Feeding a Fussy Eater: Examining Longitudinal Bi-directional Relationships between Child Fussy Eating and Maternal Feeding Practices

Kimberley M. Mallan, PhD [ab], Elena Jansen, PhD [bc], Holly Harris BNut&Diet (Hons)[bc], Clare Llewellyn, PhD [d], Alison Fildes, PhD [de], & Lynne A. Daniels, PhD [bc]

Affiliations:

[a] School of Psychology, Australian Catholic University, 1100 Nudgee Road, Banyo, Queensland 4014, Australia.

[b] School of Exercise and Nutrition Sciences, Queensland University of Technology, 60 Musk Avenue, Kelvin Grove, Queensland 4059, Australia.

[c] Centre for Children's Health Research, Corner of Graham Street and Raymond Terrace, South Brisbane, Queensland 4101, Australia.

[d] Department of Behavioural Science and Health, University College London, Gower St, London, WC1E 6BT, United Kingdom

[e] School of Psychology, University of Leeds, Woodhouse Lane, Leeds, LS2 9JT, United Kingdom

Address correspondence to: Dr Kimberley Mallan, School of Psychology, Australian Catholic University, 1100 Nudgee Road, Banyo, Queensland 4014, Australia. Email: Kimberley.Mallan@acu.edu.au; Phone: +61 7 38616093

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Abstract

Objective: Child fussy eating has been associated with a range of maternal feeding practices; however whether effects are parent-driven, child-driven or bidirectional (i.e., both) remains unclear. This study tested for bi-directional relationships between non-responsive and structure-related maternal feeding practices and child fussy eating at ages 2, 3.7 and 5 years using a cross-lagged model approach.

Methods: First-time Australian mothers (N = 207) reported 4 non-responsive and 4 structure-related feeding practices and child food fussiness (FF) using validated questionnaires at child ages 2, 3.7, and 5 years. Bivariate cross-lagged analyses were conducted for each of the 8 feeding practices separately.

Results: Both child- and parent-driven associations were observed. Higher FF at 3.7 years predicted higher non-responsive feeding practices and less structure-related practices at 5 years. Higher structure-related practices at 2 and 3.7 years predicted lower FF at 3.7 and 5 years respectively. Use of food as a reward for behaviour at 3.7 years predicted higher FF at 5 years.

Conclusions: Both parent- and child-driven associations explain the relationship between fussy eating and feeding practices. Given that early fussy eating is associated with more non-responsive feeding, providing parents with anticipatory guidance to manage fussy eating behaviour in infants and toddlers may help to avoid the use of these practices. Furthermore, the use of structure-related feeding practices and avoiding the use of food rewards may help to prevent the development of fussy eating.

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Introducing infants and toddlers to a variety of nutritious foods is important for the development of healthy food preferences and eating habits (Benton, 2004; Schwartz, Scholtens, Lalanne, Weenen, & Nicklaus, 2011). Food neophobia is a normal developmental phase with most children initially rejecting new and unfamiliar foods (Dovey, Staples, Gibson, & Halford, 2008). However, some children (as many as 50% of 2-year olds [Carruth, Ziegler, Gordon, & Barr, 2004]) continue to eat only a limited variety of foods; rejecting certain types of foods – both familiar and unfamiliar – to them (Dovey et al., 2008). This behaviour is defined as picky eating, fussy eating or food fussiness (FF; measured via the Children's Eating Behaviour Questionnaire [CEBQ; Wardle, Guthrie, Sanderson, & Rapoport, 2001]). Food fussiness and food neophobia share a common etiological pathway (Smith et al., 2017). At some stage in a child's development, all foods are new to a child (Gibson & Cooke, 2017), rendering it difficult for parents and clinicians to distinguish between the academic definitions of fussy eating and food neophobia (Dovey et al., 2008). Early FF has been associated with lower consumption of a variety of foods essential for long-term health, particularly vegetables (Cardona Cano et al., 2015; Tharner et al., 2015). Strategies parents use to feed children, or feeding practices have been proposed as potential shapers of FF (e.g., Finnane, Jansen, Mallan, & Daniels, 2016). However, more recent evidence suggests that FF is at least in part, a heritable eating behaviour trait (Fildes, van Jaarsveld, Cooke, Wardle, & Llewellyn, 2016; Smith et al., 2016) and that children's FF may in fact shape the parental feeding practices (e.g., Jansen et al., 2017).

The existence of cross-sectional relationships between child FF and inappropriate (i.e., non-responsive) parental feeding practices is well documented (Cole, An, Lee, & Donovan, 2017). Higher FF has been associated with a range of feeding practices including more instrumental feeding (using food as a reward; Jansen, Mallan, Nicholson, & Daniels, 2014), pressure to eat (pressuring a child to eat certain foods, or finish a meal; Jani, Mallan, & Daniels, 2015; Jansen et al., 2012) and restriction (restricting access to/limiting the amount of certain foods; Antoniou et al., 2015; Gregory, Paxton, & Brozovic, 2010b). Recently, there has been interest in how structure-related feeding practices around mealtimes, such as the timing and setting of meals and level of family engagement, also contribute to children's eating behaviours (Jansen et al., 2014). For example, Finnane et al. (2016) reported inverse cross-sectional associations between FF and a structured eating environment characterized by children eating meals at the table and with other members of the family. Longitudinal studies have also found support for a prospective relationship between pressure to eat and fussy eating (Galloway, Fiorito, Lee, & Birch, 2005; 2010a).

