

Original Article

A descriptive study investigating the use and nature of baby-led weaning in a UK sample of mothers

Amy Brown and Michelle Lee

Department of Psychology, School of Human Sciences, Swansea University, Swansea, UK

Abstract

An alternative to traditional weaning methods known as baby-led weaning (BLW) appears to be emerging in the UK. This approach advocates bypassing typical weaning practices of spoon-feeding puréed foods or baby rice, encouraging instead the introduction of foods in their whole form to the infant from 6 months old. A key tenet of BLW is self-feeding. Anecdotally, the practice of BLW appears to be gaining in popularity. However, research evidence is scant, and little is known about the nature of BLW and the demography of those who utilize it. This study aimed to characterize a sample of women who have chosen to adopt the BLW method and to describe associated attitudes and behaviours. Six hundred and fifty five mothers with a child between 6 months and 12 months of age provided information about timing of weaning onset, use of spoon-feeding and purées, and experiences of weaning and mealtimes. Those participants who used a BLW method reported little use of spoon-feeding and purées and were more likely to have a higher education, higher occupation, be married and have breastfed their infant. BLW was associated with a later introduction of complementary foods, greater participation in meal times and exposure to family foods. Levels of anxiety about weaning and feeding were lower in mothers who adopted a BLW approach. These findings provide an insight into BLW practices and the characteristics of a small population of users.

Keywords: weaning, baby-led weaning, infant feeding, complementary feeding, breastfeeding.

Correspondence: Amy Brown, Department of Psychology, School of Human Sciences, Swansea University, Swansea SA2 8PP, UK. E-mail: a.e.brown@swansea.ac.uk

Introduction

Following publication of the World Health Organization (WHO) recommendations on infant and young child feeding (World Health Organisation 2001), the UK Department of Health's current weaning advice is to introduce complementary foods from 6 months of age (UK Department of Health 2007). More specifically, a gradual transition from spoon-fed puréed foods and baby rice to foods prepared with a coarser texture, finger foods and eventual consumption of

family foods by 12 months of age is recommended (Department of Health 2007). The choice of purées and baby rice as first foods is common in the UK (Seaman *et al.* 1996), and this is reinforced in current guidelines.

Recently, a new trend in weaning, known as baby-led weaning (BLW), appears to be emerging in the UK as an alternative to traditional weaning methods (Rapley 2006; Rapley & Murkett 2008). The fundamental principles of BLW are threefold. First, food items are offered to the infant in their whole form as

finger foods rather than puréed. Second, infants self-feed by selecting and grasping foods, making initial mouth contact and then ingestion through their own actions rather than via spoon-feeding. Third, infants join in family meals, consuming family foods straight-away (Rapley & Murkett 2008).

Research on BLW is extremely sparse. Rapley (2003) carried out a small-scale observational study on five infants introduced to complementary foods using the BLW method. Although all of the infants were able to self-feed by 6.5 months and showed signs of chewing and swallowing, the sample is small, and no data about the amount of food actually ingested were provided. Rapley (2006) and Rapley & Murkett (2008) suggest that the BLW method may reduce food fussiness and allows the infant to self-regulate food intake according to appetite (Rapley 2003). To date, however, there is no empirical evidence in support of these claims.

Anecdotally, the use of BLW appears to be increasing in the UK. BLW has an established online presence in the form of dedicated web sites, message boards and Internet forums, and a book presenting the method to parents (Rapley & Murkett 2008). Furthermore, Reeves (2008) notes, in a critique of BLW, that a number of articles in the media (The Independent Online 2006; The Guardian Online 2008) have championed the use of BLW. Recently, Arden (2009) conducted a mixed-method study investigating factors affecting decision-making in relation to readiness for weaning. When analysing the qualitative part of her study, Arden (2009) found that a number of participants, who were recruited through Internet parenting forums, wrote about BLW. This finding gives an early indication that BLW is being practised by parents on the basis of Internet-sourced information, which is unlikely to be impartial.

Given the dearth of research on BLW, we were interested in determining the characteristics and attitudes of mothers who employ the BLW method with infants between 6 and 12 months of age. This study aims to gather information about those following BLW, the extent to which purées and spoon-feeding are used and mothers' experiences of weaning. A further aim of the study is to make comparisons between a sample of women who uses BLW and a sample of women who uses traditional weaning methods in terms of breastfeeding duration, age at introduction of first foods, sources of information about complementary feeding and experience of weaning.

Materials and methods

Participants

Six hundred and fifty-five mothers with a youngest or only child between 6 and 12 months of age were recruited using a poster advertising the study placed in nurseries and community centres hosting mother and baby groups in the City and County of Swansea, UK. This age range was targeted as it is recognized as the period of weaning, where infants progress from initial tastes of foods to eating family foods (Department of Health 2007). These community groups were located in areas with varying degrees of social deprivation. In addition, advertisements for the study were posted on five Internet parenting sites. One aim of the study was to make comparisons between mothers who followed BLW and mothers who used conventional weaning methods. Therefore, recruitment posters advertising the study mentioned only that we were interested in when and how complementary foods were introduced to babies. Responses were sought from mothers who

Key messages

- A baby-led weaning (BLW) style was found to be associated with a number of maternal feeding behaviours such as a later introduction of complementary foods, offering fresh home-made produce and allowing the infant to participate in family meal times.
- Mothers who follow a BLW approach expressed higher levels of confidence in giving their infant complementary foods and fewer concerns about nutrient intake and mess during meal times.
- Further research is needed to establish the long-term outcomes and limitations of this weaning method.

employed a variety of weaning practices by advertising in a wide range of locations, including those aimed at the BLW community.

