# *Controlling feeding practices moderate the relationship between emotionality and food fussiness in young children*

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# Controlling feeding practices moderate the relationship between emotionality and food fussiness in young children.

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**Abstract**

Emotional child temperament has consistently been found to be related to food fussiness. One factor that may exacerbate or reduce the risk conferred by children's emotionality is parent feeding practices during mealtimes. Specifically, the use of controlling feeding practices aimed at increasing food consumption may particularly affect children with an emotional temperament. The primary aim of this study was to investigate whether the association between child food fussiness and higher emotionality found in previous studies is moderated by maternal use of controlling feeding practices, namely verbal pressure, physical prompts and food rewards. Sixty-seven mother-child dyads were video-recorded during a meal in their home and mothers' use of controlling feeding practices during this meal were coded. Mothers completed a questionnaire assessing child temperament. Moderation analyses revealed that maternal use of verbal pressure and physical prompts moderated the relationship between higher emotionality and food fussiness, but maternal use of food rewards did not. These results indicate that the use of verbal pressure and physical prompts may have a particularly negative influence on fussy eating for children higher in emotionality.

*Keywords*: Food fussiness, Emotionality, Controlling feeding practices, Child, Mother, Observation

# 1 INTRODUCTION

Food fussiness, the consumption of an inadequate variety of food (Dovey, Staples, Gibson, & Halford, 2008), is a common child feeding problem associated with nutritional deficiency (Galloway, Fiorito, Lee, & Birch 2005; Tharner et al., 2014), an increased risk of being underweight (Dubois, Farmer, Girard & Peterson, 2007; Viljakainen, Figueiredo, Rounge, & Weiderpass, 2019), elevated levels of depression and anxiety (Jacobi, Schmitz, & Agras, 2008; Zucker et al., 2015) and parental stress (Goh & Jacob, 2012; Trofholz, Schulte, and Berge 2017). The development of food fussiness, like most child feeding problems, has been attributed to a combination of child and parent factors, two of which are emotional child temperament (e.g., Rendall, Dodd & Harvey, 2022) and parents' controlling feeding practices (e.g., Harris, Fildes, Mallan & Llewellyn, 2016; Jansen et al., 2017). The aim of this research was to investigate the role of these factors and their interrelationship in children's food fussiness. This is important because it can provide further insight into the characteristics and experiences of children who are fussy eaters and may yield information to support interventions for children at risk of fussy eating.

Emotional temperament, also known as negative affectivity and difficult temperament, has been described as an innate predisposition to get easily upset and distressed, characterised by high levels of mood instability, angry reactivity and irritability (Buss & Plomin, 1984; Rothbart, Ahadi, Hershey & Fisher, 2001). Previous research has demonstrated a consistent association between high emotional child temperament and food fussiness (Jacobi, Agras, Bryson & Hammer, 2003; Haycraft, Farrow, Meyer, Powell & Blissett, 2011; Powell, Farrow, & Meyer, 2011; Hafstad, Abebe, Torgersen & von Soest, 2013; Rendall et al., 2022). The association has yet to be explained, but it could be that highly emotional children are more reactive and may be reluctant to try out new and disliked foods (Kidwell, Kozikowski, Roth, Lundahl & Nelson 2018).

Parent feeding practices may also contribute to the development of children's food fussiness, specifically feeding practices considered controlling such as the use of verbal pressure, physical prompts and food rewards (Birch, Marlin & Rotter, 1984; Galloway et al., 2005; Galloway, Fiorito, Francis & Birch, 2006; Webber, Cooke, Hill & Wardle, 2010; Harris et al., 2016; Holley, Haycraft & Farrow, 2017; Jansen et al., 2017). It is suggested that the use of these feeding practices may exacerbate food fussiness by promoting dislikes for foods that parents want children to eat (Galloway et al., 2005; Newman & Taylor, 1992; Newman & Layton, 1984). Findings relating to the use of non-food rewards are not straightforward however, with some studies reporting their use to be an adaptive feeding practice increasing food acceptance (e.g., Hendy, Williams, & Camise, 2005; Wardle, Herrera, Cooke, & Gibson, 2003). This may be attributed to the positive messages about the child's competence and achievement brought about by winning or earning non-food rewards such as stickers may convey to fussy eaters (Cameron, Banko & Pierce, 2001).

Of course, parent behaviour often occurs in response to child temperament and associations between feeding practices and child temperament have been reported. For example, Hughes, Shewchuk, Baskin, Nicklas, & Qu (2008) found that parents whose children are low in negative affect are more likely to use what has been labelled an indulgent feeding style; characterised by parents making few demands on their children to eat. Additionally, parents who perceived their children to be high in negative affectivity have been found to be more likely to use pressure and restriction (Horn, Galloway, Webb & Gagnon, 2011; Haycraft & Blissett, 2012). Further, mothers of infants scoring higher on difficult temperament reported using more food rewards (Stifter, Anzman-Frasca, Birch & Voegtline, 2011; McMeekin, Jansen, Mallan, Nicholson et al., 2013).

It has been suggested that there may be an interaction between these different aspects of children's eating, with parents' use of negative feeding practices affecting emotional children's risk for fussy eating (Hafstad et al., 2013; Haycraft et al., 2011). Mealtimes can be a challenging time in early childhood as this is the period where children are expected to transition to adult food and are likely faced with new food experiences that elicit different reactions that vary from child to child (Mayeaux, Donovan, Lee, & Moskowitz, 2010). Children with high emotional temperaments are easily distressed and react intensely to situations that arouse anger and challenge them. Reactions are typically characterised by intense crying, hiding, temper tantrums and shrinking back (Buss & Plomin, 1984). Persuading children with high emotional temperament to try new foods or foods which they deem as less palatable may be met with intense reactions from such children. If these reactions are interpreted as inappropriate or rebellious by parents, it could result in parents using controlling feeding practices to encourage food consumption which could, in turn, could result in struggles between parents and their child during mealtimes and an increased reluctance to try foods. Through this process, children with emotional temperaments may be particularly likely to be fussy if their parent responds with the use of controlling feeding practices.

Research has begun to explore associations between food fussiness, emotional temperament and parental feeding practices, specifically investigating whether parents' feeding practices influence the association between emotional temperament and food fussiness. A recent study (Kidwell et al., 2018) investigated whether the relationship between emotional temperament and food fussiness is moderated by parents' use of two parent feeding practices. One, the use of food rewards and the other, emotional feeding which is the practice of using food to comfort or distract children even when they are not hungry (Wardle, Sanderson, Guthrie, Rapoport & Plomin, 2002). It was found that parents reported using

more food rewards and emotional feeding with highly emotional children. It was also found that emotional feeding moderated the relationship between emotional temperament and food fussiness; the relationship between emotional temperament and food fussiness was significant when parents reported using moderate and high levels of emotional feeding but non-significant with low levels of emotional feeding. Use of food rewards, however failed to moderate the relationship between emotional temperament and food fussiness.

