

# Breast is best: Positive mealtime interactions in breastfeeding mothers from Israel and the United Kingdom

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## Abstract

We examined mealtime interactions to assess whether they varied according to maternal body mass index, country and mode of feeding in 41 Israeli and UK mother–infant dyads. Feeding behaviours were coded using the Simple Feeding Element Scale. Significantly, more UK mothers breastfed during the filmed meal compared to Israeli mothers. Mealtime interactions did not vary according to maternal body mass index or country. Women who breastfed (as opposed to those who bottle fed or fed solids) provided fewer distractions during the meal, a more ideal feeding environment and fed more responsively.

## Keywords

breastfeeding, feeding cues, infants, mealtime interactions, obesity

## Introduction

The World Health Organization (WHO) reported in 2010 that there were 42 million overweight and obese children under the age of 5 years, and it is estimated that 9.5 per cent of infants worldwide are above the 95th percentile in weight (Ogden et al., 2010). One of the risk factors for obesity in early life is rapid weight gain in infancy (Baird et al., 2005), but risk is also conferred by the following factors: the mother's body mass index (BMI) as well as her weight gain during pregnancy (Cedergren, 2004), duration of breastfeeding and bottle feeding (Dietz and Gortmaker, 2001), the age at which solid foods are introduced (Ong et al., 2006) and parental feeding practices (Brown and Arnott, 2014).

Decisions about feeding early in life, such as whether to breastfeed and for how long, are important determinants of growth velocity (Singhal and Lanigan, 2007). Breastfeeding is likely to contribute to responsive feeding since it is thought that mothers are more in tune with their baby's hunger and satiety cues. Mode of feeding, when solid foods are introduced, what is fed during weaning, parental feeding styles and behaviours during mealtimes shape early eating habits (Blissett, 2011). Birch (2006) notes that

a parent's role is not to decide how much the child should eat but to determine the type of food that children are introduced to, the portion size, the frequency with which it is eaten and the social context within which eating occurs. This has been used as a core construct within the NOURISH trial: 'mother provides, child decides' (Daniels et al., 2009). Moreover, feeding behaviours vary, and Blissett (2011) notes that each mother tends to follow a different feeding style. For example, an authoritarian feeding style (a controlling type of feeding) is characterized by strict rules about food consumption, whereas an authoritative (more responsive in terms of warmth) feeding style involves placing high expectations upon the child's diet (i.e. healthy foods).

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Few studies have explored maternal characteristics and infant feeding behaviours. However, Brown and Lee (2011) investigated maternal feeding style during weaning and noted that mothers with a high BMI show a high level of concern for their child's weight and attempt to control their child's size. The findings by Brown and Lee (2011) therefore suggest that mothers who scored high in the restraint and emotional eating sub-scales of the Dutch Eating Behaviour Questionnaire (DEBQ) were more concerned for their child's weight compared to mothers who scored lower. Interestingly enough, those mothers who saw themselves as heavy also perceived their infant's body size as larger than average. In support, Rodgers et al. (2013) noted that maternal dietary restraint predicted infant's change in BMI Z-scores.

These findings strengthen the claim that feeding is not only about what the infant eats but also about how a mother and her infant interact during the meal. Understanding the complexity of early mealtime interactions and their effect in the long term is of considerable interest since early experiences of feeding predict eating later in life (Nicklaus and Remy, 2013).

Studies have shown that infants are born with the ability to self-regulate their consumption of food and signal to their mothers when they are hungry and when they are full. Birch notes that parents may not recognize their infant's hunger and satiety signals; consequently, they over-feed their infant, potentially leading to a reduced ability to self-regulate (Birch et al., 2003; Birch and Fisher, 1998; Stifter et al., 2011). Li et al. (2010) suggested that infants who were bottle-fed in early infancy were more likely to empty the bottle or cup in late infancy compared to infants who were fed directly from the breast. Breastfeeding is therefore associated with the infant actively drawing the milk out of the breast, thus controlling the pace of their meal and energy consumption.

Formula feeding or feeding breast milk from a bottle may encourage a more passive form of feeding since mothers can judge volume consumed and may be more able to control the feed duration and amount. Therefore, feeding from a bottle is associated with parental feeding control and lower ability to self-regulate energy intake (Arenz et al., 2004). Thus, some feeding practices in early infancy are positively associated with poorer energy compensation, overconsumption and eventually the development of later obesity (Baker et al., 2004). A recent follow-up study by Li et al. (2014) noted some long-term effects of early feeding styles on eating behaviours at 6 years of age. Bottle-fed infants were more likely to be encouraged to empty their bottles and showed lower satiety responsiveness at 6 years old compared to breastfed infants. Thus, feeding practices can have an enduring impact on later eating traits.

In addition, excessive parental control over feeding such as restriction or pressure to eat may be adversely associated

with under- or overfeeding, respectively, potentially leading to feeding problems (Farrow and Blissett, 2006b; Johnson and Birch, 1994). Other studies suggest that lower levels of feeding behaviour control promote healthier eating behaviours in childhood (Faith et al., 2004; Fisher and Birch, 1999; Savage et al., 2007).

Several studies have now shown the high levels of heritability in eating traits such as food fussiness or satiety responsiveness (Llewellyn et al., 2010). This further suggests that parental feeding practices such as restriction or pressure may be in response to inherent child eating traits. Some eating traits could place children at a higher risk of obesity, for example, rapid eating, eating in the absence of hunger, eating enjoyment and low satiety responsiveness. Fisher and Birch (2002) demonstrated that obese children are more likely to eat in the absence of hunger and respond less to internal cues of satiety than healthy weight children.