Demographic information about the participants was collected (Table 1). The mean age of the respondents at childbirth was 29.56 years (range from 17–45) and the mean number of years in education was 14.87. Of the mothers, 68.9% were primiparous. The participants also provided details about infant birthweight and gestational age at birth. The infants were excluded from the analysis if they had low birthweight (<2500 g) or were born prematurely (<37 weeks) (World Health Organization 1992). Multiple births were also excluded. Of the 702 respondents, 655 mothers with a child between 6 months and 12 months of age (mean age 8.34 months) whose child had started consuming complementary foods were included in the analysis. All of the participants gave informed consent prior to inclusion in the study. All aspects of this study have been performed in accordance with the ethical standards set out in the 1964

Declaration of Helsinki. Approval for this study was granted by the Department of Psychology Research Ethics Committee at Swansea University.

Measures

Data were collected using an online questionnaire designed and hosted using SurveyMonkey.com (<http://surveymonkey.com>). Adverts were placed upon web sites and message forums¹ aimed at mothers with infants of weaning age. Specifically, a subset of web sites dedicated to BLW was targeted to recruit mothers following this method.² The posters that advertised the study provided a web link to the online questionnaire. Web site access was during March to April 2009. Consent was collected using a series of checkboxes that had to be completed. The participants completed the online questionnaire that asked about their behaviours and experiences of introducing solid foods to their infant. The participants also indicated whether they initiated breastfeeding at birth and for how long they breastfed for.

Table 1. Sample distribution by demographic factors

Indicator	Group	n (%)
Age	<19	22 (3.3)
	20–24	90 (13.6)
	25–29	278 (42.1)
	30–34	194 (29.4)
	>35	76 (11.5)
Education	No formal	25 (3.8)
	School	88 (13.3)
	College	174 (26.4)
	Higher	373 (56.5)
Marital Status	Married	457 (69.2)
	Cohabiting	170 (25.8)
	Single	26 (4.0)
Home	Owned	425 (64.5)
	Rented	183 (28.3)
	Council	33 (4.5)
	Other	14 (2.7)
Maternal occupation	Professional and managerial	267 (40.5)
	Skilled	116 (17.6)
	Unskilled	185 (28.0)
	Other	48 (7.3)
Paternal occupation	Professional and managerial	213 (32.3)
	Skilled	218 (33.0)
	Unskilled	169 (25.6)
	Other	37 (5.6)

Age of introduction to complementary food

The participants provided the age of the infant at first introduction to any complementary food and also the age at introduction to foods in the whole form or finger foods (e.g. a carrot stick rather than puréed carrots). In addition, the participants provided details of the first complementary foods given, the type of food given, what form it was in (purée or whole) and whether it was home made or commercially produced.

Style of weaning

Two of the main characteristics of BLW are using foods in their whole form rather than puréed foods and allowing the infant to self-feed rather than to be spoon-fed. As there is no formal definition of BLW and the method is open to interpretation, the participants were asked to approximate the extent to which

¹www.bounty.com; www.mumsnet.com; www.iwantmymum.com.

²www.baby-led.com; <http://rapleyweaning.com>; <http://babyledweaning.com>; <http://groups.yahoo.com/b-lw>.

spoon-feeding was employed as a percentage of the time spent feeding their infant. The participants also estimated the extent to which puréed foods were used during weaning as a proportion of all foods together. This gave a measure of degree of BLW. The response options were 100%, 90%, 75%, 50%, 25%, 10% and 0% in both cases. The mothers who used child care were asked to indicate the degree of spoon-feeding and exposure to puréed foods the infant received when in the care of others.

Experiences of weaning and meal times

The participants rated a series of statements that related to their experience of feeding their infant complementary foods. Measures included maternal anxiety about feeding, enjoyment of feeding their infant and confidence. Response options used a five-point Likert scale (disagree to agree). The participants also provided information about their infant's inclusion in family meal times and the amount of milk feeds the infant typically consumed.

Sources of information and support

The participants indicated using a five-point Likert scale (disagree to agree) how strongly they used different sources for information, advice and support for weaning and feeding issues regarding their infant. This included sources such as a health visitor, a partner, their mother, friends and books.

Data analysis

Data analyses were carried out using SPSS v13 (SPSS Inc., Chicago, Illinois, USA). A factor analysis was conducted on the items that measured experience of weaning. Factor analysis is a statistical technique that searches for patterns in relationships between variables. It combines large numbers of variables together into a smaller number of factors based on similarities in the variables. For example, items that measure confidence in different ways may be grouped together. To conduct the factor analysis, a principal component analysis was extracted that was subject to varimax rotation. Factors with eigenvalues over 1 were used.

The factor scores computed were saved as regression scores and used for the data analysis as recommended by Tabachnik & Fidell (2006).

As no official classification of BLW exists and the method is open to individual interpretation, the participants were not asked directly whether they were following a BLW style. Instead, two questions focused on the main principles of BLW: using food in its whole form rather than purées and allowing the infant to self-feed rather than be spoon-fed. The participants therefore indicated (as described earlier) the proportion to which they used purées and spoon-feeding with their infants. As a result of these two questions, the participants were split into two main groups for both purée and spoon use. The participants who used purées 10% of the time or less formed one group, labelled 'baby led weaning' (BLW), and the participants who used purées more than 10% of the time were labelled 'standard weaning' (SW). Similarly, for spoon use, the participants who used spoon-feeding 10% of the time or less were labelled as 'baby led weaning' (BLW), and the participants who used spoon-feeding more than 10% of the time were labelled under 'standard weaning' (SW). This distinction was made for three main reasons. First, it allowed inclusion of those who very occasionally used purees or spoon-feeding in the BLW category. Second, splitting the groups in this way produced two groups of similar size for comparison. Third, in terms of key behaviours such as age of introduction to solid foods and breastfeeding duration, while no significant difference was seen between those using a BLW approach 100% or 90% of the time, both these groups differed significantly to those using the approach 75%, 50%, 25% or 0% of the time.

Spearman's correlations were used to examine the association between degree of BLW, demographic data and styles and experiences of weaning. Furthermore, those classified as using a BLW approach for both spoon-feeding and purée use were compared with those using an SW approach to report age of first introduction to complementary foods, report breastfeeding duration and describe first complementary foods used.

