Short Communication

The importance of mealtime structure for reducing child food fussiness

Faye Powell^{*}, Claire Farrow[†], Caroline Meyer^{‡,§} and Emma Haycraft^{||}

^{*}School of Health and Social Sciences, University of Bedfordshire, UK, [†]School of Life and Health and Sciences, Aston University, UK, [‡]Institute for Digital Healthcare, The University of Warwick, UK, [§]Human Metabolism Research Unit, University Hospitals Coventry and Warwickshire NHS Trust, UK, and ^{||}School of Sport Exercise and Health Sciences, Loughborough University, UK

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 with 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 with 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.

Correspondence: Dr. Faye Powell, School of Health and Social Sciences, University of Bedfordshire, LU1 3JU, UK. E-mail: Faye.powell@beds.ac.uk

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. Galloway *et al.* 2003; Dovey *et al.* 2008). 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 a 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. Neumark-Sztainer *et al.* 2004; Hammons & Fiese 2011). 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. Orrell-Valente *et al.* 2007; Berlin *et al.* 2011). 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 (Levine *et al.*, 2011); however, research findings are mixed. Distractions such as TV viewing have also been linked higher energy intake at mealtimes (e.g. Coon *et al.*, 2001) and overweight (e.g. Dubois *et al.* 2008), and further research is needed to clarify the association between fussy eating and the use of distractions.

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

Observational studies of the home mealtime environment, particularly in non-clinical groups, are rare and many studies rely on parents' reports of mealtimes

and eating behaviour (e.g. Galloway *et al.* 2003; Berlin *et al.* 2011). Whilst some studies suggest that mothers are reasonably accurate in their reports of mealtime interactions (Cooper *et al.* 2004; Farrow & Blissett 2005), others have found that maternal reports are not validated by independent observations (Haycraft & Blissett 2008) or that the accuracy of maternal reports depends on child weight (Farrow *et al.* 2011). Therefore, the present study aims to explore the relationship between observations of fussy child eating behaviour and mealtime structure. It was hypothesised that greater fussy eating behaviour would be observed in children whose mothers do not eat with them, who do not allow the child input into food choice or portion size, or who use a distraction during the meal.

Methods and materials

Participants

Seventy-five mothers (mean age = 35.94, range 26.78–45.82, SD = 4.19) participated with their children (mean age = 3.31 years, range 2.26–4.37, SD = 1.17). There were 37 boys and 38 girls. Families were recruited through advertisements distributed to nurseries, pre-schools, children centres and online parenting sites. Mothers were predominantly White British (97%), with a modal occupation of 'associate professional and technical occupations' (Office for National Statistics 2000). Maternal mean self-reported BMI was 23.83 (SD = 3.32) and mean objective, age and gender adjusted child BMI *z*-score was 0.55 (SD = 0.86), indicating a healthy BMI (Child Growth Foundation 1996).

Measures and procedure

Following ethical approval from Loughborough University's Human Participants Sub-Committee,

Key messages

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

recruitment and consent, mothers completed demographic information and mother–child dyads were observed during a typical lunch or evening meal at their home. The mealtime was recorded using a video camera whilst the researcher waited in another room. After maternal consent, children who assented were weighed and measured by the researcher using a Leicester height measure (to nearest 0.1 cm) and digital Secca scales (to the nearest 0.1 kg).

Mealtime structure and environment

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

Child eating behaviour

Mealtime duration and the total number of mouthfuls consumed by the child were recorded to calculate the child's speed of eating (mouthfuls per minute). Two subscales from the Child Mealtime Coding Scheme (CMCS; Haycraft 2007) were used to provide an index of child enjoyment of food; positive comments (e.g. 'mmm this food is yummy') and negative comments (e.g. 'I don't like it') about food made by the child. A count was made for every vocalisation made in each category during the meal. The CMCS was also used to generate an overall index of how easy or difficult the child was to feed, ranging from 1 (easy; e.g. usually autonomous feeder, eats well with little protest) to 5 (difficult; e.g. much resistance to offers of food, refusal to eat). The CMSC has been shown to have good inter-rater reliability (Haycraft 2007). A measure of food refusal was adapted from Young & Drewett's (2000) coding scheme for food refusal/rejection. To account for the fact that not all children in the sample were spoon-fed a

broader definition of food refusal was used. A count was made each time the child shook their head, turned their head away, pushed food away (either from parental prompt or around the plate), said 'no' or commented with a similar meaning, made negative comments about not wanting to consume food, spat food out or verbally or physically rejected foods on the plate.