This study aims to further examine the interplay between children's food fussiness, emotionality and parents' use of controlling feeding practices; to further explore associations between controlling feeding practices and food fussiness and to investigate whether the relationship between children's emotional temperament and food fussiness is moderated by maternal use of controlling practices. The focus will be on the use of controlling feeding practices (use of verbal pressure, physical prompts and food rewards) implicated in the development of food fussiness (e.g., Galloway et al., 2005, 2006; Webber et al., 2010; Harris et al., 2016; Jansen et al., 2017). Unlike the majority of studies that have assessed feeding practices through parent-report, this study will adopt an observational approach. While parent reports of feeding interactions are considered to be relatively accurate (e.g., Whelan & Cooper, 2000; Cooper et al., 2004) given parents have the opportunity to observe their children's eating behaviours and are well informed, there is evidence that parents under-report their use of certain practices and/or may have limited awareness of their own behaviour (Melby et al., 1998; Bergmeier, Skouteris, & Hetherington, 2015). Observational research using structured coding schemes is therefore important as it offers a more objective way of capturing parent behaviour, which can complement research using parent-report.

Our primary hypothesis and focus was that the association between emotionality and fussy eating will be stronger when more controlling feeding practices of verbal pressure, physical prompts and food rewards are used than when fewer of these practices are used. In addition,

we examined whether previous findings were replicated by examining the following hypotheses: i) emotional temperament will be positively associated with food fussiness; ii) emotional temperament will be positively associated with maternal use of verbal pressure, physical prompts and food rewards; iii) maternal use of verbal pressure, physical prompts and food rewards will be positively associated with food fussiness; and iv) maternal use of non-food rewards will be negatively associated with food fussiness.

## 2 METHOD

Ethical approval for this study was obtained from the local Research Ethics Committee (UREC 15/43/KH).

### *2.1 Participants*

Sixty-seven mother-child pairs took part in this study. Data from these participants is also included in another study (Rendall, Dodd & Harvey, 2020). It focused on children aged two to four years as this age range has been found to be associated with increased parent perception of child food fussiness (Carruth et al., 2004; Hafstad et al., 2013). Previous research in this area have found that few fathers participate in research of this kind (see Patrick & Nicklas, 2005; Holley et al., 2017). It was therefore decided to only invite mothers to participate, to avoid the methodological limitation of having a mixed sex parental group, but insufficient fathers for sub-group analysis. We acknowledge that this limits the conclusions we can draw from this study and discuss the implications of the decision below. The mean age of children who participated was 3 years (S.D = 1 year) and the sample was comprised of 39 girls and 28 boys. Mothers' age ranged from 22 to 45 years (M = 36 years; S.D = 5 years); most were well-educated (65.7% had an undergraduate or postgraduate degree), the majority described themselves as white British (80.6%) (OPCS; 2003) and almost all were living with a spouse/partner (92.5%).

Children were excluded if they met the following exclusion criteria: (1) children whose

mothers reported diagnosed nut allergies or lactose intolerance as the foods selected for the mealtime observation could contain nuts and dairy; (2) children whose mothers reported atypical development or failure to meet developmental milestones as developmental disorders may result in unusual eating habits due to motor problems and/or sensory difficulties.

### *2.2 Measures*

In addition to providing background information on child's age and sex (male or female) as well as on maternal ethnicity, marital status, education and age, mothers also completed the following questionnaires.

#### *2.2.1 Children's Eating Behaviour Questionnaire- Food Fussiness Subscale (CEBQ FF; Wardle, Guthrie, Sanderson & Rapoport, 2001).*

The CEBQ FF was used to assess mother's perception of their child's food fussiness. The subscale consists of six statements which evaluate whether the child eats a variety of foods, the child's interest in new foods and how difficult the child is to please with meals e.g., *my child decides he/she doesn't like a food, even without tasting it.* Three of the six statements which allude to food acceptance, e.g., "*my child is interested in tasting food he/she hasn't tasted before"* are reverse coded. Respondents rate on a 5-point Likert scale (1= never, 5= always) how applicable each statement is to their child. Mean scores were computed, ranging from one to five, with higher scores reflecting greater child food fussiness. The CEBQ FF has been demonstrated as having high reliability with a Cronbach's alpha value of .91 (Wardle et al, 2001) and has been found to correspond to behavioural measures of children's food rejection and acceptance behaviours (Rendall et al., 2020). For the current sample, Cronbach's alpha for food fussiness was 0.94.

### *2.2.2 Emotionality Activity Sociability Scale (EAS; Buss & Plomin, 1984).*

The EAS is made up of 20 statements assessing four dimensions of children's temperament, emotionality, activity, sociability and shyness. The emotionality subscale of the EAS was used to measure emotional child temperament in the current study. This subscale comprises of 5 items to assess children's tendency to become easily and intensely aroused e.g. "*my child cries easily"*. Respondents are asked to rate on a 5-point Likert scale (1= not characteristic or typical of your child to 5 = very characteristic or typical of your child) how well these statements described their child's behaviour. Mean scores were calculated and ranged from one to five, with higher scores indicating that the trait is more typical of the child. The EAS has been found to have good internal reliability with alpha values exceeding 0.70 (Ganiban, Saudino, Ulbricht, Neiderhiser, & Reiss, 2008; Saudino, McGuire, Reiss, Hetherington, & Plomin, 1995) and high test-retest correlations (Goodyer, Ashby, Altham, Vize, & Cooper, 1993). For the current sample, Cronbach's alpha for emotionality was 0.74.

### *2.2.3 The Family Mealtime Coding System (FCMS; Haycraft & Blissett, 2008).*

The FMCS was used to assess the controlling feeding practices that mothers used during the mealtime observation. The FMCS is an observational measure based on the Child Feeding Practices subscales (CFQ; Birch et al., 2001) of pressure to eat and restriction. The FMCS comprises four subscales: pressure to eat, restriction of consumption, use of physical prompts and use of incentives/rewards. This study made use of three subscales of the FMCS: pressure to eat, use of physical prompts and use of rewards/incentives. In the present study, use of rewards/incentives was divided into use of food rewards and non-food rewards. Restriction is described in the FMCS as limiting the child's consumption of particular foods e.g., *"you can't have any cake"* or by restricting the amount of food the child is allowed to consume,

e.g., *"you can't have any more biscuits*". Restriction as described by the FMCS refers to overt restriction demonstrated during mealtimes and not to the covert control of portion sizes or what the child consumes. Due to the design of this study, children were provided with a typical meal comprising of four food items at age-appropriate portion sizes, overtly restricting the type or amount of food the child consumed during the mealtime, therefore the fourth subscale, restriction of consumption, was not expected to be observed and was not assessed. Mothers could covertly control the order in which food items were presented to their children, however, for example choosing to offer dessert after the child had tried the other food items. The FMCS assesses the frequency of the feeding practices used by parents during mealtimes which are described briefly below:

### *2.3 Procedure*

The study's procedure has been described in detail elsewhere (see Rendall et al., 2020). In brief, mothers completed the EAS, CEBQ FF, FMCS and demographic questionnaires prior to a mealtime observation. Ahead of the observation, mothers were emailed a food checklist consisting of nineteen foods that children will either find appealing or unappealing based on the characteristics of foods reported by parents of fussy eaters as being consistently avoided or preferred (Boquin, Smith-Simpson, Donovan, & Lee, 2014). For each food, mothers were asked to indicate whether their child was likely to find the food familiar and appealing, familiar and unappealing, unfamiliar and appealing or unfamiliar and unappealing. This was to ensure that children participating in the study were offered a meal that consisted of liked and disliked and familiar and unfamiliar foods. Children were observed in their homes during a typical meal which consisted of four food items, two of which were familiar (appealing and unappealing) and two of which were unfamiliar (appealing and unappealing), based on mothers' responses on the food checklist. A video camera was used to capture the child's

eating behaviour during the meal which was placed on a tripod and positioned in the dining area. Mothers were asked to behave as they usually would during a typical meal, for example, encouraging their child to eat if that is what they would typically do.

