Parental modelling of eating behaviours:
Observational validation of the Parental Modelling of Eating Behaviours scale (PARM)

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Abstract

Parents are important role models for their children's eating behaviours. This study aimed to further validate the recently developed Parental Modelling of Eating Behaviours Scale (PARM; Palfreyman, Haycraft & Meyer, 2012) by examining the relationships between maternal self-reports on the PARM with the modelling practices exhibited by these mothers during three family mealtime observations. Relationships between observed maternal modelling and maternal reports of children's eating behaviours were also explored. Seventeen mothers with children aged between 2 and 6 years were video recorded at home on three separate occasions whilst eating a meal with their child. Mothers also completed the PARM, the Children's Eating Behaviour Questionnaire and provided demographic information about themselves and their child. Findings provided validation for all three PARM subscales, which were positively associated with their observed counterparts on the observational coding scheme (PARM-O). The results also indicate that habituation to observations did not change the feeding behaviours displayed by mothers. In addition, observed maternal modelling was significantly related to children's food responsiveness (i.e., their interest in and desire for foods), enjoyment of food, and food fussiness. This study makes three important contributions to the literature. It provides construct validation for the PARM measure and provides further observational support for maternal modelling being related to lower levels of food fussiness and higher levels of food enjoyment in their children. These findings also suggest that maternal feeding behaviours remain consistent across repeated observations of family mealtimes, providing validation for previous research which has used single observations.

Keywords: Maternal; Eating Behaviours; Child; Modelling; Social influences; Parental feeding strategies; Mealtime interactions; Observations; Questionnaire; PARM; PARM-O.

Parental modelling of eating behaviours:

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Parental modelling of eating behaviours and attitudes and the consequences for children is a relatively under-researched area compared to controlling feeding practices, such as restricting food intake and pressuring children to eat (e.g., Birch, Davison & Fisher, 2003; Fisher & Birch 1999; Francis, Hofer & Birch 2001; Palfreyman, Haycraft & Meyer, 2012). Limited research has shown that outcomes related to parental modelling can be both positive and negative, depending on the behaviours being modelled by the parent and the behaviours that are copied by the child. Indeed, maternal self-reports of modelling have been associated with positive outcomes in children's dietary development, such as greater consumption of healthy foods like fruit and vegetables (e.g., Palfreyman et al., 2012; Tibbs et al., 2001; Young, Fors & Hayes, 2004), lower levels of children's food fussiness, and greater interest in foods (Gregory, Paxton & Brozovic, 2010). Reduced variety in children's diets and low levels of fruit and vegetable intake have been related to poorer health outcomes in both adults and children (e.g., Dauchet, Amouyel, Hercberg & Dallongeville, 2003; Hu et al., 2000; World Health Organisation, 2003). However, parental modelling has also been associated with negative outcomes, such as greater intake of unhealthy snack foods (Brown & Ogden, 2004; Palfreyman et al., 2012), elevated levels of dietary restraint and dietary disinhibition (Cutting, Fisher, Grimm-Thomas & Birch, 1999; Hill, Weaver & Blundell, 1990), and increased dieting behaviours (Hill & Franklin, 1998; Pike & Rodin, 1991). High levels of dietary restraint, dietary disinhibition and increased dieting behaviours displayed by mothers have been related to increased risks of their children developing maladaptive eating patterns and having higher weight levels (Fisher & Birch, 1995), factors associated with the subsequent development of disordered eating. This contrasting literature suggests the potential for the

transmission of both adaptive and maladaptive eating behaviours via the children copying behaviours that their parents model. However, to date, these relationships have not been explored using *observed* maternal modelling, so it is not clear whether these factors are related to objective assessments of maternal modelling or just to maternal reports. This is a serious omission given that studies have found conflicting results regarding the links between observations of mothers' controlling feeding practices and self-reports of these behaviours (e.g., Haycraft & Blissett, 2008; Lewis & Worobey, 2011; Sacco et al., 2007).

