Full Title

Observation of parental functioning at mealtime using a sibling design.

Running Head

Observation of parental functioning at mealtime

Type of manuscript

Original Article

Authors

Ellen Moens, PhD, Caroline Braet, PhD, & Julie Vandewalle, MA
Department of Developmental, Personality and Social Psychology, Ghent University,
H. Dunantlaan 2, Ghent, Belgium.

Corresponding author

Ellen Moens, Department of Developmental, Personality and Social Psychology, Ghent
University,
H. Dunantlaan 2,
9000 Ghent,
Belgium.

E-mail: ellen.moens@ugent.be

Tel : 0032 9 264.64.12

Fax : 0032 9 264.64.99

Abstract

This study investigates whether parental feeding practices are part of the shared environment or responsive to characteristics of different children from the same family. Thirty six mothers with two children (4-12 y) of which 10 sibling-pairs were discordant for weight status (healthy weight – overweight), were invited to the lab for a standard meal. Maternal responsive and controlling behaviour was observed and coded. Children's weight status and eating behaviour was assessed. Results indicated that in general, mothers show similar levels of responsiveness and controlling behaviour within families. However, the use of mothers' authoritarian and permissive behaviour and her expressions of involvement at mealtime were consequently related to children's amount of food eaten and their restraining eating style. Thus, the amount of food children eat, both observed and assessed by questionnaire, seems related to more maladaptive parenting practices in mothers. This pleads for more tailor-made guidelines when advising parents of children with eating- and weightproblems.

Key Words parental feeding practices, observation, sibling pairs

Introduction

Families serve as a model and a principal learning environment for children who need to learn how to regulate their energy intake and how to acquire a varied eating pattern. It is often assumed that parenting practices are part of the shared family environment that influence children's development of eating behaviour. However, following an interactional point of view, children are considered active agents (Bronfenbrenner, 1977) and may evoke parental behaviours (Caspi & Moffitt, 1995). Bi-directionality is indeed more likely and involves that parenting practices result from an interaction between parent and child characteristics. Also, in the context of feeding, it is interesting to study within family variability potentially leading to differential outcomes in siblings. The main goal of the article is to examine shared versus non-shared parental influences on children's eating behaviour.

In the general parenting domain, two major dimensions can be distinguished: (1) demandingness or parental control and (2) responsiveness or parental support (Maccoby & Martin, 1983). In the feeding domain, parental control is defined as attempts to monitor the child's eating by restricting the child from eating certain foods or pressuring the child to eat other foods (Birch, 1999). Parental support is generally referred to as affective warmth and acceptance as well as well-modulated parental involvement in different domains of a child's development (e.g. Patterson, Reid, & Dishion, 1992), such as the feeding domain.

Research in this domain has mainly focused on specific parental feeding practices reflecting aspects of parental control. Much of the literature in this domain rely on two subscales of the Child Feeding Questionnaire (Johnson & Birch, 1994), namely Restriction and Pressure to Eat, to capture these practices and examine their relationships with children's eating behaviour and weight status. Although it is assumable that a certain

amount of parental control is necessary to learn children to cope with the current food environment, controlling practices have been shown to have a detrimental impact on children's eating behaviour. It was evidenced that high parental feeding restriction can lead to selective food preferences in children (Fisher & Birch, 1999) and diminished abilities to self-regulate their energy intake (Johnson & Birch, 1994), which in turn indirectly contributed to the development of overweight as was shown by means of longitudinal research designs (Faith, Scanlon, Birch, Francis, & Sherry, 2004; Francis & Birch, 2005). However, there are also a number of cross-sectional studies reporting no association between parental restriction and children's eating (Moens & Braet, 2007) or child weight (Robinson, Kiernan, Matheson, & Haydel, 2001). This was also confirmed by a longitudinal study showing that lower parental control was associated with higher child BMI-z score after three years (Campbell et al., 2010) As such, it seems that parental strategies that reflect permissive feeding practices neither promote a healthy eating nor healthy weight development.

With respect to parental involvement in the feeding domain, there also are conflicting results. The well-known study of Lissau and Sorensen (1994) retrospectively showed that children from neglectful families are almost 10 times more likely to become overweight in adulthood. And this picture was confirmed by two more studies on this topic that found less positive involvement in mothers of children with overweight (Birch, Marlin, Kramer & Peyer, 1981; Kinston, Loader, Miller & Rein, 1988). On the other hand, other studies found no significant differences in parental involvement between families with and without overweight children (Johnson, Brownell, St Jeor, Brunner, & Worby, 1997; Stradmeijer, Bosch, Koops, & Seidell, 1999).

