



Daily manifestations of Children's avid eating behaviour and associations with temperament, parental feeding practices and wellbeing

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ABSTRACT

Recent evidence has identified four distinct eating profiles in 3-5-year-old children in the UK: avid, happy, typical, and avoidant. Among these profiles, children with avid eating behaviour exhibit high responsiveness to food cues, emotional eating, fast eating speed, and low responsiveness to fullness, posing risks for overeating and higher adiposity. Despite the implications, there is limited research on how avid eating manifests and impacts parents' behaviour and wellbeing. This study aimed to report the frequency of children's avid eating behaviour and explore its associations with child demographics, child temperament, home environment, parental feeding practices, and parental wellbeing. This study collected data via Ecological Momentary Assessment from 109 parents of a 3-5-year-old child identified as having an avid eating profile through a latent profile analysis of parents' reports of their children's eating behaviour. Using baseline and momentary data, the novel findings revealed that children with avid eating frequently requested food, especially snacks, with higher occurrences during weekends. Older children and boys showed higher probabilities of avid eating. High surgency in children correlated with more frequent food requests, while greater effortful control in children related to fewer eating occasions. Parents of children with higher probability of avid eating reported higher stress, depression, and anxiety, as well as frequent food requests from their child. Additionally, food insecurity was linked to increased food requests, suggesting a complex interplay between food availability and eating behaviour. The study underscores the need for targeted interventions to support parents in managing children's avid eating behaviour and improving overall family wellbeing.

1. Introduction

A recent Latent Profile Analysis (LPA) has demonstrated that there exist four distinct eating profiles in 3-5-year-old children living in the UK, described as avid, happy, typical and avoidant (Pickard et al., 2023). The Latent Profile Analysis approximates that 1 in 5 children (21.9 % of the 995 children sampled) in the UK display avid eating behaviour (Pickard et al., 2023). The identification of such profiles provides insight into how eating behaviours cluster and, as such, which children may be more susceptible to the development of negative health outcomes. For example, children in the avid eating profile displayed high

responsiveness to food cues in the environment, high levels of eating in response to emotions combined with fast eating speed, low responsiveness to fullness, and low food fussiness; behaviours which may result in eating in the absence of hunger and overeating (Boutelle et al., 2014). Children with an avid eating style may subsequently be at greater risk of higher adiposity in later life (Kininmonth et al., 2021).

Despite the increased susceptibility of developing overweight or obesity, there has been little research into how avid eating behaviour in young children manifests and how parents experience the eating behaviours in children with avid eating tendencies. Qualitative research has provided an in-depth understanding of parents' subjective

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experiences of feeding children with avid eating behaviour (Edwards et al., 2024a). The research demonstrated that children continuously asked for food throughout the day, which was characterised by parents as an “insatiable hunger” (Edwards et al., 2024a, p. 3). Most parents also reported that their child with avid eating behaviour loved food and was willing to eat a wide variety of foods. However, avid eating behaviour in children is more complex than just a physiological response to hunger (Edwards et al., 2024a). Parents reported multiple reasons for their children asking for food, such as seeking attention, craving specific foods, boredom, habit or expectation, both when prompted by food cues and as part of their regular eating routine (Edwards et al., 2024a). Parents identified various food cues that triggered their children to ask for food, such as seeing food outlets like ice cream vans or sweet shops and observing others eating, including peers, siblings, and parents. However, avid eating behaviour and contextual factors, such as food environment and parent practices, have not yet been quantified and examined in detail.

The qualitative research also illustrated the practices that parents use in response to their child’s avid eating behaviour, with many parents describing the interactions they had with their child around food as a daily struggle (Edwards et al., 2024a). Feeding practices are goal-directed behaviours which directly influence children’s eating (Shloim et al., 2015) and can be classified into four broad groups: coercive (e.g., using food to soothe a child or reward a behaviour), structured (e.g., routine and organization of the food environment), autonomy support (e.g., child involvement in meal preparation), and indulgent (e.g., preparing separate food) (Loth et al., 2022; Vaughn et al., 2016). Parents described using coercive feeding practices to manage situations where they experienced high levels of personal burdens, such as time constraints and stress. Given that managing the frequent eating occasions and food requests of children with avid eating behaviour is reported to be challenging for many parents, it is crucial to consider parental feeding behaviour within the broader context of the intricate parent-child feeding relationship. As well as parents using certain feeding practices in response to the child’s eating behaviour, such as pressuring a child who is low in food responsiveness to eat, the child’s eating behaviour is also shaped by parental feeding practices (Kininmonth et al., 2023a, 2023b). For example, Kininmonth et al. (2023a) found that emotional eating at 15/16 months was associated with increased instrumental feeding, such as using food to comfort a child, which in turn was associated with greater emotional overeating at 5 years old. Furthermore, managing difficult feeding interactions is linked to increased parental stress and reduced wellbeing (Edwards et al., 2024a; Haycraft, Farrow, & Blissett, 2013). Poorer parental mood and wellbeing can in turn adversely affect both feeding practices and children’s healthy eating behaviours, leading to poorer diet quality (Jarman et al., 2015; Webb et al., 2018). Therefore, research is needed to investigate the relationships between avid eating behaviour, parental stress and wellbeing, and feeding practices.

However, it is not only parental factors which are important in understanding avid eating behaviour; there are multiple interacting influences, such as a child’s temperament and home food environment, on children’s eating behaviour as evidenced in previous research (Varela et al., 2023). The high level of food approach displayed in preschoolers with avid eating is potentially related to a child’s temperament, defined as the innate aspects of an individual’s personality (Rothbart, Ahadi, & Hershey, 1994). Previous research evidenced higher levels of surgency, characterised as higher levels of impulsivity, sensation seeking and activity (Rothbart, Ahadi, & Hershey, 1994), in children with an avid eating profile compared to other eating profiles (Pickard et al., 2023). Indeed, eating behaviours are associated with child temperament (Haycraft, Farrow, Meyer, Powell, & Blissett, 2011; Zhou, SooHoo, Zhou, Perez, & Liew, 2019). For example, children who exhibit higher levels of emotionality or stress may use food as a coping mechanism, while those with lower self-regulation (also termed ‘effortful control’) might struggle to control their eating impulses and responsiveness to

food cues.