### *2.4 Observation Coding Scheme*

Video recordings of mother-child dyads during the mealtime were coded offline by the researcher (SR) using the Observer XT9 Software (http://www.noldus.com/human-behaviourresearch/products/theobserver-xt-90). A coding scheme adapted from the FMCS was defined which included a detailed description of the controlling feeding practice to be coded from the video recordings (Table 1 in supplementary material). The following variables were coded from video-taped observations of parent-child interaction whilst the child ate a meal provided for the purposes of the research study:

#### *2.4.1 Use of verbal pressure*

These are verbal encouragements from the parent to the child to persuade him/her to consume more food and includes vocalisations such as "*try some more of the soup*" or "*have some more broccoli".*

#### *2.4.2 Use of Physical Prompts*

These are the parent's use of physical movements to encourage the child to consume more food including strategies such as pushing a plate of food towards the child, placing the food on a fork/spoon ready for the child to pick up and eat or feeding the child.

#### *2.4.3 Use of incentives/rewards*

These are the parent's use of verbal incentives or bribes to encourage and increase the child's food consumption. These can either be food or non-food rewards/incentives. For

example, "*if you eat your peas, you can have your favourite pudding"* or *"mummy will let you play for an hour longer if you eat your peas*".

Each feeding practice was assigned a keyboard key and every time it was observed in the video recording, it was scored by pressing the corresponding keyboard key. A second coder was trained by SR to correctly identify behaviours from the videos based on the coding scheme. The second coder was trained until interrater reliability reached 90% (Cohens $k$ = 0.896, $p < 0.01$). The second coder subsequently coded 25% of the videos with the percentage agreement between coders ranging from 82 - 96%, an indication that coding achieved a high reliability**.**

### *2.5 Data Analysis*

The hypotheses and the data analytic plan were made prior to data collection and all data driven analyses are clearly identified and discussed accordingly. To test our hypotheses, moderated regression analyses were used to determine whether the relationship between food fussiness and emotionality is moderated by controlling feeding practices. Correlation analyses were then used to investigate associations between food fussiness, emotionality and controlling feeding practices. Data were analysed using the Statistical Package for Social Sciences (SPSS), version 24. Descriptive statistics for Food Fussiness, emotionality and controlling feeding practices are shown in Table 1. An examination of the normal probability plot and the histogram revealed the study variables to be skewed and non-normally distributed. This was further confirmed by significant Shapiro-Wilk's tests for normality on all variables making the data set unsuitable for parametric analysis. Log, reciprocal and square root transformations failed to improve the distribution of the variables therefore, bootstrapped analyses generating 95% bias- corrected bootstrapped confidence intervals of correlation coefficients (1000 samples, N =67) were used where possible. Confidence

Intervals will be reported for significant bootstrapped correlations. The data were screened for assumptions made by regression analyses. Acceptable tolerance values in the collinearity statistics table (values < 0.1) indicated no significant multicollinearity. Preliminary two-tailed bootstrapped Pearson's correlations and independent samples t-tests were conducted to assess whether continuous and dichotomous child and maternal sociodemographic factors were related to food fussiness, emotionality and feeding practices. Significance levels were set at $p < .05$. There was a significant positive correlation between child age and use of verbal pressure ($r = .338$, CI $^{95\%}$ .13 – .55, $p < .001$). Mothers used more verbal pressure with older children. Mothers who were married or living with their partners used fewer food rewards ($M = 3.8$, $SE = .34$) than single mothers ($M = 7.2$, $SE = 1.8$), $t(65) = 1.83$, $p < 0.05$. Child age and [1]marital status were therefore controlled for in all analyses (non-significant findings between study and sociodemographic variables are presented in Tables 2 and 3 in the supplementary material).

## 3 RESULTS

### *3.1 Descriptive Statistics*

Table 1 shows the descriptive data for CEBQ FF, EAS and FMCS. Mean scores on the CEBQ FF subscale for children in this sample are similar to those obtained from previous studies that have used this measure with a similar age group (e.g., Debarse et al., 2016; Rendall et al., 2020). Mean scores for emotional temperament measured using the EAS for children in this sample are slightly higher than the mean scores obtained from a previous study (e.g., Haycraft & Blissett, 2012) but are comparable with mean scores for emotionality obtained by previous studies with a similar age -group (e.g., Hafstad et al., 2013; Pliner & Loewen, 1997). Mean scores on the use of verbal pressure and physical prompts observed

[1] The results were consistent even when marital status was not controlled for.

from mothers in this sample using the FMCS are similar to the mean scores obtained from a previous study who used this measure with mothers of young children with a similar age group (e.g., Haycraft, Farrow & Blissett, 2013). In this study mothers' use of incentives using was divided into the use of food and non-food rewards. However, when data were combined for comparison with the use of incentives in other studies, the FMCS mean of this feeding practice was considerably higher compared to the FMCS mean for mothers' use of incentives in previous studies (e.g., Haycraft & Blissett, 2008; Haycraft et al., 2013).

[Table 1 here]

### *3.2 Moderated analyses exploring moderated effects of controlling feeding practices on the relationship between food fussiness and emotionality*

To test hypothesis (i), bootstrapped moderation analyses using PROCESS macro version 3.3 (Hayes, 2019) were used to determine whether the relationship between food fussiness and emotionality is moderated by controlling feeding practices. Three separate bootstrapped moderation analyses were conducted to test the hypothesis that emotionality is more strongly associated with child food fussiness when more controlling feeding practices are used, namely verbal pressure, physical prompts and food rewards. Significance levels were set at $p < 0.05$. Before performing moderation analyses, to avoid multicollinearity between the interaction variable with either the predictor or moderator, these variables were centred by subtracting the means from the individual scores and an interaction variable was created from the product of the centred variables. In each analysis, the dependent variable was food fussiness. Child age and marital status were entered in step 1 to control for their effects, the predictor (centred emotionality) and the moderator (centred controlling feeding practice) were entered in step 2 while an interaction variable derived from the product of the centred predictor and the centred moderator was entered in step 3. Moderation effects are indicated

when the interaction variable entered in step 3 is significant after controlling for the main effects of the predictor and moderator in step 2. Where there are moderation effects, PROCESS macro investigates the interaction by testing the conditional effects of the predictor at three levels of the moderator: one standard deviation below the mean (low), at the mean (average) and one standard deviation above the mean (high).

### *3.2.1 Use of verbal pressure*

Mothers use of verbal pressure significantly moderated the positive relationship between emotionality and food fussiness (B = .05, t = 2.31, $CI^{95\%}$ .002 - .096, $p < 0.05$) as indicated in Figure. 1. The relationship between food fussiness and emotionality was significant when mothers used average (B = 0.31, t = 4.33, $p < 0.01$) or greater (B = 0.48, t = 4.79, $p < 0.001$) pressure during mealtimes. The relationship between food fussiness and emotionality, however, was not significant when maternal use of verbal pressure during mealtimes was low (B = 0.14, t = 1.42, p = .160).

[Figure 1 here]

### *3.2.2 Physical Prompts*

Mothers use of physical prompts also significantly moderated the positive relationship between emotionality and food fussiness (B = .06, t = 2.14, $CI^{95\%}$ .01 - .13, $p < 0.05$) as indicated in Figure. 2. The relationship between food fussiness and emotionality was significant when mothers used average (B = 0.16, t = 1.59, $p < 0.01$) or greater (B = 0.40, t = 2.66, $p < 0.01$) physical prompts during mealtimes. The relationship between food fussiness and emotionality, however, was not significant when maternal use of physical prompts during mealtimes was low (B = -.07, t = -.68, p = .499).

