

The importance of mealtime structure for reducing child food fussiness

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28 The aim of this study was to explore how the structure of mealtimes within the family setting is related
29 to children's fussy eating behaviours. Seventy-five mothers of children aged between 2 and 4 years
30 were observed during a typical mealtime at home. The mealtimes were coded to rate mealtime
31 structure and environment as well as the child's eating behaviours (food refusal, difficulty to feed,
32 eating speed, positive and negative vocalisations). Mealtime structure emerged as an important factor
33 which significantly distinguished children with higher compared to lower levels of food fussiness.
34 Children whose mothers ate with their child and ate the same food as their child were observed to
35 refuse fewer foods and were easier to feed compared to children whose mothers did not. During
36 mealtimes where no distractors were used (e.g., no TV, magazines or toys), or where children were
37 allowed some input into food choice and portioning, children were also observed to demonstrate
38 fewer fussy eating behaviours. Findings of this study suggest that it may be important for parents to
39 strike a balance between structured mealtimes, where the family eats together and distractions are
40 minimal, alongside allowing children some autonomy in terms of food choice and intake.

41

42 **Keywords:** Food fussiness; mealtimes; eating behaviour; children; family; modelling

43 **Introduction**

44 Parents frequently report concerns about their children's picky or fussy eating (e.g., Mascola et al.,
45 2010) whereby children fail to consume an adequate variety of foods through rejection of both
46 familiar and unfamiliar foods (e.g., Dovey et al., 2008; Galloway et al., 2003). Food fussiness can
47 represent a barrier to healthy food consumption and a healthy BMI, with associated problems
48 including low fruit and vegetable intake (Galloway et al., 2003; Jacobi et al., 2003) and essential
49 nutrient deficiency (Falciglia et al., 2000). Given that fussy eating habits established in early
50 childhood can persist into adulthood (e.g., Nicklaus et al., 2005), there is need for a thorough
51 understanding of the early risk factors for fussy eating and ways to modify them.

52 The development of eating behaviour in children is rooted within the family context (Ventura
53 & Birch, 2008). One important aspect of parents' socialisation of their children's eating is the
54 mealtime environment and several studies have found positive associations between the frequency of
55 family meals and child eating behaviour, such as the consumption of healthier foods (e.g., Hammons
56 & Fiese, 2011; Neumark-Sztainer et al., 2004). However, the importance of family mealtimes is likely
57 to stretch beyond just their frequency, and interest is growing into the role of the structure of
58 mealtimes within the family setting (e.g., Berlin et al., 2011; Orrell-Valente et al., 2007). Within
59 studies exploring family mealtimes, it is often unclear whether parents or family members are eating
60 the same food as their child during the meal or eating something different (Hammons & Fiese, 2011).
61 Given the importance of modelling in the development of children's food preferences (e.g.,
62 Palfreyman et al., 2014) and evidence from experimental studies that children tend to sample
63 unfamiliar foods more readily when an adult is also eating the same food (Harper & Sanders, 1975),
64 it is likely that this could be an important component in relation to children's fussy eating behaviour.

65 Factors such as not eating at a table and the presence of distractions at meals have also been
66 associated with the presence of child feeding problems (Cooper et al., 2004). Parental use of
67 distractions at mealtimes (when a child will not eat without a distraction) has been identified as a
68 diagnostic criterion for infantile feeding disorders (Levinne et al., 2011), however research findings

69 are mixed. Distractions such as TV viewing have also been linked higher energy intake at mealtimes
70 (e.g., Coon et al., 2001) and overweight (e.g., Dubois et al., 2008) and further research is needed to
71 clarify the association between fussy eating and the use of distractions.

72 Another aspect that may be important when considering the mealtime environment is that of
73 child autonomy (Satter, 1990; 1995). Satter (1995) highlights the importance of reciprocity in the
74 feeding process, with parents providing structure within a mealtime but allowing infants and young
75 children the opportunity for choice and exploration (Satter 1990). Research has shown that over time,
76 given autonomy, young children tend to eat a variety of food and achieve a nutritionally adequate diet
77 (e.g., Rolls, 1986). Therefore it is possible that allowing children autonomy or input into decisions
78 around food choice or portion size may be important in the development of adaptive eating behaviour.
79 Exploration of mealtime structure in more detail, rather than just the frequency of family meals, may
80 provide greater insight into how mealtime structure may be adapted to promote healthier child eating
81 behaviour.