Finally, in addition to child and parent factors that may be related to avid eating behaviour, it is important to include measures of the broader context, such as household food security, when examining these associations. Food security, defined as consistent access to sufficient and nutritious food (Blumberg et al., 1999), directly influences both the quality and quantity of food available to children. For example, in food-secure households, parents might have more resources and opportunities to implement structured and balanced feeding practices and facilitate access to high-quality healthy food, potentially mitigating overeating tendencies in children (Arlinghaus & Laska, 2021; Baxter et al., 2022; McCurdy et al., 2022). Our previous research indicated that parents of children with avid eating reported greater food insecurity than the other eating profiles (Pickard et al., 2023), which aligns with findings of recent review (Bidopia et al., 2023). By examining household food security, we can better understand the complex dynamics at play and develop more effective interventions to promote healthy eating habits among children with avid eating behaviour.

To date, there is no existing literature quantifying avid eating in young children concerning the frequency of eating and food requests. This research therefore aimed to quantify how avid eating manifests, specifically eating and food request frequency, in children on a day-to-day basis. This paper also aimed to explore the relationships between children’s avid eating behaviour and child demographics, child temperament, household food security, parents’ feeding practices and their overall wellbeing. Since this is an exploratory study, no specific hypotheses were preregistered. However, the full study and the intended analysis plan were preregistered before data collection (<https://osf.io/n48yv>).

2. Methods

The results presented in this paper are taken from the baseline data and food surveys collected as part of a larger Ecological Momentary Assessment (EMA) study for the APPETiTe (Appetite in Preschoolers: Producing Evidence for Tailoring Interventions Effectively) project. EMA involves participants using a smartphone device to respond to surveys at various random or scheduled times throughout the day, over several days or weeks (Anestis et al., 2010). At the initial recruitment in Spring 2022, parents were asked to complete several baseline measures to provide a nuanced understanding of children’s requests for food and eating habits. We used this initial sample to determine latent eating profiles in children between 3 and 5 years old (for the full procedure and detail of the eating profiles see Pickard et al., 2023). In 2023, we used the validated model specifications from the original latent profile analysis to assign the children of all interested parents to one of the four eating profiles; avoidant, typical, happy, avid.

Recruitment, enrolment, and data collection were undertaken from October 2023 to April 2024. Ethical approval was provided by the Aston University Health and Life Sciences Research Ethics Committee (HLS21079). All parents provided informed consent to provide data on behalf of their child. For a full overview of the EMA study protocol and all the included measures at each wave of data collection please see Edwards et al., 2024b.

2.1. Participants

Due to the novelty of this research, a precise power calculation was not feasible. Therefore, based on previous research (Berge et al., 2017; Loth et al., 2018, 2023), we aimed to invite 200 parents to the larger EMA study to ensure sufficient data for examination of within- and between-subject effects while accounting for attrition. Primary caregivers of children aged 3–5 years who were interested in taking part in any of the associated APPETiTe studies were asked to complete the Child Eating Behaviour Questionnaire (CEBQ; Wardle, Guthrie, Sanderson, & Rapoport, 2001). The children were assigned to one of the four

originally identified eating profiles based on the model specifications from the original Latent Profile Analysis (Pickard et al., 2023). Parents with a child identified as having an avid eating behaviour profile were invited to join the EMA study (N = 312), yielding 146 responses of interest (see Fig. 1 for an overview of recruitment to the study).

Because the current study took place in Winter 2023, the parents who had expressed interest in the initial wave of recruitment in 2022 re-reported their child's eating behaviour to ensure children still displayed an avid eating behaviour profile. The raw scores from the CEBQ subscales were standardised and fit to the original profile solution using the model specifications (available at <https://osf.io/gehq9>). When re-profiled, using the model specification of the original Latent Profile Analysis, N = 109 children (74.7 %) remained assigned to the 'avid eating' profile, N = 31 (21.2 %) were now assigned to the 'typical eating' profile and N = 6 (4.1 %) were now assigned to the 'happy eating' profile. As such, these 37 children were excluded from the subsequent analysis leaving the remaining sample of 109 children.

Eligibility criteria necessitated that the parents had a good understanding of English, lived in the United Kingdom and were responsible for feeding their child more than half the time when at home. Children who were autistic, had severe learning disabilities, or a chronic illness that directly affected their dietary needs and eating habits were not eligible to participate. One participant who had completed the EMA study indicated that their child was above the age range for the study (82 months old), so they were excluded from all further data analysis.

2.2. Procedure

Participation in this study was remote; surveys were administered through a mobile smartphone app, which was downloaded directly to parents' personal smartphones. Parents were informed that if they did not have a compatible smartphone, they could request one from the research team to use for the study period, though none did. Caregivers completed a baseline questionnaire, 10 days of EMA, and an end-of-

