An exploratory study of healthcare professionals' and parents' knowledge of, attitudes to, and experiences with, Baby-Led Weaning

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An exploratory study of healthcare professionals' and parents' knowledge of, attitudes to, and experiences with, Baby-Led Weaning

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ABSTRACT

Objective: Baby-Led Weaning (BLW) is an alternative approach for introducing complementary foods to infants that emphasizes infant self-feeding rather than adult spoon-feeding. Here we examined healthcare professionals' and parents' knowledge of, attitudes to, and experiences with, BLW.

Design, setting and participants: Healthcare professionals (n=31) and parents who had used BLW (n=20) completed a semi-structured interview using one of two tailored interview schedules examining their knowledge of, attitudes to, and experiences with, BLW. Interview notes and transcripts were analysed using content analysis to identify patterns and extract illustrative quotes.

Results: Healthcare professionals in the main had limited direct experience with BLW and the main concerns raised were the potential for increased risk of choking, iron deficiency, and inadequate energy intake. Although they suggested a number of potential benefits of BLW (greater opportunity for shared family meal times, fewer mealtime battles, healthier eating behaviours, greater convenience, and possible developmental advantages) most felt reluctant to recommend BLW because of their concern about the potential increased risk of choking. By contrast, parents who had used this style of feeding reported no major concerns with BLW. They considered BLW to be a healthier, more convenient and less stressful way to introduce complementary foods to their infant and recommended this feeding approach to other parents. Although parents did not report being concerned about choking, 30% reported at least one choking episode – most commonly with raw apple.

Conclusion: Given the lack of research on BLW, further work is needed to determine whether the concerns expressed by healthcare professionals and potential benefits outlined by parents are valid. The current study suggests healthcare professionals should specifically discourage parents who plan to use or are using BLW from offering raw apple.

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ARTICLE SUMMARY

65 Article focus

- Healthcare professionals are an important source of information for parents during the complementary feeding period.
- The literature suggests that there is a mismatch between healthcare professionals' and parents' knowledge and attitudes to infant feeding.
- 70 Baby-Led Weaning (BLW) is an alternative approach for introducing complementary foods to infants that is becoming increasingly popular with parents.

Key messages

- 75 Healthcare professionals identified a number of potential benefits of BLW including more shared family meals, promotion of healthier eating behaviours and greater convenience for parents. However, healthcare professionals also had strong concerns about the risk of iron deficiency, inadequate energy intake and choking, and as a result 80 most felt reluctant to recommend it.
- Parents who had practised BLW reported more benefits and had fewer concerns about BLW than healthcare professionals.
- Healthcare professionals should specifically discourage parents who plan to use or are using BLW from offering raw apple.

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Strengths and limitations of this study

- This is the first study to interview healthcare professionals about BLW.
- The healthcare professionals and parents were self-selected.

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INTRODUCTION

Traditionally the method of infant feeding recommended to parents in most developed countries, including the United Kingdom and New Zealand, has been to spoon-feed their infant puréed food before moving on to mashed and finger foods as the child grows. [1-3] Recently an alternative approach, known as Baby-Led Weaning (BLW), has emerged[4 5] and anecdotal evidence suggests that many parents are attempting BLW. [6] Baby-Led Weaning recommends that instead of spoon-feeding, parents encourage their infant to self-feed. The small body of existing research suggests that BLW is feasible for most 6-month old infants from a motor development point of view. [7] It also suggests that BLW is associated with lower levels of maternal anxiety, restriction, pressure to eat and monitoring during the complementary feeding period; [8] and perhaps healthier eating patterns and BMI. [9] However, in the absence of any longitudinal or randomized controlled trial data, it is not possible to determine whether these associations are causal.

Healthcare professionals are an important source of information for parents during the complementary feeding period, and can potentially have as much influence on decisions around milk feeding and introducing solids as cultural values or material resources. [10 11] However, healthcare professionals' knowledge and attitudes about infant feeding often differ from those of parents. [12 13]

Previous studies on healthcare professionals' knowledge and attitudes towards infant feeding have focused on milk feeding or timing of the introduction of complementary food. [14-17] To date no study has examined attitudes to BLW in healthcare professionals working with young families.

The aim of this explorative study was to examine the knowledge of, attitudes to, and experiences with, BLW of healthcare professionals and of parents who had used this style of feeding with their infant.

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METHODS

Participants

The participants were 31 healthcare professionals who were working with infants and families, and 20 parents (mothers of children aged 8 months – 2 years) who had used BLW when introducing solids to their infant.

Participants were recruited by email "snowballing", word of mouth (healthcare professional peer-to-peer networks, parenting groups, La Leche League), or newspaper advertising. The study was approved by the Human Ethics Committee of the University of Otago, Dunedin, New Zealand.