82 Observational studies of the home mealtime environment, particularly in non-clinical groups,
83 are rare and many studies rely on parents' reports of mealtimes and eating behaviour (e.g. Berlin et
84 al., 2011; Galloway et al., 2003). Whilst some studies suggest that mothers are reasonably accurate
85 in their reports of mealtime interactions (Cooper et al., 2004; Farrow & Blissett, 2005), others have
86 found that maternal reports are not validated by independent observations (Haycraft & Blissett, 2008)
87 or that the accuracy of maternal reports depends on child weight (Farrow et al., 2011). Therefore, the
88 present study aims to explore the relationship between observations of fussy child eating behaviour
89 and mealtime structure. It was hypothesised that greater fussy eating behaviour would be observed in
90 children whose mothers do not eat with them, who do not allow the child input into food choice or
91 portion size, or who use a distraction during the meal.

92

93

94 **Methods and Materials**

95 ***Participants***

96 Seventy-five mothers (mean age=35.94, range 26.78-45.82, SD=4.19), participated with their
97 children (mean age=3.31 years, range 2.26-4.37, SD=1.17). There were 37 boys and 38 girls. Families
98 were recruited through advertisements distributed to nurseries, pre-schools, children centres and
99 online parenting sites. Mothers were predominantly White British (97%), with a modal occupation of
100 'associate professional and technical occupations' (Office for National Statistics, 2000). Maternal
101 mean self-reported BMI was 23.83 (SD=3.32) and mean objective, age and gender adjusted child
102 BMI Z-score was .55 (SD = .86), indicating a healthy BMI (Child Growth Foundation, 1996).

103

104 ***Measures and procedure***

105 Following ethical approval from Loughborough University's Human Participants Sub-Committee,
106 recruitment and consent, mothers completed demographic information and mother-child dyads were
107 observed during a typical lunch or evening meal at their home. The mealtime was recorded using a
108 video camera while the researcher waited in another room. After maternal consent, children who
109 assented were weighed and measured by the researcher using a Leicester height measure (to nearest
110 0.1cm) and digital Secca scales (to the nearest 0.1kg).

111 ***Mealtime structure and environment.*** The mealtime recordings were firstly coded using six
112 items relating to the environment and structure of the child's mealtime, using variables previously
113 used by Cooper et al. (2004) and Orrell-Valente et al. (2007). These include whether the mother eats
114 with the child, eats the same food as the child, allows their child some autonomy in food choice,
115 whether distractions are used (e.g. watching television, play with toys) and whether the father or
116 siblings are eating with the child. Autonomy in food choice refers to a parent allowing the child some
117 input in the type and/or amount of food provided for the meal.

118 ***Child Eating Behaviour.*** Mealtime duration and the total number of mouthfuls consumed by
119 the child were recorded to calculate the child's speed of eating (mouthfuls per minute). Two subscales
120 from the Child Mealtime Coding Scheme (CMCS; Haycraft, 2007) were used to provide an index of

121 child enjoyment of food; positive comments (e.g., “mmm this food is yummy”) and negative
122 comments (e.g., “I don’t like it”) about food made by the child. A count was made for every
123 vocalisation made in each category during the meal. The CMCS was also used to generate an overall
124 index of how easy or difficult the child was to feed, ranging from 1 (easy; e.g., usually autonomous
125 feeder, eats well with little protest) to 5 (difficult; e.g., much resistance to offers of food, refusal to
126 eat). The CMSC has been shown to have good inter-rater reliability (Haycraft, 2007). A measure of
127 food refusal was adapted from Young and Drewett’s (2000) coding scheme for food refusal/rejection.
128 To account for the fact that not all children in the sample were spoon-fed a broader definition of food
129 refusal was used. A count was made each time the child shook their head, turned their head away,
130 pushed food away (either from parental prompt or around the plate), said “no” or commented with a
131 similar meaning, made negative comments about not wanting to consume food, spat food out, or
132 verbally or physically rejected foods on the plate.