[Figure 2 here]

### *3.2.3 Use of food rewards*

Mothers use of food rewards did not moderate the relationship between food fussiness and emotionality. (See Table 4 in Supplementary materials for results).

### *3.3 Correlations between food fussiness, emotionality and controlling feeding practices*

To test hypotheses (ii) bootstrapped Pearson's partial correlations controlling for child age and marital status were used to investigate associations between food fussiness, emotionality and feeding practices. An alpha of $p < 0.05$ was used to indicate statistical significance. As shown in Table 2, food fussiness was significantly positively correlated with emotionality. Emotionality was significantly positively related to maternal use of verbal pressure, physical prompts and food-rewards. Food fussiness was also significantly positively correlated with maternal use of verbal pressure, physical prompts and food-rewards and negatively correlated with the use of non-food rewards.

[Table 2 here]

## 4 DISCUSSION

The aim of this study was to further explore associations between controlling feeding practices and food fussiness and to investigate whether the relationship between children's emotional temperament and food fussiness is moderated by maternal use of controlling feeding practices namely; verbal pressure, physical prompts and food rewards. The key finding of this paper is that consistent with our first hypothesis, independent observations of maternal use of verbal pressure and physical prompts moderated the relationship between

emotional temperament and child food fussiness. The relationship between emotional temperament and food fussiness was significant when mothers used more verbal pressure and physical prompts but was not significant when mothers used fewer verbal pressure and physical prompts. Contrary to predictions, independent observations of maternal use of food rewards did not moderate the relationship between food fussiness and emotional temperament. This different pattern for food rewards may provide some insight into the reasons that verbal pressure and physical prompts are associated with food fussiness in children with emotional temperaments. It is plausible that the emotional tone of mealtimes may be a crucial factor in determining how fussy or not a child becomes. Mothers of infants who reported greater mealtime negativity have been observed to be more controlling, experienced more conflict with their children, who in turn were observed to be less emotionally positive and consumed less food (Farrow & Blissett, 2006). Mealtimes are likely to be emotionally charged for children with high emotional temperaments and as a result, they may be more difficult to feed, however using verbal pressure and physical prompts to encourage food consumption may exaggerate emotional reactivity, cause a power struggle, make the tone of the mealtime more negative, and increase the likelihood of negative associations with food and increased food fussiness. Rewards, on the hand, may not have this same negative effect on mealtimes explaining why food rewards failed to moderate the relationship between food fussiness and higher emotionality. This interpretation is supported by contrasting findings showing that positive mother-child interactions result in “smooth-flowing” mealtimes characterised by fewer power struggles and healthier dietary self-regulation (Demir et al., 2012). Lack of finding of a moderating effect of food rewards on the relationship between food fussiness and emotional temperament could also be attributed to the low frequency of food rewards during the observed mealtime.

Supporting our second hypothesis, higher emotionality was associated with greater food fussiness and with maternal use of greater levels of verbal pressure, physical prompts and food-rewards which is consistent with previous research (e.g., Horn et al., 2011; Haycraft et al, 2011; Powell et al., 2011; Haycraft & Blissett, 2012; McMeekin et al., 2013; Hafstad et al., 2013). Our effect sizes, however, for correlations between observed pressure and food rewards with emotionality are slightly larger than has been reported in previous research using parent report. In addition, more verbal pressure, physical prompts and food rewards were associated with greater child food fussiness while maternal use of non-food rewards was significantly negatively associated with child food fussiness which are also consistent with previous research (e.g., Birch, Marlin, & Rotter, 1984; Stark, Collins, Osnes, & Stokes, 1986; Vereecken, Keukelier, & Maes, 2004; Galloway et al., 2005; Harris et al., 2016; Jansen et al., 2017; Holley et al., 2017). Similarly, effect sizes for correlations between observed pressure and food rewards with food fussiness are slightly larger than has been reported in previous research using parent report. Maternal feeding practices may occur as a response to children's emotional temperament and emotional expression during mealtimes. Children with an emotional temperament are more likely to display strong negative emotion and to be more emotionally volatile and to be fussy eaters. It is reasonable to assume that children with high emotionality therefore express strong emotions and distress during mealtimes and may refuse to eat certain foods. These emotions and behaviours may elicit controlling feeding practices such as verbal pressure, physical prompts and rewards from mothers during mealtimes.

The different effects found for verbal pressure, physical prompts and food rewards, which are associated with more fussiness, and non-food rewards, which are associated with less fussiness, may be driven by the extent to which these practices create conflict during mealtimes, which may exacerbate food fussiness. The use of food rewards is less likely to create conflict but may affect fussiness due to over justification effects. Previous research has

demonstrated that the use of food rewards with fussy eaters often leads to a preference for the foods used as the reward and a decrease in liking for the rewarded foods (Birch et al. 1984; Newman & Taylor, 1992).This has been attributed to what is termed 'over justification effects' (e.g., Newman & Taylor, 1992; Newman & Layton, 1984) whereby when parents "bribe" fussy eaters to consume a disliked food, then it reinforces their perception that the rewarded food is less palatable than the food being used as a reward, resulting in decreased liking for the rewarded food. It has been suggested that non-food rewards may convey positive messages about the child's competence and achievement (Cameron et al., 2001). Fussy eaters may view non-food rewards such as stickers as a prize to be won which could encourage food acceptance as they are likely to feel a sense of accomplishment after they have won a particular "prize" for consuming a novel or disliked food.

Given that child temperament is an inherent characteristic which is not amenable to change whereas parents feeding practices are modifiable, the finding that feeding practices moderated the relationship between emotionality and food fussiness may be used to inform future interventions aimed at increasing food consumption and dietary variety in fussy eaters. Future interventions may be better targeted at educating parents of children high in emotionality on the detrimental effects of controlling feeding practices and to enable parents to use more adaptive feeding practices such as modelling, positive reinforcement and repeated exposure that have been shown to be associated with healthy eating behaviours. A few interventions based on these principles have previously been evaluated, although their long-term benefits on food fussiness is unknown. For example, the "Fun not Fuss with Food" programme (Fraser, Wallis & John, 2004) which educated parents on the use of adaptive feeding practices such as modelling and positive reinforcement resulted in a significant reduction in food fussiness. Similarly the "fun with food" educational programme (Haywood & McCann, 2009) which instructed parents not to use pressuring feeding strategies resulted in

an increase in the range of foods accepted by fussy eaters. Importantly, our results suggest that changing parental feeding practices is unlikely to lead to improvements in food fussiness for children who have a low emotionality temperament style.

While our interpretations of the study findings are plausible, the conclusions are impeded by the cross-sectional design of this study. The proposed model, of the risk of fussy eating conferred by emotional temperament being exaggerated in the context of controlling feeding practice, is consistent with the findings. Nevertheless, it is also possible that food fussiness causes mothers to use more controlling feeding practices, particularly in children with emotional temperaments. Future research using longitudinal designs could clarify the temporal precedence of child food fussiness and maternal feeding practices.