As such, the literature does not present a consistent picture with respect to the relation between the two main parenting dimensions and children's eating behavior and weight status. Several explanations can be put forward for this. First, there might be a conceptual problem when defining and applying these two dimensions in the feeding domain. It seems especially difficult to get the concept of parental feeding control clear-cut defined. Until now, studies were directed to the amount of control while also the domain in which parents control their children's food intake matters. Satter (1987) appropriately assigns responsibilities regarding food intake to parents and children. Parents should take responsibility for the timing and for the type of food offered, while children are responsible for the amount of food eaten. Consistent with this view, we want to consider if authoritarian attempts to control the child's eating (with no respect for the child choices on what and how much he or she eats) can be differentiated from permissive (the child can decide on what and how much he or she eats) and from authoritative feeding (the child is offered and encouraged to eat healthy foods, but is given responsibility on the amount of food eaten).

Second, there could also be methodological explanations for the found inconsistencies. One should remark that the majority of the studies is limited by its reliance on parental reporting of feeding practice. Although the Child Feeding Questionnaire is widely used and has shown to be internally consistent and reliable over time, this does not tell us whether parents are accurate reporters of their feeding strategies. Especially, when eating is a conflict domain in the family. Moreover, there is no questionnaire that measures parental involvement in feedings situations. An observational study of family functioning in 2007 compared observations during actual mealtime situations with self-report measures of parents with overweight children vs. parents of normal-weight children (Moen, Braet, & Soetens, 2007). While parents reported more restrictive feeding practices, the observations

showed that maladaptive feeding strategies (both authoritarian as permissive feeding) were twice as prevalent in families with overweight children compared to families with children with a healthy weight. In addition, while parents reported an equal amount of parental involvement, observations revealed that parents of overweight children showed less positive involvement during mealtime. This stresses the importance of a multi-method multi informant design in this domain.

Finally, the majority of former studies have used data from one child per family. Research suggests that parents may report using different controlling feeding practices in response to characteristics of each sibling. There are a few studies that addressed parental behaviour in relation to children's weight status and eating behaviour using a sibling design. This seems an interesting methodology to include in research on the influence of parental feeding behaviour as it can better control for environmental factors that may impact child eating behaviour or weight status (eg. family SES, parental education, snack foods at home; Faith, 2005). Already in 2000, Saelens, Ernst and Epstein included sibling pairs discordant for obesity, and found more between-family variability in maternal control towards children than within-family variability. Other studies found that differences in mother's feeding practices corresponded to differences in children's BMI Z-scores (Keller, Pietrobelli, Johnson, & Faith, 2006) and to sibling differences in eating behaviours (Farrow, Galloway, & Fraser, 2009). Horn and colleagues investigated the role of a child's temperament in the feeding interaction with parents. They found that parents reported more food restriction for the more distractible child and reported more responsibility towards the child with a more negative mood (Horn, Galloway, Webb & Gagnon, 2011). These three latter sibling studies suggest that parental control would be part of the non-shared environment. To the best of

our knowledge there are no studies that use observation methodologies to study within family variability in parental feeding control and parental involvement.

In sum, inconsistencies with regard to parental control and involvement in the feeding domain could be due to conceptual differences and measurement issues when reporting about feeding strategies. The current study aims to observe mothers' behaviour during mealtime. In doing that, according to recent insights, both involvement and parental feeding control will be refined. By including sibling pairs, it will be possible to examine whether mothers show different feeding behaviour within their family. Moreover, we will investigate whether within family differences in parental behaviour are related to differences in child body weight and eating behaviour of siblings. It is hypothesized that while parental involvement would be part of the shared environment, parental control is part of the non-shared environment and as such responsive to specific characteristics of the child.

Method

Subject Recruitment

A total of 36 mothers of at least two sibling children ($N = 72$) between 4 and 12 years old participated in this study and visited the lab to consume a standard meal together. Families were drawn from a questionnaire study on parental feeding practices and children's eating behaviour which includes 60 families with at least two siblings from the region of Flanders. Thirty-six families agreed to participate in the current observational mealtime study (response rate 60%). Next to the age criterion (at least two children between 4 and 12 years old), no further in-or exclusion criteria were described. The protocol was approved by the Ethical Committee of the University.

Procedure

Observations were conducted at the laboratory by trainees in psychology guided by standardized instructions and under direct supervision of two researchers. In the lab, the video camera was installed, the table was set and three chairs were present. While information was given, the informed consent was obtained and weight and length of mother and the two children were measured. We took several precautions to avoid that behavioural patterns would emerge as part of the family's reaction to the presence of the camera. First, mothers were told that the aim of the study was to study children's eating behaviour and differences between children within families. In that way, mothers were not aware of the fact that their behavior would be observed. After the meal, we debriefed the mothers. Second, all family members had the opportunity to habituate to the camera before the start of the recordings. Finally, the mother received the instruction that the mealtime should occur in the most typical conditions (as it occurs at home). After the meal, we asked her to rate the typicality of the dinner on a scale from '1' (very untypical meal) to '10' (very typical meal). The mean score was 7.86 ($SD = 1.14$).