Given the influence of eating traits on the risk of obesity and the role of parents in responding to these characteristics, mealtimes may hold the key to understanding the dynamic nature of the parent-child interaction in determining food intake and the development of appetite control. Eating traits can be measured with questionnaires such as the Baby Eating Behaviour Questionnaire (Llewellyn et al., 2011) or the Child Eating Behaviour Questionnaire (Wardle and Johnson, 2002). However, mealtime interactions are best understood in real time and via recorded observations rather than recall. This presents a methodological challenge insofar as it requires both the presence of an investigator during mealtimes and a valid coding structure to score discrete behaviours of the mother and the baby during the meal.

Even with validated coding schemes, such as the Nursing Child Assessment Feeding Scale (NCFAS; Hodges et al., 2007), there remain challenges including low reliability and low internal consistency of the scale for infants under 12 months of age. In addition, coding behaviours is made more difficult since mothers report difficulty in understanding cues from their babies signalling hunger and satiety during meals (Hodges et al., 2008). Notwithstanding the difficulty of observing and characterizing mealtime interactions, the early feeding period provides an important window into how caregivers affect infant self-regulation of energy intake and also how responsive parents are to their infant's temperament and eating traits. In particular, it is useful to capture the mood, atmosphere and characteristics of the verbal communication during feeds since the mealtime is not merely about the content of the meal but how it is delivered and what is said.

This study is nested within a larger study exploring feelings, eating behaviours and infant feeding practices in Israeli and UK mothers from pregnancy (Shloim et al., 2013) until 2 years post-partum (Shloim et al., 2014).

The rationale for comparing the two countries is primarily based on cultural differences, for example, the greater identification by Israeli women with American ideals of body image. Laungani (2006) notes that body dissatisfaction is more common in countries where people have a more Western lifestyle with Israeli women being exposed to aspects of Western values through media and by its close relationships with the United States (Heesacker et al., 2000). Despite Western influences, Israel is considered non-Western in terms of lifestyle (Heesacker et al., 2000), as being less affluent and privileged than the United States. Thus, Israeli women show lower levels of body dissatisfaction compared to American women (Barak et al., 1994; Heesacker et al., 2000; Safir et al., 2005) despite the acceptance of the thin ideal in both countries.

Both Israel and the United Kingdom are Western-focused, industrially developed countries. However, life in Israel is very different to that in the United Kingdom. Israel is a relatively new country (established in 1948) constantly battling for recognition within a hostile climate. The average number of children in Israel is three per family (Israel Central Bureau of Statistics (CBS), 2007; Remennick, 2000) compared to 1.7 in the United Kingdom (Shaw and Giles, 2009). The majority of Israelis perceive childless people to have empty lives (Remennick, 2000), whereas studies from the United Kingdom report the increasing numbers of voluntarily childless women (Shaw, 2010). It is therefore possible that higher levels of stress in Israel, shorter duration of maternal leave and the threat of losing your child to military service all contribute to very different experiences of motherhood, to well-being and to the eating behaviours of Israeli and UK women.

Previous comparisons of Israeli and UK mothers found no differences in infant eating behaviours, but across both countries, heavier mothers tended to feed their infants according to a schedule (Shloim et al., 2014). In support, the EMPOWER study reported that obese mothers were observed as responding during feeding with pressure to eat or a restriction on eating depending on the size of their 9-month-old infants (Barlow et al., 2010).

Taking account of the importance of maternal BMI and the possible influence of cultural differences as reported by Shloim et al. (2013), the primary aim of this study was to investigate mealtime interactions of mother–baby dyads, within a sample of healthy weight and overweight/obese mothers. It was hypothesized that (a) heavier mothers would have less positive feeding interactions than healthy weight mothers, (b) the babies of heavier mothers would have a faster pace of eating and a greater interest in food and (c) breastfeeding mothers would be more in tune with their baby's signals during feeding and be less distracted by external cues. Moreover, as the length of maternity leave varies between Israel and the United Kingdom (Shloim et al., 2014) resulting in Israeli mothers returning to work 14

weeks following birth (compared to UK mothers who return to work 26–52 weeks post-partum), it was hypothesized that Israeli mothers would have fewer feeding experiences than UK mothers, potentially resulting in a less positive mealtime interaction.

## Methods

### Participants

The sample was drawn from 156 women in Israel ( $N=67$ ) and the United Kingdom ( $N=89$ ) who were participating in a study to explore emotions and eating behaviours during pregnancy (Shloim et al., 2013). A total of 73 women participated in the follow-up study ( $N=42$ ; 59% (Israel),  $N=31$ ; 41% (the United Kingdom)). These women were approached to take part in an in-depth study on feeding interactions involving filmed feeding in the home every 6 months for 2 years. A total of 41 mothers were filmed four times resulting in a total of 164 films exploring mealtime interactions (in a 2-year follow-up). The results of the first recorded mealtime are presented here. Although the sample size is relatively small (further addressed in the 'Limitations' section), given the eventual recruited numbers and the acknowledged cultural differences between the two countries, certain comparisons were made between Israeli versus UK samples. Furthermore, large sample sizes are difficult to obtain in studies of filmed mother–infant interactions as described by Khadr et al. (2011).