Caution should be taken in generalising the findings of this study as White British and highly educated mothers from two-parent households were over-represented in our sample as is typical of research in this field (e.g., Powell et al., 2011; Holley et al., 2017). Feeding practices used by mothers vary by ethnicity, education, and socio-economic status (e.g., Sherry et al., 2004; Vereecken et al., 2004; Cardel et al., 2012; Wehrly, Bonilla, Perez, & Liew, 2014). Therefore, future replications that include greater numbers of mothers from other ethnic and socio-economic groups would help establish if these findings can be generalised across UK populations. It should also be noted that findings are limited to mothers as fathers were not included in this study.

As this study used observation methods and mothers knew that mealtimes were being recorded, this may have introduced some social desirability bias. It is also plausible that mothers may have been uncomfortable and/or anxious about being video-recorded. Both of these factors may have influenced mothers' behaviour and their use of some feeding practices. It therefore possible that what we observed was not an entirely accurate reflection of typical behaviour. This limitation applies to all observational research where the

participants know they are being recorded but one approach in future research, where resources allow, would be to conduct repeated observations of mothers feeding practices which may help reduce behaviour that is not typical and improve ecological validity.

An important point to consider in maternal use of controlling feeding practices is mothers' psychopathology which was not measured in this study. Previous research has demonstrated that maternal symptoms of depression, anxiety and stress has an impact on how mothers interact with their children resulting in the use of less sensitive and more controlling feeding strategies during mealtimes to cope with their children's fussy eating (e.g., Gordon, 2003; Hurley, Black, Papas, & Caulfield, 2008; Mitchell, Brennan, Hayes & Miles, 2009).

While independent observation of mothers' feeding practices in their own homes was a significant strength of this study as it allowed for a first-hand experience of real time overt behaviour that was not reliant on self-report, emotionality and food fussiness relied on parent-report methods, which is a limitation that could be addressed in future research.

The results contribute to the literature by advancing the understanding of the associations between children's emotional temperament, parents' use of controlling feeding practices and food fussiness. This study is the first to demonstrate the moderating role of verbal pressure and physical prompts in the relationship between children's emotional temperament and food fussiness. Overall, the findings suggests that while emotional temperament may potentially be a risk factor for the development of children's food fussiness, the feeding practices that mothers use during mealtimes may ultimately determine if such children become fussy eaters.

## 5 CONCLUSION

This study investigated the association between emotional temperament, parents' controlling feeding practices and food fussiness and extended previous research by observing parent's use of controlling feeding practices. The findings highlight the negative influence of

the use of controlling feeding practices with children high on emotionality, future interventions should be aimed at developing effective feeding strategies to prevent the development of food fussiness in these children.

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CRediT authorship contribution statement

**Stella Rendall**: Conceptualization, Methodology, Software, Formal analysis, Investigation, Visualization, Resources, Writing- Original Draft. **Helen Dodd:** Project administration, Conceptualization, Supervision, Writing- Review & Editing. **Kate Harvey**: Project administration, Conceptualization, Supervision, Writing- Review & Editing.

REFERENCES

Bates, J. E., Pettit, G. S., Dodge, K. A., & Ridge, B. (1998). Interaction of temperamental resistance to control and restrictive parenting in the development of externalizing behavior. *Developmental Psychology*, *34*(5), 982–995. https://doi.org/10.1037/0012-1649.34.5.982

Bergmeier, H., Skouteris, H., & Hetherington, M. (2015). Systematic research review of observational approaches used to evaluate mother-child mealtime interactions during preschool years. *American Journal of Clinical Nutrition*, *101*(1), 7–15. https://doi.org/10.3945/ajcn.114.092114

Birch, L. L., Marlin, D. W., & Rotter, J. (1984). Eating as the "Means" Activity in a Contingency: Effects on Young Children's Food Preference. *Child Development*, *55*(2), 431–439. https://doi.org/10.2307/1129954

Birch, L L, Fisher, J. O., Grimm-Thomas, K., Markey, C. N., Sawyer, R., & Johnson, S. L. (2001). Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite*,

*36*(3), 201–210. https://doi.org/10.1006/appe.2001.0398

Brann, L.S. & Skinner, J.D. (2005). More controlling child feeding practices are found among parents of boys with an average body mass index compared with parents of boys with a high body mass index. *Journal of the American Dietetic Association, 105 (9), 1411-1416.*

Buss, A. H., & Plomin, R. (1984). Theory and measurement of EAS. *Temperament: Early Developing Personality Traits*, 98–130.

Cameron, J., Banko, K. M., & Pierce, W. D. (2001). Pervasive negative effects of rewards on intrinsic motivation: The myth continues. *The Behavior Analyst*, *24*(1), 1–44.

Cardel, M., Willig, A. L., Dulin-Keita, A., Casazza, K., Beasley, T. M., & Fernández, J. R. (2012). Parental feeding practices and socioeconomic status are associated with child adiposity in a multi-ethnic sample of children. *Appetite*, *58*(1), 347–353.

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. https://doi.org/10.1192/bjp.184.3.210

de Barse, L. M., Cano, S. C., Jansen, P. W., Jaddoe, V. V. W., Verhulst, F. C., Franco, O. H., … Tharner, A. (2016). Are parents' anxiety and depression related to child fussy eating? *Archives of Disease in C*hildhood *101*(6*), 533-538.* https://doi.org/10.1136/archdischild-2015-309101

Demir, D., Skouteris, H., Dell'Aquila, D., Aksan, N., McCabe, M. P., Ricciardelli, L. A., … Baur, L. A. (2012). An observational approach to testing bi-directional parent-child interactions as influential to child eating and weight. *Early Child Development and Care*, *182*(8), 943–950. https://doi.org/10.1080/03004430.2012.678591

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*.

https://doi.org/10.1016/j.appet.2007.09.009

Dubois, L., Farmer, A. P., Girard, M., & Peterson, K. (2007). Preschool children's eating behaviours are related to dietary adequacy and body weight. *European Journal of Clinical Nutrition*, *61*(7), 846–855. https://doi.org/10.1038/sj.ejcn.1602586

Farrow, C.V., & Blissett. J. (2006). Breast-feeding, maternal feeding practices and mealtime negativity at one year. *Appetite*, 46 (1), 49-56.

Farrow, C. V., Galloway, A. T., & Fraser, K. (2009). Sibling eating behaviours and differential child feeding practices reported by parents. *Appetite*, *52*(2), 307–312.

Fox, N. A. (1989). Psychophysiological correlates of emotional reactivity during the first year of life. *Developmental Psychology*, *25*(3), 364-372.

Fraser, K., Wallis, M., & John, W. S. (2004). Improving children's problem eating and mealtime behaviours: An evaluative study of a single session parent education programme. *Health Education Journal*, *63*(3), 229–241. https://doi.org/10.1177/001789690406300304

Galloway, A.T, Fiorito, L., Francis, L.A, & Birch, L.L. (2006). "Finish your soup": Counterproductive effects of pressuring children to eat on intake and affect. *Appetite,* 46:318-323.

Galloway, A. T., Fiorito, L., Lee, Y., & Birch, L. L. (2005). Parental pressure, dietary patterns, and weight status among girls who are "picky eaters." *Journal of the American Dietetic Association*, *105*(4), 541–548. https://doi.org/10.1016/j.jada.2005.01.029

Ganiban, J. M., Saudino, K. J., Ulbricht, J., Neiderhiser, J. M., & Reiss, D. (2008). Stability and change in temperament during adolescence. *Journal of Personality and Social Psychology*, *95*(1), 222-236.