The dinner consisted of a weighed portion of spaghetti bolognese; a jug of water and grated cheese were available on the table. Before the start of the videotaped meal, the observer left the room. The video camera started when the family began to eat and was stopped when everybody had finished. After 20 minutes, the observer entered the lab, cleaned the plates and the portions were weighed again. Mothers ate on average 428.28 gr ($SD = 65.27$) and the children 341.81 gr ($SD = 130.11$). Finally, mothers were asked to fill out complementary questionnaires.

Measures

Adapted Mealtime Family Interaction Coding System (Adapted MICS) and Mealtime Observation Items. The present study adopted a coding system based on the Mealtime

Family Interaction Coding System (MICS; Dickstein, Hayden, Schiller, Seifer, & San Antonio, 1994) to rate the videotaped parental practices at mealtimes. The original MICS is a dimensional observational coding system adapted from the McMaster Model of Family Functioning (Epstein, Bishop, & Levin, 1978). It contains seven general ratings to be scored on a 7-points scale ranging from 1 (“very unhealthy”) to 7 (“very healthy”). For the purpose of this study, we focused on two general ratings: (1) ‘Behaviour Control’ (‘BC’) and (2) ‘Interpersonal Involvement’ (‘IV’). Respectively, the two general ratings refer to (1) “the way in which the family expresses and maintains standards for the behaviour of its members” and (2) “the extent to which family members show interest in, and place value on, each other’s activities and concerns” – which is comparable with our definitions of parental control and parental support. The general rating of ‘IV’ remained operationalized as in the MICS. In line with Patrick, Niklas, Hughes, & Morales (2005), we recoded the general rating of ‘BC’. Codes 1 and 2 were operationalized as ‘permissive feeding style’ and codes 6 and 7 as ‘authoritarian feeding style’ (maladaptive styles); codes 3 to 5 were defined as ‘authoritative feeding style’ (adaptive style).

Based on previous research with the MICS (Moens et al., 2007), we added 6 IV and 7 BC observations items in order to collect more detailed observations. These observation items are scored with ‘1’ (= behaviour did not occur), ‘2’ (= behaviour occurred doubtfully), ‘3’ (= behaviour was present), ‘4’ (= behaviour was clearly present) and ‘5’ (= behaviour was frequently displayed). The IV subscale (based on 6 IV observation items) has a Cronbach alpha of .84 in the present study. According to recent insights on parental feeding ‘BC’ observation items measured authoritarian (4 observation items), authoritative (2 observation items) or permissive (1 observation item) feeding strategies. For the

authoritarian subscale and for the authoritative subscale Cronbach alpha was respectively .57 and .58.

The video recordings were coded by psychology students who were blind to the direction of the hypotheses. The coders were familiarized with the operational definitions of the general ratings and the mealtime observation items and received a practical training. During the 20 minute session, there were two codings at fixed intervals for both the general ratings (at 3' and 12' for IV; at 6' and 15' for BC) as for the observation items (at 9' and at 20'). A mean score was calculated and used in the analyses. Sixteen at random selected recordings were recoded by an additional observer. A significant correlation showed a good agreement between observers for the general rating of BC, $r = .76$. and of IV, $r = .73$, both significant at $p = .001$.

Anthropometric and demographic information. Children's and mothers' length and weight were measured in the lab, following standardized instructions. Participants were dressed in light clothing and measured without shoes. The BMI for the adults ($\text{weight}/\text{height}^2$) and the adjusted BMI for the children ($\text{Actual BMI}/\text{Percentile 50 of BMI for age and gender} \times 100$) was used in the analyses. Children's weight status was identified in relation to the European body mass index values for 0-to 21-year-olds (Fredriks, van Buuren, Wit, & Verloove-Vanhorick, 2002). We used the widely accepted cut-off for assigning children to the overweight group (i.e. a percentage of 120% or more indicates overweight; Troiano & Flegal, 1998). The familial socio-economic situation was calculated using the Hollingshead Index of Social Position (ISP), based on parents' education and occupation. This index results in an ISP total score that can be converted to five social position indexes (Hollingshead, 1975). In the present study we solely included the mother's education and occupation. Children from different socio-economic groups and from city as well as rural environments were included.

Children's eating behavior was assessed by means of (1) the amount of food (in gr.) eaten during mealtime and (2) by the Dutch Eating Behaviour Questionnaire – parent version (original DEBQ; van Strien, Frijters, Bergers & Defares, 1986). As such, both adaptive as well as maladaptive eating was measured. The DEBQ assesses external eating (10 items), emotional eating (13 items) and restrained eating (10 items). Items are scored on a 5-point Likert scale and subscale scores are calculated by adding the individual item scores. The parent version assesses the parental perspective on the child's eating behaviour. Research revealed satisfying internal consistency and external validity and a stable factor structure for the DEBQ Parent version (Braet et al., 2008). The present study found Cronbach alphas varying from .75 to .86 for the parent version.