Data collection

The data were collected during 2010 in Dunedin, New Zealand. Healthcare professionals were interviewed at their place of work and mothers in their own home. The same researcher (SC) conducted all interviews, which typically lasted 1 - 1.5 hours.

Interview schedule and process

The two interview schedules used were developed from the existing literature about BLW[7 8 18] and the expert opinion of the authors (Table 1 and Table 2). As some healthcare professionals had not heard of BLW, a brief description of BLW was given at the start of the interview when necessary. Interviews were conducted in a flexible manner that allowed participants to share their opinions and experiences in relation to the questions.

Table 1 Questions used in interviews with healthcare professionals
1. What is your professional role?
2. Have you heard of Baby-led Weaning (BLW)?
3. Where did you hear about BLW?
4. When did you hear about BLW?
5. If somebody asked you what BLW is, how would you describe it?
6. What do you think of BLW as an alternative method for introducing solid foods to infants?
7. Do you consider there may be benefits of BLW?
8. Do you consider there may be disadvantages of BLW?

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9. Do you have any concerns about BLW?

Table 2 Questions used in interviews with parents who had used Baby-Led Weaning
1. If someone asked you: "What is Baby-Led Weaning (BLW)?" what would you tell them?
2. How did you hear about BLW?
3. Why did you decide to try BLW?
4. How old was your baby when you started BLW?
5. How old is she now?
6. How much of her food do you feed her and how much does she feed herself?
7. Where did/do you get most of your information about BLW?
8. What were the first foods you offered your baby?
9. What form were the foods in that you first offered your baby?
10. Were there any foods you avoided because you were using BLW?
11. Did your baby eat at the same time as the rest of the family?
12. Do you think your baby is a fussy or picky eater?
13. Were you worried about BLW in any way?
14. Did your baby gag on food?
15. Was it food she had fed herself?
16. Did your baby ever choke on food?
17. Was it food she had fed herself?
18. Do you consider there were advantages of BLW for you and your baby?
19. Do you consider there were disadvantages of BLW for you and your baby?
20. Overall, do you think BLW worked for you and your baby?
21. Would you recommend other parents try BLW?
22. Do you have any useful tips for other parents trying BLW?
NB: "She" or "he" was used appropriately for the sex of the child.

150 **Data analysis**

Field notes were taken during the interviews with healthcare professionals and extended immediately following the meeting. Interviews with mothers were tape-recorded and transcribed verbatim. Content analysis [19] was performed on all interviews by reviewing all transcripts several times for
155 recurring patterns (reviewing the two groups separately). Saturation of patterns was evident with no new patterns emerging after interview number 12 (mothers) and 14 (healthcare professionals). Interesting or important

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patterns communicated by the interviewees were highlighted. Data analysis was led by one member of the research team (SC); and interpretation was verified during research team meetings (with RWT and ALH) to scrutinise emerging patterns. Each pattern has been summarized, and illustrative quotes are included.

RESULTS

Thirty-one healthcare professionals were interviewed, comprising: practice nurses (n=11), Well-Child providers (a government funded service supporting families with young children and assessing health status, see: http://www.wellchild.org.nz/) (n=4), dietitians (n=4), general practitioners (n=3), paediatricians (n=2), lactation consultants (n=2), midwives (n=2), and a paediatric speech-language therapist (n=1). The parents were twenty mothers who had a child aged 8 – 24 months (mean=13 months).

Healthcare Professionals

The patterns that emerged were remarkably consistent across the interviews with healthcare professionals.

Knowledge

Nearly half (n=13/31) of the healthcare professionals had heard about BLW. Most of these had been introduced to the concept by their colleagues or friends and family (rather than patients). The healthcare professionals who knew about BLW described it as the child feeding themself whole foods, instead of being spoon-fed purées. There was little discussion of other aspects of BLW.

Attitudes

All healthcare professionals considered that BLW could be beneficial for the family and the child.

Healthcare professionals considered that **shared family mealtimes** would be the main advantage of BLW. They were aware of the nutritional and

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psychological benefits of family meals and they envisaged family mealtimes would be easier and more pleasant with BLW:

The best thing is that an adult can eat their meal while the child is having theirs. There's no juggling trying to feed the baby while shoving a spoonful for yourself. (General Practitioner)

Some healthcare professionals thought **mealtime battles** would be less likely with BLW for two reasons: parents would have an alternative approach to try if their child refused to be spoon-fed; and because BLW allows the child to eat at their own pace and stop when they have had enough, they would not be "*bribed*" or "*forced*" to eat food:

I think it's healthier that the baby is in control of what they eat… and you aren't forcing them to eat...there's far too many of us who just finish our plates instead of stopping when we are full. (Dietitian)

Overall, healthcare professionals thought BLW would encourage healthier dietary behaviours by promoting a **wider variety of foods** and allowing the child to explore and learn about food at their own pace:

Being able to look at it, hold it and see it as food, instead of slop must have advantages? (Paediatrician)

They also considered BLW would encourage **better appetite and self-regulation skills**, as parents would be less able to control the child's food intake. They saw similarities between BLW and breastfeeding on demand and thought the two would complement each other well.