Goh, D. Y., & Jacob, A. (2012). Perception of picky eating among children in Singapore and its impact on caregivers: a questionnaire survey. *Asia Pacific Family Medicine*, *11*(1), 5. https://doi.org/10.1186/1447-056X-11-5

Goodyer, I. M., Ashby, L., Altham, P. M. E., Vize, C., & Cooper, P. J. (1993). Temperament and major depression in 11 to 16 year olds. *Journal of Child Psychology and Psychiatry*, *34*(8), 1409–1423.

Gordon, M. (2003). Roots of empathy: Responsive parenting, caring societies. *The Keio Journal of Medicine*, *52*(4), 236–243.

Hafstad, G. S., Abebe, D. S., Torgersen, L., & von Soest, T. (2013). Picky eating in preschool children: The predictive role of the child's temperament and mother's negative affectivity. *Eating Behaviors*, *14*(3), 274–277. https://doi.org/10.1016/j.eatbeh.2013.04.001

Harris, Fildes, Mallan & Llewellyn (2016). Maternal feeding practices and fussy eating in toddlerhood: a discordant twin analysis. *International Journal of Behavioural Nutrition and Physical Activity*, 13 (1), 81-90. https://doi.org/10.1186/s12966-016-0408-4

Haycraft, E. L., & Blissett, J. M. (2008). Maternal and Paternal Controlling Feeding Practices: Reliability and Relationships With BMI. *Obesity*, *16*(7), 1552–1558. https://doi.org/10.1038/oby.2008.238

Haycraft, E.L., & Blissett, J. (2008). Controlling feeding practices and psychopathology in a non-clinical sample of mothers and fathers. *Eating Behaviors*, *9*(4), 484–492. https://doi.org/10.1016/j.eatbeh.2008.07.007

Haycraft, E.L., Farrow, C., Meyer, C., Powell, F., & Blissett, J. (2011). Relationships between temperament and eating behaviours in young children. *Appetite*, *56*(3), 689–692. https://doi.org/10.1016/j.appet.2011.02.005

Haycraft, E.L. & Blissett, J. (2012). Predictors of maternal and paternal controlling feeding practices with 2- 5 year old children. *Journal of Nutrition Education and Behaviour, 44 (5), 390-397.*

Haycraft, E.L., Farrow, C. & Blissett, J. (2013). Maternal symtoms of depression are related to observations of controlling feeding practices in mothers of young children. *Journal*

*of Family Psychology, 27 (1), 159-164.*

Hayes, A. F. (2019). *The PROCESS macro for SPSS and SAS (version 3.3) from https://processmacro.org/download/html, Accessed 12 February, 2019.*

Haywood, P., & McCann, J. (2009). A Brief Group Intervention for Young Children with Feeding Problems. *Clinical Child Psychology and Psychiatry*, *14*(3), 361–372. https://doi.org/10.1177/1359104509104046

Horn, M. G., Galloway, A. T., Webb, R. M., & Gagnon, S. G. (2011). The role of child temperament in parental child feeding practices and attitudes using a sibling design. *Appetite*, *57*(2), 510–516. https://doi.org/10.1016/j.appet.2011.06.015

Hughes, S. O., Shewchuk, R. M., Baskin, M. L., Nicklas, T. A, & Qu, H. (2008). Indulgent feeding style and children's weight status in preschool. *Journal of Developmental and Behavioral Pediatrics : JDBP*, *29*(5), 403–410. https://doi.org/10.1097/DBP.0b013e318182a976

Hurley, K. M., Black, M. M., Papas, M. a, & Caulfield, L. E. (2008). Maternal symptoms of stress, depression, and anxiety are related to nonresponsive feeding styles in a statewide sample of WIC participants. *The Journal of Nutrition*, *138*(4), 799–805. https://doi.org/138/4/799

Jacobi, C., Agras, W. S., Bryson, S., & Hammer, L. D. (2003). Behavioral validation, precursors, and concomitants of picky eating in childhood. *Journal of the American Academy of Child and Adolescent Psychiatry*, *42*(1), 76–84. https://doi.org/10.1097/00004703-200306000-00025

Jacobi, C., Schmitz, G., & Agras, W. S. (2008). Is picky eating an eating disorder? *International Journal of Eating Disorders, 41, 626-634.* https://doi.org/10.1002/eat.20545

Jansen, P. W., de Barse, L. M., Jaddoe, V. W. V., Verhulst, F. C., Franco, O. H., & Tiemeier, H. (2017). Bi-directional associations between child fussy eating and parents'

pressure to eat: Who influences whom? *Physiology & Behavior*, 176, 101-106. https://doi.org/10.1016/j.physbeh.2017.02.015

Kidwell, K.M., Kozikowski, C., Roth, T., Lundahl, A., & Nelson, T.D. (2018). Concurrent and longitudinal associations among temperament, parental feeding styles and selective eating in a preschool sample. *Journal of Paediatric Psychology, 43 (5), 572-583.*

Mayeaux, M., Donovan, S., Lee, S.-Y., & Moskowitz, H. (2010). Defining Perceptions of Picky Eater Children by Conjoint Analysis. *Journal of Nutrition Education and Behaviour*, *42*(4), S77.

McMeekin, S., Jansen, E., Mallan, K., Nicholson, J., Magarey, A., & Daniels, L. (2013). Associations between infant temperament and early feeding practices. A cross-sectional study of Australian mother-infant dyads from the NOURISH randomised controlled trial. *Appetite, 60* (1), 239-245. https://doi.org/10.1016/j.appet.2012.10.005

Melby, J., Conger, R., Book, R., Rueter, M., Lucy, L., Repinski, D., … Scaramella, L. (1998). The Iowa Family Interaction Rating Scales. Ames: Iowa State University.

Mitchell, S., Brennan, L., Hayes, L., & Miles, C. L. (2009). Maternal psychosocial predictors of controlling parental feeding styles and practices. *Appetite*, *53*(3), 384–389. https://doi.org/10.1016/j.appet.2009.08.001

Newman, J. & Layton, B. D. (1984). Over Justification: A Self-Perception Perspective. *Personality and Social Psychology Bulletin*, *10*(3), 419–425. https://doi.org/10.1177/0146167284103010

Newman, J, & Taylor, A. (1992). Effect of a mean-end contingency on young children's food preferences. *Journal of Experimental Child Psychology*, *64*, 200–216.

Noldus Information Technology, bv. (2008). *The Observer XT (Version 9.0)[Computer software]*. Author Wageningen, the Netherlands.

Pliner, P, & Loewen, E. R. (1997). Temperament and food neophobia in children and their

mothers. *Appetite, 28 (3), 239-254*. https://doi.org/10.1006/appe.1996.0078

Powell, F. C., Farrow, C. V., & Meyer, C. (2011). Food avoidance in children. The influence of maternal feeding practices and behaviours. *Appetite, 57*(3), 683–692. https://doi.org/10.1016/j.appet.2011.08.011

Rendall, S., Dodd, H., & Harvey, K. (2020). Behavioural validation of a parent-report measure of child food fussiness. *Appetite*, *154*, 104796. https://doi.org/https://doi.org/10.1016/j.appet.2020.104796

Rendall, S., Dodd, H., & Harvey K. (2022). The influence of child temperament, maternal psychopathology and maternal cognition on child food fussiness. [Manuscript submitted for publication]. School of Psychology and Clinical Language Sciences, University of Reading.

Rothbart, M. K., Ahadi, S. A., Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The children's behavior questionnaire. *Child Development*, *72*(5), 1394–1408. https://doi.org/10.1111/1467-8624.00355

Saudino, K. J., McGuire, S., Reiss, D., Hetherington, E. M., & Plomin, R. (1995). Parent ratings of EAS temperaments in twins, full siblings, half siblings, and step siblings. *Journal of Personality and Social Psychology*, *68*(4), 723.