As would be expected, the age of the infant was significantly inversely associated with the frequency

of spoon-feeding and puréeing of meals. Therefore, the age of the infant was controlled throughout the data analysis.

Results

Knowledge of baby-led weaning

The participants were given a brief description of the key principles of baby-led weaning in terms of spoon-feeding and purée use and asked whether they had heard about the method at all (response options: I have never heard of it, I know a little, I know a moderate amount, I know a lot, I consider myself well informed). Only 2.6% ($n = 17$) of the sample had never heard of the method before with 58.2% of the sample ($n = 384$) considering themselves well informed about the method. Degree of knowledge of BLW was inversely correlated with proportion of spoon-feeding (Spearman's $\rho = 0.629$, $P < 0.001$) and purée use (Spearman's $\rho = 0.574$, $P < 0.001$).

Style of weaning

The participants were not asked to identify themselves as users of BLW or not as this was open to individual interpretation. They were asked to indicate the extent to which they spoon-fed their infant and the proportion of foods given in puréed form. The responses ranged from spoon-feeding all of the time to self-feeding all of the time (Table 2). Similarly, the extent to which purées were used ranged from 100% of the time to not used at all (0%) (Table 2). Spoon-feeding was positively correlated with giving puréed foods (Spearman's $\rho = 0.872$, $P < 0.001$). The respondents were classified as using the BLW method if spoon-feeding or use of purées was $\leq 10\%$ of the time. Of the sample, 52% used BLW based on spoon use, and 57% used BLW based on purée use. The remainder of the sample were classified as using SW methods.

The mothers who had returned to work and whose infant was in child care were further asked the method of feeding and type of food used while that infant was in child care. The infants were fed puréed food a higher proportion of the time in a child care

Table 2. Maternal use of spoon-feeding and puréeing

	Method	<i>n</i> (%)
Spoon-feeding	100% spoon-fed	37 (5.6)
	90% spoon-fed	68 (10.3)
	75% spoon-fed	76 (11.5)
	50% spoon-fed	68 (10.3)
	25% spoon-fed	54 (8.2)
	10% spoon-fed	108 (16.3)
	0% spoon-fed	235 (35.5)
Purées	100% purées	29 (4.4)
	90% purées	47 (7.1)
	75% purées	50 (7.6)
	50% purées	60 (9.1)
	25% purées	51 (7.7)
	10% purées	88 (13.3)
	0% purées	292 (44.1)

Table 3. Association between proportion of spoon-feeding and puréeing and maternal demographic factors

	Spoon-feeding	Puréeing
Education mother	-0.191**	-0.194**
Married or not	-0.104**	-0.113**
Paternal occupation [†]	-0.118**	-0.120*
Maternal occupation [†]	-0.088*	-0.084**
Return to work	-0.098	-0.075*
Own home or not	-0.046	-0.035
Income	-0.042	-0.051
Age of mother	0.020	-0.012

* $P < 0.05$, ** $P < 0.01$, Spearman's ρ . [†]Where response options gave category of 'other', these participants were excluded from the correlation because of its non-ordinal form.

setting [$F(1, 193) = 4.406$, $P < 0.05$] but did not differ in the proportion of time that the infant fed themselves [$F(1, 199) = 1.903$, $P > 0.05$].

Style of weaning and demographics

A wide range of respondents completed the questionnaire (Table 1). There were a number of significant correlations (Spearman's ρ) between weaning style and demographic data (Table 3). Significant negative associations were seen between degree of spoon-feeding and puréeing, and maternal education, maternal occupation, paternal occupation and marital status. The mothers who often gave infants food in its

solid form and allowed their infant to self-feed had significantly more years of education, had a professional or a managerial occupation (and/or partner with this occupation) and were married. In addition, the mothers who gave food in its solid form more frequently were significantly less likely to have returned or be returning to work before their infant was 12 months old. No significant association was seen, however, for maternal age, home ownership or income with either use of BLW or SW methods. Demographic factors were controlled for throughout the analysis.

Style of weaning and introduction of complementary foods

The participants indicated the age of the infant at introduction of complementary foods. The mean age of introduction of complementary foods was 21.83 weeks [standard deviation (SD): 2.55]. Of the participants, 34.2% introduced complementary foods when the infant was 6 months or older while 23.1% had introduced complementary foods before the infant was 17 weeks old. This compares with UK-wide behaviours (as measured by the Infant Feeding Survey 2007) of 51% of mothers who introduced complementary foods before the infant was 17 weeks old and only 2% of mothers who waited until the infant was 6 months old. However, as noted by Bolling *et al.* (2007), a gradual shift is being made to later weaning with 4 years now having passed since the Infant Feeding Survey data was collected in 2005.

The mothers who used a BLW approach with a low level of spoon-feeding introduced complementary foods significantly later than those who used an SW approach with a higher proportion of spoon-feeding [$F(1, 636) = 166.312, P < 0.001$]. Similarly, the mothers who used a low level of purées introduced complementary foods significantly later than those who used a higher proportion [$F(1, 607) = 144.77, P < 0.001$]. The mean age at introduction of complementary foods for those who used an SW approach was 19.93 (spoon use) and 19.75 (puree use) weeks compared with 22.60 (spoon use) and 22.05 (puree use) for those who used a BLW approach. A BLW style was, however, associated with an earlier introduction of

foods in their solid form compared with those who used an SW approach. This occurred for both measures of spoon-feeding [$F(1, 574) = 61.339, P < 0.001$] (22.88 weeks for BLW vs. 25.83 weeks for SW) and purée use [$F(1, 552) = 70.400, P < 0.001$] (22.86 weeks for BLW vs. 26.56 weeks for SW).