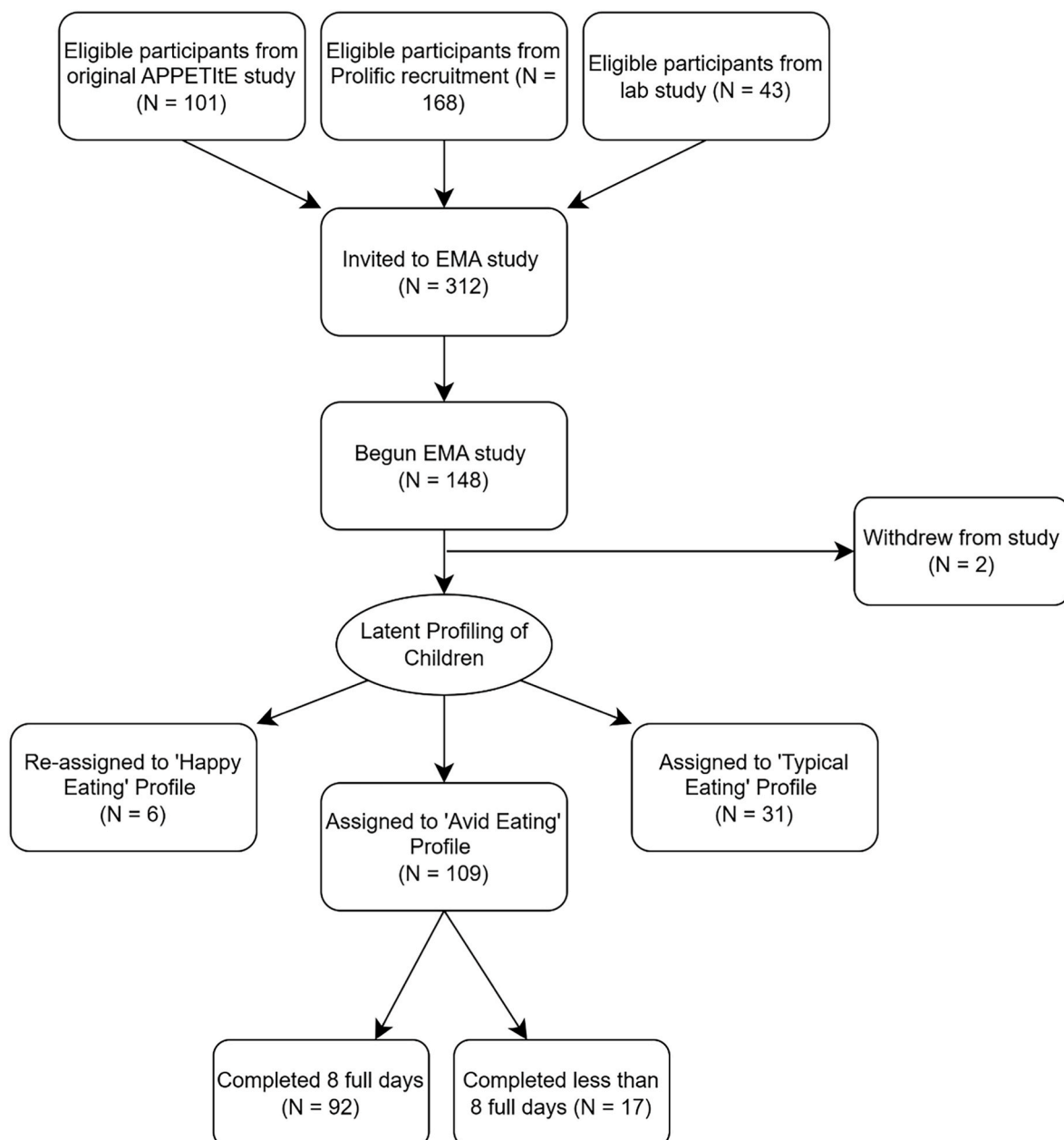


Fig. 1. Flow Chart of Recruitment and Retention to EMA study.

study questionnaire through the smartphone application Expiwell. All of the results presented in this manuscript pertain to the data collected from the baseline questionnaire and the 10-day EMA period.

2.3. Measures

This article focuses specifically on the data given in the baseline questionnaire, which gathered information about parent and child characteristics (e.g., demographics, socioeconomic class, food insecurity) and general parent mood and wellbeing, as well as the context of eating occasions during the EMA period (see supplementary material for an overview of the measures). At baseline, parents were asked to report on the child's average food request frequency (weekday and weekend) and the child's average eating frequency (weekday and weekend). During the EMA period, parents were asked to report on the context of each eating occasion, which included the atmosphere, people present, the type of meal, and who initiated the eating occasion.

Parents' food security was evaluated using the Short Form of the Household Food Security Scale within the baseline questionnaire (HFSS; Blumberg et al., 1999). Parents responded either "yes" or "no" to items 1, 2, 4, and 5, "Almost every month", "Some months but not every month", and "In only one or two months" to item 3, and "Often", "Sometimes", and "Never true" to items 6 and 7. Scores were categorized as 0–1 for high or marginal food security, 2–4 for low food security, and 5–6 for very low food security. The scale showed very good reliability among our sample (Cronbach's $\alpha = .88$).

Parental feeding practices were measured at baseline using the Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007). The CFPQ consists of 49 items divided into twelve subscales; Child Control (5 items): allowing the child to control their eating behaviours, Emotion Regulation (3 items): using food to manage the child's emotional states, Encouraging Balance and Variety (4 items): promoting a well-balanced diet, including a variety of foods and healthy choices, Environment (4 items): ensuring healthy foods are available at home, Food as a Reward (3 items): using food as a reward for the child's behaviour, Involvement (3 items): encouraging the child's participation in meal planning and preparation, Modelling (4 items): demonstrating healthy eating habits for the child, Monitoring (4 items): keeping track of the child's consumption of less healthy foods, Pressure (4 items): pressuring the child to eat more at meals, Restriction for Health (4 items): controlling the child's intake to limit unhealthy foods and sweets, Restriction for Weight Control (8 items): controlling the child's intake to reduce or maintain their weight, and Teaching about Nutrition (3 items): using explicit educational techniques to encourage healthy eating. The first 13 questions had a 5-point response scale "never, rarely, sometimes, mostly, and always". The remaining questions had a 5-point scale, "disagree, slightly disagree, neutral, slightly agree, and agree". The CFPQ scales demonstrated reasonable reliability within the sample, with Cronbach's α for the twelve scales ranging from 0.59 to 0.85 (please see the supplementary material for the full reliability analysis of all measured constructs).