One experienced researcher coded all of the observations. A second independent observer, who was trained on the FMCS, coded a random sample of 20% of the observations. Inter-rater reliability was assessed using intra-class correlations (McGraw & Wong 1996). The mean intra-class correlation coefficient was 0.84 (range 0.79–0.94), and the mean level of significance was $P < 0.001$. This indicates a high degree of agreement between the coders and suggests that the coding of this measure achieved good reliability.

Data analysis

Preliminary analysis of the data using Shapiro–Wilk tests and visual inspection of plots/graphs indicated the data was largely non-normally distributed; consequently non-parametric statistics were used where possible. Preliminary Spearman's two-tailed correlations revealed no significant associations between observed child eating behaviour with parent age, parent BMI and child BMI z -scores, or maternal occupation (all $P > 0.05$). Younger children were observed to refuse more foods ($r = -0.43$, $P < 0.001$) and were rated as more difficult to feed ($r = 0.41$, $P < 0.001$); however, child age was not related to child eating speed ($r = 0.17$, $P = 0.16$), positive vocalisations made about food ($r = 0.15$, $P = 0.20$) or negative vocalisations about food (-0.08 , $P = 0.47$). There were no significant associations between child age and mealtime structure; mother eating with child ($r = -0.20$, $P = 0.09$), mother eating same food as child ($r = -0.17$, $P = 0.15$), input in food choice ($r = -0.13$, $P = 0.27$) and use of distractions ($r = 0.06$, $P = 0.60$). Mann–Whitney U tests indicated no significant differences in observed child eating behaviour dependent on whether children were male or female; White or non-White; observed at lunch ($n = 39$) or evening meal ($n = 36$); and whether the father or siblings were present (all $P > 0.05$). Next,

Mann–Whitney U tests evaluated whether there were significant differences in child eating behaviour dependent on the mealtime structure and environment. The P -value was set at <0.01 to reduce the chance of type I errors.

Results

Descriptive statistics

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

Mealtime structure and observed child eating behaviour

Descriptive and Mann–Whitney U statistics for each of the observed mealtime structure variables in relation to child eating behavior are presented in Tables 2–5. Children whose mothers ate with them refused fewer foods during the meal ($U = 280.50$, $z = 3.93$, $P < 0.001$) compared with mothers who did not and were observed as being easier to feed ($U = 366.00$, $z = -2.99$, $P = 0.003$) compared with children whose mothers did not. In addition, children whose mothers ate the same food as them refused fewer foods ($U = 280.50$, $z = -3.98$,

$P < 0.001$), made fewer negative vocalisations about food ($U = 424.00$, $z = -2.58$, $P = 0.01$) and were easier to feed ($U = 354.00$, $z = -3.19$, $P = 0.001$) compared with children whose mothers who ate something different or did not eat with them.

Children who were allowed input in food choice and/or portion size refused foods less during the meal ($U = 321.00$, $z = -3.61$, $P < 0.001$), made fewer negative comments about food ($U = 326.00$, $z = -4.02$, $P < 0.001$), had a faster eating rate ($U = 321.00$, $z = -3.61$, $P < 0.001$) and were observed as being easier to feed ($U = 383.50$, $z = -2.95$, $P = 0.003$). Children who had a distraction during the meal (e.g. TV, radio, books, magazines, toys) refused foods more ($U = 140.00$, $z = -2.79$, $P = 0.005$) and made more negative vocalisations about food ($U = 160.00$, $z = -2.79$, $P = 0.005$) than those who were not distracted.