A number of healthcare professionals who had children of their own thought BLW would be **more convenient** than the conventional method of spoon-feeding purées:

It sounds so much easier. Making purées is time consuming, and then they hardly eat anything and you have to throw it all out or you buy those jars of food, which are really expensive. (Dietitian)

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Healthcare professionals suggested two **developmental advantages**: BLW
225 might encourage better oral and chewing skills because the child is offered pieces of food to eat so they may have more opportunity to develop their mouth and jaw movements instead of sucking food from a spoon as they do with purées; and enhanced fine motor skills as the child has greater opportunities to manipulate food with their fingers and practice their fine
230 motor movements.

However, in addition to these potential benefits, strong concerns about BLW were also expressed.

235 **Choking** was a major concern expressed by many of the healthcare professionals, particularly those who had not observed BLW. The potential risk of choking meant most healthcare professionals felt reluctant to recommend BLW:

> *The potential for choking would make me feel very hesitant about giving*
> 240 *my child whole food at 6 months. As a health professional I'd need to see some sound evidence before I could endorse this method [BLW]. (Dietitian)*

The specific concerns voiced regarding choking were that a 6 month old
245 infant would not be developmentally ready to chew whole pieces of food and that parents may leave the infant alone in their highchair with their food. Additionally healthcare professionals considered that parents may become competitive about their infant's BLW progress, considering that their child is more advanced if they have certain foods or a greater variety of foods earlier
250 than other children, and therefore might be motivated to offer unsafe foods that would increase the child's risk of choking:

> *Just give the baby that food, she'll be fine. Sometimes it's almost like a challenge to see how they cope, another one of those competitive parenting things…oh look she's eating raw carrot at age 6 months.*
> 255 *(Dietitian)*

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Healthcare professionals considered that there were two possible dietary disadvantages with BLW: the potential for **growth faltering**, and for **poor iron status**. There was concern that adopting BLW would mean forgoing any 260 iron-fortified infant cereal, and that a BLW diet would comprise low-energy low-iron fruits and vegetables and include very few iron-rich foods. In addition to low-energy foods, clumsy self-feeding (particularly at the beginning of BLW) might lead to growth faltering. Contrasting this, a few healthcare professionals thought BLW infants could consume energy beyond 265 their needs as a result of **poor food choices**:

> *Young children arrive here and they're under two eating twisties [an extruded cereal snack], chocolate biscuits - would BLW be that for some parents? (Practice Nurse)*

270 At the other extreme, some healthcare professionals commented that parents (especially first-time parents) are often apprehensive about their infant's growth and compare it to that of other infants and that a "chubby" or "bonny" baby is viewed as healthy even when it reflects overweight or obesity. Some healthcare professionals suggested BLW may **increase parental anxiety**. 275 They thought parents would struggle watching their infant learn to eat, especially at the start when they might eat very little:

> *Parents expect to see their child growing consistently - linear growth - and if they do not this evokes anxiety. How would you know if the child was eating enough? Parents would not cope with the child playing with 280 food and not eating it. (Practice Nurse)*

Finally, some healthcare professionals thought BLW would be **messy** for the parents and suggested that there would be a lot of food wasted, which many parents would not tolerate:

> 285 *I could imagine in the first couple of weeks that the infant wouldn't eat much and that there would be an awful lot of playing and squashing. Some parents may not be able to cope with this. (Practice Nurse)*

Experiences

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290 Some healthcare professionals had observed BLW. The experiences that shaped their knowledge and attitudes to BLW are listed in Table 3.

Table 3 Healthcare professionals experiences with Baby-Led Weaning

Attitude formed from experience	Supporting quote
Concern about energy and nutrient sufficiency of BLW	*"The two parents I know who have chosen BLW are offering only fruits and vegetables...Although fruits and vegetables are great foods, babies need more nutrients... So I wonder how they would get these [nutrients] if they were only having fruits and vege...nutrients could be limited but also the variety of food that a child is exposed to." (General Practitioner)*
Concern about mess	*"I would be concerned about the mess and wastage of food. Some of our families live on a very tight food budget and I've seen the mess when doing BLW and I think a lot of food gets wasted." (Well Child Provider)*
Concern about increased risk of choking Concern about poor food choices	*"I would also be very wary of choking. Much stricter BLW guidelines on the foods to offer children (size, shape and texture) are needed not only for choking but also for health reasons. One mother I know thought a Tim-Tam [chocolate coated cream filled biscuit] was the perfect BLW food." (Dietitian)*

295 **Parents**

The patterns that emerged were very consistent across the interviews with parents.