Measurement of parental feeding practices (including parental modelling) has tended to be via self-report questionnaires (e.g., Birch et al., 2001; Farrow, Galloway & Fraser, 2009; Webber, Cooke, Hill & Wardle, 2010). However, many existing measures have concentrated on controlling feeding practices (e.g., the Child Feeding Questionnaire; Birch et al., 2001). Those that have measured modelling have a number of limitations, such as including only a few items (e.g., Musher-Eizenman & Holub, 2007), thereby limiting their scope, and employing single-use measures (e.g., Hendy Williams, Camise, Eckma, & Hademannn, 2008; Tibbs et al., 2001). These limitations with previous measures of modelling motivated the development of the Parental Modelling of Eating Behaviours scale (PARM; Palfreyman et al., 2012). Initial assessments of the PARM using a previous parental self-report subscale of modelling (Musher-Eizenman & Holub, 2007) confirmed its convergent and concurrent validity and its good levels of reliability (Palfreyman et al., 2012).

Few studies have examined the relationships between observed parental feeding practices and self-report data, but those that have done so have produced mixed results. For example, several studies have failed to find any significant associations between maternal self-reported data and observations of controlling feeding behaviours (e.g., Haycraft & Blissett, 2008;

Lewis & Worobey, 2011; Sacco et al., 2007). However, Farrow and Blissett (2006) found maternal self-report data were significantly related to relevant observations of maternal feeding behaviours for pressure to eat but not for restriction. This inconsistent pattern of results could be due to mothers being less aware of their restrictive feeding behaviours or being less likely to report such practices if they perceive them to be considered less desirable or are aware of the negative outcomes associated with their use.

Research exploring maternal feeding behaviours has tended to use single observations of family mealtimes (e.g., Blissett, Haycraft & Farrow, 2010; Blissett & Haycraft, 2011; Drewett, Kasese-Hara & Wright, 2002; Haycraft & Blissett, 2008; Sacco et al., 2007; Stein, Woolley, Cooper & Fairburn, 1994; Stein et al., 2001). This is common practice as observational studies are time-consuming for both participants and researchers, are often difficult to recruit to, and can be costly (Simon-Morton & Baranowski, 1991). Interestingly, some research (e.g., Orrell-Valente et al., 2007) has used multiple observations over time to try and counter the effect of the observer through habituation and has calculated an average of the behaviours observed across all sessions. In addition, a study by Young and Drewett (2000) found variations in the eating behaviours of 1 year old children over four separate mealtime observations. However, as highlighted by the authors, this age represents a transitional period between parental feeding and self-feeding, so it is highly likely that eating behaviours observed during this period would be different from those of older children whose eating behaviours are more established. While Young and Drewett's study concentrated on the eating behaviours of children, they also reported variations among mealtimes in terms of parents' feeding behaviours and this, coupled with evidence of a bidirectional relationship between parental feeding practices and children's eating behaviours (e.g. Farrow et al., 2009; Horn, Galloway, Webb & Gagnon, 2011), would suggest that eating behaviours and feeding

practices employed by parents might vary over sequential mealtimes. Thus, Young and Drewett (2000) recommended that future research within this area observe a minimum of two mealtimes. However, to date, research has not explored whether there is a difference between these two methods of collecting observational mealtime data (single versus multiple observations) and whether parental feeding strategies such as restriction or modelling captured during one observation are representative of these strategies captured over several sessions with young children (over the age of 1 year).

In summary, parental modelling of eating behaviours and attitudes are likely to play a significant role in the development of children's eating behaviours. The PARM (Palfreyman et al., 2012) was developed as a tool to measure this construct. However, as has been done with other feeding practice measures (e.g., Stice, Fisher & Lowe, 2004), further construct validation of the PARM is required by examining how well maternal self-report data on the PARM links to observations of mothers' modelling of eating behaviours. Therefore, the primary aim of this study was to provide further validation of the PARM (and its three individual subscales) by examining the relationships between self-reported and observed modelling behaviours. Following on from the work of Farrow and Blissett (2006), it was hypothesised that self-reported maternal modelling would be closely related to observed maternal modelling. Prior to testing this core aim, it was necessary to determine whether there was consistency in maternal feeding behaviours (modelling, restriction, pressure) across three mealtime observations. Finally, the study aimed to explore the relationships between observed maternal modelling and children's eating behaviours. Based on previous self-report findings (Gregory et al., 2010), it was hypothesised that observed maternal modelling would be significantly related to children's eating behaviours.