Statistical analyses

Children within each family were assigned to be child 1 or child 2 according to their age. To eliminate any effects of age, with one sibling consistently being older, in 50% of cases the older child was assigned to be child 1 and the younger child was assigned to be child 2. For the remaining cases the reverse method was used. This procedure is in accordance with Farrow et al. (2009). With regard to possible gender effects, we conducted a series of independent t-tests to examine gender differences across the sample on the different parent behaviour observations and children's measures. Using an alpha of $p < .001$ to reduce the risk of Type 1 errors, no gender differences were found. Consequently, gender was not controlled for in further analyses.

To ascertain familial correlation of parental behaviour as observed at mealtime for their two children, a series of two-way random intraclass correlation coefficients (absolute agreement) were used, as described by the procedure of Keller et al. (2006). Next, for each sibling pair within-family difference scores were calculated for parental mealtime behaviour and

children's characteristics (by subtracting scores for child 2 from scores for child 1). These difference scores were correlated to assess whether parents showed different levels of mealtime practices with siblings with different characteristics. These analyses will be conducted for all 36 sibling pairs and for concordant ($n=26$) and discordant ($n=10$) pairs separately.

Results

Descriptive statistics

Participating mothers were on average 37 years ($SD = 3.69$; range 30-46 years) and had a mean BMI of 24.64 ($SD = 5.28$; range 18-47). Of the mothers, 67% was normal-weight ($BMI \leq 25$); 27% were overweight ($25 < BMI \leq 30$) and 6% was obese ($BMI > 30$). The familial socio-economic situation was calculated using the Hollingshead Index of Social Position (ISP), resulting in a score that can be converted to five social position indexes (Hollingshead, 1975). To avoid cells with expected frequencies less than five, we recoded the five social position indexes into three social classes (upper, upper middle into 'high' and middle into 'middle' and lower middle and lower into 'low'). The middle class was most present, 50.70% of the current sample. 46.30 % of the families belonged to highest class and 3% to the lowest classes.

Of the 72 children that took part, 42% is male. Their mean age is 7.04 ($SD = 1.98$) and the children have a mean adjusted BMI of 105.78% ($SD = 15.06$; range 86-157). Across the sample and according to the European body mass index values for 0-to 21-year olds (Fredriks et al., 2002), 17% of the children had overweight, whilst the others had a healthy weight. There were 10 pairs of siblings that were discordant for their overweight status.

Table 1 shows descriptive statistics for parental mealtime behaviour and children's eating behaviour and amount of food eaten for all children ($n=72$) and for the children of the

concordant ($n=52$) and the discordant sibling pairs ($n=20$) separately. Within the subgroup of discordant siblings, paired sample t-tests indicated that there were significant differences between the overweight and the non-overweight sibling on dietary restraint ($t(9) = 3.00, p < .05$) and external eating ($t(9) = 4.07, p < .01$), with higher scores for the overweight sibling. The IV subscale score significantly differed for discordant siblings ($t(9) = -2.61, p < .05$), indicating a higher parental involvement towards the non-overweight sibling.

Within-family differences in parental feeding behaviour

Table 2 shows the intraclass correlation coefficients for mealtime behaviour observed in parents for two sibling children. All coefficients are significant and positive, indicating that parents show significantly similar feeding practices within families. When repeating the analysis for the subgroup of 26 concordant and 10 discordant sibling pairs, the same significancies are found.

Next, differences in sibling amount of food eaten at mealtime in lab, maladaptive eating (as reported by the DEBQ), age and weight status were correlated with differences in parental behaviour during mealtime using Pearson's correlations. Due to the large number of correlations being performed the alpha level was reduced to .001 to reduce the risk of Type 1 errors. Table 3 shows that for both general ratings of the MICS no correlations with difference scores for child characteristics were found.

Further, correlations indicate that parents showed more authoritarian feeding behaviour with the sibling who is younger and eats more at mealtime. Parents are also more authoritarian with the sibling that shows a less restraint eating style, and this seems particularly the case in discordant siblings. Parents showed more permissive feeding behaviour at mealtime with the older sibling, who has a higher adjusted BMI, ate less at mealtime and has a more restraint eating style. Differences in parents' authoritative feeding

behaviour were not correlated with differences in siblings' characteristics. Finally, parents showed more expressions of positive involvement towards the sibling that is younger and eats more during the mealtime. When correlational analyses were repeated for the subgroups of concordant and discordant sibling pairs, no new correlations were found.