133 One experienced researcher coded all of the observations. A second independent observer,
134 who was trained on the FMCS, coded a random sample of 20% of the observations. Inter-rater
135 reliability was assessed using intra-class correlations (McGraw & Wong, 1996). The mean intra-class
136 correlation coefficient was .84 (range .79-.94) and the mean level of significance was $p < .001$. This
137 indicates a high degree of agreement between the coders and suggests that the coding of this measure
138 achieved good reliability

139

140 *Data analysis*

141 Preliminary analysis of the data using Shapiro-Wilk tests and visual inspection of plots/graphs
142 indicated the data was largely non-normally distributed; consequently non-parametric statistics were
143 used where possible. Preliminary Spearman’s two-tailed correlations revealed no significant
144 associations between observed child eating behaviour with parent age, parent BMI and child BMI z
145 scores, or maternal occupation (all $p > .05$). Younger children were observed to refuse more foods (r
146 = $-.43$, $p < .001$) and were rated as more difficult to feed ($r = .41$, $p < .001$), however child age was not

147 related to child eating speed ($r = .17, p = .16$), positive vocalisations made about food ($r = .15, p = .20$) or
148 negative vocalisations about food ($r = -.08, p = .47$). There were no significant associations between child
149 age and mealtime structure; mother eating with child ($r = -.20, p = .09$), mother eating same food as
150 child ($r = -.17, p = .15$), input in food choice ($r = -.13, p = .27$) and use of distractions ($r = .06, p = .60$).
151 Mann-Whitney U tests indicated no significant differences in observed child eating behaviour
152 dependent on whether children were male or female; White or non-White; observed at lunch ($n = 39$)
153 or evening meal ($n = 36$); and whether the father or siblings were present (all $p > .05$). Next, Mann-
154 Whitney U tests evaluated whether there were significant differences in child eating behaviour
155 dependent on the mealtime structure and environment. The p-value was set at $< .01$ to reduce the
156 chance of type I errors.

157

158 **Results**

159 *Descriptive Statistics.*

160 Descriptive statistics for independent observations of child eating behaviour are presented in
161 Table 1. Mean scores are similar to other data in similar samples (Haycraft et al., 2007; Young &
162 Drewett, 2000). The mean mealtime duration was 23.21 minutes ($SD = 7.75$; 95% CI [21.37, 25.04]).

163

164 [Table 1]

165

166 **Mealtime structure and observed child eating behaviour**

167 Descriptive and Mann-Whitney U statistics for each of the observed mealtime structure
168 variables in relation to child eating behavior are presented in Tables 2 -5. Children whose mothers
169 ate with them refused fewer foods during the meal ($U = 280.50, z = 3.93, p < .001$) compared to mothers
170 who did not and were observed as being easier to feed ($U = 366.00, z = -2.99, p = .003$) compared to
171 children whose mothers did not. In addition, children whose mothers ate the same food as them
172 refused fewer foods ($U = 280.50, z = -3.98, p < .001$), made fewer negative vocalisations about food

173 (U=424.00, z=-2.58, p=0.01), and were easier to feed (U=354.00, z=-3.19, p=0.001) compared to
174 children whose mothers who ate something different or didn't eat with them.

175 Children who were allowed input in food choice and/or portion size refused foods less during
176 the meal (U=321.00, z=-3.61, p<.001), made fewer negative comments about food (U=326.00, z=-
177 4.02, p<.001), had a faster eating rate (U=321.00, z= -3.61, p<.001), and were observed as being
178 easier to feed (U=383.50, z=-2.95, p=.003). Children who had a distraction during the meal (e.g., TV,
179 radio, books, magazines, toys) refused foods more (U=140.00, z=-2.79, p=.005), and made more
180 negative vocalisations about food (U=160.00, z=-2.79, p=.005) than those who were not distracted.