Method

Participants

Initially, 18 families of children aged between 2 and 6 years responded to advertisements and, after speaking directly with the researcher, participated in this study. After data collection, one family was excluded due to the mother eating with the target child on only one of the three observed occasions, thereby not permitting the required modelling observations. This left 17 families in this study who were each observed/recorded on three separate mealtimes. Therefore, the total number of mealtime observations conducted was 51.

The mothers ranged in age from 22 to 44 years (mean age of 34.0 years, SD = 6.22). Mothers reported their ethnicity as predominantly White/British with only one family reporting Asian ethnicity. Mothers' mean BMI calculated from measurements recorded by the researcher at session one was 24.54 (SD = 2.09, range 21.20 to 28.80). Mothers had a mean of 5.5 years of education after the age of 16 (SD = 2.03, range 0 to 8 years) and reported working between 0 and 40 hours per week (mean 11.24 hours, SD = 11.42).

The children had a mean age of 4 years and 5 months (53 months; SD = 23.32; range 19 to 73 months). There were 10 male (59%) and seven female (41%) children in the sample. The mean age and gender adjusted child BMI z-score calculated from measurements taken by the research was 0.71 (SD = 1.28; range -1.07 to 2.94; Child Growth Foundation, 1996), suggesting generally healthy child weight.

Measures and Procedure

Following Institutional Review Board ethical approval, recruitment occurred in four ways. Participants were recruited by: (i) contacting a list of participants who had taken part in

previous studies and agreed to be contacted for future research (n=2); (ii) via online posts placed on parenting websites (e.g., www.netmums.com) (n=8); (iii) via posters displayed in nurseries, preschools, schools and two universities within the East Midlands of the UK (n=4); (iv) and, finally, via a snowball method where the researcher asked participants if they knew anyone else who would be interested in taking part (n=4). These methods recruited 18 families in total (one of which was later excluded). Prior to the mealtime observations commencing, informed consent was provided by the mothers.

Mealtime Observations

Observations occurred at home during a typical family mealtime, either lunch or dinner, on three separate occasions. All three observations took place over a two week period and, when possible, within one week (dependent on the availability of the participants). Mothers and their child were asked to have "a normal family meal". On each occasion, the researcher arrived 30 minutes before the pre-arranged mealtime and set up the recording equipment. A camcorder (Sony Handycam DCR-SR58E) was used to record the mealtimes. The researcher left the room during the mealtime (or removed herself from the child's line of sight when this was not possible). For 10 of the families participating, the researcher was not present for the second or third mealtime. The camcorder was left with the families, who were asked to record the mealtime(s) as had been done on the first occasion. Siblings were present for 30 of the 51 mealtime observations (59%) and fathers were present for 15 (29%). However, neither siblings nor fathers were analysed for this validation study. Mealtime recordings were coded in real time using all occurrence sampling. The length of children's mealtimes ranged from 13.57 to 41.55 minutes, with a mean mealtime duration of 22.1 minutes (SD = 7.70). Twenty-two percent (n=11) of the recorded observations were coded by a second, independent researcher in order to determine inter-rater reliability for all of the observational

subscales used within this study. Intra-class correlation (ICC) coefficients ranged from .71 to 1.0 ($p < 0.001$), indicating high inter-rater reliability.

Parental Modelling of Eating Behaviours - Observational Coding Scheme (PARM-O).