Most parents (n=18/20) started BLW when their child was 5.5 - 6 months of
300 age and all parents had exclusively breastfed their child up until this age. The BLW approach advises parents to watch for signs of developmental readiness before introducing their child to solid food. However most parents recalled starting solids at an age based on advice from their healthcare professional or because they were following the WHO guidelines, although a small number
305 (n=2/20) of parents started solids when their infant started reaching out for food.

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The most commonly offered first foods were vegetables (steamed or boiled pumpkin, potato, kumara (New Zealand sweet potato), broccoli, carrot) (n=13/20) and fruit (avocado, banana) (n=11/20). Most parents (n=16/20) reported that their child shared every meal with one or more family members. Parents liked that their child could feed themself with BLW, however many (n=15/20) also reported some spoon-feeding, although this was infrequent or only in unusual circumstances, such as when their child was sick. Parents reported doing this to avoid mess, to increase iron intake by spoon-feeding iron-fortified infant cereal, or to increase energy intake especially when their infant was sick or appeared too tired to self-feed.

Knowledge

The majority of parents defined BLW as having 3 main components: offering finger-sized pieces of food, allowing the child to be in control of how much they ate, and not spoon-feeding purées:

> *Letting your baby lead in terms of the pace and amount of solids eaten…offering them whole, safe foods when they are physically ready to feed themselves... keeping milk [breast/formula] as their main food source until they naturally increase the amount they eat and drop milk feeds on their own. (Parent 2)*

Nearly half of the parents first heard about BLW through a parenting group while others had discovered it online or were told about it by their Well-Child provider. One mother had not heard of the term "Baby-Led Weaning" but said "*it was instinctive*" to offer her child pieces of food and allow them to feed themself. The majority of parents obtained their BLW information from online sources, drawing on other parents' experiences through blogs, threads and forums.

Attitudes

The main reason parents chose to follow BLW was because it "***made sense***" and "*seemed logical*". Lifestyle reasons also motivated parents to follow BLW.

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340 They considered that BLW was **less time consuming** and **less expensive** than making puréed food:

With three other children, I was way too busy to prepare special foods i.e. purées and also I didn't want to buy them - they're expensive. (Parent 15)

345 Parents considered that there were advantages of BLW during the complementary feeding period, and also in the future. During the complementary feeding period, parents reported **less meal preparation** (the baby ate what the family was eating, there was no purée preparation) and **reduced mealtime stress** because they were not spoon-feeding the baby and 350 eating their own meal simultaneously. Some parents (n=6/20) reported it was liberating that BLW does not include a detailed step-by-step weaning protocol and instead **promotes responding to the infant** and thought that fewer "rules" made the **transition to food less frightening and complicated**:

355 *With my first child I became so worried about getting the food [purées] to exactly the right consistency. It [BLW] made sense to me, because she was demand fed so it seemed like the natural progression. (Parent 8)*

360 In addition parents believed that BLW had encouraged their child to develop healthier eating behaviours, for example being **able to respond appropriately to hunger and satiety cues**, sharing **family meals** and eating a **wider variety of foods**:

I felt it would give my daughter the opportunity to experience, from the 365 *outset, everything that is pleasurable about food, the textures, colours, individual tastes…a lovely way to have them be a real participant in the meal – eating what we eat, copying us, and really joining in…not being fed separately. (Parent 2)*

370 Most parents had no concerns with BLW (n=15/20). Those parents who did have concerns were worried about the appropriateness of certain foods, for example raw apple. Current guidelines on types of BLW foods to offer are

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3 incomplete and some parents reported **not knowing what foods to offer** at
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5 what age:
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7 375 *I wasn't worried but a bit concerned that some of the advice was*
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9 *conflicting e.g. the book says apple is fine and people I've spoken to who*
10 *have used BLW have said no apples. (Parent 7)*
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13 One mother was concerned about her infant's **iron intake**, so she spoon-fed
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15 380 her infant iron fortified rice cereal daily while following BLW. Other parents
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17 felt that the iron from breast milk would be adequate until the infant started
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19 eating high iron meat or meat alternatives:
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21 *Solids are just a taste and texture thing, breast milk or formula being*
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23 *their main nutrition until 9 months, so don't worry if your baby takes*
24 385 *their time adjusting to solids. (Parent 6)*
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26
27 Nearly all parents (n=19/20) reported that their infant gagged on food. Some
28
29 parents had completed a first aid course prior to their infant starting BLW to
30 equip themselves for dealing with gagging or choking. **Gagging was not a**
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32 390 **concern** to parents, instead they considered it was a natural part of a child
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34 learning to eat and adapting to new textures that are quite different to milk.
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36 Parents were aware that an infant's gag reflex is much further forward on
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38 their tongue when they first start eating and because of this, they understood
39 gagging was highly likely:
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41 395 *I felt like I was really prepared, I had read the book [4] so knew about*
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43 *gagging and choking and that mostly it is gagging because the baby's*
44 *gag reflex is much further forward than an adult's…gagging is a very*
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46 *important learning process. (Parent 12)*
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48 Parents viewed gagging as an innate safety mechanism that is activated when
49 400 food has not been sufficiently chewed for swallowing. One parent explained
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51 that gagging returned the food to the front of the mouth for further chewing
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53 and that if the infant did not gag then the food could cause obstruction and
54 possibly choking.
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Parents were aware **choking** was a common criticism of BLW, and although most reported that choking did not occur, 30% (n=6/20) reported one or more episodes. Although choking can be very serious, all parents who reported choking (n=6/20) reported that the infant independently dealt with the choking by expelling the food from their mouth through coughing and parents did not have to intervene with first aid. All parents who could recall the food that was responsible (n=4/6) reported that raw apple was the food their infant had choked on. Parents expressed feeling more relaxed around four weeks after introducing complementary foods; they saw that their infant could manage different textures, and was developing more coordinated eating skills. Parents also felt that by this time the difference between gagging and choking was more obvious and that they realised it was mostly gagging.