Discussion

The current study examined parental functioning by means of observations of their mealtime behaviour. By doing so, we tried to avoid response bias, which is often inherent to parental reporting of feeding behaviours. A sibling design enables to study whether parental feeding strategies are shared by siblings in the same household. It was our hypothesis that while parental involvement would be part of the shared environment, parental control at mealtime would be more responsive to specific characteristics of the child.

Results revealed that all intraclasscoefficients were positive and significant, indicating that mothers showed a high degree of similarity in their mealtime behavior towards their different children. Also, for the subgroup of discordant sibling pairs, this high degree of similarity was found despite significant weight differences between siblings. This is in accordance with other sibling design studies. Saelens et al. (2000) solely included sibling pairs discordant for obesity and found no within-family variability in maternal feeding control. Also Farrow et al. (2009) found significant positive intraclass correlations for all subscales of the Child Feeding Questionnaire, with the exception of one subscale namely Perceived Child Weight.

However, we found differences in parental practices at mealtime also to be related to certain differences in children 's characteristics. This was especially true for the maladaptive feeding control behaviour - both authoritarian and permissive feeding. Mothers showed more authoritarian feeding behaviour towards the child that is younger, eats a greater

amount of food at mealtime and has a less restraining eating style of its own. This last correlation was even stronger for the subgroup of sibling pairs discordant for overweight.

For the permissive feeding subscale, the same significancies are found but in the opposite direction. Mothers show more permissive feeding behaviour towards the child that is older, eats less at mealtime and has a more restraining eating style of its own. There was also a relationship with within-differences for child's weight, indicating that mothers show more permissive mealtime behaviour with the child that is heavier. When we reran the analyses for a subgroup of discordant sibling pairs, the same correlation was found to be of significance, although only trend significant because of the stringent Bonferroni correction we applied.

The findings are important as they add to existing findings in the same direction. Farrow et al. (2009) also found that parents reported more feeding control practices in answer to certain eating behaviour characteristics of their child. More specifically, these authors examined the use of restriction and pressure to eat - both subscales of the CFQ. They found that parents reported using greater restrictive feeding practices and more pressure to eat with children who are fussier than their siblings. Parents also reported using more pressuring practices with siblings who ate slower, emotionally under-ate, enjoyed food less, were less responsive to food, and were more responsive to internal satiety cues. This study however, and other sibling design studies, solely focus on maladaptive feeding practices, in particular on too strict parental controlling practices.

In the present study, by adapting the taxonomy of Baumrind (1971), we also focused on too little parental control (permissive feeding practices) but even more important, we also included an adaptive way of feeding control, namely authoritative feeding. Interesting, and in contrast with the maladaptive feeding control practices, mothers' authoritative

feeding was not related to within-family differences of children's characteristics. Observation items of our coding system that refer to authoritative feeding are: (1) mother reacts responsively on food request or food finish, the child decides on the amount of food eaten; and (2) mother stimulates autonomy in the child's eating. Therefore, we suggest that authoritative practices are more related to functional eating patterns and what is eaten. In addition maladaptive practices seem more related to the amount of food eaten at mealtime (and validated by the findings on the DEBQ-questionnaire parent report). This could also lead to the cautionary assumption that in general parents engage in adaptive feeding practices but lapse into maladaptive practices in response to certain difficulties the child is showing, which is in accordance with Webber, Hill, Cooke, Carnell, & Wardle (2010). Especially the result that parents tend to act more in an authoritarian way toward their child that eats more, shows that the rule of the division of responsibilities as formulated by Satter is not common practice in parents. Given the consequences of too strict parental control on the amount that children eat on the development of their internal selfregulation mechanism, it is important to inform young parents. Mitchell, Farrow, Haycraft & Meyer (2013) stress in their review on the topic that the depth of feeding-related advices for parents are limited and that the education is being given too late. They plead for a preventive approach. Parents, as part of pre-natal care, can be given practical guidelines on how to support a healthy eating development and how to cope with difficult eating situations (like a child that eats too much). More research is needed on how these guidelines can be implemented on a structural level in the different environments of the child, e.g family, school, child care.

Differences in the two general ratings of behaviour control and involvement were unrelated to within differences of children's characteristics. We can assume that these general styles are more family-specific than child-specific. However, there is no full