The Parental Modelling of Eating Behaviours - Observational Coding Scheme (PARM-O) was developed specifically for this study and was based on the three subscales of the PARM (Palfreyman et al., 2012). The coding scheme was devised as a way to record modelling behaviours that are independently observed during a mealtime. It has three subscales which explore: verbal modelling; behavioural modelling; and, unintentional modelling. Brief descriptions are provided below and a copy of the coding scheme is available from the authors on request. High scores on the PARM-O subscales indicate greater observed instances of modelling during mealtimes.

i. Verbal modelling

Verbal modelling was coded by tallying the number of instances that mothers verbally modelled their eating behaviours (e.g., *"I can't eat my chips because I'm on a diet"*), their likes and dislikes (e.g., *"peas are my favourite"*), or produced positive/negative food-related vocalisations during the mealtime (e.g., *"mmm lovely"* or "*ugh"*).

ii. Behavioural modelling

Behavioural modelling was coded by tallying the number of times mothers modelled eating behaviours which their child could copy, such as eating certain items first, sharing foods from plates, and selecting food items in front of their child. This included forms of intentional modelling in which mothers drew attention to their eating behaviour.

iii. Unintentional modelling

Unintentional modelling was coded for by counting the number of times the target child copied a behaviour displayed by the mother where the mother had not used verbal or direct

behavioural modelling, and was therefore interpreted by the researcher as being unintentionally modelled. An example of this would be the mother leaving an item of food uneaten, perhaps because she is full, and the child then also leaving the same item even though the child is not full (as indicated by the child eating more of other foods).

Family Mealtime Coding System (FMCS; Haycraft & Blissett, 2008)

Additional maternal feeding practices were coded for using the Family Mealtime Coding System (Haycraft & Blissett, 2008), which is based on subscales from the Child Feeding Questionnaire (Birch et al., 2001). The FMCS has been used successfully in previous research (e.g., Blissett & Haycraft, 2011; Farrow, Blissett & Haycraft, 2011) to explore observed occurrences of more controlling feeding practices employed by mothers (i.e. pressure to eat, use of physical prompts, verbal and physical restriction of food, and use of incentives). Observed instances of these feeding practices were recorded to create total scores. The use of the FMCS allowed for a range of feeding strategies to be assessed in relation to the preliminary aim of the study - i.e. to determine whether there was consistency in maternal feeding behaviours among three separate observations.

Self-report data collection

Mothers also completed a questionnaire pack prior to the first mealtime observation. Mothers provided background information about themselves and their child (including ethnicity, age, and gender) and completed the following questionnaires.

Parental Modelling of Eating Behaviours Scale (PARM; Palfreyman, et al., 2012)

The PARM is a self-report measure consisting of 15 items, designed to measure parental modelling of eating behaviours using a 7-point Likert scale with three anchors (Strongly

disagree – Neutral – Strongly Agree). The measure consists of three subscales: Verbal Modelling (6 items; α = .81) which examines how parents model their eating behaviours and food preferences through verbal communication; Behavioural consequences (6 items; α = .88) which explores mothers intentionally modelling eating behaviours that their child then copies; and, Unintentional modelling (3 items; α = .78) which measures parental awareness of behaviours their children have copied or have in common with their parent which parents have not intentionally modelled. This measure has been shown to have good validity and reliability with a maternal sample (Palfreyman et al., 2012).

Children's Eating Behaviour Questionnaire (CEBQ; Wardle, Guthrie, Sanderson & Rapoport, 2001).

The CEBQ is a 35 item parental self-report measure, designed to assess eating styles in children using a five-point Likert frequency scale ranging from 'Never' to 'Always'. The measure consists of eight subscales but, for this study, the '*Desire to drink*' subscale was removed. This left *Food responsiveness* (5 items; α = .75), *Enjoyment of food* (4 items; α = .91), *Emotional over-eating* (4 items; α = .64), *Emotional under-eating* (4 items; α = .66), *Satiety responsiveness* (5 items; α = .71), *Slowness in eating* (4 items; α = .76), and *Food Fussiness* (6 items; α = .96). The CEBQ has been found to have good internal validity (Webber, Cooke, Hill & Wardle, 2010) and good test–retest reliability (Carnell & Wardle, 2007; Wardle et al., 2001).

When both observation and questionnaire data had been collected, the researcher measured the height and weight of the mother and the target child (wherever possible, this happened after the first mealtime). Participants were asked to remove their shoes and then their weight was recorded to the nearest 0.1kg using Salter electronic scales. Height measurements to the

nearest 0.5cm were taken for both the mother and the target child, by measuring participants when they were asked to stand tall against a wall with their heels back and their feet flat.