Many of the parents reported that **mealtime mess** was the main disadvantage of BLW. Infants were able to pick up their food and "squash, smear and throw it". Some parents were apprehensive about their infant eating in public or at other people's homes because of the mess. Mess was more of a problem in the early phases of BLW when the infant had not mastered the coordination skills needed to get food to their mouth, and parents said as the level of skill improved the mess declined. Parents who also had experience with the conventional method of starting solids thought finger foods and self-feeding were messy whatever the age:

> *As someone who's done it both ways [BLW and spoon-feeding], I think they're both pretty messy and wasteful! (Parent 5)*

Some parents recalled feeling impatient during the first month of BLW as their infant, while learning to eat, could spend **long periods of time at the table** and appear to be "*playing with food*". Additionally parents reported that **some family meals were not appropriate** for their baby and that at these times knowing what to offer the infant was a challenge:

> *I struggled with the "baby eats what the family eats" concept... Most of what we really eat has a lot of salt, sugar, sauces, etc in it, and it takes*

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3 *work to think of how to adjust it or intervene in the cooking process to fit*
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5 *baby. (Parent 5)*
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8 440 Parents recalled encountering both positive and negative experiences during
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10 the BLW period, however all the mothers concluded that they would
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12 recommend BLW to other parents:
13 *I couldn't imagine any other way of introducing solids and will certainly*
14
15 *do BLW with any future children. I think the fact that our son has*
16
17 445 *control over eating means that he doesn't have to fight for control…food*
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19 *is not a battleground here. (Parent 19)*
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22 Two parents added that they would recommend supplementing BLW with
23
24 some spoon-feeding for reassurance about nutrients:
25 450 *I say to people to use a combination. I felt good about this because she*
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27 *was able to explore food and learn about it but at the same time get the*
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29 *nutrients that she needed. (Parent 15)*
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32 **Experiences**
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34 455 Table 4 presents practical recommendations parents offered for overcoming
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36 challenges when using BLW.
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Table 4 Practical recommendations from parents for successful Baby-Led Weaning

Practical recommendation	Supporting quote
Place a large cloth under the infant's highchair to collect spilled food - the cloth could be shaken outside and washed in the machine.	*"Prepare for mess with bibs, strip the child, messy mats, have a washcloth handy, a hungry dog to eat scraps helps too and then relax and let them go for it."*
Use full cover (sweatshirt) bibs.	
In the warmer (summer) months the family could try eating outside.	

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Put the infant in their highchair with their nappy on. Then follow with a bath to wash off any food mess.	
Put infant in the highchair in the kitchen so they can begin their meal while the family meal is being prepared and interact with them while they are eating.	*"Watch your baby but don't interfere, I wouldn't like someone picking food off my plate and putting it into my mouth because they thought I was eating too slowly. Not to worry too much about quantities – remembering that milk is still on offer."*
Seek advice from parenting groups and others doing BLW. Collect and share food and recipe ideas.	*Sometimes you get stuck for ideas of what to offer and talking to others doing BLW can get the creativity going again... It's amazing how many ways there are to cook and present food.*
Parents, whether following BLW or not, should complete a first aid course. This should teach the difference between gagging and choking, and can improve confidence for dealing with choking (if it occurs).	*"Go to a first aid course, preferably one targeted at parents. This will give you confidence to deal with choking if it happens."*
Have realistic expectations about mess and your infant's eating progress. Parents need to appreciate that starting solids is a transition period which may last many months.	*"Don't think that things will be heaps easier in the short-term than the conventional way. A baby with finger food will still need a lot of support, because they'll drop things a lot and need you to pick them up."*
Try and enjoy the BLW experience by allowing the baby to explore food and have fun with eating.	*"Don't stress about the quantities they eat, the mess they make or the seemingly frequent gagging episodes."*