### Procedure

The researcher (N.S.) contacted all mothers between 5 and 12 weeks after the birth of their child and set a date to visit, at a convenient time to film a 'meal'. The researcher asked the participants to feed their baby as normal and try to ignore the presence of the researcher. The time of the meeting was arranged in advance to coincide with the usual time of a feed, although this was more challenging with breastfed infants. Mothers were interviewed on this occasion with questions on mood, eating behaviours following pregnancy, their infant's daily schedule and eating habits as described elsewhere (Shloim et al., in press). Thus, on the few occasions mothers suspected the baby was not yet ready to eat, the researcher waited until the mother felt it was the right time to feed and then subsequently interviewed the mother. Thus, in most of the occasions, the feeding commenced after babies demonstrated hunger by crying or by being unsettled.

Breastfeeding was defined as a feed directly from the breast, not expressed milk given by bottle. Non-breastfeeding meals were defined as those where formula or solid foods such as pureed fruits, vegetables or bread with soft cheese were offered to the infant.

### The Simple Feeding Elements Scale

The Simple Feeding Elements Scale (SFES; Mohebati, in preparation) was developed from the Health Exercise and Nutrition for the Really Young (HENRY) programme, an intervention aimed at preventing obesity within the first few months of an infant's life (Brown et al., 2013; Rudolf et al., 2010). The scale was also used as part of the EMPOWER clinical trial (<http://www.ncbi.nlm.nih.gov/pubmed/20645998>) which was developed to empower mothers to prevent the development of obesity from infancy, results of which were submitted to the UK Department of Health in March 2007 (Reference Number 060/0003). The scale originally contained 7 feeding variables but was modified to include 10 variables pertaining to mother–baby feeding interactions (see Box 1). Examples of the elements are the positioning item for which a higher score is awarded for feeding the baby face-to-face, whereas a lower score is awarded when the baby is facing the TV. Another element is child participation where the baby is encouraged to self-feed, and as such, a lower score is awarded when mothers

restrict eating, such as when a mother removes a plate from her child in order to prevent him or her from eating independently. The SFES is rated on a 3-point Likert scale by a trained observer, ranging from 1 (less ideal; indicating feeding while the baby is distracted by TV or toys, feeding foods which are less healthy) to 3 (more ideal; feeding the baby face to face, pausing the feed while a potent disengagement cue occurs, etc.). Elements were coded separately as Cronbach's alpha showed a weak correlation between the scale elements. Further details of the scale are available elsewhere (Nursing Child Assessment Satellite Training; Barnard et al., 1993; Mohebati, in preparation). All films were viewed by the lead researcher (N.S.), a qualified psychotherapist with training in both the SFES and *Nursing Child Assessment Satellite Training (NCAST)*. A second researcher (C.N.), trained in the SFES, was asked to view the films and code them independently. Finally, the third researcher (L.M.; experienced NCAST and SFES coder) also viewed and rated the material independently. For variables that did not reach an agreement of more than 75 per cent, L.M. adjudicated the final score.

**Box 1.** The Simple Feeding Elements Scale (SFES): description of elements.

Element	Description of element
Setting	Absence of distractions during the meal such as no TV, no toys and so on. A less ideal feeding occurs while the infant is watching the TV while eating.
Positioning	Infant and caregiver face each other during the meal. A less ideal positing is while an eye-contact is impossible.
Mood and atmosphere	Caregiver enjoys the mealtime interaction compared to caregivers feeling annoyed or irritated during the feed.
Child participation	Infant is encouraged to participate in self-feeding. A less positive feed is while the caregiver restrains infants' attempts to self-feed, by removing the plate, for example.
Pacing	Caregiver allows the infant to set the pace of eating.
Avoids feeding while distracted	Caregiver avoids feeding the infant when distracted.
Avoids feeding while disengaging	Caregiver avoids feeding when the infant needs a break (i.e. is disengaging).
Qualitative aspects of verbal communication	Caregiver avoids using commands or negative comments during the mealtime such as 'eat this', 'no more of this' and so on.
Quantitative aspects of verbal communications	Caregiver talks to the infant during the mealtime. A less ideal feed is while no vocalization is observed.
Fruits, vegetables and breast milk	The meal contains fruits, vegetables and/or breast milk.

### BMI and weight measurements

Babies' weight, length/height and age at measurement were recorded from the Child Health Parent Held Records ('red book' in the United Kingdom and equivalent in Israel). Standardized Z-scores for weight (WHO, 2010) were calculated for all infants and are presented as mean Z-scores for weight in Table 1. One infant was born pre-term and the Z-score for weight was excluded from the table. The results from this meal interaction were originally removed as eating behaviours vary between pre-term

and full-term babies. However, as no significant differences were observed when removed or retained, the data were kept. Mothers were asked to report their own weight and height and then BMI was calculated as weight (kg) divided by height (m) squared. Mothers were then categorized as underweight ( $\text{BMI} < 18.5 \text{ kg/m}^2$ ), healthy weight ( $25 \text{ kg/m}^2 > \text{BMI} \geq 18.5 \text{ kg/m}^2$ ), overweight ( $30 \text{ kg/m}^2 > \text{BMI} \geq 25 \text{ kg/m}^2$ ) or obese ( $\text{BMI} \geq 30 \text{ kg/m}^2$ ) using WHO classifications. The validation process for maternal self-reported BMI was conducted using a sensitivity analysis. This was carried out by creating a second