Discussion

This study aimed to explore whether there were any significant differences between observations of children's eating behaviour depending on the mealtime structure. As predicted, mealtime structure emerged as an important factor which significantly distinguished dyads with higher, compared with lower, levels of fussy child eating behaviour. Previous research with older children has highlighted the importance of family mealtimes in the development of healthy and adaptive eating (e.g. Neumark-Sztainer *et al.* 2004; White *et al.* 2013). Supporting and extending this, the present study found that children whose mothers not only ate with them but also ate the same food as them, refused fewer foods and were easier to feed compared with children whose mothers did not. This provides support for lab-based research where 2–5-year-olds accepted and ingested more of a novel food when an adult was eating a similar food, of the same colour, rather than just sitting together but not eating (Addessi *et al.* 2005) and provides further evidence that mealtime structure may play an important role in providing an opportunity for the role modelling of healthy eating. This is particularly important given that observations of maternal modelling have been found to be related to increased enjoyment of food and lower food fussiness (Palfreyman *et al.* 2015). Future research should utilise observational

Table 1. Descriptive statistics for independent observations of child eating behaviour

		Mean ($n = 75$)	SD
Child eating	Speed (mouthfuls per minute)	3.09	1.56
Behaviour	Food refusals ^a	4.52	6.55
	Difficult to feed ^f	3.67	0.98
	Positive vocalisations about food ^a	3.58	3.31
	Negative vocalisations about food ^a	1.48	2.85

SD = standard deviation. ^a=counts: frequency of occurrence across mealtime. ^f=ratings: objective rating based on mealtime – lower score reflects higher rating.

Table 2. Descriptive statistics and Mann–Whitney tests of difference: mother eating with child

	Mother eating with child (<i>n</i> = 46) Mean (SD)	Mother not eating with child (<i>n</i> = 29) Mean (SD)	Mann–Whitney <i>U</i>
Speed ^m	3.22 (1.28)	2.90 (1.90)	505.50
Food refusals ^c	2.07 (3.19)	8.07 (8.38)	280.50***
Difficulty to feed ^f	3.98 (0.78)	3.22 (1.08)	366.00**
Positive vocalisations ^c	4.17 (3.41)	2.72 (3.00)	417.50
Negative vocalisations ^c	0.67 (1.39)	2.66 (3.88)	422.00

^m=mouthfuls per minute. ^c=counts: frequency of occurrence across mealtime. ^f=ratings: objective rating based on mealtime: lower score reflects higher rating. ***P* < 0.005. ****P* < 0.001.

measures to reduce potential self-report bias (Haycraft & Blissett 2008; Farrow *et al.* 2011) and explore the interaction between mealtime structure, modelling and the mealtime atmosphere/dynamic.

Interestingly, there were no significant differences in children's eating behaviour according to whether their father or siblings were present. However, fathers were present in only 19 of the 75 mealtimes, and this sample may be underpowered to detect significant differences according to paternal presence. Future studies should

Table 3. Descriptive statistics and Mann–Whitney tests of difference: mother eating same food as child

	Mother eating same food as child (<i>n</i> = 43) Mean (SD)	Mother not eating same food as child (<i>n</i> = 32) Mean (SD)	Mann–Whitney <i>U</i>
Speed ^m	3.15 (1.31)	3.00 (1.86)	555.00
Food refusals ^c	2.12 (3.50)	7.80 (8.23)	280.50***
Difficulty to feed ^f	4.00 (0.78)	3.22 (1.06)	354.00**
Positive vocalisations ^c	4.07 (3.51)	2.90 (2.93)	471.50
Negative vocalisations ^c	0.73 (1.55)	2.50 (3.79)	424.00*

^m=mouthfuls per minute. ^c=counts: frequency of occurrence across mealtime. ^f=ratings: objective rating based on mealtime: lower score reflects higher rating. **P* < 0.01. ***P* < 0.005. ****P* < 0.001.