DISCUSSION

Although anecdotal reports suggest that the use of BLW is increasing, fewer than half of the healthcare professionals in the current study had heard about this approach. Those who were aware of BLW had limited knowledge of the details and were not aware of all the practices promoted as part of BLW. [4 5] Healthcare professionals suggested potential benefits of BLW (greater opportunity for shared family meal times, fewer mealtime battles, healthier eating behaviours, greater convenience, and possible developmental advantages) but most felt reluctant to recommend it because of their concern

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3 470 about the potential increased risk of choking. Most healthcare professionals had not seen BLW in action and therefore had difficultly understanding how a 6-month-old infant could possess the mastication and coordination skills needed to safely manage whole pieces of food.

475 Overall, parents reported that using BLW had been a positive experience, that they recommended it to other parents, and would follow it again if they had another child. As well as it being the *"logical way"* to introduce complementary foods, parents reported that BLW was less time consuming, involved less meal preparation, caused less stress, and resulted in fewer 480 mealtime battles. Although, some parents struggled with drawn out mealtimes and the food mess created by the self-feeding infant, these disadvantages did not discourage these parents from following BLW. Furthermore, parents who had previously used the conventional method (spoon-feeding purées) with one of their older children considered both 485 approaches (BLW and conventional) to be messy.

Healthcare professionals and parents' attitudes toward BLW were similar, in some respects. Both agreed that BLW may promote shared family meals, reduce mealtime battles, and be more convenient than spoon-feeding purées, 490 they also agreed that the mess produced when an infant self-feeds could be substantial. Furthermore, both groups considered BLW could encourage healthier eating patterns, including better self-regulation of energy intake. However, there were some noticeable differences in the attitudes of the two groups, particularly concerning safety and nutrient sufficiency. Healthcare 495 professionals had serious concerns about potential choking and low iron intake, as well as the ability of an infant to self-feed at 6 months. Although some parents had considered the potential problems raised by healthcare professionals they were not as concerned by these. Moreover, they reported that these concerns decreased as they followed BLW and their baby appeared 500 happy and healthy.

The healthcare professionals' concern about a possible increased risk of

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choking aligns with opinions expressed by other healthcare professionals.[5] [20 21] Choking is more likely with very hard foods such as raw apple or round coin-shaped foods such as sausage. [22] Children develop the ability to chew before they develop the ability to hold food in their mouth or to move it backwards for swallowing. [23] At about 6 months of age, infants develop a munching type oral-motor action; this movement, in conjunction with the ability to sit unsupported, promotes swallowing of thicker, chunkier pieces of food. [24] The founder of BLW, Gill Rapley, disputes that a healthy 6-month-old infant would be at increased risk of choking with BLW. [4] [5] Rapley acknowledges gagging is common with BLW because at 6 months of age the baby's gag reflex is further forward on their tongue than it is at 1 year. [5] However, based on her personal observations, Rapley considers choking is more likely with spoon-feeding because the baby learns to use suction to take the purée from the spoon, which causes food to be taken to the back of the throat where it is swallowed, encouraging the infant to learn to swallow food without chewing first. [5]

Interestingly most parents in the current study were not concerned about choking. Although some had initial concerns, these quickly diminished when they witnessed how proficient their infant was at bringing food forward and expelling it out of their mouth if needed, and all parents felt prepared for dealing with a choking incident if it happened. Others have reported similar findings with mothers following BLW initially being concerned about choking but over time becoming less nervous and more able to distinguish between the action of gagging to move food and actual choking. [25] Furthermore 93.5% of the BLW group in the recent study by Townsend and Pitchford[9] reported never having experienced a choking incident. It is of concern, however, that in the current study, 30% of parents reported at least one choking incident, most with raw apple. Although no serious incidents were reported, this suggests that parents who are following BLW should be specifically discouraged from offering raw apple to their infant.

Healthcare professionals expressed concern about whether BLW infants

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would be able to consume sufficient iron. In New Zealand, spoon-feeding iron-fortified baby rice cereal is a popular way for parents to increase their infant's iron intake. Healthcare professionals in this study quickly recognized that this would not be possible with BLW and they speculated that this would 540 put the infant at risk of suboptimal iron status, which is already a concern for many New Zealand infants (6.9% having iron deficiency anaemia, and a further 12.5% having suboptimal iron status). [26] Most parents in the present study believed that the breast milk their infant was receiving would supply enough iron until meat or other high-iron meat alternatives were 545 introduced. Similarly, mothers from Brown and Lee[25] were not concerned about iron intake. Although healthy, term, normal birth weight infants are considered to obtain enough iron from their mother's breast milk and from the redistribution of iron from haemoglobin to iron stores during the first six months of life, [27] from six months of age, iron becomes a critical nutrient 550 and all infants should receive iron-rich complementary foods such as meat, meat alternatives or iron-fortified foods. [2 27] [28-30]