Data analysis

Kolmogorov-Smirnov tests established that the data were non-normally distributed and therefore non-parametric statistics were used, when possible, to test the study's hypotheses.

To test whether there was consistency among the observed maternal feeding practices during observations 1, 2 and 3, a series of Friedman tests of difference was conducted. Following this, preliminary two-tailed Spearman's rho correlations were conducted between maternal and child demographic factors (specifically, child age, maternal age, maternal years of education post 16, child BMI z scores, and maternal BMI) with the study's key variables (PARM, PARM-O and CEBQ subscales). These preliminary analyses were run on the basis of relationships established between demographic and child feeding/eating factors in past research (e.g., Cooke & Wardle, 2005; Faith et al., 2004; Farrow & Blissett, 2006; Francis & Birch, 2005; Gregory et al., 2010; Hendricks, Breifeel, Novak & Ziegler, 2006; Murashima, Hoerr, Hughes, & Kaplowitz, 2012). The PARM verbal modelling subscale correlated positively with measured maternal BMI ($r = .632$; $p = .006$) and the PARM-O behavioural modelling subscale correlated positively with mothers' post 16 education ($r = .525$, $p = .031$). Maternal age was significantly and positively correlated with the CEBQ's satiety responsiveness ($r = .538$, $p = .026$) and slowness in eating ($r = .571$, $p = .017$) subscales. Significant correlations were not found between any of the other subscales and the above demographic factors. One-tailed Spearman's rho correlations (or partial correlations, controlling for maternal BMI for all analyses involving PARM verbal modelling, maternal education for analyses exploring PARM-O behavioural modelling, and maternal age for all

analyses involving CEBQ satiety responsiveness and slowness in eating) were then conducted to test the study's hypotheses. Significance was set at $p<0.05$, given the moderate sample size and the exploratory nature of this study.

Results

Characteristics of the sample and tests of difference between observations 1, 2 and 3

Descriptive statistics (means, SDs) for the variables reported on in this study can be seen in Table 1. To explore whether there was consistency among observed maternal modelling and feeding practices between the first, second and third observations, a series of Friedman tests was run (see Table 1).

TABLE 1 HERE

The results show that there were no significant differences among maternal modelling or feeding practices across the three mealtime observations, thus suggesting consistency.

Given that there were no significant differences in observed mealtime modelling and feeding practices across the three mealtimes, mean scores were subsequently calculated for all observed modelling variables (PARM-O) (using the data obtained from all three mealtime observations) and these values were used in subsequent analyses. Descriptive statistics for these variables, and for the CEBQ subscales, are presented in Table 2.

TABLE 2 HERE

Modelling scores on the PARM are consistent with those reported in previous research using this measure (Palfreyman et al., 2012; 2013). PARM-O subscale scores indicate that high levels of verbal modelling and low levels of unintentional modelling were observed. The mean scores for the CEBQ subscales were similar to those found in previous studies with UK samples (e.g., Wardle et al., 2001; Webber, Hill, Saxton, Van Jaarsveld & Wardle, 2009).

Links between self-reported and observed modelling behaviours

A one-tailed partial correlation, controlling for maternal age, between the PARM and PARM-O verbal modelling subscales, yielded a significant, positive correlation (r = .519, p = .020). A one-tailed partial correlation, controlling for maternal education, revealed that PARM scores on the behavioural consequences of modelling subscale were positively and significantly related to PARM-O behavioural modelling (r = .578, p = .009). Finally, a one-tailed Spearman's rho correlation showed that maternal PARM scores on the unintentional modelling subscale were not significantly related to observed maternal unintentional modelling (r = .232, p = .19), although the result was in the expected direction.

Links between modelling behaviours and children's eating behaviour

Results of the correlations between observed maternal modelling and children's eating behaviours are reported in Table 3.

TABLE 3 HERE

Observed maternal verbal modelling was found to be significantly, negatively associated with the CEBQ subscales of food responsiveness and emotional over-eating. Observed maternal behavioural modelling was found to be significantly negatively correlated with children's

emotional over-eating and significantly positively related to food enjoyment. Unintentional modelling was negatively associated with the CEBQ subscale food fussiness. No other significant correlations were found between observed maternal modelling and children's eating behaviours.