A recent cross-sectional twin design, showed that mothers reported using higher pressure and instrumental feeding with their fussier twin (Harris, Fildes, Mallan, & Llewellyn, 2016). However, reverse causation cannot be ruled out with cross-sectional data, even using discordant sibling designs. Emerging evidence suggests that the relationship between FF and parental feeding practices may be bi-directional (Black & Aboud, 2011; Jansen et al., 2017; Walton, Kuczynski, Haycraft, Breen, & Haines, 2017). A recent study of mother-child dyads (N = 4845) from the Netherlands examined bi-directional effects between parental pressure to eat and fussy eating (Jansen et al., 2017). Maternal reports of fussy eating were collected at 1.5, 3, 4 and 6 years and pressure to eat was reported at 4 years. Evidence for a bi-directional relationship was found: (i) fussy eating at 1.5 and 3 years was predictive of pressure to eat at 4 years (child-driven effects), and (ii) pressure to eat at 4 years predicted fussy eating at 6 years, controlling for level of fussy eating at 4 years (parent-driven effect). Despite strengths of this study in terms of longitudinal design and a

large sample, there were a number of limitations. Namely, pressure to eat was only measured at 1 out of 4 time points, therefore baseline levels of this practice could not be controlled for in the analysis. Further, it was the only feeding practice considered.

In order to establish the extent to which the relationship between child eating behaviour and maternal feeding practices is child- versus parent-driven, a symmetrical cross-lagged model with repeated assessments of both fussy eating and a range of feeding practices is needed. Thus, the aim of this study was to test for bi-directional relationships between (higher) non-responsive and (lower) structure-related maternal feeding practices and higher child FF at ages 2, 3.7 and 5 years using a cross-lagged model approach.

Method

Design and Participants

The present study involved secondary analysis of longitudinal data collected from participants enrolled in the control condition of the <blinded for review> randomized controlled trial (RCT) which evaluated an early feeding intervention targeting first time mothers (Australian and New Zealand Clinical Trials Registry Number 12608000056392; Daniels et al., 2009). The <blinded for review> RCT was granted ethical approval by 11 university and hospital human research ethics committees.

Eligibility for enrolment in <blinded for review> was restricted to English speaking first-time mothers who gave birth to a healthy (>35 weeks, >2500 g) singleton infant. Consecutive recruitment on postnatal wards of mainly publicly funded hospitals in two Australian cities (Adelaide and Brisbane) was carried out in 2008 and 2009. A total of 698 mothers were enrolled in the study and 346 were allocated to the control condition at child age 4 months (baseline). As reported previously (Daniels et al., 2015), mothers who agreed to participate were older, more

likely to have completed a university level education and less likely to smoke during pregnancy than mothers who declined to participate. Mothers in the control condition received no intervention content but could access 'usual care' resources in their state. The focus of the present analysis is on data collected at child age: 24 months (*SD* = 1.0, range = 21-27 months), 3.7 years (*SD* = 0.3, range = 3.4-4.2 years), and 5 years (*SD* = 0.1, range = 4.9-5.5 years). The RCT sample characteristics have been described in detail elsewhere (Daniels et al., 2015).

For the present study, data were available for 207 control group mothers and their children. Inclusion in the present study was based on completion of at least 2 of the 3 assessment points (i.e., 24 months, 3.7 years and 5 years). Compared to mothers who were not included in the study (*n* = 139), those included were older (*M* age at birth = 30.38 years [*SD* = 5.23] vs *M* = 29.19 years [*SD* = 5.35], *p* = .041) and more likely to have completed a university degree (65% vs 46%, *p* = .001), but did not differ on baseline BMI (measured at child age 4 months; *M* = 25.99 [*SD* = 5.67] vs *M* = 26.48 [*SD*=5.12], *p* = .42).

The study sample consisted of 94 male and 113 female children. Based on measured height and weight child BMI Z scores (calculated using World Health Organization Anthro version 3.0.1 and macros [World Health Organisation, 2006]) across the 3 time points indicated that BMI Z score was close to average at each time point (*M* = 0.87 [*SD* = 0.98] at 2 years; *M* = 0.58 [*SD* = 0.85] at 3.7 years; *M* = 0.44 [*SD* = 0.89] at 5 years), and only a small proportion were classified (World Health Organisation, 2006) as overweight or obese (BMI Z score >2; 9.1% at 2 years, 3.4% at 3.7 years; 4.4% at 5 years) and no children were underweight (BMI Z score <-2) or at risk of underweight (BMI Z score <-1).