**Table 1.** Participants' characteristics.

	N (%)	Mean (SD)	Median	IQR	Missing data (%)
Mother's age (years)	41	34.1 (3.8)	33	26–40	–
Israel	23	34.6 (4.1)	26	26–40	–
The United Kingdom	18	33.8 (2.9)	29	29–40	–
Number of children before pregnancy					
None	14 (35)	–			
One or more	26 (65)	–	1	0–8	2.2
Level of education					
No degree	3 (7)	–	5	4–5	4.4
Degree or higher	36 (93)	–			
Mother's BMI (kg/m <sup>2</sup> )					
$\geq 18.5 < 25$	28 (68)	24 (3.4)	24.3	18.1–32.8	8.8
$\geq 25$	13 (32)				
Ever breastfed					
Yes	32 (78)	–	–	–	8.8
No	9 (22)	–	–	–	
Duration of breastfeeding					
Less than 12 weeks	4 (12)				22
12 weeks or more	31 (88)				
Breastfeeding during filming					
Israel	6 (26)				–
The United Kingdom	14 (77)				–
Other feeding during meal					
Israel	17 (74)				–
The United Kingdom	4 (23)				–
Infant's age at filming (weeks)					
Total	40	21.5 (9.4)	23	5–24	2.5
Israel	23	17.7 (6.4)	20	5–24	2.5
The United Kingdom	17	23.7 (3.7)	24	16–27	2.5
Infant's weight (kg)	40	6.5 (1.3)	6.8	3.3–9.2	2.5
Infant's Z-scores for weight	33	–0.89 (1.09)	–	–3.07 <sup>a</sup> –1.23	12

BMI: body mass index; SD: standard deviation; IQR: interquartile range.

Levels of education: 4 = no degree; 5 = degree or higher qualification.

<sup>a</sup>One baby was born pre-term, so the Z-score was excluded from this range.

variable where 2 kg was added and subtracted to weights, and the BMI categories were re-checked. This analysis resulted in no difference in the distribution across the categories, providing confidence that the use of reported rather than measured BMI was acceptable. Due to the relatively low number of underweight and obese women ( $N=4$  vs  $N=6$ , respectively), the categories were pooled and the analysis undertaken comparing healthy weight ( $N=28$ ; BMI  $< 25$  kg/m<sup>2</sup>) to overweight/obese women ( $N=13$ ; BMI  $\geq 25$  kg/m<sup>2</sup>). The limitations of this procedure are further addressed at the end of this article.

### Data analysis

Analysis was conducted using Stata version 12 and SPSS Statistics 20. Each film was scored according to the SFES. Mann–Whitney tests were applied to determine any potential differences between mothers according to sociodemographic

variables such as age and levels of education. An additional variable to identify mode of feeding (breastfeeding vs other feeding) was created and its correlation with BMI and SFES scores assessed. All scores were then compared by BMI category and by mode of feeding (i.e. frequency of mothers obtaining ideal, average or less than ideal ratings for each element) using the Mann–Whitney test. Spearman's rank correlation test was applied to determine whether there was any evidence of correlation between each element of the SFES. Finally, the data were analysed to determine whether there were differences in the results between the two countries, using the Mann–Whitney test.

### Ethical considerations

The study was approved by the Ethics Committee at the Institute of Psychological Sciences at the University of Leeds, Reference No. 11-0137.

## Results

A total of 41 women from Israel and the United Kingdom agreed to take part in the study. Table 1 presents the main characteristics of the participants who were filmed. Mothers' mean age was 34.1 (3.8) years. Most were married ( $N=38$ , 87%), multiparous and 14 women were primiparous. Maternal BMI was similar in both countries, and most mothers were within the healthy weight range compared to overweight/obese. At the time of filming, babies ranged in age from 5 to 24 weeks. This reflected mothers' availability and willingness to arrange a filmed mealtime. Mothers reported that they introduced solid foods between 4 and 6 months. The findings were not in agreement with the national recommendations in Israel and the United Kingdom advising mothers to introduce solid food at 6 months. (<http://www.health.gov.il/English/SearchResults/Pages/GlobalSearch.aspx>; <http://www.nhs.uk/conditions/pregnancy-and-baby/pages/solid-foods-weaning.aspx>).

Babies' age was normally distributed with two outliers: one baby being much younger (5 weeks of age) and one baby older (27 weeks) than the main cohort. The average age of introduction to solid food was 16 weeks and did not vary significantly between countries. No significant differences were identified between countries for the age at which weaning commenced. Mode of feeding was similar in both countries, and significantly more women had ever breastfed compared to those who had not in each country ( $p<0.01$ ). Of the total sample, 83 per cent of women had initiated breastfeeding and were either still breastfeeding or had stopped at the time of the study. Nevertheless, only 48 per cent of the women breastfed during the filmed interactions. Significantly, more women from the United Kingdom elected to breastfeed their baby during the mealtime compared to the Israeli sample ( $p<0.01$ ). This might be attributed to the working status of mothers with higher levels of stay-at home mothers in the United Kingdom compared to Israel. Thus, breastfeeding during the day (in which the films were recorded) was more common in the United Kingdom simply due to work constraints. The higher levels in UK breastfeeding mothers were not significantly related to babies' age.

## SFES

Most mothers scored the maximum for most of the elements of the scale (3). As such, mothers tend to feed a healthy meal, not in front of the TV and did not use feeding commands. In other words, this sample consisted of mothers who were generally responsive to their infants. Their behaviours were commensurate with a healthy level of interaction, whether they elected to breastfeed, bottle-feed or provide their infants with solids during the mealtime. Table 2 presents the scores for the SFES, first for the total sample and then according to BMI category and mode of

feeding. Mean duration of the feed was 21 (4.8) minutes (range: 8–26 minutes) and was similar between breastfeeding and other feeding modes ((21.8 (4.9) versus 19.5 (4.5) minutes, respectively).

