings suggest that mothers who are overweight/obese perceive their
280 children as more avoidant of, or reluctant to consume, food but not drink. Mothers who are
281 overweight/obese might be less aware of, or able to respond to, their own fullness cues and
282 might also struggle to identify and respond to these cues in their children too (Hodges et al.,
283 2013). Alternatively, it is also possible that mothers with overweight/obesity, or who have
284 greater concerns about their own eating, are more attuned to their child's satiety cues
285 perhaps due to being concerned about trying to prevent overweight in their child (e.g.,
286 Baughcum et al., 2001; Francis et al., 2001), which could be important for preventing the
287 intergenerational transmission of obesity. Longitudinal work is required to tease apart these
288 different potential pathways. Our findings could also reflect an issue with portion size,
289 whereby mothers with overweight/obesity might be providing portions of food for their
290 children which are too large and so children's refusal to eat all the food provided could be
291 interpreted as them eating slowly and being more responsive to satiety. Such findings have
292 potentially important implications for healthy development in children as large portions is a
293 prime precursor for overeating (Fisher, Rolls, & Birch, 2003) which is directly linked to the
294 development of overweight. Further work is required to determine if portion size is a
295 problem and to support parents to provide appropriate portions for young children.

296

297 Our finding that mothers with overweight/obesity reported their children as having a stronger
298 desire for drinks supports previous work which has found pre-schoolers from obese families
299 to have a greater desire to drink than pre-schoolers not from obese families (Wardle, Guthrie,
300 Sanderson, Birch & Plomin, 2001). Desire to drink has been associated with a liking for

301 consuming sweetened drinks rather than being an indication of greater thirst (Sweetman,
302 Wardle & Cooke, 2008). Greater consumption of sweet or sugary drinks has been strongly
303 associated with increased child weight (Malik, Pan, Willett & Hu, 2013; Welsh et al., 2005)
304 and so the fact that mothers with overweight/obesity in this study perceive their children to
305 request more drinks could be a further determinant in the intergenerational transmission of
306 obesity. If these mothers respond by giving their children more sugar-sweetened beverages,
307 this could contribute to the development of childhood overweight.

308
309 No studies to date have explored differences between mothers who are healthy weight or
310 overweight/obese in a wide range of controlling and non-controlling feeding practices and
311 reports of their children's eating behaviours. Strengths of our study include a good size
312 sample of mothers and the use of well-established measures. Further strength lies in
313 extending previous research in this area by considering a broader array of feeding practices
314 and child eating behaviours in a large group of mothers. Limitations include the fact that
315 most mothers reported their ethnicity as White British and many were educated to university
316 degree level or above. Therefore, even though our sample is representative of wide
317 Westernised populations, this work needs replicating with more sociodemographically
318 diverse samples as evidence suggests that both SES and ethnicity can impact feeding
319 practices (Cardel et al., 2012), so our results might not hold for other families. Some of our
320 findings, while significant, indicated relatively small differences between the behaviours of
321 the two groups and so caution is needed when extrapolating these findings. We
322 acknowledge that numerous analyses were run with no adjustment for multiple testing which
323 could increase the likelihood of spurious findings, and the use of self-report BMI data is also
324 a limitation which might have resulted in a slight underreporting of weight and over-reporting
325 of height (e.g., Rowland, 1990; Weden et al., 2013). Future research using objective
326 height/weight measurements, for parents and children, is warranted to build on these
327 findings and to allow consideration of the contribution of child weight status to feeding
328 practices and child eating behaviours. Further research also needs to explore fathers'

329 weight status in relation to their feeding interactions, given evidence that fathers' and
330 mothers' feeding practices can differ and be predicted by different factors (e.g., Haycraft &
331 Blissett, 2012).

332

333 In conclusion, this study has highlighted that mothers with overweight/obesity use an array of
334 less healthy feeding practices with their children than do mothers with healthy weight.

335 Specifically, they assign more control of eating to their child and encourage less balance and
336 variety around food, have a less healthy home food environment, and engage in less

337 modelling of healthy eating with their children. This study has also demonstrated significant

338 differences in perceptions of child eating behaviours in mothers with overweight/obesity

339 versus those with healthy weight, with mothers who are overweight/obese perceiving their

340 children as more avoidant around, or reluctant to consume, food but not drink. These

341 findings shed novel insights into the different home food environments and experiences that

342 might be encountered by children whose parents are overweight compared to healthy weight.

343 Our findings are important for the ongoing development of effective health-promotion and

344 obesity-prevention interventions which need to be tailored by parent weight status and to

345 focus on feeding practices and on perceptions and expectations around healthy child eating

346 behaviours. Gaining a better understanding of the drivers of less healthy feeding

347 interactions is vital for enabling health professionals to offer better support to families.

348

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471 *Table 1: Descriptive statistics and tests of difference for the study variables, presented for*
 472 *mothers who are healthy weight and mothers with overweight/obesity.*

	Mothers who are healthy weight (n=249)		Mothers with overweight / obesity (n=188)		Mann Whitney Z	p-value
	Mean	SD	Mean	SD		
Maternal BMI	22.15	1.71	29.93	4.23	17.91	<.001
Comprehensive Feeding Practices Questionnaire (CFPQ)						
Child control	2.23	0.61	2.49	0.77	3.26	<.001
Encourage balance and variety	4.54	0.45	4.41	0.54	2.18	.029
Environment	4.07	0.73	3.88	0.76	2.30	.021
Involvement	3.74	0.92	3.63	0.90	1.39	.164
Modelling	4.31	0.61	4.06	0.69	3.64	<.001
Monitoring	4.32	0.72	4.29	0.68	0.84	.399
Pressure to eat	2.89	0.98	2.75	0.98	1.62	.104
Restriction for health	3.18	1.01	3.19	0.95	0.10	.917
Restriction for weight control	1.96	0.66	2.09	0.86	0.82	.412
Food as a reward	2.47	1.11	2.51	1.05	0.30	.768
Emotion regulation	1.81	0.66	1.91	0.76	0.92	.359
Children's Eating Behaviour Questionnaire (CEBQ)						
Food responsiveness	2.41	0.76	2.49	0.89	0.61	.540
Enjoyment of food	3.88	0.72	3.73	0.76	1.83	.067
Emotional overeating	1.90	0.61	2.02	0.79	0.75	.454
Desire to drink	2.53	0.98	2.80	0.96	2.99	.003
Satiety responsiveness	2.94	0.62	3.12	0.68	2.68	.007
Food fussiness	2.70	0.86	2.86	0.94	1.78	.074
Slowness in eating	2.89	0.74	3.03	0.83	2.12	.034
Emotional undereating	2.86	0.86	2.94	0.89	0.93	.353

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