Measures

Feeding practices. Maternal child feeding practices were assessed with the Feeding Practices and Structure Questionnaire (FPSQ-28; Jansen, Mallan, & Daniels, 2015) which measures 4 non-responsive feeding practices (Reward for Behaviour, Reward for Eating, Persuasive Feeding, Overt Restriction), and 4 structure-related feeding practices (Family Meal Setting, Structured Meal Timing, Structured Meal Setting, Covert Restriction). Details of each scale (number of items and example items) are presented in Table 1. All items are scored on a 5-point scale and mean scores for each scale are calculated. Higher scores indicate higher use of the practice. In the present sample, the FPSQ-28 has demonstrated longitudinal measurement invariance at 2, 3.5 and 5 years of age (Jansen et al., 2015) and all scales have shown acceptable internal reliability (Cronbach's $\alpha \geq .70$) except for Structured Meal Timing with Cronbach's α of .60 at child age 2 years, .68 at 3.7 years and .57 at 5 years (Jansen et al., 2015; Jansen et al., 2014; Jansen, Williams, Mallan, Nicholson, & Daniels, 2016)

Food Fussiness. The 6 item Food Fussiness (FF) scale of the validated CEBQ (Wardle, Guthrie, Sanderson, & Rapoport, 2001) was completed by mothers at all time points. The FF scale showed excellent reliability at all time points (Cronbach's α = .92 at 2 years, .92 at 3.7 years and .93 at 5 years). Each item was answered on a 5-point Likert scale from 1 to 5 and a mean score calculated with higher mean score indicating greater FF.

Data analysis

Participants who had completed the FPSQ-28 and FF scale of the CEBQ at 2 (n = 52) or 3 time points (n = 155) were included in present study. Missing values on the FPSQ scales or FF scale were predicted at the item level using Expectation Maximisation (EM) imputation in SPSS

Version 22 using the full dataset as well as the auxiliary variables available: child age and baseline (4 month) child weight-for-age z-score, maternal BMI and maternal age.

Bivariate cross-lagged model analyses were conducted in Mplus Version 7.3 (Muthén & Muthén, 2012) to examine associations between each of the 8 feeding practices and FF (see Figure 1). For each feeding-FF pair, 4 sets of paths were simultaneously tested: (i) autoregressive paths (continuity across time for each variable); (ii) cross-lagged paths from feeding practices to FF; (iii) cross-lagged paths from FF to feeding practices; and (iv) cross-sectional correlations between the feeding practices and FF at each of the three time points. Child gender and maternal education (as an indicator of family socioeconomic status) were considered as covariates. Correlational analyses showed that child gender was significantly correlated with food fussiness but none of the feeding practices whereas maternal education was significantly correlated with some of the feeding practices but not with food fussiness. Additional cross-lagged models adjusting for child gender or maternal education regressed onto the first food fussiness or child feeding variable were tested and did not substantively change any of the models in which these covariates were not included, therefore the models without covariates are reported here. Model fit was assessed with the following indices and acceptable cut-offs (Hu & Bentler, 1999): chi-square statistic (not significant), Comparative Fit Index (CFI) > .95, and Root Mean Square Error of Approximation (RMSEA) <.08. As recommended by Little (2013) modification indices were examined to determine if inclusion of additional autoregressive paths between each variable at 2 and 5 years would significantly improve model fit.

Results

In the present sample (N = 207) child FF mean score was slightly above the mid-point on the 5-point scale at all time points (Table 1). Maternal use of Reward for Behaviour and Reward for Eating were below or around the mid-point at all time points, however mean scores on the remaining feeding practice scales of the FPSQ were consistently high (Table 1). All maternal feeding practices and child FF demonstrated stability over time; for all variables significant positive correlations were observed between 2 and 3.7 years of age and 3.7 and 5 years of age (shown in autoregressive paths in Figures 2 and 3).

The fit indices for the cross-lagged models are presented in Table 2. Model fit was good with 6/8 chi-square statistics being non-significant (except Family Meal Setting and Structured Meal Timing), the majority of RMSEA <.08 and all models reflecting a CFI >.95. None of the models showed a bi-directional relationship between feeding practices and FF. Three models showed a child-driven relationship (i.e. significant cross-lagged paths from FF to feeding practices) while another three showed a parent-driven relationship (i.e. cross-lagged paths from feeding practices to FF).

Child-driven relationships were seen for Reward for Eating, Persuasive Feeding and Covert Restriction. Reward for Eating and FF (Figure 2, panel B) were significantly positively correlated at 2, 3.7 and 5 years. One cross-lagged path was significant: higher FF at 3.7 years predicted higher Reward for Eating at 5 years (p = .036). Persuasive Feeding and FF (Figure 2, panel C) were significantly positively correlated at 2, 3.7 and 5 years. Again, one cross-lagged path was significant: higher FF at 3.7 years predicted higher Persuasive Feeding at 5 years (p =.026). Covert Restriction and FF (Figure 3, panel A) were not significantly correlated at 2, 3.7

or 5 years and one cross-lagged path was significant: higher FF at 2 years was associated with lower Covert Restriction at 3.7 years (p = .021).

Parent-driven relationships were seen for Structured Meal Setting and Timing as well as Reward for Behaviour. Structured Meal Timing and FF (Figure 3, panel B) were not significantly correlated at 2, 3.7 or 5 years. However Structured Meal Timing at 3.7 years negatively predicted FF at 5 years (p = .004). Structured Meal Setting and FF (Figure 3, panel C) were negatively correlated at 2 years but were not significantly correlated at 3.7 or 5 years. Two cross-lagged paths were significant: higher Structured Meal Setting at 2 and 3.7 years was significantly associated with less FF at 3.7 (p = .020) and 5 years (p = .040). Reward for Behaviour and FF (Figure 2, panel A) were significantly positively correlated at 2 and 5 years, but not at 3.7 years. One cross-lagged path was significant: Reward for Behaviour at 3.7 years was positively associated with FF at 5 years (p = .035).