The child's temperament was measured at baseline using the Children's Behaviour Questionnaire-Very Short Form (CBQ-VSF; Putnam & Rothbart, 2006). The CBQ-VSF is a 36-item parent-report tool designed to assess the temperament of children aged 3–8 years. Parents rated how likely their child is to react in various situations on a 7-point scale: 1-extremely untrue of my child, 2-quite untrue, 3- slightly untrue, 4-neither true nor untrue, 5-slightly true, 6-quite true, 7-extremely true of my child. The questionnaire measures three broad dimensions: surgency/extraversion, negative affectivity, and effortful control. Surgency (12 items) reflects high levels of activity, impulsivity, and intense pleasure, with low shyness, Negative Affectivity (12 items) is characterised as higher levels of discomfort, anger/frustration, fear, and sadness, with lower levels of soothability, and Effortful Control (12 items) reflects high scores for low-intensity pleasure, perceptual sensitivity, attentional control, and inhibitory control. The CBQ-VSF

subscales demonstrated good reliability within the sample, with Cronbach's α of 0.81 for surgency, 0.75 for negative affect, and 0.73 for effortful control.

Additionally, caregivers completed three baseline questionnaires to assess their general mood. The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) measured symptoms of anxiety (7 items) and depression (7 items) on a 4-point Likert scale from 0 ("not at all") to 3 ("most of the time"). This scale displayed good reliability among our sample for both the anxiety subscale (Cronbach's $\alpha = .80$) and the depression subscale (Cronbach's $\alpha = .78$). The Perceived Stress Scale (PSS; Cohen et al., 1983) measured baseline stress across 10 items (e.g., "In the last month, how often have you felt that things were going your way?"), with scores ranging from 0 ("never") to 4 ("very often") and was also reliable among the sample (Cronbach's $\alpha = .87$). Lastly, the World Health Organization Wellbeing Index (WHO-5; Topp et al., 2015) evaluated wellbeing across 5 items (e.g., "I have felt cheerful and in good spirits"), with scores from 0 ("at no time") to 5 ("all of the time") and was also found to have good reliability (Cronbach's $\alpha = .87$).

Whilst all children were classified as displaying avid eating behaviour, based on the Latent Profile solution for children's eating behaviour (Pickard et al., 2023), each child was assigned a probability of assignment to an avid eating profile, which could range from 0.0 to 1.0. The probability of being assigned to the avid eating profile for this group of children had an average score of $P = .83$ ($SD = 0.18$, $min = 0.41$, $max = 1.0$). This score was used within our analyses as an index of the degree of avid eating behaviour displayed by each child within this sample.

2.4. Data analyses

Data was cleaned, coded and analysed in SPSS 29.0 (IBM). Demographic characteristics of the parent-reported baseline measures were analysed using cross-tabulation and correlational matrices. The child's probability of avid eating assignment, and parents' estimates of eating and food request frequency were taken from the baseline measures. The number of reported eating and food request occasions were taken from the reported incidents during the 10-day EMA period. As per the protocol, parents with less than 8 'complete' days of data collected were removed as outliers when running the statistical tests for the number of eating and food request occasions. Independent t-tests were conducted to determine any significant differences in eating behaviour between child sex and parent sex, while correlations were conducted to determine significant associations between avid eating behaviour and child and parent age. The associations between avid eating characteristics and the variables of child temperament, parental feeding practices, parental wellbeing, and food security were then explored using Pearson's correlations using a p-value of < 0.05 to detect significant associations.

3. Results

3.1. Demographics

The 109 parents had a mean age of 34.6 years ($SD = 5.5$, $min = 24.8$, $max = 55.3$), 24 (22 %) were male and 85 (78 %) were female. Children had an average age of 53.1 months ($SD = 10.3$, $min = 36.8$, $max = 71.43$), 50 (45.9 %) were male and 59 (54.1 %) were female. Over half of the participants were educated to an undergraduate degree level or higher ($n = 64$, 58.7 %), 53 parents (48.6 %) were working full-time, and 35 (32.1 %) were working part-time.

The majority of parents were White ($n = 91$, 83.5 %), followed by Asian ($n = 8$, 7.3 %), Black ($n = 7$, 6.4 %), Mixed ethnicity ($n = 1$, 1 %) or other ($n = 2$, 1.8 %). Overall participants felt that they were 'living quite comfortably' ($n = 47$, 43.1 %) or 'managing' their current household income ($n = 46$, 42.2 %), $n = 9$ (8.3 %) said that they were finding it quite difficult and $n = 6$ (5.5 %) were finding it very difficult. Two-thirds of the participants reported high or marginal food security

($n = 72$, 66.1 %), 16 reported low food security (14.7 %) and 21 reported very low food security (19.3 %). Parents reported spending approximately 4–6 h with their child on a weekday and more than 10 h together on weekend days.

3.2. Demographics and avid eating

Pearson's correlations were conducted to determine whether the demographic factors of parent and child age were associated with the degree of avid eating characteristics (see Table 1).

The posterior probability of a child's assignment to the avid eating profile was positively associated with the child's age. The age of the parent was negatively associated with parental baseline estimates of children's food eating frequency on a typical weekday.

Independent t-tests were conducted to determine any significant differences in the eating behaviour variables by child sex (Table 2) and parent sex (Table 3).

Female parents reported a greater frequency of children eating on weekdays than male parents, and more requests for food from their children on weekends and weekdays than male parents (Table 3).

3.3. Manifestation of avid eating behaviour in young children

3.3.1. Eating occasions of children with avid eating

In the baseline questionnaire, parents estimated an average of 4 eating occasions ($SD = 2$, $min = 1$, $max = 10$) on a weekday and 5.2 occasions ($SD = 1.8$, $min = 1$, $max = 10$) on a weekend when with their child. The average parent-reported estimate of frequency of requests for additional food from their child on a weekday was 5 times ($SD = 2.8$, $min = 0$, $max = 10$) and 6.6 times on a weekend when they were with their child ($SD = 2.7$, $min = 1$, $max = 10$).