Discussion

This study had three aims. A preliminary aim was to explore whether there was consistency in maternal feeding behaviours across three separate mealtime observations. No significant differences in feeding behaviours were observed, suggesting consistency across observations. The primary study aim was to provide construct validation for the newly developed Parental Modelling of Eating Behaviours Scale (PARM), by examining associations between maternal self-reports of modelling behaviours with their observed modelling behaviours, as assessed via the PARM-O coding scheme. Self-reported and observed variables were positively related. Finally, the study explored associations between observed maternal modelling and children's eating behaviours, with some significant associations being identified.

There were no significant differences in the frequency of feeding practices used by mothers in the first, second or third observations. Whilst using a mean score over a number of observations may provide a wider view of mealtime behaviours, these preliminary findings would suggest that mothers' feeding behaviours do not change significantly as they become more accustomed to being observed. This is contrary to research with infants which has suggested variation across mealtimes (Young & Drewett, 2000) but may be related to the older age of the current sample of children or the more in depth analysis of parental feeding practices conducted within this study. While this study's finding does not mean that feeding

behaviours are unaffected by the presence of an observer or camera, it does provide support for the reliability of data from studies that have used only one observation of individual families (e.g., Blissett, Farrow & Haycraft, 2010; Blissett & Haycraft, 2011; Farrow & Blissett, 2006; Haycraft & Blissett, 2008; Stein et al., 1994; Sacco et al., 2007) by suggesting reasonable consistency in maternal feeding practices. In relation to the behaviours modelled by the parent, it is noteworthy that the presence of the observer/camera might influence the mother into intentionally modelling more positive behaviours and consciously checking or omitting behaviours which she may consider to be negative.

The findings partially support the study's primary hypothesis. Specifically, a strong, significant relationship was found between maternal self-reported and observed verbal modelling, providing construct validation for the PARM verbal modelling subscale. The findings also provide validation of the behavioural consequences of modelling subscale, suggesting that mothers who report higher levels of outcomes relating to their modelling behaviours also display higher levels of behavioural modelling in general. While the relationships between self-reported and unintentional modelling did not reach significance, the relationship was positive and in the expected direction. The absence of significant associations is likely to be related to the moderate size of the current sample and to the fact that only few instances of unintentional modelling were recorded during mealtimes. Unintentional modelling is also a difficult construct to measure observationally, as parents provide a continuous role model for their child. In relation to this study, this meant that observational coding criteria had to be devised that would code only behaviours which could be isolated as unintentionally modelled behaviour, and this led to the decision that the target child had to copy the unintentional behaviour within the observed mealtime. The result of this may be that other unintentional modelling, which may have influenced the child's eating

behaviours, may not have been recorded. The construct of unintentional modelling, while important in understanding the overall effect of parental modelling, needs further development and research, and the relationships found via these preliminary attempts at measuring this construct need to be treated with due caution. A greater understanding of more intentional forms of modelling would allow for unintentional modelling to be more easily addressed in future research.

It was predicted that observed maternal modelling would be associated with children's eating behaviours. As with previous research (Gregory et al., 2010), increased children's enjoyment of food was significantly related to maternal modelling and, in particular, behavioural modelling. Food fussiness was not found to be significantly related to verbal or behavioural modelling, but lower levels of food fussiness were related to higher levels of unintentional modelling. These preliminary findings suggest that parental modelling in general may be important in helping to reduce fussiness in children and that maternal modelling may also be associated with children's increased food enjoyment. Furthermore, the characteristics of the child may also be important; for example, children who display high levels of food enjoyment may be more responsive to parental modelling whereas children who are less fussy may be more likely to imitate the eating behaviours of their parents, including those behaviours that parents are less aware that they are exhibiting. Interestingly, mothers who displayed higher levels of verbal modelling also reported that their children were less responsive to food and were less likely to over-eat in response to emotional cues; these relationships are both likely to be important in the development of adaptive children's eating behaviours and the prevention of overweight (e.g., Blissett, Haycraft & Farrow, 2010; Oliver, Wardle & Gibson, 2000). It is important to note that while the results of the present study indicate favourable relationships between maternal modelling and children's eating