Sherry, B., McDivitt, J., Birch, L. L., Cook, F. H., Sanders, S., Prish, J. L., … Scanlon, K. S. (2004). Attitudes, practices, and concerns about child feeding and child weight status among socioeconomically diverse white, Hispanic, and African-American mothers. *Journal of the American Dietetic Association*, *104*(2), 215–221. https://doi.org/10.1016/j.jada.2003.11.012

Stark, L. J., Collins, F. L., Osnes, P. G., & Stokes, T. F. (1986). Using reinforcement and cueing to increase healthy snack food choices in preschoolers. *Journal of Applied Behavior Analysis*, *19*(4), 1308086. https://doi.org/10.1901/jaba.1986.19-367

Stifter, C. A., Anzman-Frasca, S., Birch, L. L., & Voegtline, K. (2011). Parent use of food

to soothe infant/toddler dis- tress and child weight status. An exploratory study. *Appetite, 57, 693–699.*

Tharner, A., Jansen, P. W., Kiefte-de Jong, J. C., Moll, H. A, van der Ende, J., Jaddoe, V. W. V, … Franco, O. H. (2014). Toward an operative diagnosis of fussy/picky eating: a latent profile approach in a population-based cohort. *The International Journal of Behavioral Nutrition and Physical Activity*, *11*(1), 14. https://doi.org/10.1186/1479-5868-11-14

Trofholz, A. C., Schulte, A. K., & Berge, J. M. (2017). How parents describe picky eating and its impact on family meals: A qualitative analysis. *Appetite*, *110*, 36–43. https://doi.org/10.1016/j.appet.2016.11.027

Vereecken, C. A., Keukelier, E., & Maes, L. (2004). Influence of mother's educational level on food parenting practices and food habits of young children. *Appetite*, *43*(1), 93–103. https://doi.org/10.1016/J.APPET.2004.04.002

Viljakainen, H. T., Figueiredo, R. A. O., Rounge, T. B., & Weiderpass, E. (2019). Picky eating – A risk factor for underweight in Finnish preadolescents. *Appetite*, *133*(August 2018), 107–114. https://doi.org/10.1016/j.appet.2018.10.025

Wardle, J, Guthrie, C. A., Sanderson, S., & Rapoport, L. (2001). Development of the Children's Eating Behaviour Questionnaire. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *42*(7), 963–970. https://doi.org/10.1111/1469-7610.00792

Wardle, J., Sanderson, S., Guthrie, C. A., Rapoport, L., & Plomin, R. (2002). Parental feeding style and the inter-generational transmission of obesity risk. *Obesity Research*, *10*(6), 453–462.

Wardle, J, Herrera, M.-L., Cooke, L., & Gibson, E. L. (2003). Modifying children's food preferences: the effects of exposure and reward on acceptance of an unfamiliar vegetable. *European Journal of Clinical Nutrition*, *57*(2), 341–348.

https://doi.org/10.1038/sj.ejcn.1601541

Webber, L., Hill, C., Cooke, L., Carnell, S., & Wardle, J. (2010). Associations between child weight and maternal feeding styles are mediated by maternal perceptions and concerns. *European Journal of Clinical Nutrition*, *64*(3), 259–265. https://doi.org/10.1038/ejcn.2009.146

Webber, L., Cooke, L., Hill, C., & Wardle, J. (2010). Associations between children's appetitive traits and maternal feeding practices. *Journal of the American Dietetic Association*, *110*(11), 1718–1722. https://doi.org/10.1016/j.jada.2010.08.007

Wehrly, S. E., Bonilla, C., Perez, M., & Liew, J. (2014). Controlling parental feeding practices and child body composition in ethnically and economically diverse preschool children. *Appetite*, *73*, 163–171.

Whelan, E., & Cooper, P. J. (2000). The association between childhood feeding problems and maternal eating disorder: a community study. *Psychological Medicine*, *30*(1), 69–77. https://doi.org/10.1017/S0033291799001543

Zucker, N., Copeland, W., Franz, L., Carpenter, K., Keeling, L., Angold, A., & Egger, H. (2015). Psychological and psychosocial impairment in preschoolers with selective eating. *Pediatrics*, peds-2014.

Table 1: Descriptive statistics for child food fussiness, emotionality and controlling feeding practices (N = 67).

| Measure | Mean (SD) | Median (IQR) | Range | Min/Max |
|---|---|---|---|---|
| **Child Food Fussiness** | 3.19 (0.89) | 3.00 | 1 - 5 | 1.67/5.00 |
| **Emotionality** | 3.26 (1.10) | 3.20 | 1 - 5 | 1.00/5.00 |
| **Controlling Feeding Practices** | | | | |
| **Use of verbal pressure** | 8.32 (3.42) | 8.00 | - | 2.00/16.00 |
| **Use of Physical Prompts** | 5.81 (3.29) | 6.00 | - | 0.00/12.00 |
| **Use of Non-food reward** | 1.91 (2.27) | 1.00 | - | 0.00/7.00 |
| **Use of Food reward** | 4.06 (2.88) | 4.00 | - | 0.00/12.00 |

Note. IQR = interquartile range, SD = standard deviation

Table 2: Two tailed bootstrapped partial correlations between child food fussiness, emotionality and controlling feeding practices (N = 67).

| | **Food Fussiness [CI$^{95\%}$]** | **Emotionality [CI$^{95\%}$]** |
|---|---|---|
| **Food Fussiness** | | .73** [.57, .81] |
| **Controlling feeding practice** | | |
| **Use of verbal pressure** | .67** [.51, .80] | .411*[.16, .61] |
| **Physical prompts** | .74** [.63, .82] | .751** [.63, .84] |
| **Food rewards** | .62** [.45, .77] | .495** [.28, .67] |
| **Non-food rewards** | -.23* [-.44, -.008] | .157 [-.11, .38] |

**p < 0.05, ** p < 0.001, CI$^{95\%}$ = 95% confidence interval lower, upper bound values. Child age and marital status included as a covariate.*

*Fig. 1:* Maternal use of verbal pressure moderates the relationship between food fussiness and emotionality.