## Relation to maternal BMI

Among the healthy weight mothers, just over half elected to breastfeed on the day of filming compared to feeding a mixed or solid food meal. Among the overweight mothers, fewer elected to breastfeed on the day of filming compared to offering a bottle or solid meal, but this was not significantly different either within the group or compared to healthy weight mothers. BMI category revealed no significant differences in mealtime interaction scores in the SFES (Table 2, Figure 1).

## Mode of feeding

Significant differences in SFES elements were found by mode of feeding (Figure 2, Table 3). For example, breastfeeding mothers were more likely to feed without distraction (the baby accepts the feed without being distracted;  $p<0.01$ ) and scored higher for setting (no distractions of TV or toys during mealtime;  $p<0.05$ ). They were also more likely to pause the feed during a potent disengagement cue ( $p<0.01$ ), such as turning the head away or face gazing. Breastfeeding mothers by definition allowed the baby to self-feed and determine their own pace of eating.

## Correlations between and within SFES elements

The duration of feeding correlated with feeding disengagement ( $\rho=0.16$ ;  $p<0.05$ ). Thus, the longer the feed, the more likely mothers would pause in order to respond to disengagement cues such as arching the back or moving the head away from the food or the breast.

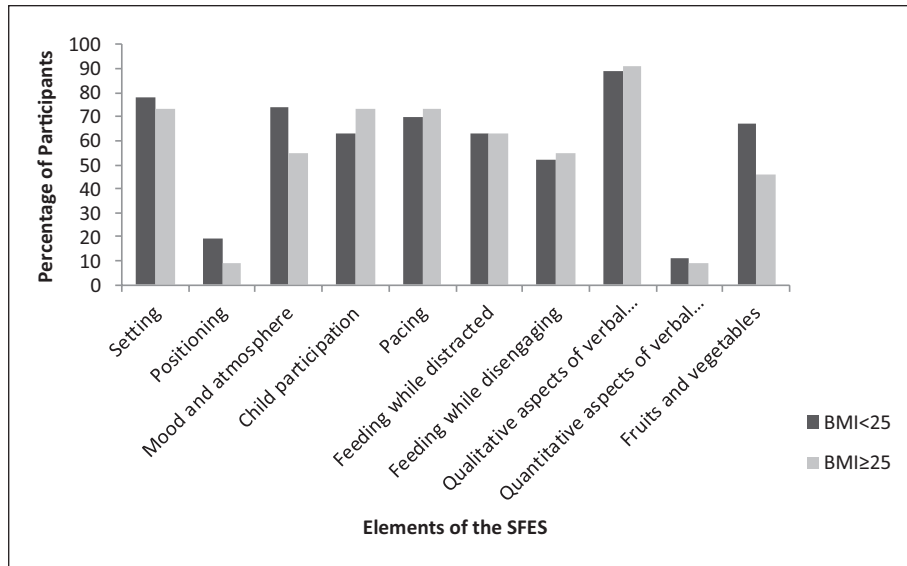
Child participation was negatively correlated with positioning ( $\rho=-0.42$ ;  $p<0.01$ ) indicating that a face-to-face position during the meal was associated with greater restriction of the child self-feeding (Table 3). Child participation was also positively correlated with pacing ( $\rho=0.62$ ;  $p<0.01$ ), suggesting that children who fed themselves determined their own pace of eating. It was positively correlated with feeding commands ( $\rho=0.65$ ;  $p<0.01$ ; qualitative aspects of verbal communication). Thus, the more mothers encouraged self-feeding, the fewer eating commands they issued, such as 'eat this now', 'eat more', 'enough with the pasta' and so on, whether breastfed or otherwise fed. Mothers who did not use feeding commands were also likely to pause feeding during a disengagement cue ( $\rho=0.51$ ;  $p<0.01$ ).

Pacing was negatively correlated with positioning ( $\rho=-0.48$ ;  $p<0.01$ ). An ideal interaction would involve caregiver and infant having their faces aligned, as in a