behaviours, the outcome of modelling is dependent on the behaviours being modelled and, as such, could be positive or negative. The pattern of relationships that were found in this exploratory study might be partly due to the sample recruited for this study, with the mothers being more concerned with healthy eating or responding in accordance with the perceived demand characteristics of the study. Thus, our findings support the notion that modelling of eating behaviours is linked to children's eating behaviours (e.g., Gregory et al., 2010); however, the direction of causality between maternal modelling and children's eating behaviours needs further investigation. Previous research has highlighted the bidirectional relationship between parental feeding practices and children's eating behaviours (e.g., Birch & Fisher, 2000; Webber et al., 2010). While maternal modelling may influence the eating behaviours and food consumption of children, as suggested by previous research (e.g., Gregory et al., 2011; Palfreyman et al., 2012), the eating behaviours displayed by children might also prompt maternal modelling. For example, mothers may use verbal modelling to correct certain eating behaviours considered to be 'inappropriate' or to reinforce 'appropriate' behaviours in their child. Future research needs to consider the potential bidirectional relationship between parental modelling and children's eating behaviours and should explore the temporal precedence of these behaviours to determine whether modelling is effective in promoting healthy eating interventions. Due to the cross-sectional design of the present study, the question of whether the impact of modelling observed in this and previous research persists in subsequent eating episodes when the mother is absent cannot be addressed. However, a longitudinal study conducted by Gregory et al. (2011) found that maternal modelling of vegetable intake predicted greater vegetable intake in children at 1 year follow-up. This, coupled with evidence of concordance between maternal and child intake (e.g., Brown & Ogden, 2004; Coulthard & Blissett, 2009; Palfreyman et al., 2012; Reinaerts, Nooijer, Candel & Vries, 2007; Tibbs et al., 2001), supports the role of parental modelling in

the development of children's eating behaviours but future research needs to explore in greater depth the longitudinal effect of modelling.

The further validation of the PARM means that there is now a brief, multifaceted self-report measure of parental modelling of eating behaviours available to explore modelling of eating behaviours. Not only is a self-report measure a good tool to have in exploring parental feeding practices, but the inclusion of three distinct facets of modelling will enable researchers using the PARM to begin to unpack the relationships between aspects of modelling and other factors. The PARM has already helped to provide further understanding of the relationships between modelling and factors such as maternal and child healthy food intake (Palfreyman et al., 2012) and maternal eating psychopathology (Palfreyman, Haycraft & Meyer, 2013). This validation study also supports the newly developed PARM-O coding scheme which, to date, is the only observational coding scheme to explore parental modelling of eating behaviours. This means that future observational research in this area will have a basis to work on and a coding measure to use.

While this study has provided preliminary construct validation for the PARM, particularly the verbal and behavioural consequences of modelling subscales, the study did have a number of limitations. The study was exploratory and observational, requesting that families take part in three mealtime observations. This resulted in a fairly small sample size and further research would benefit from a larger sample. In addition, families who agreed to take part in this study may have done so due to being health conscious or concerned about their children's eating behaviours. This may have influenced the behaviours that mothers modelled and could have increased the likelihood that observed and self-reported behaviours would coincide. In addition, coding of certain maternal modelling behaviours proved to be

challenging. This was due to the fact that parents provide a continuous role model for the child throughout the meal and deciding on which aspects should be picked out as definite instances of behavioural and unintentional modelling was a difficult task, especially as these two facets of modelling can overlap. It should also be noted that for a substantial number of the observations, siblings and fathers were also present for the meal. Due to the small sample size, the influence of other family members could not be in included in the analyses but their presence might have provided further models of behaviour for the target child to copy (Birch, 1980; Fraser et al., 2011; Reinaerts et al., 2007; Salvy, Vartanian, Coelho, Jarrin & Pliner, 2008). Finally, although multiple observations were conducted for each family, the sample size was small and the study was underpowered. The chances of Type I errors occurring may have increased accordingly and so these results should be viewed with some caution. Strengths of this study included the use of multiple observations of mealtimes and the creation of an observational coding scheme (PARM-O) to complement the self-report measure.