confirmation for the hypothesis that parental involvement would be part of the shared environment. Within-family differences for the IV-subscale were related to sibling differences in age and amount of food eaten. Mothers showed more positive involvement towards the sibling that is younger. This could refer to a developmental trend in parental involvement in eating situations, which probably fits with the development of the child. The mother also showed more involvement towards the child that ate more. As was seen in former research, parental attention and encouragement during mealtime was indeed related to the consumption of larger amounts of food (e.g. Koivisto, Fellenius & Sjoeden, 1994). On the other hand, more recent research gives evidence for associations between overeating in children and lack of parental support (Shuetzmann, Richter-Appelt, Schulte-Markwort, & Schimmelmann, 2008), which would also be related to early attachment processes (Wilkinson, Rowe, Bishop, & Brunstorm, 2010). As the current study cannot address direction of causality for the observed associations, further longitudinal research is needed to elucidate these relationships. Nevertheless, it seems that parental involvement is a more important parental dimension to study in relationship to children's eating development than formerly assumed. It is possible that parental involvement in feeding situations, like parental control, can be situated along a continuum with maladaptive forms of involvement on the extreme sides (too much or too little involvement). It is however not yet clear how the adaptive form of parental involvement in feeding situations should be clear-cut conceptualized. On the other hand, it seems that a pleasant atmosphere at the table, where family members show their interest in each other, and eating development is considered as a learning process, whereby parents do not display coercive practices are protective for the development of a healthy, varied and balanced diet (Mitchell et al., 2013).

Strengths of the current study are the sibling design and the use of observations to measure parental control and involvement. An important limitation concerns the lower internal consistency of the authoritative and the authoritarian subscale of the BC-factor. It is possible that this factor was represented by too few items. It might be relevant to conduct a new observation study using an extended coding system with new items measuring different types of parental control. Another limitation is the small sample size. However, a power analysis showed that a sample of 64 would yield statistical power of .80 (based on $\alpha = .05$) to detect medium correlational effects, indicating that the current sample was sufficiently powered.

Conclusions

Next to the developmental stage also the amount of food the children eat, both observed and assessed by questionnaire, seems to be related to more extreme parenting practices in mothers. Mothers tend to engage in an authoritarian feeding style towards the child that eats more. Although this relationship needs to be further clarified, it seems that, in nowadays society, it is challenging for young parents to get their child to eat an adequate amount of food. The finding that this eating pattern of children also relates to differences in their mothers' expression of involvement at mealtime indicates the importance of studying relational aspects in the link between parental feeding behaviour and children's eating behaviour.

Acknowledgements

This research was supported by a post-doctoral research grant awarded to the first author by the National Fund for Scientific Research-Flanders (Belgium).

References

- Baumrind, D. (1971). Current patterns of parental authority. *Developmental Psychology Monograph, Part 2,4*, 1-103.
- Birch, L. L. (1999). Development of food preferences. *Annual Review of Nutrition*, 19, 41–62.
- Birch, L.L., Marlin, D.W., Kramer, L., & Peyer, C. (1981). Mother-child interaction patterns and the degree of fatness in children. *Journal of Nutrition Education*, 13(1), 17-21.
- Braet, C., Soetens, B., Moens, E., Mels, S., Goossens, L., & Van Vlierberghe L. (2007). Are two informants better than one? Parent-child agreement on the eating styles of children who are overweight. *European Eating Disorder Review*, 15, 410-417.
- Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, 32, 513-530.
- Campbell, K., Andrianopoulos, N., Hesketh, K., Ball, K., Crawford, D., Brennan, L., Corsini, N., & Timperio, A. (2010). Parental use of restrictive feeding practices and child BMI z-score. A 3-year prospective cohort study. *Appetite*, 55(1), 84-88.
- Caspi, A., & Moffitt, T.E. (1995). The continuity of maladaptive behavior. In D. Cicchetti, & D. Cohen (Eds.), *Manual of developmental psychopathology* (pp. 472-511). New York, NY: Wiley.
- Dickstein, S., Hayden, L. C., Schiller, M., Seifer, R., & San Antonio, W. (1994). Providence Family Study. Family Mealtime Interaction coding system. (Unpublished coding manual). Brown University School of Medicine: Bradley Hospital.
- Epstein, N. B., Bishop, D. S., & Levin, S. (1978). The McMaster Model of family functioning. *Journal of Marriage and Family Counseling*, 4, 19–31.
- Faith, M.S. (2005). Development and modification of child food preferences and eating patterns: behaviour genetic strategies. *International Journal of Obesity*, 29, 549-556.
- Faith, M.S., Scanlon, K.S., Birch, L.L., Francis, L.A., & Sherry, B. (2004). Parent-child feeding strategies and their relationships to child eating and weight status. *Obesity Research*, 12(11), 1711-1722.
- Farrow, C.V., Galloway, A.T., & Fraser, K. (2009). Sibling eating behaviours and differential child feeding practices reported by parents. *Appetite*, 52, 307-312.
- Fisher, J.O., & Birch, L.L. (1999). Restricting access to palatable foods affects children's behavioural response, food selection, and intake. *American Journal of Clinical Nutrition*, 69, 1264-1272.
- Francis L.A., & Birch, L.L. (2005). Maternal weight status modulates the effects of restriction on daughters' eating and weight. *International Journal of Obesity*, 29, 942-949.