From the 10-day EMA period, 109 parents reported on 2370 in-the-moment eating occasions in which their child ate food. Meals accounted for 1708 (72.1 %) and snacks accounted for 662 (27.9 %) eating occasions. Approximately one-third of eating occasions ($k = 775$, 32.7 %) were initiated by the child requesting or helping themselves to food. The majority of meals occurred in the home ($k = 2200$, 92.8 %) and in the presence of other family members ($k = 1740$, 73.4 %). Parents reported that 72.9 % of the eating occasions had a pleasant atmosphere, 12.5 % had a neutral atmosphere and 14.6 % had a stressful/chaotic atmosphere.

There was a significant relationship between the food eaten (meal versus snack) and the person initiating the eating event (child versus other) ($\chi^2(1, N = 2370) = 555.9$, $p < .001$). Children requested or initiated eating a snack 69.2 % of the time compared to requesting or initiating eating a meal 18.6 % of the time. There was a total of 856 occasions when a child initiated an eating occasion or requested food from the parent, of which the parent refused the request for food on only 66 occasions (7.7 %); during 790 (92.3 %) of the occasions the child was

Table 1

Pearson's correlations between child eating behaviour and child and adult age.

Variable	Child Age	Parent Age
Baseline Probability of Avid Eating	0.255 ^a	−0.101
Baseline Weekday Eating Frequency	−0.007	−0.243 ^b
Baseline Weekday Food Request Frequency	0.03	−0.143
Baseline Weekend Eating Frequency	0.068	−0.096
Baseline Weekend Food Request Frequency	0.056	−0.01
EMA reported Eating Occasions	0.013	0.139
EMA reported Food Requests	−0.013	0.07

NB. Based on the Latent Profile solution, each child was assigned a posterior probability of assignment to the avid eating profile, which could range from 0.0 to 1.0. This score was used within our analyses as an index of the degree of avid eating behaviour displayed by each child within this sample.

^a Correlation is significant at the 0.01 level (2-tailed).

^b Correlation is significant at the 0.05 level (2-tailed).

Table 2

Comparison of child eating behaviour variables between boys and girls.

	Boys ($n = 50$)	Girls ($n = 59$)	F statistic	P-value
Baseline Probability of Avid Eating	0.839 \pm 0.19	0.83 \pm 0.17	2.199	0.141
Baseline Weekday Eating Frequency	4.29 \pm 2.38	3.83 \pm 1.52	7.244	0.008
Baseline Weekday Food Request Frequency	5.04 \pm 2.87	4.93 \pm 2.8	0.286	0.594
Baseline Weekend Eating Frequency	5.52 \pm 2.02	4.85 \pm 1.54	3.82	0.053
Baseline Weekend Food Request Frequency	6.8 \pm 2.71	6.46 \pm 2.77	0.216	0.643
EMA reported Eating Occasions	37.18 \pm 13.5	38.96 \pm 10.58	2.5	0.117
EMA reported Food Requests	30.47 \pm 11.02	32.98 \pm 9.16	1.97	0.163

Boys had a significantly higher frequency of eating frequency on weekdays than girls (Table 2).

Table 3

Comparison of child eating behaviour variables between male and female parents.

	Males ($n = 24$)	Females ($n = 85$)	F statistic	P-value
Baseline Probability of Avid Eating	0.84 \pm 0.16	0.83 \pm 0.19	2.783	0.098
Baseline Weekday Eating Frequency	3.17 \pm 1.09	4.29 \pm 2.09	5.549	0.02
Baseline Weekday Food Request Frequency	3.5 \pm 1.72	5.4 \pm 2.93	15.373	<0.001
Baseline Weekend Eating Frequency	4.46 \pm 1.25	5.35 \pm 1.89	1.961	0.164
Baseline Weekend Food Request Frequency	5.33 \pm 2.16	6.98 \pm 2.78	7.25	0.008
EMA reported Eating Occasions	41.32 \pm 8.41	37.07 \pm 12.88	2.27	0.135
EMA reported Food Requests	34.05 \pm 7.06	31.03 \pm 10.87	3.54	0.063

allowed to eat.

3.3.2. Avid eating behaviour

A greater probability of avid eating was associated with the baseline reports of requests for food on a weekend ($r = 0.287$, $p = .002$) (see Fig. 2).

3.4. Avid eating and child temperament

The probability of avid eating was positively associated with surgency (Table 4). Effortful control was negatively associated with frequency of eating and probability of avid eating but not with frequency of requests for food. Interestingly, higher child surgency was positively associated with all baseline parent-reported eating and food request frequencies, but negatively associated with food requests reported by the parent during the 10-day EMA period.

3.5. Children's avid eating and parent wellbeing

Parent wellbeing was significantly lower, and depression was significantly higher in children with greater avid eating probability. Parents' level of depression was positively associated with the estimated eating frequency on weekdays and food requests on weekends from children. Parents' level of anxiety was positively associated with the estimated eating frequency on weekdays and weekends and food requests on weekends from children.