Discussion

The findings from this longitudinal examination of the relationship between child FF and maternal feeding practices revealed both child-driven and parent-driven relationships. Higher FF at 2 years predicted less Covert Restriction at 3.7 years and higher FF at 3.7 years predicted greater use of two non-responsive feeding practices at 5 years: Persuasive Feeding and Reward for Eating. Lower Structured Meal Setting at 2 and 3.7 years predicted higher FF at 3.7 and 5 years, respectively, and lower Structured Meal Timing at 3.7 years predicted higher FF at 5 years. Finally, higher Reward for Behaviour at 3.7 years predicted higher FF at 5 years.

The earliest child-driven relationship observed in the present study was that higher FF at 2 years was found to predict less Covert Restriction at 3.7 years. Covert restriction of 'unhealthy' foods may have decreased in response to child fussy eating behaviour potentially as a strategy to ensure adequate food intake in children who eat only a limited variety of foods. Qualitative research with parents may help to assess this proposed explanation of the current findings. Two other child-driven relationships were higher FF at 3.7 years predicted higher use of Reward for Eating and Persuasive Feeding at 5 years. These findings are consistent with those of a recent cross-sectional twin study (Harris et al., 2016) and the longitudinal study by Jansen et al. (2017) which together suggest that the relationship between FF and non-responsive/coercive feeding practices may be child-driven, at least initially. Whilst we found no evidence of an effect of these non-responsive practices on child FF, Jansen et al. found that although earlier fussy eating at 1.5 and 3 years predicted pressure to eat at 4 years, pressure to eat at 4 years predicted fussy eating at 6 years. The only evidence for a non-responsive feeding practice influencing child FF in the present study was a small but statistically significant relationship between Reward for Behaviour at 3.7 years and higher FF at 5 years. This novel finding needs to be interpreted with caution and replicated in larger samples. In sum, the present findings strongly support the notion that parents use less desirable feeding practices in response to their child's perceived early fussy eating behaviour; however it may be that these feeding practices do impact child eating in the longer term.

Evidence for parent-driven relationships was also evident in the findings with structure-related feeding practices prospectively predicting lower FF. Specifically more Structured Meal Setting at 2 and 3.7 years was related to lower FF at 3.7 and 5 years and more Structured Meal Timing at 3.7 years was related to lower FF at 5 years. These findings are in line with the

theoretical perspective (DiSantis, Hodges, Johnson, & Fisher, 2011; Eneli, Crum, & Tylka, 2008) that providing meal time structure will encourage healthy eating habits in children via role modelling and reducing distractions (such as television). The present data indicate that structured meals may 'curb' the development of FF as children grow or at least attenuate the expression of this appetitive trait. Given that food neophobia (rejection of new foods) is believed to peak between 2-6 years of age (Dovey et al., 2008) this indicates that parents can help to positively manage this 'normal' behaviour and move through this developmental stage by providing structure around eating occasions. It is unknown to what extent the present findings apply to children with severe fussy eating or Avoidance Restrictive Food Intake Disorder. While the provision of structure at mealtimes may be beneficial other more directed strategies such as the use of non-food rewards, social praise, repeated exposure and modelling may be required to improve these children's intake of rejected foods, particularly vegetables (Caton, Ahern, Remy, Nicklaus, Blundell, & Hetherington, 2013; Cooke, Chambers, Añez, & Wardle, 2011).

Taken together, the present findings add to this existing literature on feeding strategies/practices that may have a positive impact on children's acceptance of certain foods, typically vegetables, and hence reduce food fussiness. Specifically, the clinical implication of these findings are that parents do need to be provided with alternative feeding practices and strategies to cope with the emergence of neophobic and potentially fussy eating behaviour in their toddlers. Evidence suggests that many parents respond to fussy eating with non-responsive practices such as persuasive feeding and using food rewards that have the potential to adversely impact on future eating behaviours (DiSantis et al., 2011). Therefore, it is essential that parents are well equipped with positive feeding practices such as implementing structure mealtimes for

their child in addition to strategies (such as repeated exposure) previously shown to increase acceptance of disliked foods (Caton et al., 2013).

The present study adds to the emerging literature in the area of child feeding that utilises longitudinal data and cross-lagged analyses to investigate the complex nature of the mother-child feeding relationship. More specifically, this study clarifies previous work on determinants of FF and gives weight to speculation that many of the observed cross-sectional relationships between non-responsive practices and FF are indeed child-driven. Despite the novelty and methodological strengths of the present study the results need to be considered in light of some limitations. Firstly, the sample was relatively small and homogenous (highly educated, Australian first-time mothers of healthy weight children). This limits the generalisability of study findings to other populations and as such further research is required to examine whether the present findings can be replicated in families that are socioeconomically disadvantaged, from non-Western backgrounds and with overweight or obese children.