Style of weaning and first complementary foods

The participants provided details about the first complementary food they gave their infant. In terms of first food consumed, the infants received a variety of foods: 33.3% ($n = 220$) received baby rice, 60.3% ($n = 398$) received fruit or vegetables and 6.2% ($n = 41$) consumed a different type of food. Examples of this included toast, chicken or a cooked meal such as spaghetti bolognese: 45.9% of the infants received this first food as a purée and 51.5% received food in its solid form. For 26.9%, the food was commercial produce while 71.6% consumed fresh produce.

The mothers who used a BLW approach in terms of puree use differed significantly in the first foods they offered their infant compared with those who used an SW approach [$\chi^2(1, 643) = 173.39, P < 0.001$]. Similarly, the mothers who followed a BLW approach using a low proportion of spoon-feeding differed significantly in the first foods they offered their infant compared with those who used an SW approach [$\chi^2(1, 633) = 254.83, P < 0.001$]. Whereas 59.5% (spoon use) and 62.6% (puree use) of the mothers who used an SW approach gave baby rice as a first food, only 10.8% (spoon use) and 14.2% (puree use) of the mothers who followed a BLW approach gave this food. The mothers who used a BLW were most likely to give a first food that was a fruit or vegetable (78.9% based on spoon use and 76.8% based on puree).

The mothers who used a BLW approach in terms of low use of purées were significantly less likely to have given a purée for a first food than those who used an SW approach [$\chi^2(1, 604) = 224.98, P < 0.001$]. Of those who used a BLW approach, 23.1% gave a purée for their infants' first food compared with 86.0% of those who used an SW approach. Similarly, the mothers who used a BLW approach in terms of low use of spoon-feeding were significantly less likely to have given a purée for a first food than those who

used an SW approach [$\chi^2(1, 633) = 255.23, P = 0.000$]. Of those who used a BLW approach, 17.6% gave a purée for their infants' first food compared with 81.2% of those who used an SW approach.

Style of weaning and breastfeeding

The mean duration of breastfeeding for the sample up to 6 months post-partum was 107.89 days (SD: 81.17). In general, breastfeeding duration was greater among the sample than would be expected compared with measures such as the Infant Feeding Survey (Bolling *et al.* 2007). In the current sample, 11.2% of the participants formula-fed from birth (compared with 22% of the Infant Feeding Survey sample), with 61.9% still breastfeeding at 6 weeks (compared with 48%). Relationships were significant independently of Socio-economic status (SES).

Based on a measure of purée use, the mother who used the BLW method breastfed for a significantly longer duration than those who used an SW method [$F(1, 552) = 37.053, P < 0.001$] (127.36 days for BLW vs. 82.11 weeks for SW). Consistent with this, the mothers classified as BLW users based on use of spoon-feeding breastfed for a significantly longer duration than those who spoon-fed more often [$F(1, 575) = 37.715, P < 0.001$] (128.59 days for BLW vs. 85.44 weeks for SW).

Of the respondents, 33% ($n = 218$) were still breastfeeding at the time of completing the questionnaire. Levels of breastfeeding among the participants were generally higher than those reported in the Infant Feeding Survey (Bolling *et al.* 2007) where only 25% of the respondents were still breastfeeding at 6 months post-partum. The participants who were still breastfeeding reported a significantly lower proportion of purée use [$F(1, 552) = 27.109, P < 0.001$] and spoon-feeding [$F(1, 575) = 31.187, P < 0.001$] compared with those who were not breastfeeding at that current time.

Style of weaning and meal times

BLW was associated with infant participation in family meal times. The infants who received a higher proportion of their meals by spoon-feeding (Spearman's $\rho = -0.424, P < 0.001$) or in purée

form (Spearman's $\rho = -0.399, P < 0.001$) were significantly less likely to sit with the family at meal times. If they did participate in meal times, the infants who received a higher level of puréed foods (Spearman's $\rho = -0.595, P < 0.001$) or were spoon-fed more often (Spearman's $\rho = -0.550, P < 0.001$) were significantly less likely to consume the same foods as the family. If they did consume family foods, the infants who received a higher proportion of their foods via spoon (Spearman's $\rho = 0.752, P < 0.001$) or purée (Spearman's $\rho = 0.772, P < 0.001$) were more likely to have that food mashed or puréed than the mothers who had a baby-led approach. Finally, if participating in family meals and consuming family foods, the infants who received a higher proportion of their meals via purée (Spearman's $\rho = 0.766, P < 0.001$) or spoon (Spearman's $\rho = 0.760, P < 0.001$) were significantly more likely to be spoon-fed these foods.

The mothers also indicated whether they followed a set feeding schedule for introducing complementary foods to their infant such as starting with certain foods, specific amounts and certain meal times. The mothers who gave a greater proportion of meals by spoon (Spearman's $\rho = 0.427, P < 0.001$) and purée (Spearman's $\rho = 0.431, P < 0.001$) were significantly more likely to follow a schedule of introducing foods. This relationship was independent of the age of the infant.

Style of weaning and consumption of food

The participants completed a series of questions about their infant's current diet in terms of both complementary food and milk intake. First, the mothers were asked to recall how many meals composed of complementary foods a day their infant was offered at around 6 months old. The participants were given the option of zero if their infant had not yet started complementary foods. The number of meals offered was associated with the degree of spoon and purée use. The mothers who followed a BLW approach both in terms of purée use [$F(1, 546) = 65.008, P < 0.001$] and spoon use [$F(1, 569) = 79.529, P < 0.001$] offered significantly fewer meals in a day than those who followed an SW approach. The mean number of complementary meals a day for those who followed the BLW was 2.23 (spoon

use) and 2.28 (puree use). This compared with figures of 3.25 (spoon use) and 3.30 (puree use) for those following an SW approach.

Second, the mothers were asked to indicate frequency of milk feeds per day that their infant currently consumed. The mothers who reported a higher frequency of spoon and purée use indicated that the infant consumed fewer milk feeds (independent of the age of the infant) than those mothers who used BLW. The mothers who followed a BLW approach classified in terms of purée use [$F(1, 609) = 34.391, P < 0.001$] and spoon use [$F(1, 637) = 71.420, P < 0.001$] gave significantly more milk feeds during the day than those who followed an SW approach. The mean number of milk feeds a day for those who followed a BLW was 5.86 (spoon use) and 5.63 (puree use). This compared with figures of 4.31 (spoon use) and 4.35 (puree use) for those who followed an SW approach.