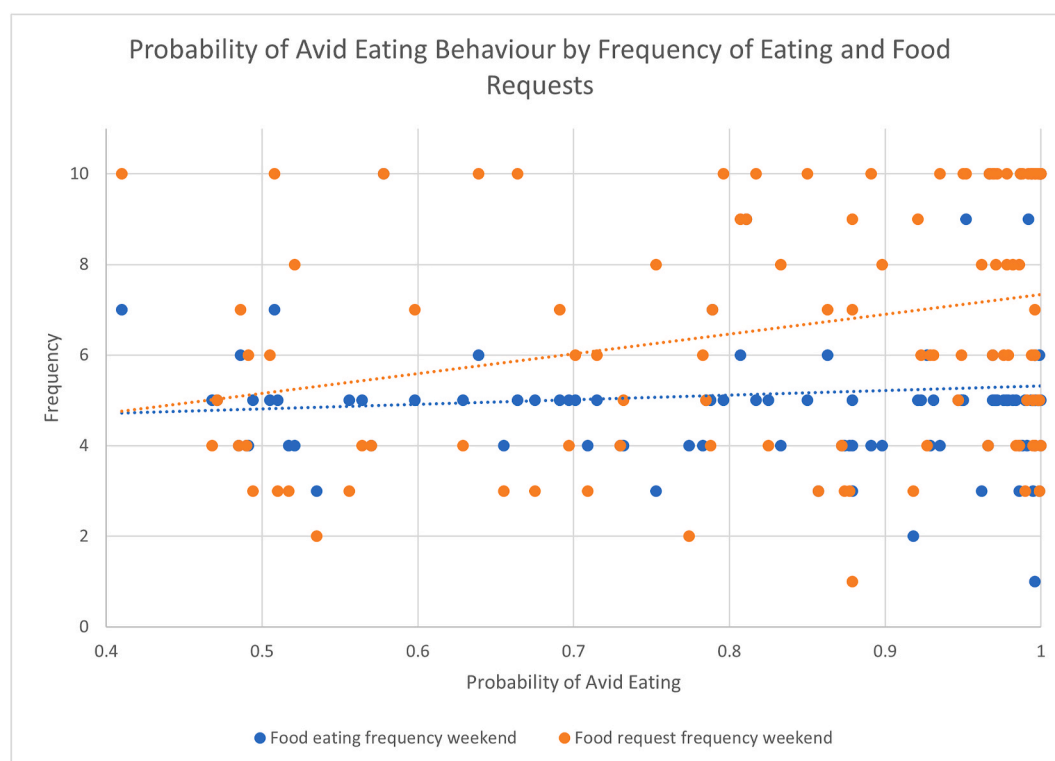


Fig. 2. Probability of avid eating behaviour by frequency of eating and food requests.

3.6. Children's avid eating and parental feeding practices and food environment

Parents reported using more encouragement of balance and variety and teaching about nutrition but less pressure to eat and restriction for weight in the context of more requests for food from their child. Lower restriction for weight purposes was associated with greater frequency of eating. The probability of avid eating was positively correlated with greater use of food as a reward and pressuring a child to eat. Parents who reported higher frequencies of their children asking for food and eating food also reported greater food insecurity (see Table 4). However, household food insecurity was negatively associated with the number of reported food requests during the EMA period.

4. Discussion

This study aimed to illustrate how avid eating manifests in children on a daily basis and to examine the associations between children's avid eating behaviour with child temperament, parental feeding practices and parents' wellbeing.

4.1. Manifestation of avid eating behaviour

Our findings support and extend previous research that avid eating behaviour in young children is multifaceted, driven by both physiological hunger and other factors such as food cues and habitual behaviour (Edwards et al., 2024a). Children with avid eating tendencies displayed a high frequency of food requests, particularly during weekends, which was not always matched by the number of eating occasions. This discrepancy suggests that parents are declining some food requests, and indeed do this more frequently with increasing probability of avid eating in their children.

As evidenced in qualitative work, parents of children with avid eating behaviour report frequent food demands from their children and that the management of this can be challenging (Edwards et al., 2024a).

A significant relationship was found between the type of food (meal vs. snack) and who initiated the eating event. Children were more likely to request or initiate snacks than meals, suggesting that snacks might be perceived as more desirable by children or less likely to follow a structured routine as meals often do. This finding emphasises the need for parents to be mindful of snack availability and the need for parent support in managing multiple snack requests.

Parents reported children had more eating occasions and food requests on weekends compared to weekdays, most likely due to increased parent presence at the weekends. The ecological momentary assessment (EMA) offered valuable insights into the context and nature of eating occasions for children with avid eating. With meals constituting the majority of parent-reported eating events, primarily occurring at home and in the presence of other family members, the data underscore the importance of the home environment and family context in children's eating behaviour (Snuggs et al., 2019). The predominance of pleasant atmospheres during these eating occasions indicates generally positive mealtime experiences in families of children with avid eating behaviour, although the presence of stressful or chaotic atmospheres in a notable minority of instances points to potential areas for intervention to improve family mealtimes. This supports earlier research that found an association between the emotional atmosphere at mealtimes and risk for overweight in 6–12-year-old children (Berge et al., 2014).

Analysis of demographic data revealed that older children had a higher probability of exhibiting avid eating behaviours. This positive association between child age and avid eating might reflect developmental changes, such as increased autonomy and physical growth, which could drive greater food intake and more frequent eating occasions. For example, the development of the Child Eating Behaviour Questionnaire demonstrated that children become more food-responsive and less satiety-responsive with age (Wardle et al., 2001). Furthermore, parents estimated a higher weekday eating frequency for boys than for girls. This difference could be attributed to varying nutritional needs and activity levels, with boys potentially requiring more energy intake due to higher physical activity (Díaz-Quesada,

Table 4

Pearson's correlations between avid eating characteristics and variables of interest.