Table 4. Descriptive statistics and Mann–Whitney tests of difference: input in food choice

	Child input in food choice (<i>n</i> = 39) Mean (SD)	Child no input in food choice (<i>n</i> = 36) Mean (SD)	Mann–Whitney <i>U</i>
Speed ^m	3.69 (1.50)	2.39 (1.34)	321.00***
Food refusals ^c	2.03 (3.23)	7.39 (8.11)	321.00***
Difficulty to feed ^f	4.00 (0.77)	3.29 (1.07)	383.50**
Positive vocalisations ^c	3.89 (3.55)	3.21 (3.02)	549.50
Negative vocalisations ^c	0.37 (1.00)	2.76 (3.67)	326.00***

^m=mouthfuls per minute. ^c=counts: frequency of occurrence across mealtime. ^f=ratings: objective rating based on mealtime: lower score reflects higher rating. ***P* < 0.005. ****P* < 0.001.

continue to explore the role of additional family members during mealtime interactions in order to ascertain the whether their presence and behaviour during mealtimes affect child eating behaviour.

Less fussy eating was also observed in children whose mothers allowed them some autonomy in food choice. Previous research has shown that over time, given autonomy, young children tend to eat a variety of food and achieve a nutritionally adequate diet (e.g. Rolls 1986). Similarly our findings suggest that

Table 5. Descriptive statistics and Mann–Whitney tests of difference: distraction

	Distraction used (<i>n</i> = 10) Mean (SD)	Distraction not used (<i>n</i> = 65) Mean (SD)	Mann–Whitney <i>U</i>
Speed ^m	2.20 (1.53)	3.23 (1.53)	186.50
Food refusals ^c	11.00 (8.49)	3.46 (4.70)	140.00*
Difficulty to feed ^f	3.00 (1.15)	3.78 (0.92)**	180.00
Positive vocalisations ^c	2.10 (1.97)	3.82 (3.43)***	212.50
Negative vocalisations ^c	4.40 (5.00)	1.00 (2.02)	160.00*

^m=mouthfuls per minute. ^c=counts: frequency of occurrence across mealtime. ^f=ratings: objective rating based on mealtime: lower score reflects higher rating. **P* < 0.01. ***P* < 0.005. ****P* < 0.001.

autonomy in food choice or portion size is related to fussy eating behaviour. However, it is possible that the degree to which mothers allow autonomy is actually dependent on the child's eating behaviour; mothers of fussy eaters may feel the need to direct and stipulate what their child eats, in an attempt to counter their fussy, restrictive eating behaviours and improve their dietary intake. Longitudinal studies are essential in order to infer causal relationships between mealtime structure and fussy eating behaviours in children. As autonomy in food choice has emerged as an important and interesting factor, future studies should consider measuring autonomy in portion size and autonomy in food type independently to ascertain which is the most important. In addition, exploring the idea of 'choice' on a continuum, rather than a dichotomy, could provide an insight into the degree of choice that may appropriate in promoting adaptive eating behaviour in young children.

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

In summary, the results of this study indicate that more adaptive eating behaviours are seen in children where mothers eat with them and consume similar foods. Whilst this and previous evidence highlight the importance of structured family mealtimes (e.g. Cooper *et al.* 2004; Berlin *et al.* 2011), the findings in relation to child autonomy in food choice and portioning also support ideas from the feeding dynamics approach that the degree of parental control of a child's intake should be minimal (e.g. Satter 1995). It may be important for parents to strike a balance between a clear structure,

where the family eats together and distractions are minimal, and allowing children some autonomy in terms of food choice and intake. This may increase the opportunity for role modelling of healthy eating, promote more autonomous eating in the child and reduce food fussiness. Further research is needed to explore observed mealtime structure and environment in greater depth and in wider socio-demographic and ethnic groups.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Contributions

FP collected, analysed and interpreted the data, and wrote the initial draft of the manuscript. CM, CF and EH oversaw the study processes, provided statistical guidance in data analyses and assisted in the interpretation of results. All co-authors participated in manuscript preparation and critically reviewed all sections of the text for important intellectual content.

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