In addition, a higher frequency of spoon and purée use was associated with fewer milk feeds during the night. The mothers who followed a BLW approach both in terms of purée use [$F(1, 359) = 13.447, P < 0.001$] and spoon use [$F(1, 378) = 9.056, P < 0.01$] gave significantly more milk feeds during the night than those who followed an SW approach. Of the mothers who followed a BLW, 70.3% (spoon use) and 67.1% (puree use) still gave milk feed at night compared with 46.8% (spoon use) and 46.0% (puree use) of those who followed an SW approach. Both these

relationships occurred independently of breastfeeding duration or whether the mother was still breastfeeding at the time of completing the questionnaire.

Finally, the mothers were asked to estimate how much of the food offered their infant actually swallowed (response options: all or nearly all of it, most of it, some of it, a little of it, barely any or none at all). Estimates of food actually consumed increased with degree of spoon-feeding (Spearman's $\rho = 0.369, P < 0.001$) and puréeing (Spearman's $\rho = 0.314, P < 0.001$).

Style of weaning and experience of meal times

The participants rated a series of statements that examined their experience and enjoyment of feeding their infant complementary foods (Table 4). An exploratory factor analysis was conducted on these items to establish factor structure. The rotated component matrix explained 65.52% of the variance and produced four factors. The first accounted for 35.86% of the variance and was weighted on four items that described the infant enjoying foods and meal times being pleasurable. This factor was labelled 'enjoyment'. The second factor accounted for 12.98% of the variance and was based on items that described the mother becoming anxious her infant was not eating enough or getting enough nutrients. This was labelled 'anxiety about nutrients'. A third factor labelled

Table 4. Factor analysis of experience of meal times

	Enjoyment	Anxious nutrients	Anxious mess	Confidence
I enjoy giving my baby solids	0.698	-0.031	-0.327	0.205
My baby really enjoys solid foods	0.808	-0.241	-0.048	0.026
My baby accepted solids easily and quickly	0.784	-0.204	0.021	0.034
I worry that my baby does not eat enough	-0.272	0.747	0.101	0.172
I worry that my baby does not get enough nutrients	-0.156	0.803	0.139	0.144
Feeding my baby solid foods is very stressful	-0.484	0.522	0.179	0.181
I try and make sure my baby does not get in a mess when eating solids	-0.087	0.056	0.742	0.285
The mess my baby makes when eating makes me very anxious	-0.106	0.205	0.838	0.111
I really dislike the mess my baby makes when eating	-0.077	0.149	0.820	-0.076
Feeding my baby solids is very time consuming	-0.045	0.123	0.652	0.036
I feel confident giving my baby solid foods	0.515	-0.144	-0.094	0.620
I feel knowledgeable about giving my baby solid foods	0.331	-0.441	0.006	0.499
I worry about my baby choking	0.078	0.143	0.183	-0.827
% Variance explained	35.86	12.98	8.92	7.76

Values in bold denote high factor scores.

'anxiety about mess' was based on maternal anxiety and dislike of the mess created at feeding episodes. This factor accounted for 8.92% of the variance. Finally, accounting for 7.76% of the variance, the factor 'confidence' was produced. This described feeling knowledgeable about weaning, in control and confident. Two confirmatory factor analyses were conducted on random subsets of the data that resulted in similar factor structures. Therefore, the factors extracted by using the entire sample size were used. Factor scores for the four dimensions were created using the regression method (Table 4). In summary, four factors were revealed: enjoyment, anxious about nutrients, anxious about mess and confidence.

Maternal anxiety about consumption of enough nutrients was related to greater use of spoon-feeding (Pearson's $r = 0.194$, $P < 0.001$) and purée use (Pearson's $r = 0.203$, $P < 0.001$). The mothers who used a higher degree of spoon-feeding (Pearson's $r = 0.260$, $P < 0.001$) or purees (Pearson's $r = 0.163$, $P < 0.001$) also reported greater concerns about the mess involved in weaning.

Moreover, the mothers who spoon-fed (Pearson's $r = -0.320$, $P < 0.001$) or used purées (Pearson's $r = -0.371$, $P < 0.001$) a higher proportion of the time reported decreased confidence during meal times than those who were more baby-led in their feeding style. No significant association was found between level of enjoyment and degree of baby-led feeding.

Style of weaning and sources of support and advice

The respondents provided information about the sources of advice and information about the weaning they utilized. An exploratory factor analysis was conducted on these items (Table 5) explaining 54.984% of the variance and producing three factors. The first accounted for 26.31% of the variance and included health professional sources. The second accounted for 15.36% of the variance and described family sources. The final factor described external sources such as Internet forums, books and friends. This was labelled 'external sources' and accounted for 13.31% of the variance. Two confirmatory factor analyses were conducted on random subsets of the data that

Table 5. Factor analysis of sources of support and advice during weaning

	Health professional	Family	External sources
Health visitor	0.782	0.013	0.161
GP	0.674	0.197	-0.015
Partner	-0.245	0.712	0.125
Mother	0.297	0.659	0.058
Mother in law	0.413	0.692	0.013
Friends in real life	0.307	0.099	0.605
Online communities	-0.290	0.172	0.639
Books	0.114	-0.038	0.710
% of variance	26.311	15.360	13.310

Values in bold denote high factor scores.

resulted in similar factor structures. Therefore, the factors extracted by using the entire sample size were used. Factor scores for the three dimensions were created using the regression method. In summary three factors were produced: support from health professionals, support from family members and support from external sources.

Both frequency of spoon-feeding (Spearman's $\rho = 0.288$, $P < 0.001$) and frequency of purée use (Spearman's $\rho = 0.352$, $P < 0.001$) were significantly associated with seeking advice from health professionals. The mothers who used a BLW approach sought significantly less support from health professionals. No association was seen between method of weaning and support from family and external sources.