	Avid Eating Probability	Eating Frequency Weekday	Food Request Frequency Weekday	Eating Frequency Weekend	Food Request Frequency Weekend	EMA reported Eating Occasions	EMA reported Food Requests
CBQ-VSF - Surgency	.249 ^a	.266 ^a	.282 ^a	.277 ^a	.362 ^a	−0.196	−.223 ^b
CBQ-VSF - Negative Affect	0.093	0.121	0.063	−0.039	0.016	0.012	0.061
CBQ-VSF - Effortful Control	−.243 ^b	−.240 ^b	−0.108	−.290 ^a	−0.169	0.15	0.175
CFPQ - Child Control	0.042	.199 ^b	0.141	0.053	0.015	−0.04	−0.084
CFPQ - Emotional Regulation	0.103	0.092	0.012	0.161	0.02	−0.002	0
CFPQ - Balance and Variety	−0.073	0.039	.208 ^b	0.075	0.136	−0.118	−0.067
CFPQ - Environment	−0.071	−.208 ^b	−0.077	−0.151	−0.034	0.08	0.128
CFPQ - Food Reward	.198 ^b	0.042	−0.044	−0.082	−0.058	−0.057	−0.041
CFPQ - Involvement	−0.148	0.098	.266 ^a	0.049	0.09	0.078	0.046
CFPQ - Modelling	−0.171	−0.082	−0.039	−0.118	−.199 ^b	0.064	0.095
CFPQ - Monitoring	−0.102	−0.092	−0.102	−0.088	−0.072	0.045	0.04
CFPQ - Pressure to Eat	.193 ^b	−0.095	−.211 ^b	−0.058	−.203 ^b	−0.078	−0.085
CFPQ - Restriction for Health	0.049	−0.121	0.057	−0.09	0.108	0.148	0.156
CFPQ - Restriction for Weight	−0.004	−.317 ^a	−.215 ^b	−.328 ^a	−.189 ^b	0.085	0.08
CFPQ - Teaching	−0.024	−0.008	.196 ^b	0.042	.226 ^b	−0.033	0.022
WHO-5 - Parent Wellbeing	−.233 ^b	−.215 ^b	−0.178	−0.14	−.265 ^a	0.118	0.114
Parent Perceived Stress	0.055	.244 ^b	0.123	0.063	0.119	−0.112	−0.115
HADS - Parent Anxiety	0.117	.228 ^b	.244 ^b	0.113	.283 ^a	−0.191	−0.19
HADS - Parent Depression	.213 ^b	.262 ^a	0.088	0.107	.189 ^b	−0.016	−0.03
Household Food Insecurity	0.072	.382 ^a	.288 ^a	.227 ^b	0.173	−0.195	−.227 ^b

CBQ-VSF = Children's Behaviour Questionnaire- Very Short Form (Putnam & Rothbart, 2006).

CFPQ = Comprehensive Feeding Practices Questionnaire (Musher-Eizenman & Holub, 2007).

HADS = Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983).

WHO-5 = World Health Organization Wellbeing Index (Topp et al., 2015).

^a Correlation is significant at the 0.01 level (2-tailed).^b Correlation is significant at the 0.05 level (2-tailed).

Gálvez-Calabria, Connor, & Torres-Luque, 2022; Tucker, 2008). Additionally, the social and environmental contexts might influence boys and girls differently in terms of access to and attitudes toward food (Graziani, Guidetti, & Cavazza, 2021). Female parents estimated a higher frequency of their children eating on weekdays and compared to male parents, as well as more frequent requests for food from their children on weekends and weekdays. These differences might be reflective of differing parenting roles or responsibilities (Yaffe, 2023), with a higher percentage of male parents reporting being in a full-time working role as opposed to female parents, thus female parents more frequently respond to their child's food needs.

4.2. Associations with avid eating behaviour

The findings of this study reveal intricate relationships between child temperament, avid eating behaviours, and the associations with both parent wellbeing and parental feeding practices. Children with higher effortful control, which refers to the ability to regulate behaviour and emotions, tended to eat less frequently and had a lower probability of avid eating. The ability to exercise self-control may help these children resist frequent eating and maintain more regulated eating patterns (Johnson, 2000; Nix et al., 2021). Interestingly, effortful control was not associated with the estimated frequency of food requests. This could be because the act of requesting food does not necessarily require immediate impulse control and may be driven by other factors such as routine

or social cues (Edwards et al., 2024a). Interventions that focus on enhancing effortful control, such as through mindfulness practices or self-regulation strategies, could help children better manage their eating behaviour. Conversely, children exhibiting higher surgency—a trait characterised by high levels of activity and positive emotionality—showed a greater likelihood of avid eating and frequent requests for food. This finding supports the original research that identified that children in the avid eating profile showed higher surgency than children in the other three eating profiles (Pickard et al., 2023). However, findings from the EMA period indicate that parents with more surgent children report fewer food requests. We hypothesise that this may reflect a limitation of the EMA design, as parents of more surgent children may struggle to find the time to self-initiate a survey in their smartphone app. While our study did not collect direct measures on this specific challenge, prior research suggests that parents of surgent children often experience higher demands on their attention and time due to their child's heightened activity level and impulsivity (Bussing et al., 2003). These characteristics may contribute to difficulties in engaging with structured data collection methods, such as initiating surveys. Additionally, our review into the feasibility of ecological momentary assessment (EMA) compliance indicates that caregivers facing high daily demands may have lower response rates in app-based data collection (Pickard et al., 2025).

Parental feeding practices were also explored, revealing that parents reported more encouragement of a balanced diet and nutrition

education with children who expressed frequent food requests, while simultaneously reporting less pressure to eat. These findings may reflect a responsive approach by parents who perceive frequent food requests as a sign of heightened interest in food, prompting efforts to guide their children toward healthier choices and eating habits and not needing to entice the child to eat (Kininmonth et al., 2023b). Both increased food requests and increased eating occasions in children were associated with less restriction for weight purposes in parents. This finding aligns with existing literature suggesting that parents are less likely to engage in restrictive feeding practices when they perceive their children as having an avid appetite or keen interest in food (Brown et al., 2008; Francis et al., 2001).

However, a higher probability of avid eating was linked to greater use of food as a reward and increased pressure to eat. Whilst our current design prevents causal conclusions, the association between avid eating behaviour and the use of these feeding practices is important given that in longitudinal studies, pressure to eat and instrumental feeding predict increases in avid eating behaviour (Kininmonth et al., 2023a). Since behaviours associated with the avid eating profile (i.e., increased emotional eating and food responsiveness) are associated with increased adiposity risk (Herle et al., 2020), parents would likely benefit from support to reduce their use of these practices.