Fredriks, A. M., van Buuren, S., Wit, J. M., & Verloove-Vanhorick S. P. (2002). Body index measurements in 1996-1997 compared with 1980. *Archives of Diseases in Childhood*, 82, 107-112.

Hollingshead, A.B. (1975). *Four Factor Index of Social Status*. New Haven, CT: Yale University.

Horn, M.G., Galloway, A.T., Webb, R.M., & Gagnon, S.G. (2011). The role of child temperament in parental feeding practices and attitudes using a sibling design. *Appetite*, 57, 510-516.

Johnson, S.L., & Birch, L.L. (1994). Parents' and children's adiposity and eating style. *Pediatrics*, 94 (5), 653-661.

Johnson, B., Brownell, K.D., St. Jeor, S.T., Brunner, R.L., & Worby, M. (1997). Adult obesity and functioning in the family of origin. *International Journal of Eating Disorders*, 22, 213-218.

Keller, K.L., Pietrobelli, A., Johnson, S.L., & Faith, M.S. (2006). Maternal restriction of children's eating and encouragements to eat as the 'non-shared environment': A pilot study using the child feeding questionnaire. *International Journal of Obesity*, 30, 1670-1675.

Kinston, W., Loader, P., Miller, L., & Rein, L. (1988). Interaction in families with obese children. *Journal of Psychosomatic Research*, 32, 513-532

Koivisto, U., Fellenius, J., & Sjöden, P. (1994). Relations between parental mealtime practices and children's food intake. *Appetite*, 22, 245-258.

Lissau, I., & Sorensen, T. (1994). Parental neglect during childhood and increased risk of obesity in young adulthood. *The Lancet*, 8893: 324-327.

Maccoby, E.E., & Martin, J.A. (1983). Socialization in the context of the family: Parent-child interaction. In Mussen, P.H. (Ed.), *Handbook of child psychology. Vol IV. Socialization, personality and social development* (pp. 1-101). New York: Wiley.

Mitchell, G.L., Farrow, C., Haycraft, E., & Meyer, C. (2013). Parental influences on children's eating behaviour and characteristics of successful parent-focussed interventions. *Appetite*, 60, 85-94.

Moens, E., & Braet, C. (2007). Predictors of disinhibited eating in children with and without overweight. *Behaviour Research and Therapy*, 45, 1357-1368.

Moens, E., Braet, C., & Soetens, B. (2007). Observation of family functioning at mealtime. A comparison between families of children with and without overweight. *Journal of Pediatric Psychology*, 32(1), 52-63.

Patrick, H., Niklas, T., Hughes, S., & Morales, M. (2005). The benefits of authoritative feeding style: caregiver feeding styles and children's food consumption patterns. *Appetite*, 44, 243-249.

Patterson, G.R., Reid, J., & Dishion, T. (1992). *Antisocial boys. A social interactional approach. Volume 4*. Eugene: Castalia Publishing Company.

Robinson, T. N., Kiernan, M., Matheson, D. M., & Haydel, K. F. (2001). Is parental control over children's eating associated with childhood obesity? *Obesity Research*, 9(5), 306-312.

Saelens, B.E., Ernst, M.E., & Epstein, L.H. (2000). Maternal child feeding practices and obesity: a discordant sibling analysis. *International Journal of Eating Disorders*, 27, 459-463.

Satter, E., (1987). *How to get your kid to eat...but not too much*. Palo Alto, CA: Bull.

Schuetzmann, M. , Richter-Appelt, H/, Schulte-Markwort, M., & Schimmelmann, B.G. (2008). Associations among the perceived parent-child relationship, eating behavior, and body weight in preadolescents: results from a community-based sample. *Journal of Pediatric Psychology*, 33, 110-114.

Stradmeijer, M., Bosch, J., Koops, W., & Seidell, J. (2000). Family functioning and psychosocial adjustment in overweight youngsters. *International Journal of eating Disorders*, 27, 110-114.

Troiano, R.P. & Flegal K.M. (1998). Overweight children and adolescents: description, epidemiology and demographics. *Pediatrics*, 101, 497-504.

van Strien, T., Frijters, J.E.R., Bergers, G.P.A., & Defares, P.B. (1986). The Dutch Eating Behavior Questionnaire (DEBQ) for assessment of emotional, external and restrained eating 772-782.

Webber, L., Hill, C., Cooke, L., Carnell, S., & Wardle, J. (2010). Associations between child weight and maternal feeding styles are mediated by maternal perceptions and concerns. *European Journal of Clinical Nutrition*, 64(3), 259-265.

Wilkinson, L.L., Rowe, A.C., Bishop, R.J., & Brunstorm, J.M. (2010). Attachment anxiety, disinhibited eating, and body mass index in adulthood. *International Journal of Obesity*, 34, 1442-1445.