Discussion

This study documents for the first time the use of BLW in a sample of mothers with an infant aged between 6 and 12 months. There was a wide range in frequency of use of spoon-feeding and puréed foods reported, and roughly half of the demographically diverse sample were categorized as using the BLW method. Following a BLW approach was associated with a later introduction of complementary foods, a higher number of milk feeds, increased participation in family meal times and fewer maternal concerns about the weaning process.

A BLW approach was associated with a higher SES. Mothers who used a BLW method were more

likely to have a higher level of education, to have a higher occupation, that their partner has a higher occupation and to be married. No association, however, was seen for age, home ownership or income, suggesting that BLW is not only followed by those of higher socio-economic status. It is possible that a higher level of education is associated with a BLW approach at the present time as information about BLW is not given in mainstream sources (Department of Health 2007). Those with access to the Internet tend to have a higher level of education (Office for National Statistics 2008) and are therefore better placed to gain access to information about the method.

There were a number of important comparisons between those who follow a BLW and an SW approach in terms of introduction of complementary foods. First, mothers who followed a BLW approach introduced complementary foods later than those following an SW approach. The mean age of introduction for those who followed a BLW style was closer to the WHO guidelines for the introduction of complementary foods to infants (World Health Organization 2002). A higher SES is generally associated with a later introduction of solid foods (Fewtrell *et al.* 2003). However, this relationship was independent of socio-economic status. One explanation for this association is the nature of BLW. In order to be able to self-feed, a baby needs to have reached certain developmental milestones: sitting up, hand–eye coordination, loss of tongue thrust reflex, etc. (Naylor & Morrow 2001). Thus, mothers who elect to follow a BLW approach may delay weaning until the recommended 6 months post-partum out of necessity because younger infants would be unable to self-feed. Conversely, mothers who use SW methods are able to encourage a younger infant to ingest purées or baby rice using a spoon and thus may attempt to introduce complementary foods earlier. Although complementary foods were introduced earlier when SW methods were followed, mothers who followed a BLW approach introduced foods in their whole form (finger foods) earlier. A delay in introducing lumpier foods has been associated with later feeding difficulties (Northstone *et al.* 2001) and fussy eating (Coulthard *et al.* 2009). Infants who follow a BLW approach appear to be exposed to

coarser and lumpier food earlier and become skilled in dealing with a wide range of food textures from the start of weaning.

Mothers who followed a BLW approach were more likely to offer their infant fresh, home-made food for their first tastes of complementary food. While the Department of Health in the UK recognize that commercial food for infants is acceptable, the advice is to use home-cooked and fresh produce where possible (Department of Health 2007). This may reflect the low availability of commercially produced finger foods in comparison with purees. Similarly, infants who follow a BLW approach were more likely to participate in family meal times and eat family foods. Again, these relationships were independent of socio-economic status. Children who witness others eating foods are more likely to accept those foods themselves (Nicklas *et al.* 2001). Eating fresh produce, sharing family foods and participating in family meal times are all targets and recommendations suggested in the Department of Health's weaning advice (Department of Health 2007). Participation in meal times from an early age is therefore a positive step that could be encouraged through exposure to the BLW method.

A BLW style was associated with longer breastfeeding duration. A longer breastfeeding duration has commonly been associated with a higher SES (Taveras *et al.* 2003; Brown *et al.* 2009); however, this relationship held independently of maternal SES. A plausible explanation for this association is that baby-led feeding is the natural next step for many breastfeeding mothers in a number of ways. Breastfeeding is baby-led as the frequency, size and duration of feeds are determined by the infant and not the mother (Dewey *et al.* 1991). The mother must allow the infant to be active in, and to control feeds and to trust them to regulate their intake of milk. BLW may therefore be a natural progression for mothers who breast-feed. The mother is adept in allowing the infant to cue feeding patterns and the infant skilled at controlling his or her own intake. This relationship may also be explained through perceived need for the infant to receive solid foods. A common reason for introducing complementary foods before the 6-month guideline is that the infant is 'hungry' and needs more than milk. This is often triggered by an infant needing more

frequent milk feeds (Wright *et al.* 2004). If this occurs before the infant is 6 months old, complementary foods are likely to be pureed and spoon-fed as the infant will not have the motor skills to self-feed. Moreover, an early introduction of complementary foods is associated with breastfeeding cessation (Alder *et al.* 2004). It is possible that mothers who feel able to continue breastfeeding until 6 months therefore have more weaning options open to them at this stage. It would be interesting to examine what happens to a mother who wishes to follow a BLW approach but feels the need to introduce complementary foods earlier than 6 months.

Maternal experience of weaning differed with the degree of BLW used. Although no difference was seen in enjoyment of the weaning process, mothers who were more baby-led in their approach were more confident in feeding their infant and were less concerned about mess and amount of nutrients consumed. Following a BLW approach was also inversely associated with concern about mess during meal times. Allowing an infant to touch and explore his or her food during meal times, although messy, is important for the developmental of fine motor skills and helps weaning progression (Department of Health 2007). BLW allows the child to get involved in and experience this wide range of textures and foods and to practice the skills needed to becoming skilled at meal times. Mothers who were more baby-led in their weaning approach were also less concerned about nutrient consumption. This was despite reporting that their infant consumed a lower amount of the food offered to them and consumed a greater number of milk feeds than mothers following an SW approach. Maternal concern about food intake and pressure to eat during the pre-school years can be associated with increased fussiness, a poorer diet and lower weight (Ventura & Birch 2008). It is possible that a low level of concern during the weaning stage may help foster a permissive maternal feeding style in later years, which may have a positive impact upon child weight and eating style. An examination of the potential long-term consequences of a BLW approach is called for.