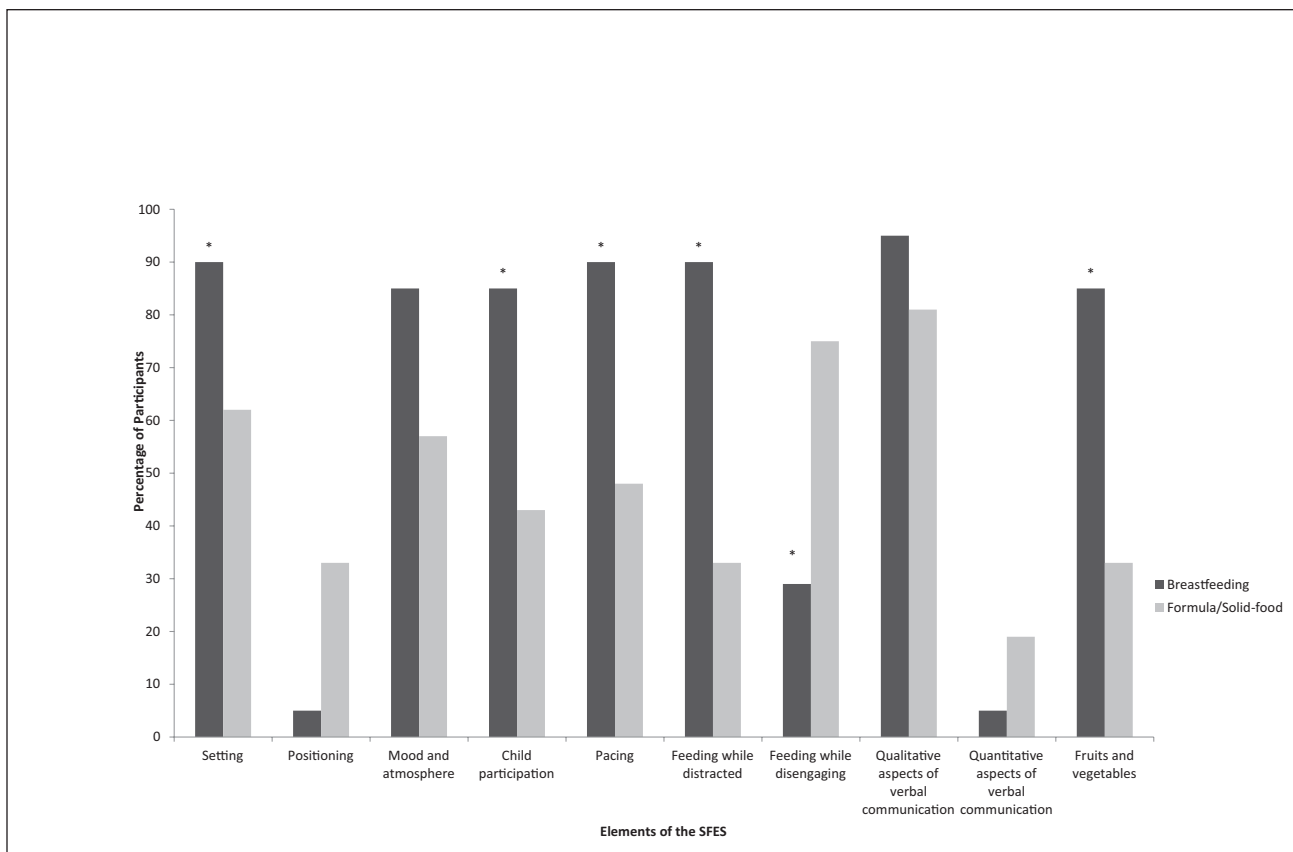
**Table 2.** The Simple Feeding Elements Scale (SFES) distribution of scores divided by total sample size, BMI and type of filmed feeding.

	Setting	Positioning	Mood and atmosphere	Child participation	Pacing	Feeding while distracted	Feeding while disengaging	Qualitative aspects of verbal communication	Quantitative aspects of verbal communication	Fruit and vegetables
<b>Total sample</b>	N=41	N=41	N=41	N=41	N=41	N=41	N=41	N=41	N=41	N=41
Less ideal	2 (5%)	7 (7%)	1 (3%)	4 (10%)	6 (15%)	6 (15%)	15 (37%)	2 (5%)	9 (22%)	—
Average	8 (20%)	<b>26 (63%)</b>	8 (20%)	9 (22%)	5 (12%)	8 (19%)	6 (13%)	4 (10%)	<b>26 (64%)</b>	18 (44%)
More ideal	<b>31 (75%)</b>	8 (19%)	<b>31 (77%)</b>	<b>28 (68%)</b>	<b>30 (73%)</b>	<b>27 (66%)</b>	<b>20 (50%)</b>	<b>35 (86%)</b>	6 (14%)	<b>23 (56%)</b>
BMI < 25	N=27	N=27	N=27	N=27	N=27	N=27	N=27	N=27	N=27	N=27
Less ideal	2 (8%)	5 (18%)		2 (8%)	2 (8%)	5 (18%)	10 (37%)	1 (4%)	6 (22%)	
Average	4 (15%)	<b>17 (63%)</b>	7 (26%)	8 (30%)	6 (22%)	5 (18%)	3 (11%)	2 (8%)	<b>18 (67%)</b>	9 (33%)
More ideal	<b>21 (78%)</b>	5 (19%)	<b>20 (74%)</b>	<b>17 (63%)</b>	<b>19 (70%)</b>	<b>17 (63%)</b>	<b>14 (52%)</b>	<b>3 (89%)</b>	3 (11%)	<b>18 (67%)</b>
BMI ≥ 25	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15
Less ideal	1 (7%)	2 (13%)	1 (7%)	2 (13%)	3 (20%)	2 (13%)	6 (40%)		1 (7%)	
Average	3 (20%)	<b>11 (73%)</b>	5 (33%)	3 (20%)	1 (7%)	3 (20%)	1 (7%)	2 (13%)	<b>12 (80%)</b>	<b>8 (53%)</b>
More ideal	<b>11 (73%)</b>	2 (14%)	<b>9 (60%)</b>	<b>10 (67%)</b>	<b>11 (73%)</b>	<b>10 (67%)</b>	<b>8 (53%)</b>	<b>13 (87%)</b>	2 (13%)	7 (47%)
Breastfeeding during filmed meal	N=21	N=21	N=21	N=21	N=21	N=21	N=21	N=21	N=21	N=21
Less ideal	1 (5%)	3 (14%)		1 (5%)		2 (10%)	4 (19%)	1 (5%)	2 (10%)	
Average	1 (5%)	<b>16 (76%)</b>	2 (9%)	2 (10%)	2 (10%)	1 (5%)	3 (14%)	1 (5%)	<b>16 (76%)</b>	3 (14%)
More ideal	<b>19 (90%)</b>	2 (10%)	<b>19 (91%)</b>	<b>18 (85%)</b>	<b>19 (90%)</b>	<b>18 (86%)</b>	<b>14 (67%)</b>	<b>19 (90%)</b>	3 (14%)	<b>18 (86%)</b>
Otherwise feeding	N=20	N=20	N=20	N=20	N=20	N=20	N=20	N=20	N=20	N=20
Less ideal	1 (5%)	4 (20%)	1 (5%)	2 (10%)	6 (30%)	4 (20%)	<b>10 (50%)</b>	1 (5%)	6 (30%)	
Average	7 (35%)	<b>9 (45%)</b>	6 (30%)	7 (35%)	2 (10%)	6 (30%)	3 (15%)	3 (15%)	<b>9 (45%)</b>	<b>14 (70%)</b>
More ideal	<b>12 (50%)</b>	7 (25%)	<b>12 (50%)</b>	<b>11 (45%)</b>	<b>12 (50%)</b>	<b>10 (50%)</b>	7 (35%)	<b>16 (80%)</b>	5 (25%)	6 (30%)

BMI: body mass index.