In addition to these limitations surrounding the sample, there are some statistical issues that should be considered when interpreting the findings. Firstly, because 25% of the sample did not complete the measures at one time point imputation of missing data was necessary to preserve the sample size. Secondly, due to the small sample size extensive adjustment of potential covariates/confounding variables was not performed. Child gender was found to be related to food fussiness but not feeding practices and therefore could not be considered a potential confounder between these variables. Similarly, maternal education was correlated with aspects of child feeding but not with food fussiness. Future research with a larger sample should consider adjusting for potential covariates including child gender, maternal education/family socioeconomic status, and maternal food fussiness. Thirdly, effect sizes for the significant cross-

lag paths were small but are comparable to those reported in other similar and larger studies (Jansen et al., 2017; Steinsbekk, Belsky, & Wichstrøm, 2016) and are independent of the small-to-medium cross-sectional and the large autoregressive effects also estimated in the models. While the strength of the autoregressive paths indicated that both child FF and maternal feeding practices are relatively stable across time, this does not preclude the possibility that interventions that target feeding practices could substantially modify both these parental behaviours and child FF. The clinical significance of changes in FF that can be attributed to changes in feeding practices is a question that the present analysis cannot directly answer – but it does provide implications for which feeding practices in particular could be targeted in experimental designs in which their direct effects on FF in both the short and longer term could be more extensively examined.

Another limitation to consider is the timing of the first assessment (child age 2 years). Assessing these behaviours earlier than 2 years of age before they become entrenched may assist in the identification of causal pathways between child eating and feeding. Indeed, with additional waves of data the present autoregressive, cross-lag model could have been compared against alternative statistical models such as the autoregressive latent trajectory model, which could allow for individual variability in trajectories of feeding practices and food fussiness and how these co-vary (Bollen & Curran, 2004).

Finally, limitations of the measures used are also relevant. Shared method variance is one limitation, social desirability bias may undermine the validity of the self-reported feeding practice data, and the low (<.70) reliability estimates of the 3-item Structured Meal Timing scale mean that results pertaining to this practice in particular should be interpreted with caution., While it must be acknowledged that the measure of FF reflects mothers' perception of the child's

behaviour, this scale has been validated against a psychometric interview to identify clinically significant fussy/picky eating (Steinsbekk, Sveen, Fildes, Llewellyn, & Wichstrøm, 2017). Furthermore, within the <blinded for review> sample FF, and the related construct of neophobia, have been associated with lower preference for fruits and vegetables and poorer dietary quality (measured in terms of intake patterns using a validated tool or using 3 day food records; Howard, Mallan, Byrne, Magarey, & Daniels, 2012; Perry, Mallan, Koo, Mauch, Daniels, & Magarey, 2015; Mallan, Fildes, Magarey, & Daniels, 2016). Including measurement of child food intake as well as what foods are offered to the child will be informative in future research on fussy eating and feeding practices.

The use of a cross-lagged model approach allowed the present study to clarify the direction of relationships between mother and child: FF tended to prospectively increase mothers' use of non-responsive feeding practices and decrease the use of the more potentially 'protective' practice of covert restriction of 'unhealthy' foods. In contrast, structure-related practices around the timing and setting of meals had positive effects on child eating behaviour with both practices leading to mothers reporting lower child FF over time. Taken together these findings can inform interventions designed to manage FF in the preschool years. Specifically, parents can be encouraged to manage FF through the use of structured meal times and settings rather than needing to resort to coercive (non-responsive) strategies to encourage healthy eating habits.

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Table 1. Maternal reported child Food Fussiness and Feeding Practices at child ages 2, 3.7 and 5 years (*N*=207).

	Assessment time point (child age)		
	2 years	3.7 years	5 years
	Mean (Standard Deviation)		
Child Food Fussiness[a] 6 items, e.g., *My child refuses new foods at first*	2.62 (0.75)	2.93 (0.81)	2.93 (0.82)
Maternal Feeding Practices[b]			
Reward for Behaviour 4 items, e.g. "*I reward my child with something to eat when (s)he is well behaved*"	1.85 (0.69)	2.20 (0.74)	2.22 (0.73)
Reward for Eating 4 items, e.g. "*When your child refuses food they usually eat, do you encourage to eat by offering a food reward (e.g., dessert)?*"	1.81 (0.71)	2.54 (0.73)	2.58 (0.71)
Persuasive Feeding 6 items, e.g. "*When your child refuses food they usually eat, do you insist your child eats it?*"	2.70 (0.60)	3.12 (0.62)	3.14 (0.60)
Overt Restriction items, e.g. "*If I did not guide or regulate my child's eating, (s)he would eat too many junk foods*"	3.40 (0.83)	3.54 (0.91)	3.46 (0.84)
Covert Restriction 4 items, e.g. "*How often do you avoid buying lollies and snacks e.g., potato chips and bringing them into the house?*"	3.20 (0.90)	3.28 (0.80)	3.24 (0.78)
Family Meal Setting 1 item, "*My child eats the same meals as the rest of the family*"	3.71 (1.27)	4.07 (1.16)	4.39 (0.96)
Structured Meal Timing 3 items, e.g. "*I decide the times when my child eats his/her meals*"	3.88 (0.59)	3.80 (0.52)	3.76 (0.52)
Structured Meal Setting 3 items, e.g. "*I insist my child eats meals at the table*"	3.96 (0.72)	4.11 (0.66)	4.31 (0.59)

[a] Measured via the Children's Eating Behaviour Questionnaire (Wardle et al., 2001); 5 point scale with higher scores indicating higher level of Food Fussiness.

[b] Measured via the Feeding Practices and Structure Questionnaire (Jansen et al., 2016); 5 point scale with higher scores indicating higher level of the feeding practice.

Table 2. Model fit indices for the bidirectional models of relationship of Food Fussiness and maternal feeding practices across child ages 2, 3.7 and 5 years (*N*=207).