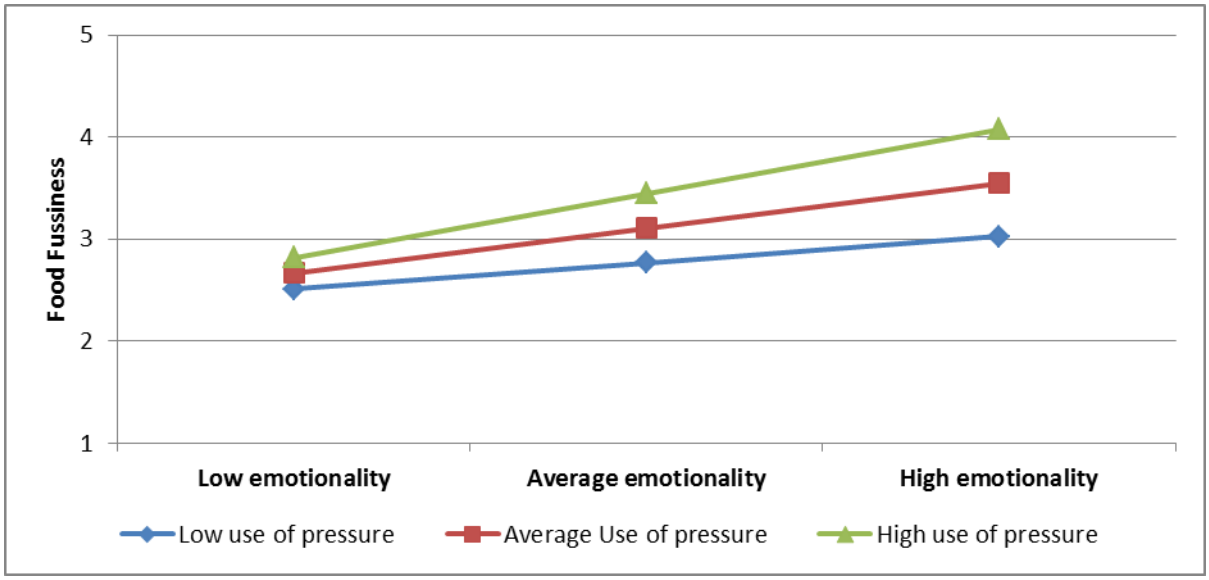
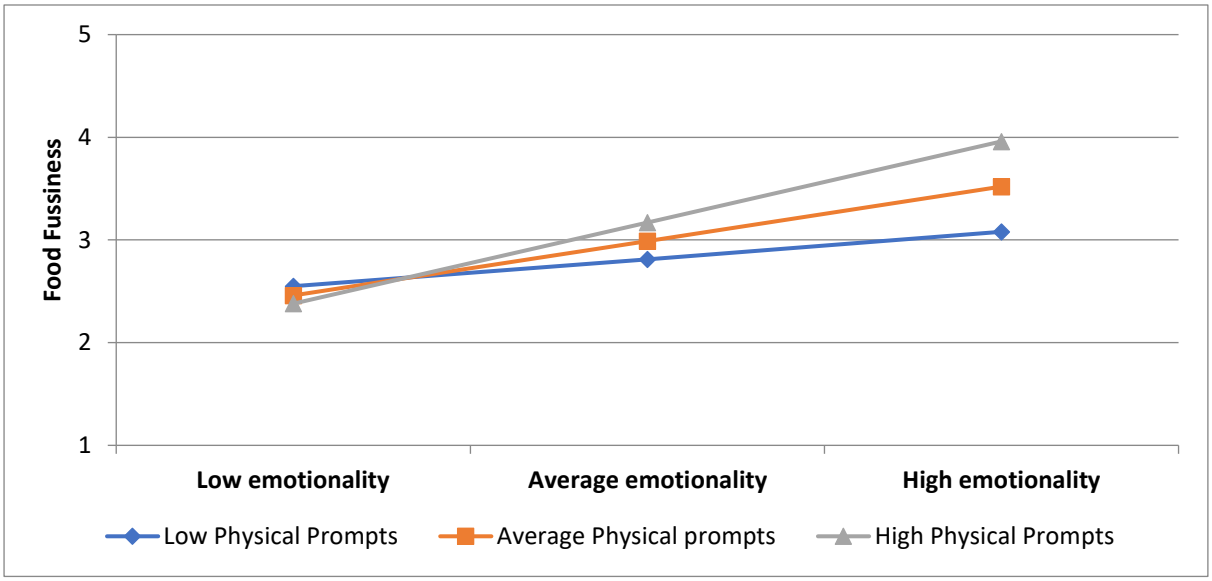



Fig. 2: Maternal use of physical prompts moderates the relationship between food fussiness and emotionality.



Supplementary Material

Table 1: Operational Definitions for the items coded from the FMCS

| Feeding Practice | Definition | Measurement |
|---|---|---|
| **Use of verbal pressure** | These are verbal encouragements from the parent to the child to persuade him/her to consume more food and includes vocalisations such as "try some more of the soup" or "have some more broccoli". | This is coded as the **total number of times** the mother uses verbal encouragements to get the child to consume the presented food. **A count was made each time the mother used verbal pressure** |
| **Use of Physical Prompts** | These are the parent's use of physical movements to encourage the child to consume more food including strategies such as pushing a plate of food towards the child, placing the food on a fork/spoon ready for the child to pick up and eat or feeding the child. | This is coded as the **total number of times** the mother uses physical encouragements to get the child to consume the presented food usually by offering the food to the child. **A count was made each time the mother used physical prompts** |
| **Use of food rewards** | These involve mother's use of food rewards to encourage food consumption by the child. This may include promising the child a favourite food for trying the presented food | This is coded as the **total number of times** the mother uses food rewards with the child to encourage food consumption. **A count was made each time the mother used a food reward.** |

| | | |
|---|---|---|
| **Use of non-food rewards** | These involve mother's use of non-food rewards to encourage food consumption by the child. This may include promising the child a favourite toy, stickers, visiting a favourite place or the chance to play a favourite game in return for trying the presented food. | This is coded as the **total number of times** the mother uses non- food rewards with the child to encourage food consumption. **A count was made each time the mother used a non-food reward.** |

Table 2: Non-significant bootstrapped Pearson's correlations between maternal age with food fussiness, emotionality and feeding practices

| | **Maternal age** |
|---|---|
| **Food Fussiness** | -.23 |
| **Emotionality** | -.04 |
| **Use of verbal pressure** | -.09 |
| **Use of physical prompts** | -.19 |
| **Use of food rewards** | .21 |
| **Use of non-food rewards** | .14 |

Table 3: Non-significant bootstrapped independent samples t-tests comparing means of child sex, maternal ethnicity and maternal education with food fussiness, emotionality and feeding practices

| | Child sex | | | | | Maternal education | | | | | Maternal ethnicity | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Females | | Males | | | University Degree | | No University Degree | | | White British | | Other Ethnicity | | |
| | M | SE | M | SE | t | M | SE | M | SE | t | M | SE | M | SE | t |
| Food fussiness | 3.3 | .14 | 3.0 | .17 | -1.47 | 3.2 | .13 | 3.1 | .19 | -.32 | 3.1 | .11 | 3.6 | .27 | 1.52 |
| Emotionality | 3.3 | .17 | 3.2 | .22 | -.39 | 3.1 | .19 | 3.1 | .26 | -.70 | 3.2 | .14 | 3.5 | .37 | .82 |
| Use of verbal pressure | 8.2 | .55 | 8.5 | .66 | .42 | 8.34 | .47 | 8.30 | .84 | -.04 | 8.1 | .41 | 9.1 | 1.33 | .67 |
| Use of physical prompts | 5.8 | .53 | 5.7 | .63 | -.12 | 5.9 | .49 | 5.5 | .71 | -.50 | 5.6 | .44 | 6.5 | .97 | .85 |
| Use of food-rewards | 4.3 | .43 | 3.7 | .59 | -.72 | 4.0 | .45 | 4.2 | .58 | .24 | 4.0 | .41 | 4.2 | .63 | -.11 |
| Use of non-food rewards | 2.2 | .40 | 1.5 | .35 | -1.21 | 2.0 | .35 | 41.6 | .46 | -.68 | 1.9 | .30 | 1.8 | .65 | .15 |

Table 4: Non-significant moderation analyses investigating the role of food rewards in the relationship between food fussiness and emotionality.

| Feeding Practice | **B** | **t** | **p** | **CI$^{95\%}$** |
|---|---|---|---|---|
| Use of food reward | .01 | .45 | .65 | -.07, .09 |

CI$^{95\%}$ = 95% *confidence interval lower, upper bound values*