181

182 [Table 2]

183 [Table 3]

184 [Table 4]

185 [Table 5]

186

187 **Discussion**

188 This study aimed to explore whether there were any significant differences between
189 observations of children's eating behaviour depending on the mealtime structure. As predicted,
190 mealtime structure emerged as an important factor which significantly distinguished dyads with
191 higher, compared to lower, levels of fussy child eating behaviour. Previous research with older
192 children has highlighted the importance of family mealtimes in the development of healthy and
193 adaptive eating (e.g., Neumark-Sztainer et al., 2004; White et al., 2013). Supporting and extending
194 this, the present study found that children whose mothers not only ate with them but also ate the same
195 food as them, refused fewer foods and were easier to feed compared to children whose mothers did
196 not. This provides support for lab-based research where 2-5-year-olds accepted and ingested more of
197 a novel food when an adult was eating a similar food, of the same colour, rather than just sitting
198 together but not eating (Addessi et al., 2005) and provides further evidence that mealtime structure

199 may play an important role in providing an opportunity for the role modelling of healthy eating. This
200 is particularly important given that observations of maternal modelling have been found to be related
201 to increased enjoyment of food and lower food fussiness (Palfreyman, et al., 2015). Future research
202 should utilise observational measures to reduce potential self-report bias (Haycraft & Blissett, 2008;
203 Farrow et al., 2011) and explore the interaction between mealtime structure, modelling and the
204 mealtime atmosphere/dynamic.

205 Interestingly, there were no significant differences in children's eating behaviour according
206 to whether their father or siblings were present. However, fathers were present in only 19 of the 75
207 mealtimes and this sample may be underpowered to detect significant differences according to
208 paternal presence. Future studies should continue to explore the role of additional family members
209 during mealtime interactions in order to ascertain the whether their presence and behaviour during
210 mealtimes affect child eating behaviour.

211 Less fussy eating was also observed in children whose mothers allowed them some autonomy
212 in food choice. Previous research has shown that over time, given autonomy, young children tend to
213 eat a variety of food and achieve a nutritionally adequate diet (e.g., Rolls, 1986). Similarly our
214 findings suggest that autonomy in food choice or portion size is related to fussy eating behaviour.
215 However, it is possible that the degree to which mothers allow autonomy is actually dependent on the
216 child's eating behaviour; mothers of fussy eaters may feel the need to direct and stipulate what their
217 child eats, in an attempt to counter their fussy, restrictive eating behaviours and improve their dietary
218 intake. Longitudinal studies are essential in order to infer causal relationships between mealtime
219 structure and fussy eating behaviours in children. As autonomy in food choice has emerged as an
220 important and interesting factor, future studies should consider measuring autonomy in portion size
221 and autonomy in food type independently to ascertain which is the most important. In addition,
222 exploring the idea of 'choice' on a continuum, rather than a dichotomy, could provide an insight into
223 the degree of choice that may appropriate in promoting adaptive eating behaviour in young children.

224 Within the present sample, younger children were found to refuse more food, and were rated
225 as more difficult to feed. Given that food fussiness is more prevalent in younger children (Carruth et
226 al., 2004) this is not unexpected and it is important to consider how age may also relate to the way
227 parents structure their mealtimes. Perhaps surprisingly, child age was also not related to any of the
228 mealtime structure variables measured, and as such, was not controlled for within the analyses. This
229 could be due to the fact that the age range within this study was relatively small (mean age=3.31
230 years, range 2.26-4.37, SD=1.17) or it could be a reflection of the social demography of this sample.
231 Caution must be taken when generalising the current findings as the sample consisted of
232 predominantly White British mothers.

233 In summary, the results of this study indicate that more adaptive eating behaviours are seen
234 in children where mothers eat with them and consume similar foods. Whilst this and previous
235 evidence highlights the importance of structured family mealtimes (e.g., Berlin et al., 2011; Cooper
236 et al., 2004), the findings in relation to child autonomy in food choice and portioning also support
237 ideas from the feeding dynamics approach that the degree of parental control of a child's intake should
238 be minimal (e.g., Satter, 1995). It may be important for parents to strike a balance between a clear
239 structure, where the family eats together and distractions are minimal, and allowing children some
240 autonomy in terms of food choice and intake. This may increase the opportunity for role modelling
241 of healthy eating, promote more autonomous eating in the child, and reduce food fussiness. Further
242 research is needed to explore observed mealtime structure and environment in greater depth and in
243 wider socio-demographic and ethnic groups.

244 **Key Messages**

- 245 - During independent observations children refused less food when mothers ate with them and
- 246 ate the same food
- 247 - Children refused more foods when distractions (e.g. TV, radio) were used during mealtimes
- 248 - Children were more positive during mealtimes where they had choice about what meal they
- 249 were being served or the portion size they were given.

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