Feeding Practice	x^2 (df)	P-value	CFI >.95	RMSEA (95% CI) <.08
Reward for Behaviour	0.80 (2)	0.67	1.00	0.01 (0.00-0.11)
Reward for Eating	2.53 (3)	0.47	1.00	0.01 (0.00-0.11)
Persuasive Feeding	4.96 (3)	0.17	0.99	0.06 (0.00-0.14)
Overt Restriction	5.65 (3)	0.13	0.99	0.07 (0.00-0.15)
Covert Restriction	7.08 (3)	0.07	0.99	0.08 (0.00-0.16)
Family Meal Setting	8.26 (3)	0.04	0.99	0.09 (0.02-0.17)
Structured Meal Timing	10.08 (3)	0.02	0.99	0.10 (0.04-0.18)
Structured Meal Setting	3.47 (2)	0.18	0.99	0.06 (0.00-0.16)

df: degrees of freedom; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation

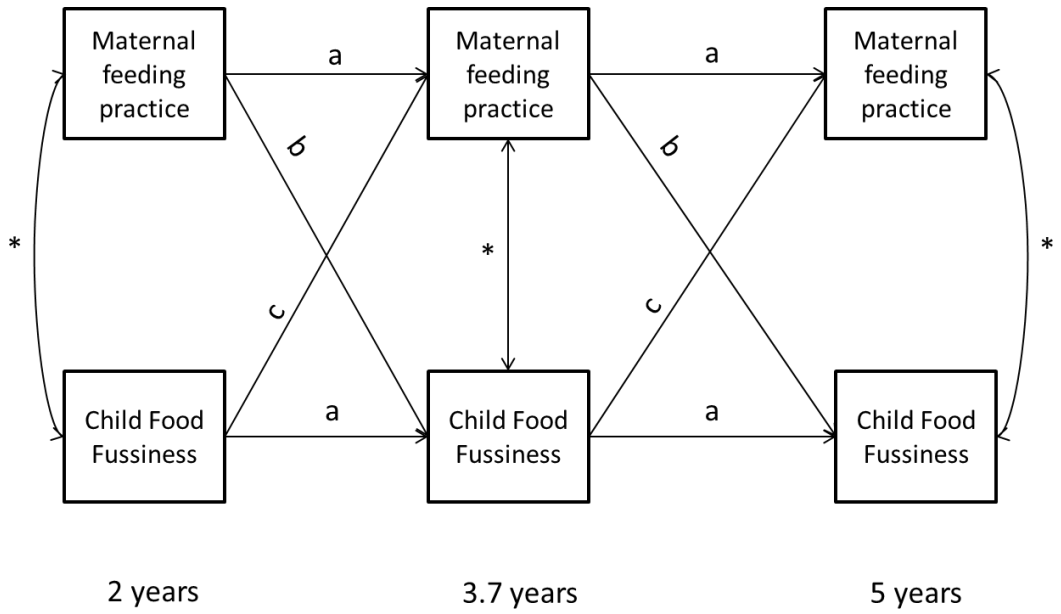
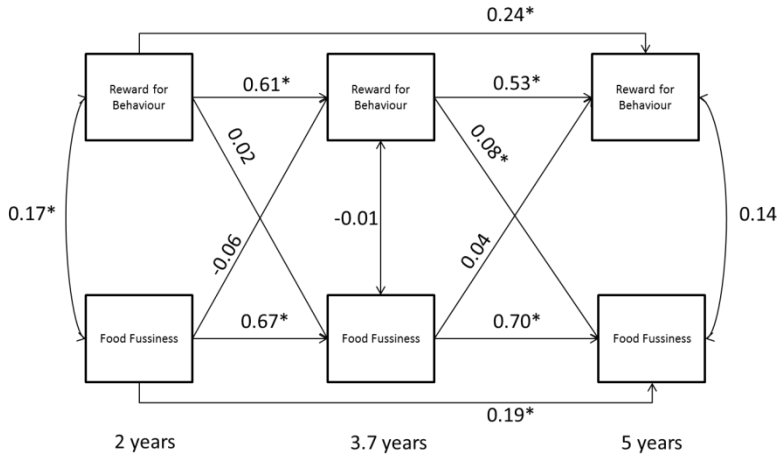
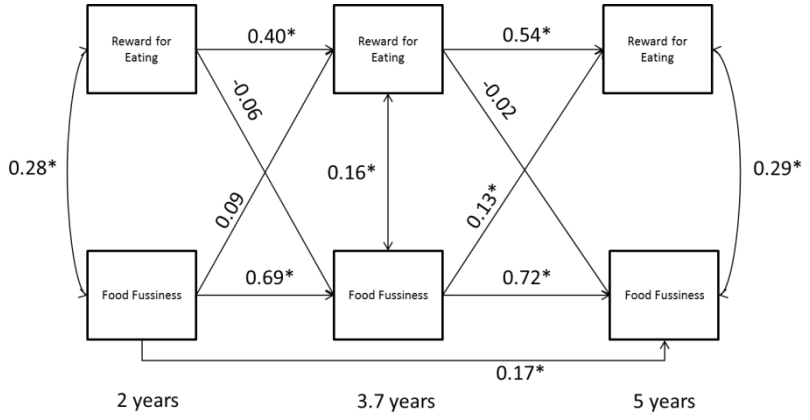