**Figure 1.** Percentages of participants with more ideal scores distributed by participants' BMI. No significant differences.



**Figure 2.** Percentages of participants with more ideal scores distributed by mode of feeding.

\*Significant at  $p < 0.05$  using Mann-Whitney test with mode of feeding as the main effect.

conversation. During a breastfeeding interaction, this would mean the mother would have to make an effort to turn her head to the side; otherwise her face would be

perpendicular to that of her breastfeeding infant's. Thus, while most breastfeeding mothers allowed their infants to set the pace of feeding (scoring ideally in terms of pacing),



**Table 3.** Simple Feeding Elements Scale (SFES) bivariate correlation matrix of mean scores.

	Setting	Positioning	Mood and atmosphere	Child participation	Pacing	Feeding while distracted	Feeding while disengaging	Qualitative verbal	Quantitative verbal	Fruit and vegetables
Setting	1.00									
Positioning	0.21	1.00								
Mood and atmosphere	0.41	0.09	1.00							
Child participation	0.11	-0.42**	0.19	1.00						
Pacing	0.18	-0.48**	0.14	0.62**	1.00					
Feeding while distracted	0.50**	-0.09	0.41	0.39*	0.62**	1.00				
Feeding while disengaging	0.08	-0.36*	0.24	0.48**	0.65**	0.60**	1.00			
Qualitative verbal	0.06	-0.70**	0.09	0.65**	0.69**	0.31	0.51**	1.00		
Quantitative verbal	0.07	0.07	0.45	-0.13	0.00	0.08	-0.03	-0.16	1.00	
Fruit and vegetables	0.21	-0.17	0.17	0.40**	0.27	0.35*	0.46**	0.21	-0.07	1.00

Spearman's correlation test.

\*Correlation is significant at the &lt;0.05 level (two-tailed).

\*\*Correlation is significant at the &lt;0.01 level (two-tailed).

most did not assume a more ideal alignment of faces to facilitate social interaction, and as such tended to exhibit an average or less ideal score on the positioning item. This is further addressed in the sections 'Discussion' and 'Limitations'.

### Analysis by country

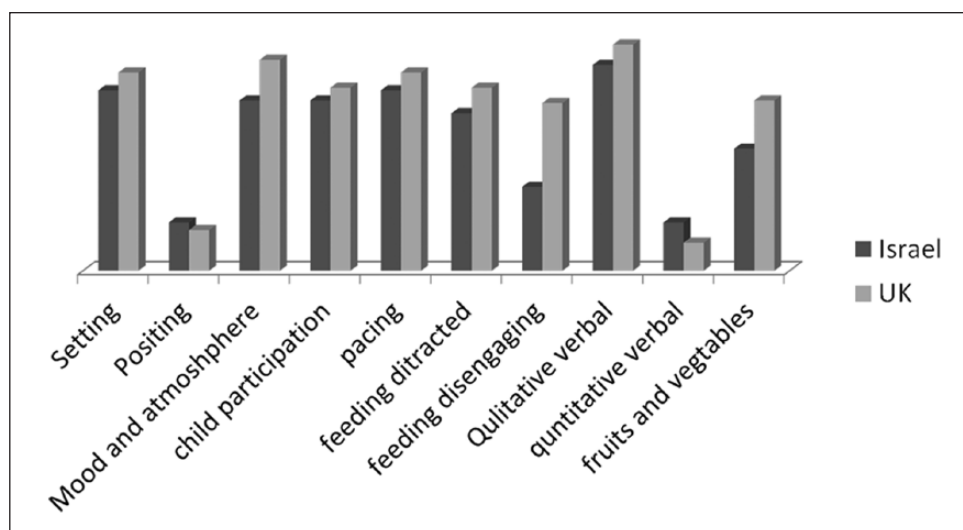
Differences in feeding interactions by country were not significant (Figure 3). However, trends revealed more positive mealtime interactions within the UK sample. This could be explained by the observation that UK babies' mean age and weight at filming were greater than for the Israeli women (Table 2), and significantly more UK women breastfed their infants during the filmed feeding.

### Discussion

In this study, we aimed to investigate mealtime interactions in mother–infant dyads when the infants were aged between 2 and 6 months. No differences were seen between mealtime interactions for healthy weight women and overweight or obese women or by country. However, breastfeeding was associated with a more positive mealtime experience than other modes of feeding. Breastfeeding mothers were more in tune with their baby's signals during feeding and were less distracted by external cues. Thus, in this study, breastfeeding mothers provided a more positive interaction during feeding by distracting the baby less, providing a more ideal environment, pausing the feed to respond to infants' signals to stop and facilitating independence through self-feeding. In addition, the longer the duration of the meal, the more mothers responded to their infant's disengagement by pausing during the expression of a satiety cue (e.g. arching the back or moving away from the breast). This was supported by a slightly longer duration of feeding for mothers who initiated breastfeeding.