There are limitations to this study that could be addressed in future research. Although the sample was large and included a wide range of maternal age

and socio-economic status, the participants were self-selecting. This led to the sample being skewed towards older (Office for National Statistics 2007) and more educated mothers (Department for Innovation, Universities and Skills 2007) completing the questionnaire. However, the aim of the research was to provide an initial characterization of BLW in a UK sample. It sought to examine the behaviours and attitudes associated with this feeding style and therefore provided a basis for a number of further questions to be explored. Demographic variables were also controlled for throughout the analyses. The study also utilized a high number of participants recruited through Internet sites. A growing numbers of studies in the social sciences make use of the Internet for recruitment (Goldberg *et al.* 1998; Fraley 2004; Arden 2009). The method is efficient and provides access to wide samples of targeted individuals in terms of geographic location (Gosling *et al.* 2004). Nevertheless, the method is criticized for attracting samples with above average education (Azar 2000) because of the predominance of White, middle-class samples using the Internet. The use of the Internet to seek out health-related information is, however, on the increase (Larkin 2000), especially among pregnant and new mothers (Russell 2006). Specifically, it allowed mothers who use a BLW approach to be located for comparison. BLW is not currently well publicized in the UK, and therefore, Internet-based advice groups for those who use BLW proved to be a valuable source of information. However, it is recognized that these samples may consist of mothers who are well informed and supported in the method, disregarding those who attempted to use BLW and chose not to continue with the method. Future research should aim to provide a more generalizable sample base including information on ethnic group

As the study was cross-sectional, it provided only a snapshot of the attitudes and behaviours associated with a BLW approach. It is possible that the positive behaviours and attitudes associated with a BLW approach stem from experience of following this method. Alternatively, perhaps maternal factors such as high maternal concern or a desire to introduce a higher amount of complementary food earlier may inhibit mothers from adopting a BLW approach or

discourage them from continuing. A longitudinal study tracking the weaning process could help answer these questions. It would be of interest to examine the experiences, in general, of mother–infant dyads that start weaning by using a BLW approach but moving to an SW approach. Why do they choose not to continue following the method?

Notably, the study raises a number of questions and issues to further investigate this approach to infant weaning and the longer term outcomes. Rapley (2003) suggests based on small-scale observation that a BLW approach may increase the acceptance of a wide range of foods possibly as a consequence of greater exposure and modelling others' behaviours. Moreover, as evidence has shown, low maternal use of pressure to eat can have a positive effect on child diet and eating style (Ventura & Birch 2008). It is possible that following a BLW approach, which allows the infant to self-regulate intake of food from an early stage of the weaning process, which could have long-term consequences.

Limitations of a BLW approach also need to be considered. Mothers who follow a BLW approach estimated that their infants swallowed smaller proportions of the food offered to them and consumed more milk feeds compared with mothers who follow an SW approach. No actual measure of food intake from complementary foods was taken however. Infants who follow a BLW approach may be reducing their intake of calories from milk more slowly than those who follow an SW approach. This could be advantageous in encouraging a more gradual transition from a milk diet to a solid diet. Moreover, it is possible that infants who follow a BLW approach self-regulate their intake of energy from these two sources better than those who follow an SW approach, which may have consequences for long-term weight gain. However, although breast milk alone supplies adequate nutrients for the first 6 months post-partum (Michaelsen *et al.* 2000), how does this gradual transition affect actual nutrient intake? Further research is needed to establish actual nutrient intake among infants who follow different weaning approaches and the short- and long-term impact of potential differences. Importantly, how does this approach work for infants who experience feeding or weight difficulties,

which means it is important that they receive extra nutrients and calories through complementary foods? An evaluation of the approach in terms of suitability or how it could be adapted for infants in a range of circumstances is needed.

Second, if one of the key components of BLW is the idea of self-feeding, what impact does this have for infants who show delayed motor development (even within the normal age range)? Research suggests that the digestive system is formed and ready for digesting solid foods by 6 months (Naylor & Morrow 2001; Walker 2001). A typical 6-month old also has the skills at this time to self-feed, sitting unsupported, to bring items to the mouth, with tongue and gag reflex evolved for eating solid foods (Naylor & Morrow 2001). Termed 'a convergence of maturation', this suggests that the average 6-month old has the skills to self-feed at the same time as the gut is ready for complementary foods. How do infants who are unable to sit up or self-feed by 6 months fit into this, however? Are they not ready for weaning or should they follow an SW approach?

This study is the first to formally characterize BLW. It points to a number of associations between a BLW style and healthy eating behaviours such as participation in family meal times and consuming home-cooked family foods. It illustrates a portrait of the type of family in which BLW is used and highlights a number of positive attitudes and behaviours that are associated with a BLW approach. Further research is now needed to establish the outcomes of following a BLW or an SW approach.

Acknowledgements

We would like to thank the mothers who volunteered to take part in this study and the Internet forums and groups who helped us advertise the study.

Source of funding

The authors did not receive funding for this work.

Conflicts of interest

No conflicts of interest have been declared.