Many of the healthcare professionals were not convinced that a 6-month old infant could eat enough to keep pace with growth when self-feeding, 555 particularly in the early days of complementary feeding. Only one study appears to have examined this, suggesting that there may be an increased incidence of underweight in BLW children (3/63) compared to spoon-fed children (0/63), although, as acknowledged by the authors, the numbers were small, and the cases and controls drawn from different populations. It has 560 been suggested that purées (which are frequently made of fruit or vegetables and thinned down with water or milk) are often very low in energy, meaning that the small volume of purées typically consumed in the early weeks would contribute relatively little to meeting a conventionally fed infant's nutrient requirements. [7] In contrast, finger foods, if carefully chosen, can be very 565 nutrient dense, so an infant who appears to be eating little when self-feeding may potentially be closer to meeting their nutrient requirements. [7] Only one parent in the current study reported being concerned about her child being able to eat enough. However, this was a self-selected sample, so those with

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3 concerns may have discontinued or chosen not to follow BLW. At this point,
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5 570 no research has examined the actual food and nutrient intake of children
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7 following a BLW approach compared with a more traditional method of infant
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9 feeding.
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12 The healthcare professionals and parents who took part in the current study
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14 575 were self-selected. Furthermore, the sample size was small. However,
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16 participants were recruited in a number of different ways, and the interviews
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18 were continued until well after saturation was achieved for both healthcare
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20 professionals and parents, suggesting that the majority of views of BLW in
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22 these groups are likely to have been captured.
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24 580
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26 Although there was some agreement between healthcare professionals and
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28 parents that BLW was likely to lead to more shared family meals, fewer
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30 mealtime battles, potentially healthier eating patterns, and to be more
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32 convenient, although messy, the healthcare professionals were, overall,
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34 585 reluctant to recommend the method. They were concerned that BLW could
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36 potentially increase choking and adversely affect the infant's iron status and
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38 energy intake. In this context, it is interesting that the UK Department of
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40 Health has supported the inclusion of some hand-held first foods in their most
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42 recent recommendations for infant feeding. [31 32] Undoubtedly, further
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44 590 research of BLW is warranted especially concerning its potential to positively
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46 influence eating behaviours, as well as its safety and nutrient sufficiency. In
47
48 the meantime, the current study suggests that healthcare professionals
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50 should specifically discourage parents who plan to use or are using BLW from
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52 offering raw apple.
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56 **Acknowledgements** We would like to thank all the families and healthcare
57
58 professionals who contributed to this study.
59
60 **Contributors** SC, ALH and RWT were all involved with the conception and

design of the study, the analysis and interpretation of the data and the writing

600 and editing of this paper. SC conducted the interviews with participants and

was responsible for the analysis and interpretation of the data. SC wrote the

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first draft of the paper, and A-L H and RWT made important intellectual contributions to the content and approved the final version.

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3 **REFERENCES**
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1. World Health Organization. Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. Geneva, Switzerland: World Health Organization, 2009.
2. Ministry of Health. *Food and Nutrition Guidelines for Healthy Infants and Toddlers (Aged 0-2): A background paper (4th Ed)*. Wellington: Ministry of Health, 2008.
3. Department of Health (DoH). *Infant Feeding*. London, UK: Department of Health, 2003.
4. Rapley G, Murkett T. *Baby-led Weaning*. London: Vermilion, 2008.
5. Rapley G. Baby-led weaning: transitioning to solid foods at the baby's own pace. Community Pract 2011;**84**(6):20-23
6. Sachs M. Baby-led weaning and current UK recommendations - are they compatible? Matern Child Nutr 2011;**7**:1-2 doi: doi: 10.1111/j.1740-8709.2010.00278.x.[published Online First: Epub Date]|.
7. Wright CM, Cameron K, Tsiaka M, Parkinson KN. Is baby-led weaning feasible? When do babies first reach out for and eat finger foods? Matern Child Nutr 2011;**7**(1):27-33 doi: doi: 10.1111/j.1740-8709.2010.00274.x[published Online First: Epub Date]|.
8. Brown A, Lee M. Maternal control of child feeding during the weaning period: differences between mothers following a baby-led or standard weaning approach. Matern Child Health J 2011;**15**(8):1265-71 doi: 10.1007/s10995-010-0678-4[published Online First: Epub Date]|.
9. Townsend E, Pitchford N. Baby knows best? The impact of weaning style on food preferences and body mass index in early childhood in a case–controlled sample. BMJ Open 2012;**2**:1
10. Abel S, Park J, Tipene-Leach D, Finau S, Lennan M. Infant care practices in New Zealand: a cross-cultural qualitative study. Soc Sci & Med 2001;**53**(9):1135-48
11. Campbell ND, Soeken KL, Rankin EAD. Infant Weaning Patterns and Related Maternal-Infant Health Outcomes. Public Health Nurs 1986;**3**(1):57-63 doi: 10.1111/j.1525-1446.1986.tb00466.x[published Online First: Epub Date]|.
12. Arden MA. Conflicting influences on UK mothers' decisions to introduce solid foods to their infants. Matern & Child Nutr 2010;**6**(2):159-73
13. Wright C, Parkinson K, Drewett R. Why are babies weaned early? Data from a prospective population based cohort study. Arch Dis Child 2004;**89**(9):813-16
14. Hellings P, Howe C. Assessment of Breastfeeding Knowledge of Nurse Practitioners and Nurse-Midwives. J Midwifery Womens Health 2000;**45**(3):264-70
15. Freed GL, Clark SJ, Lohr JA, Sorenson JR. Pediatrician involvement in breast-feeding promotion: a national study of residents and practitioners. Pediatrics 1995;**96**(3 Pt 1):490-4
16. Freed GL, Clark SJ, Sorenson J, Lohr JA, Cefalo R, Curtis P. National assessment of physicians' breast-feeding knowledge, attitudes, training, and experience. JAMA 1995;**273**(6):472-6