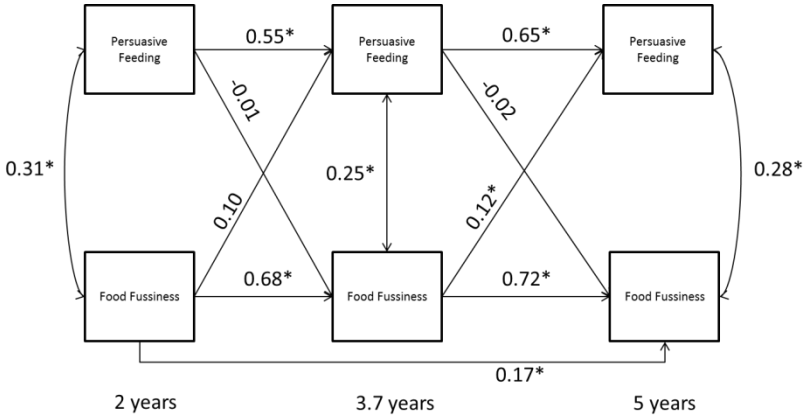
Figure 1. Paths estimated for each of the bidirectional models for each pair of variables. *cross-sectional correlations were included in all models; a = autoregressive paths; b = maternal feeding practice driven paths; c = child Food Fussiness driven paths.


0.24*
Reward for Behaviour
0.61*
Reward for Behaviour
0.53*
Reward for Behaviour
0.02
0.08*
0.17*
-0.01
0.14
-0.06
0.04
Food Fussiness
0.67*
Food Fussiness
0.70*
Food Fussiness
0.19*
2 years
3.7 years
5 years

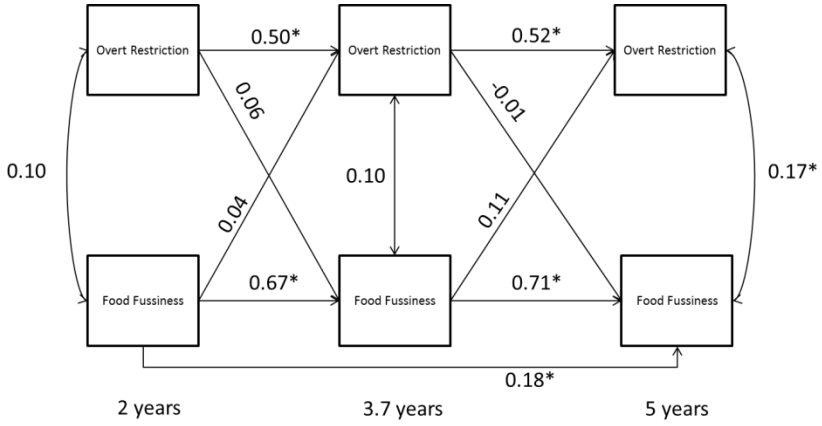
A


Reward for Eating
0.40*
Reward for Eating
0.54*
Reward for Eating
-0.06
-0.02
0.28*
0.16*
0.29*
0.09
0.13*
Food Fussiness
0.69*
Food Fussiness
0.72*
Food Fussiness
0.17*
2 years
3.7 years
5 years

B

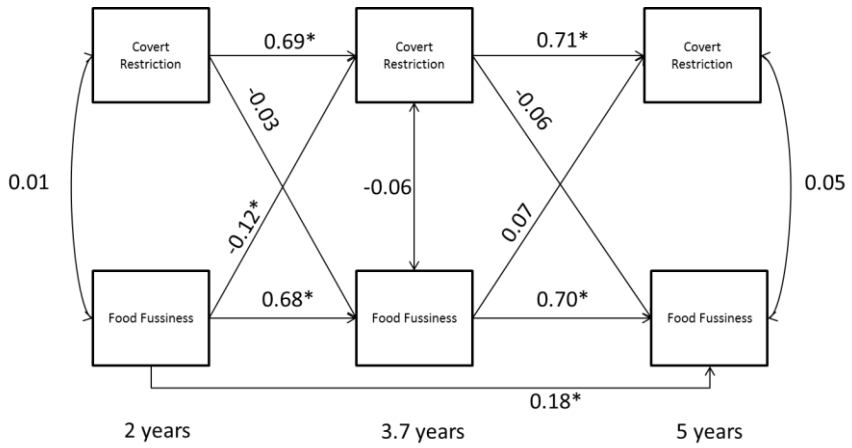

Persuasive Feeding
0.55*
Persuasive Feeding
0.65*
Persuasive Feeding
-0.01
-0.02
0.31*
0.25*
0.28*
0.10
0.12*
Food Fussiness
0.68*
Food Fussiness
0.72*
Food Fussiness
0.17*
2 years
3.7 years
5 years