Fewer commands were issued by mothers when self-feeding was encouraged. The more mothers enjoyed the mealtime interaction (positive mood and atmosphere), the more they encouraged self-feeding (allowing the baby to hold and touch the breast while breastfeeding, holding the bottle or finger food for solid food). Enjoyment did not differ by mode of feeding. These findings are similar to Farrow and Blissett (2006) who demonstrated that breastfeeding predicts fewer negative mealtime interactions in 1-year-old infants, mainly as mothers are less likely to pressure their infants to eat. In support, Brown and Arnott (2014) noted that mothers who follow an infant-led feeding approach (positively associated with breastfeeding) were more aware of their infant's hunger and satiety cues. Thus, breastfeeding can facilitate sensitivity to the infant's appetite (Caton et al., 2012; Ong et al., 2006).

Breastfeeding mothers showed more positive outcomes in relation to pacing, responding to disengagement cues



**Figure 3.** Percentages of participants with more ideal scores distributed by country. No significant differences.

and providing fewer distractions, which can be transferred to the complementary feeding period. Transitioning to solids is an important time when less maternal control and more encouragement of infant self-feeding and setting their own pace of eating (i.e. trusting the infant to know what is best) may be important in establishing healthier future eating habits. The usefulness of SFES may reside in its ability to identify elements of feeding interactions in the first year of life which may potentially impact later eating behaviours. This is unique in comparison with other existing feeding observation scales such as that developed by Hodges et al. (2013), which are applied to feeding infants aged 12 months and older.

Breastfeeding establishes a strong bond between mother and infant (Kuzela et al., 1990), and many enjoy the intimacy being established in the feeding interaction with higher levels of sensitivity to their infants 3 months postpartum (Britton et al., 2007). However, in this study, there was no difference in the level of enjoyment between mothers who breastfed or those who fed solids/formula during the meal. This could be attributable to the young age of the babies and the possibility that in the early stages of feeding the baby is less likely to exhibit food refusal and challenging behaviours, so creating a more joyful and positive experience for the mother and her baby. This might also be attributed to the selectiveness of the sample (i.e. mothers were interested in participating in a study about feeding their babies) and were thus more attuned to feeding whether they elected to breastfeed during the filmed interaction or not.

Breastfeeding produced a greater opportunity for positive mealtime interactions, even accounting for elements of the scale which favour breastfeeding such as child participation. This provides further confirmation of the benefits of breastfeeding beyond nutrition (Shah, 2013), and

the psychological benefit to mother and baby. However, for the positioning element of the scale, breastfeeding mothers tended to exhibit only average or not ideal compared to other elements. Thus, one might not expect a breastfeeding mother to align her face with her child's during breastfeeding as this is challenging given that the child's mouth is facing the breast. However, a mother who fails to align her face with her child during feeding due to distractions (e.g. mobile phone, watching TV or looking elsewhere) is less interactive and therefore coded as having a less positive mealtime experience than mothers who face their baby.

No significant differences between countries emerged, and any findings were likely to be attributable to the different modes of feeding chosen for the filmed interactions. This may have been affected by the difference in paid maternity leave entitlement between Israel and the United Kingdom (see Shloim et al., 2014).

Women in our study were highly educated and of a relatively high socioeconomic status, therefore more likely to initiate and maintain breastfeeding within a generally healthy lifestyle. This supports the findings of others including Crombie et al. (2009) who described how parents' age, level of education and health knowledge all play an important role in food and feeding choices including rates of breastfeeding. Moreover, breastfeeding could serve as a learning experience for future feeding interactions, as suggested by Britton et al. (2007). Breastfeeding mothers who demonstrated more enjoyment in the feeding interactions might be more inclined to translate this into later feeding by being more in tune with their infant's feeding cues and introduce healthier foods. We intend to follow up these infants and mothers for 2 more years to explore any ongoing effect of breastfeeding on larger mealtime interactions.

## Limitations

Our findings should be considered in relation to the limitations of the study. Women were self-selected and well-educated, originating from a relatively affluent sub-population. This might have impacted their decision and ability to breastfeed and might have contributed to a more positive feeding interaction. Although the power calculations showed that the sample size was sufficient to determine significant differences between Israeli and UK babies' and mothers' BMI (for the combined sample of all four follow-ups), a larger sample size with a broader range of weight categories might have permitted observing clearer differences in feeding interactions between countries and differing BMI categories. Moreover, it is possible that overweight and obese women demonstrate different mealtime interactions which were not considered here. This study combined both BMI categories into a single BMI group. Thus, future research could benefit by addressing possible differences for each category independently. This sample had a smaller proportion of overweight and obese women compared to levels for the general population (WHO, 2010), perhaps due to the skewed socioeconomic distribution or that obese mothers may be less likely to agree to be filmed during mealtime interactions. Finally, this study involved feeding interactions on one occasion and therefore may be unrepresentative of mother–infant feeding interactions more generally. This will be addressed in the future with further follow-up periods for each dyad, over 2 years.

## Conclusion and recommendations

Our findings indicate the feasibility of assessing mother–infant mealtime interactions in young infants and contribute to previous research by providing evidence of differences between breastfeeding and other feeding during mealtime interactions. The study also emphasizes the importance of exploring such interactions not only via what is given within a meal but also by understanding mother–infant levels of enjoyment and emotional interactions during a meal. Mealtime interactions offer an insight into the quality of the early feeding experience, and few studies to date have achieved this within a natural setting. There is a clear need to explore this area further within larger and more diverse populations.

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