Table 1
Descriptive statistics for parental mealtime behaviour and children's eating behaviour and amount of food eaten for all children (n=72) and for the subgroup of concordant the children of the discordant sibling pairs (n=20).

Measures	All children (n = 72)	Concordant siblings (n=52)		Discordant siblings (n=20)	
	M(SD)	M(SD)		M(SD)	
		Child 1	Child 2	Child with overweight	Child without overweight
Adjusted BMI	105.78 (15.06)	101.04 (11.14)	101.67 (10.78)	132.85 (9.42)	101.72 (9.35)
MICS					
General Rating BC	3.86 (1.12)	3.90 (1.17)	3.94 (1.24)	3.55 (.98)	3.85 (.88)
General Rating IV	5.64 (1.12)	5.73 (1.19)	5.75 (1.09)	5.35 (1.11)	5.40 (1.13)
BC authoritarian-subscale	7.49 (2.16)	7.21 (2.04)	7.50 (2.27)	7.35 (2.22)	8.35 (2.25)
BC authoritative-subscale	4.60 (1.17)	4.71 (1.18)	4.50 (1.20)	4.70 (1.06)	4.45 (1.30)
BC permissive-subscale	1.62 (.86)	1.60 (.93)	1.46 (.69)	2.00 (1.00)	1.70 (.92)
IV subscale	21.43 (4.30)	21.35 (5.03)	22.42 (2.90)	18.80 (4.95)*	21.70 (4.16)*
DEBQ					
External eating	3.15 (.70)	30.63 (5.81)	29.58 (4.67)	38.00 (8.50)**	30.10 (7.53)**
Emotional eating	1.93 (.73)	25.05 (9.29)	22.63 (7.92)	28.44 (11.28)	25.78 (11.12)
Restraint eating	1.51 (.52)	15.06 (4.53)	14.64 (4.30)	20.00 (7.32)*	13.30 (2.75)*
Amount of food eaten	341.81 (130.11)	367.38 (118.71)	336.73 (136.88)	362.50 (160.12)	267.80 (90.47)

MICS: Mealtime Interaction Coding System; BC: Behaviour Control; IV: Interpersonal Involvement; . Dutch Eating Behaviour Questionnaire (DEBQ)

* significant difference between children with and without overweight of the discordant siblings at a $p < .05$ level.

** significant difference between children with and without overweight of the discordant siblings at a $p < .01$ level.

Table 2

Intraclass correlation coefficients for mealtime behaviour observed in parents for all sibling pairs and for a subgroup of sibling pairs discordant for weight status.

MICS	All Sibling pairs (n=36)	Concordant sibling pairs (n=26)	Discordant sibling pairs (n=10)
General Rating BC	.83***	.86***	.74**
General Rating IV	.97***	.96***	.99***
BC authoritarian-subscale	.58***	.62***	.55*
BC authoritative-subscale	.53***	.52**	.60*
BC permissive-subscale	.75***	.87***	.54*
IV subscale	.51***	.50**	.70**

* $p < .05$; ** $p < .01$; *** $p < .001$

551

552 Table 3

553 *Difference score correlations for child characteristics and parental mealtime behaviour for the group of sibling*554 *pairs (n = 36) and the subgroup of discordant sibling pairs (n=10)*

MICS	Age	AdjBMI	Food amount	Ext Eat	Emo Eat	Restr Eat
General Rating BC						
All sibling pairs	-.44	-.14	.13	-.07	.03	-.43
Concordant pairs	-.51	.14	.21	.22	.37	-.60
Discordant pairs	-.18	-.39	-.10	-.31	.23	-.37
General Rating IV						
All sibling pairs	-.16	.01	.40	.05	.01	-.12
Concordant pairs	-.28	.12	.45	.23	.04	-.20
Discordant pairs	.20	-.17	.43	-.29	.06	-.09
BC authoritarian-subscale						
All sibling pairs	-.69*	-.19	.51*	-.05	-.27	-.66*
Concordant pairs	-.60*	.15	.54*	.45	.43	-.32
Discordant pairs	-.76	-.50	.43	-.33	-.37	-.78*
BC authoritative-subscale						
All sibling pairs	-.42	.09	-.38	-.02	.23	.48
Concordant pairs	.26	-.05	-.40	-.28	-.23	.33
Discordant pairs	.67	.28	-.30	.17	.36	.63
BC permissive-subscale						
All sibling pairs	.68*	.47*	-.52*	-.03	.15	.65*
Concordant pairs	.48	.16	-.41	-.42	-.54	.62
Discordant pairs	.84*	.66	-.63	.12	.27	.66
IV subscale						
All sibling pairs	-.62*	-.24	.51*	-.05	.08	-.49
Concordant pairs	-.70*	.41	.55*	.32	.26	-.44
Discordant pairs	-.33	-.72	.33	-.33	.30	-.51

§§§ .001

556