C

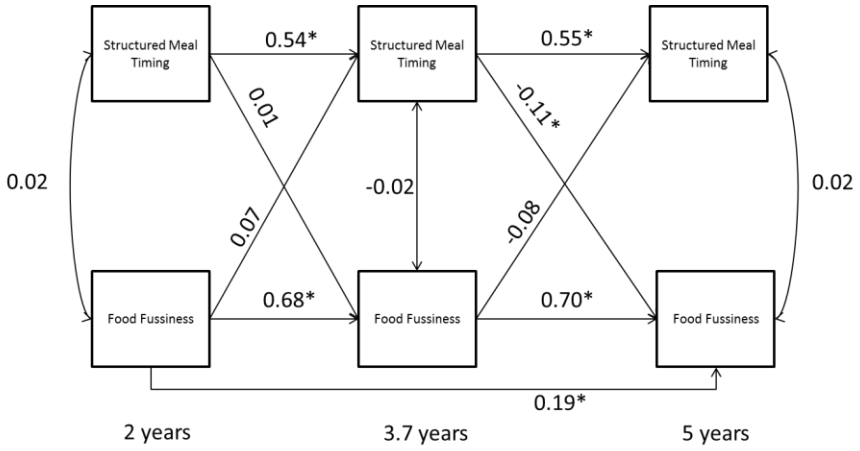

Overt Restriction
0.50*
Overt Restriction
0.52*
Overt Restriction
0.06
-0.01
0.10
0.17*
0.10
0.04
0.11
Food Fussiness
0.67*
Food Fussiness
0.71*
Food Fussiness
0.18*
2 years
3.7 years
5 years

D

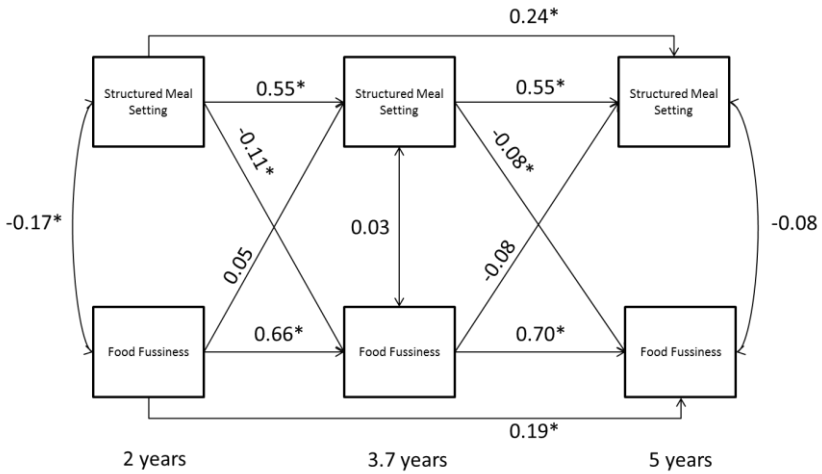
Figure 2. Bidirectional models for relations among maternal-reported Food Fussiness and Reward for Behaviour (panel A), Reward for Eating (panel B), Persuasive Feeding (panel C), and Overt Restriction (panel D) between child ages 2, 3.7 and 5 years (*N*=207). Coefficients are standardized. *$p < .05$


Covert Restriction
Covert Restriction
Covert Restriction
Food Fussiness
Food Fussiness
Food Fussiness
0.69*
0.71*
-0.03
-0.06
-0.06
0.01
0.05
-0.12*
0.07
0.68*
0.70*
0.18*
2 years
3.7 years
5 years

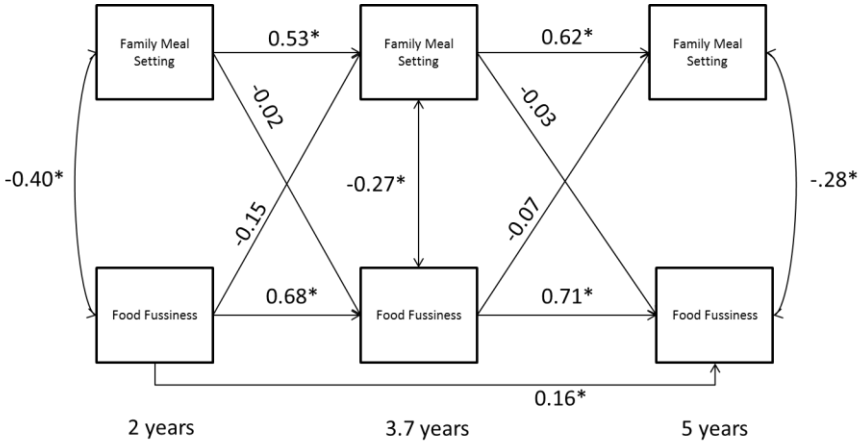
A


Structured Meal Timing
Structured Meal Timing
Structured Meal Timing
Food Fussiness
Food Fussiness
Food Fussiness
0.54*
0.55*
0.01
-0.11*
-0.02
0.02
0.02
0.07
-0.08
0.68*
0.70*
0.19*
2 years
3.7 years
5 years

B


0.24*
Structured Meal Setting
Structured Meal Setting
Structured Meal Setting
Food Fussiness
Food Fussiness
Food Fussiness
0.55*
0.55*
-0.11*
-0.08*
0.03
-0.17*
-0.08
0.05
-0.08
0.66*
0.70*
0.19*
2 years
3.7 years
5 years

C


Family Meal Setting
Family Meal Setting
Family Meal Setting
Food Fussiness
Food Fussiness
Food Fussiness
0.53*
0.62*
-0.02
-0.03
-0.27*
-0.40*
-.28*
-0.15
-0.07
0.68*
0.71*
0.16*
2 years
3.7 years
5 years

D

Figure 3. Bidirectional models for relations among maternal-reported Food Fussiness and Covert Restriction (panel A), Structured Meal Timing (panel B), Structured Meal Setting (panel C), and Family Meal Setting (panel D) between child ages 2, 3.7 and 5 years (*N*=207). Coefficients are standardized. *$p < .05$