References

- Alder E., Williams F., Anderson A., Forsyth S., Florey C. & Van der Velde P. (2004) What influences the timing of the introduction of solid food to infants. *British Journal of Nutrition* **92**, 527–531.
- Arden M. (2009) Conflicting influences on UK mothers' decisions to introduce solid foods to their infants. *Maternal & Child Nutrition* doi:10.1111/j.1740-8709.2009.00194.x
- Azar B. (2000) A web of research: they're fun, they're fast and they save money, but do Web experiments yield quality results? *Monitor on Psychology* **31**, 42–47.
- Bolling K., Grant C., Hamlyn B. & Thornton A. (2007) *Infant Feeding Survey 2005*. The Information Centre: London.
- Brown A.E., Raynor P., Benton D. & Lee M.D. (2009) Indices of Multiple Deprivation predict breastfeeding duration in England and Wales. *European Journal of Public Health* doi:10.1093/eurpub/ckp114.
- Coulthard H., Harris G. & Emmett P. (2009) Delayed introduction of lumpy foods to children during the complementary feeding period affects child's food acceptance and feeding at 7 years of age. *Maternal & Child Nutrition* **5**, 75–85.
- Department for Innovation, Universities and Skills (2007) *The Level of Highest Qualification Held by Adults*. Department for Innovation, Universities and Skills: England. SFR 05/2008.
- Department of Health (2007) *Birth to Five*. COI: London.
- Dewey K., Heinig M., Nommsen L. & Lonnerdal B. (1991) Adequacy of energy intake among breast-fed infants in the DARLING study: relationships to growth velocity, morbidity and activity level. Research on lactation, infant nutrition and growth. *Journal of Pediatrics* **199**, 538–547.
- Fewtrell M., Lucas A. & Morgan J. (2003) Factors associated with weaning in full term and preterm infants. *Archives of Disease in Childhood* **88**, 296–301.
- Fraley R.C. (2004) *How to Conduct Behavioural Research over the Internet: A Beginners Guide to HTML and CGI/Perl*. Guildford Press: New York.
- Goldberg L.R., Sweeney D., Merenda P.F. & Hughes J.E. (1998) Demographic variables and personality: the effects of gender, age, education and ethnic/racial status on self descriptions of personality attributes. *Personality and Individual Differences* **24**, 393–403.
- Gosling S.D., Vazire S., Srivastava S. & John O.P. (2004) Should we trust Web-based studies? A comparative analysis of six preconceptions about Internet questionnaires. *American Psychologist* **59**, 93–104.
- Larkin M. (2000) Online support groups gaining credibility. *Lancet* **355**, 1834.
- Michaelsen K.F., Weaver L., Branca F. & Robertson A. (2000) *Feeding and Nutrition of Infants and Young Children*. WHO Regional Publications, European Series, No 87: Copenhagen.
- Naylor A.J. & Morrow A. (eds) (2001) *Developmental Readiness of Normal Full Term Infants to Progress from Exclusive Breastfeeding to Introduction of Complementary Foods: Reviews of the Relevant Literature Concerning Infant Immunologic, Gastrointestinal, Oral Motor and Maternal Reproductive and Lactational Development*. Wellstart International and the LINKAGES Project Academy for Educational Development: Washington, DC.
- Nicklas T.A., Baranowski T., Baranowski J.C., Cullen K., Rittenbry L. & Olvera N. (2001) Family and child-care provider influences on preschool children's fruit, juice and vegetable consumption. *Nutrition Reviews* **59**, 224–235.
- Northstone K., Emmett P., Nethersole F. & the ALSPAC Study Team (2001) The effect of age of introduction to lumpy solids on foods eaten and reported feeding difficulties at 6 and 15 months. *Journal of Human Nutrition and Dietetics* **14**, 43–54.
- Office for National Statistics (2007) Internet Access 2007: Review of the National Statistician on births and patterns of family building in England and Wales. Available at: <http://www.statistics.gov.uk/STATBASE/Product.asp?vlnk=5768> (last accessed 6 June 2009).
- Office of National Statistics (2008) Internet Access 2008: Households and individuals. Available at: <http://www.statistics.gov.uk/pdfdir/iahi0808.pdf> (last accessed 6 June 2009).
- Rapley G. (2003) *Can Babies Initiate and Direct the Weaning Process?* Unpublished MSc Interprofessional Health and Community Studies (Care of the Breastfeeding Mother and Child). Canterbury Christ Church University College: Kent.
- Rapley G. (2006) Baby-led weaning: a developmental approach to the introduction of complementary foods. In: *Maternal and Infant Nutrition and Nurture Controversies and Challenges* (eds V. Moran & F. Dykes), pp. 156–171. Gutenberg Press Ltd: Malta.
- Rapley G. & Murkett T. (2008) *Baby-led Weaning: Helping Your Baby to Love Good Food*. Vermillon: London.
- Reeves S. (2008) Baby-led weaning. *British Nutrition Foundation Nutrition Bulletin* **33**, 108–110.
- Russell M. (2006) Netmums: online support for parents. *Community Practitioner* **2**, 44–45.
- Seaman C., D'Alessandro S. & Swannie M. (1996) Choice of weaning foods. *British Food Journal* **98**, 13–16.
- Tabachnik B.G. & Fidell L.S. (2006) *Using Multivariate Statistics*, 5th edn. Pearson Education UK: Harlow.
- Taveras E.M., Capra A.M., Braveman P.A., Jensvold N.G., Escobar G.J. & Lieu T.A. (2003) Clinician support and

- psychosocial risk factors associated with breastfeeding discontinuation. *Pediatrics* **112**, 108–115.
- The Guardian Online (2008) What, no puree? Available at: <http://www.guardian.co.uk/lifeandstyle/2008/nov/05/foodanddrink>
- The Independent Online (2006) Available at: <http://www.independent.co.uk/life-style/health-and-families/health-news/why-baby-knows-best-when-it-comes-to-food-428164.html>
- Ventura A.K. & Birch L.L. (2008) Does parenting affect children's eating and weight status? *International Journal of Behavioral Nutrition and Physical Activity* **5**, 1–12.
- Walker A. (2001) Gastrointestinal Development in Relation to the Duration of Exclusive Breastfeeding. In: *Developmental Readiness of Normal Full Term Infants to Progress from Exclusive Breastfeeding to the Introduction of Complementary Foods* (Naylor A. & Morrow A.), Linkages Project: Washington, DC.
- World Health Organisation (2001) Global strategy for infant and young child feeding. The optimal duration of exclusive breastfeeding, 54th World Health Assembly, Geneva.
- World Health Organization (2002) Global strategy for infant and young child feeding, 55th World Health Assembly. Geneva, Switzerland.
- World Health Organization (1992) *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision*. World Health Organization: Geneva.
- Wright C., Parkinson K. & Drewett R. (2004) Why are babies weaned early? Data from a prospective population based cohort study. *Archives of Disease in Childhood* **89**, 813–816.