The study also highlights the adverse associations between children's avid eating and parents' wellbeing. Parents of children with greater appetite avidity experienced significantly lower overall wellbeing and higher levels of depression. Furthermore, frequent food requests from children were associated with increased parental anxiety and decreased wellbeing. This finding is consistent with previous research linking difficult feeding interactions with greater parental stress and poorer mental health (Edwards et al., 2024a; Haycraft et al., 2013; Wolstenholme et al., 2019). Potentially parents with poor mental health and depression have been shown to use more coercive feeding practices, such as pressuring a child to eat (Goulding et al., 2014; Haycraft et al., 2013), which in turn may lead to avid eating behaviours in children (Kininmonth et al., 2023a). Alternatively, the correlation between children's food requests and parental anxiety may be indicative of an emotional toll on parents who may struggle to manage persistent demands for food or parents with poorer mental health may be more likely to perceive the demanding nature of their children's avid eating behaviour (Edwards et al., 2024a). In either case, the poorer wellbeing among these parents underscores the need for targeted support to help them cope with the challenges of feeding a child with avid eating behaviour.

Finally, parents who noted higher frequencies of their children asking for food and eating food were also more likely to report greater levels of food insecurity. Household food insecurity, characterised by limited or uncertain access to adequate food (Blumberg et al., 1999), could drive children to ask for food more often as a response to irregular food availability or increased hunger (Fram et al., 2011). This heightened frequency of food requests and eating occasions may be a coping mechanism for children in food-insecure households, reflecting an underlying anxiety about food scarcity (Berge et al., 2020). However, in cases of severe food insecurity, we would have expected children's eating occasions to be reduced due to meal skipping or restricted access to snacks. The associations we observed may be explained by less severe forms of food insecurity, where parents experience heightened stress and a perceived gap between food availability and their children's frequent demands, rather than a complete inability to provide meals or snacks. This may explain why household food insecurity was negatively associated with reported food requests during the EMA period. It is also worth noting that household food security does not always equate to a child's level of food security as some of the items refer specifically to measures that the parent takes rather than the child's experience (i.e., "did you ever eat less than you felt you should because there wasn't enough money to buy food?"; Blumberg et al., 1999).

The findings from this study highlight the importance of considering

the broader context of the parent-child feeding relationship when addressing children's avid eating behaviour. Interventions aimed at improving children's eating behaviours may be enhanced by supporting parents to manage stress and maintain their wellbeing, and by providing parents with strategies to handle frequent food requests. Furthermore, developing parents' skills in the promotion of a protective food environment, such as access to nutritious and varied foods while restricting exposure to more processed food, and reducing the use of coercive feeding practices could be beneficial.

4.3. Strengths and limitations

This is the first study to quantify avid eating behaviour in preschoolers and present the frequency of food requests and eating occasions in children with avid eating; with a recent feasibility study of this work demonstrating the success of using ambulatory assessment methods (Pickard et al., 2025). While this study provides valuable insights into the manifestations of avid eating behaviour in young children and its impact on parental feeding practices and wellbeing, several limitations must be acknowledged. Although the sample was representative of the UK population with regard to ethnicities and included families experiencing a range of household food security, the sample was still relatively homogenous, with the majority of parents being white, female and highly educated. This limits the generalisability of the findings to more diverse populations. However, future research should aim to include a broader demographic to better understand how avid eating behaviours manifest and are managed across different cultural and socioeconomic backgrounds, such as ethnic minorities. The study relied on self-reported data from parents, which can be subject to biases such as social desirability and recall bias. While the findings of this research do align with previous work using different study methodologies, such as qualitative interviews (Edwards et al., 2024a), further ecological assessment of avid eating behaviours should be conducted.

Furthermore, the design of this work was cross-sectional, drawing limitations on our understanding of the complexities surrounding avid eating behaviours in young children and the fluctuations in parents' wellbeing and behaviour. The subsequent detailed data collected from the in-the-moment measures of the Ecological Momentary Assessment period will provide greater insight into the fluctuations of parental feeding practices and eating events in children with avid eating in the moment.

5. Conclusion

This novel study quantifies that avid eating in preschoolers is characterised by frequent food requests and eating occasions, influenced by both physiological hunger and external food cues. Our findings indicate that children with higher levels of surgency are more prone to having avid eating behaviour, while those with better effortful control exhibit more regulated eating patterns. The study also underscores the significant associations of children's avid eating behaviour with parental mental health, with increased stress, anxiety, and depression among parents who also manage frequent food demands compared to parents who manage fewer food demands. These insights highlight the necessity for comprehensive interventions that address not only the child's eating behaviour but also support parental wellbeing and coping strategies.

Importantly, the high rate of food insecurity observed in this sample underscores the need for broader systemic interventions to address the socioeconomic determinants that influence parent-child feeding interactions and children's eating behaviours. For example, policy interventions that improve access to affordable, nutritious food—such as food subsidies, expanding food assistance programs, or implementing universal free school meals—could help mitigate food insecurity and alleviate some of the financial pressures parents face. Additionally, broader societal efforts to improve parental well-being, such as access to affordable childcare and community mental health resources, could

reduce the stress and depression that often undermine effective parenting practices. By addressing these socioeconomic challenges, systemic interventions can create an environment where parents are better equipped to implement the individual-level strategies we propose.

CRediT authorship contribution statement

Abigail Pickard: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Katie L. Edwards:** Writing – review & editing, Data curation. **Claire Farrow:** Writing – review & editing, Funding acquisition, Conceptualization. **Emma Haycraft:** Writing – review & editing, Funding acquisition, Conceptualization. **Moritz Herle:** Writing – review & editing, Funding acquisition, Conceptualization. **Clare Llewellyn:** Funding acquisition, Conceptualization. **Helen Croker:** Funding acquisition, Conceptualization. **Jacqueline Blissett:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization.

Ethical statement

All research was conducted in accordance with the Declaration of Helsinki and ethical approval was granted by the Aston University School of Health and Life Sciences Ethical Board (Project ID Number: HLS21079). Informed consent was provided by all participants.

Data and code availability

To foster transparency and replicability in science, all our hypotheses and study designs were preregistered and received ethical approval prior to data collection. The data sets generated and analysed during this study will be available from the corresponding author upon reasonable request.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2025.107982>.

Data availability

Data will be made available on request.

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