In conclusion, while it is acknowledged that these findings are preliminary and require replication, support has been obtained for all three of the PARM subscales which were positively, albeit not always significantly, associated with their observed counterparts on the PARM-O. This confirms the reliability and validity of using the PARM and the PARM-O for further research into maternal modelling of eating behaviours. Again, although preliminary, this study also suggests that maternal feeding behaviours are consistent across multiple observations, thereby providing validation for previous research which has used single family observations. Finally, this study provides initial evidence which suggests that independent observations of maternal modelling of eating behaviours are related to children's eating behaviours. These relationships warrant further research and replication but potentially

suggest the positive influence of mothers modelling eating behaviours during shared mealtimes with their children. It would be interesting for future research to explore whether children's eating behaviours change over a series of observations. Further research with larger samples is needed to replicate and expand on this study's findings.

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Table 1: Descriptive statistics and two-tailed Friedman tests between observed maternal modelling and feeding practices (n = 51 observations).

	Observation 1		Observation 2		Observation 3		Friedman test of difference	
	Mean	SD	Mean	SD	Mean	SD	χ^2	*P*
PARM-O								
Verbal modelling	9.41	5.22	10.00	8.11	10.53	7.85	0.57	0.75
Behavioural modelling	2.88	2.29	4.18	3.38	2.77	2.00	4.31	0.12
Unintentional modelling	0.94	1.14	0.88	1.58	0.77	1.20	1.68	0.43
FMCS								
Maternal verbal pressure	5.00	4.03	7.00	8.14	5.88	4.85	0.63	0.73
Maternal physical prompt	6.12	3.12	7.00	10.42	4.18	5.87	1.61	0.45
Maternal verbal restriction	1.06	1.30	0.66	0.86	1.36	2.32	0.58	0.75
Maternal physical restriction	0.35	0.79	0.65	1.22	0.42	1.06	0.61	0.74
Maternal use of incentive / conditions	1.18	1.07	0.94	1.85	1.65	3.60	2.21	0.33

PARM-O: Parental Modelling of Eating Behaviours Observational Coding Scale;
FMCS: Family Mealtime Coding System

Table 2: Descriptive statistics for maternal scores on PARM, CEBQ and average scores on PARM-O (over 3 observations) (n = 17).

	Mean	(SD)
PARM		
Verbal modelling	5.42	1.17
Behavioural Consequences	5.30	1.45
Unintentional modelling	4.08	1.65
PARM-O		
Verbal modelling	9.98	5.79
Behavioural Modelling	3.28	1.85
Unintentional Modelling	0.86	.081
CEBQ		
Food Responsiveness	2.41	(0.62)
Food Enjoyment	3.66	(0.83)
Satiety Responsiveness	2.95	(0.56)
Food Fussiness	2.76	(1.11)
Slow Eating	2.85	(0.76)
Emotional Over–Eating	1.69	(0.52)
Emotional Under-Eating	3.60	(2.40)

PARM: Parental Modelling of Eating Behaviours Questionnaire; PARM-O: Parental Modelling of Eating Behaviours Observational Coding Scale; CEBQ: Child Eating Behaviour Questionnaire

Table 3: One tailed Spearman's rho correlations (unless otherwise stated) between observed maternal modelling (PARM-O) and scores on the CEBQ (N = 17).

	Observed Maternal Modelling (PARM-O)		
	Verbal Modelling	Behavioural Modelling†	Unintentional modelling
CEBQ			
Food Responsiveness	-.533*	-.060	-.128
Food Enjoyment	.107	.526*	.126
Satiety Responsiveness ^	.093	.079	-.378
Food Fussiness	-.110	-.320	-.403*
Slow Eating ^	.130	.101	-.155
Emotional Over-Eating	-.485*	-.529*	-.388
Emotional Under-Eating	.225	.280	-.036

*p< .05
^ Partial correlations controlling for maternal age;
† Partial correlations controlling for maternal post 16 education.