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The importance of mealtime structure for reducing child food fussiness

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Abstract

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

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

Introduction

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

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

Factors such as not eating at a table and the presence of distractions at meals have also been associated with the presence of child feeding problems (Cooper et al., 2004). Parental use of distractions at mealtimes (when a child will not eat without a distraction) has been identified as a 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.

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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) wand hether 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 (-.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]

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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.

References

Addessi, E., Galloway, A. T., Visalberghi, E., & Birch, L. L. (2005). Specific social influences on the acceptance of novel foods in 2–5-year-old children. *Appetite*, 45, 264–271.

Berlin, K. S., Davies, H., Silverman, A. H., & Rudolph, C. D. (2011). Assessing Family-based Feeding Strategies, Strengths, and Mealtime Structure with the Feeding Strategies Questionnaire. *Journal of Pediatric Psychology*, 36(5),586-595.

Carruth, B. R., Ziegler, P. J., Gordon, A., & Barr, S. I. (2004). Prevalence of ''picky/fussy'' eaters among infants and toddlers and their caregivers' decision about offering new food. *Journal of the American Dietetic Association*, 104, 57–64

Child Growth Foundation. (1996). *Cross sectional stature and weight reference curves for the UK*. London, United Kingdom: Child Growth Foundation.

Cooper, P. J., Whelan, E., Woolgar, M., Morrell, J., & Murray, L. (2004). Association between childhood feeding problems and maternal eating disorder: Role of the family environment. *British Journal of Psychiatry,* 184, 210–215.

Dovey, T. M., Staples, P. A., Gibson, E. L., & Halford, J. C. G. (2008). Food neophobia and ''picky/fussy'' eating in children. A review. *Appetite*, 50, 181–193.

Dubois L, Farmer A, Girard M, Peterson K. Social factors and television use during meals and snacks is associated with higher BMI among pre-school children. Public Health Nutr. 2008; 11(12):1267–1279.

Falciglia, G. A., Couch, S. C., Gribble, L. S., Pabst, S. M., & Frank, R. (2000). Food neophobia in childhood affects dietary variety. *Journal of the American Dietetic Association*, 100, 1474 – 1481

Farrow, C. V., & Blissett, J. M. (2005). Is maternal psychopathology related to obesigenic feeding practices at 1 year? *Obesity Research,* 13(11), 1999–2005.

274   Farrow, C., Blissett, J. & Haycraft, E. (2011). Does child weight influence how mothers report their

275   feeding practices? *International Journal of Pediatric Obesity,* 6, 306–313

276   Galloway, A. T., Lee, Y., & Birch, L. L. (2003). Predictors and consequences of food neophobia

277   and pickiness in children. *Journal of the American Dietetic Association,* 103, 692–698.

278   Hammons, A. J., & Fiese, B. H. (2011). Is frequency of shared family meals related to the nutritional

279   health of children and adolescents? *Pediatrics,* 127(6), 1565–1574.

280   Harper, L. V., & Sanders, K. M. (1975). The effect of adults' eating on young children's acceptance

281   of unfamiliar foods. *Journal of Experimental Child Psychology*, 20(2), 206-214

282   Haycraft, E. (2007). *Child feeding practices in fathers and mothers of young children.* Unpublished

283   PhD Thesis, University of Birmingham.

284   Haycraft, E. & Blissett, J. (2008). Maternal and paternal controlling feeding practices: Reliability

285   and relationships with BMI. *Obesity,* 16(7), 1552-1558.

286   Jacobi, C., Agras, S., Bryson, S., & Hammer, L. D. (2003). Behavioral Validation, Precursors, and

287   Concomitants of Picky Eating in Childhood. *Journal of the American Academy of Child &*

288   *Adolescent Psychiatry,* 42(1), 76-84

289   Mascola, A. J., Bryson, S. W., & Agras, S. W. (2010). Picky eating during childhood: A longitudinal

290   study to age 11 years. *Eating Behaviors*, 11, 253-257.

291   McGraw, K. O., & Wong, S. P. (1996) Forming inferences about some intraclass correlation

292   coefficients. *Psychological Methods*, 1(1),30–46.

293   Neumark-Szainer, D. R., Wall, M. M., Story, M., & Fulkerson, J. A. (2004). Are family meal patterns

294   associated with disordered eating behaviors among adolescents? *Journal of Adolescent Health,*

295   35(5), 350-359

296   Nicklaus, S., Boggio, V., Chabanet, C., & Issanchou, S. (2005). A prospective study of food variety
297   seeking in childhood, adolescence and early adult life, *Appetite,* 44, 289–297

298   Office for National Statistics (2000). *Standard Occupational Classification 2000.* Available from:
299   http://www.statistics.gov.uk/methods_quality/ns_sec/soc2000.

300   Orrell-Valente, J. K., Hill, L. G., Brechwald, W. A., Dodge, K. A., Pettit, G. S., & Bates, J. E. (2007).
301   Just three more bites. An observational analysis of parents socialization of children's eating at
302   mealtime. *Appetite,* 34(1), 37–45.

303   Palfreyman, Z., Haycraft, E., & Meyer, C. (2014). Development of the Parental Modelling of Eating
304   Behaviours Scale (PARM): links with food intake among children and their mothers. Maternal
305   and Child Nutrition, 10, 617–629

306   Palfreyman, Z., Haycraft, E., & Meyer, C. (2015). Parental modelling of eating behaviours:
307   Observational validation of the Parental Modelling of Eating Behaviours scale (PARM).
308   *Appetite*, 86, 31-37

309   Rolls, B. J. (1986). Sensory-specific satiety. *Nutrition Review*, 44, 93–101

310   Satter, E. (1990). The feeding relationship: Problems and interventions. *The Journal of Pediatrics,*
311   117(2), 181-189

312   Satter, E. M. (1995). Feeding dynamics: Helping children to eat well. *Journal of Pediatric Health*
313   *Care,* 9, 178–184.

314   Ventura, A. K., & Birch, L. L. (2008). Does parenting affect children's eating and weight Status?
315   *International Journal of Behavioral Nutrition and Physical Activity*, 5, 15–27

316   White, H. J., Haycraft, E., Meyer, C. (2013). Family mealtimes and eating psychopathology: The role
317   of anxiety and depression among adolescent girls and boys. *Appetite*, 75, 173–179

318   Young, B. & Drewett, R. (2000). Eating behaviour and its variability in 1 year old children.