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17. Schanler RJ, O'Connor KG, Lawrence RA. Pediatricians' practices and attitudes regarding breastfeeding promotion. Pediatrics 1999;**103**(3):E35 doi: 10.1542/peds.103.3.e35[published Online First: Epub Date]|.
18. Brown A, Lee M. A descriptive study investigating the use and nature of baby-led weaning in a UK sample of mothers. Matern Child Health J 2011;**7**(1):34-47 doi: doi: 10.1111/j.1740-8709.2010.00243.x.[published Online First: Epub Date]|.
19. Patton MQ. *Qualitative Research and Evaluation Methods*. 3rd ed. Thousand Oaks, California Sage Publications, Inc., 2002.
20. Dietitians NZ Paediatric SIG convenor. Dietitians NZ Paediatric Special Interest Group Newsletter. In: NZDA, ed. May ed, 2010.
21. Rowell K and Becker H. baby-led-weaning-or-starting-solids-book-review-and-nutritionist-weighs-in-with-her-7-month-old-daughter. http://thefeedingdoctor.com, 2011.
22. Byard RW, Gallard V, Johnson A, Barbour J, Bonython-Wright B, Bonython-Wright D. Safe feeding practices for infants and young children. J Paediatr Child Health 1996;**32**(4):327-9
23. Naylor A, Morrow A. *Developmental readiness of normal full term infants to progress from exclusive breastfeeding to the introduction of complementary foods: reviews of the relevant literature concerning infant immunologic, gastrointestinal, oral motor and maternal reproductive and lactational development*. Washington DC: Wellstart International, LINKAGES Project Academy for Educational Development, 2001.
24. Pridham KF. Feeding behavior of 6-to 12-month-old infants: Assessment and sources of parental information. J Pediatr 1990;**117**(2 (Pt 2)):S174-80
25. Brown A, Lee M. An exploration of experiences of mothers following a baby-led weaning style: developmental readiness for complementary foods. Matern Child Health J 2011 doi: 10.1111/j.1740-8709.2011.00360.x[published Online First: Epub Date]|.
26. Soh P, Ferguson EL, McKenzie JE, Homs MY, Gibson RS. Iron deficiency and risk factors for lower iron stores in 6-24-month-old New Zealanders. Eur J Clin Nutr 2004;**58**(1):71-79
27. Domellof M. Iron requirements in infancy. Ann Nutr Metab 2011;**59**(1):59-63 doi: doi: 10.1159/000332138[published Online First: Epub Date]|.
28. Leong W-I, Lönnerdal B. Iron Nutrition. In: Anderson G, McLaren G, eds. Iron Physiology and Pathophysiology in Humans: Humana Press, 2012:81-99.
29. Kramer MK, R. Optimal duration of exclusive breastfeeding. Cochrane database of systematic reviews 2002(1):CD003517
30. World Health Organization. Guiding Principles For Complementary Feeding of the Breastfed Child. Geneva, Switzerland, 2004.
31. Department of Health. Start4Life: No Rush to Mush. Secondary Start4Life: No Rush to Mush 2009.
32. National Health Service (NHS). Your baby's first solid foods. Secondary Your baby's first solid foods 2011.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2,3&4
Objectives	3	State specific objectives, including any prespecified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	2&5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	N/A
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5&6
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	6&7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	N/A
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	N/A
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	N/A
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	N/A
Results			

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Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	N/A
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	21
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18-21
Generalisability	21	Discuss the generalisability (external validity) of the study results	21-22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	22

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Healthcare professionals’ and mothers’ knowledge of, attitudes to, and experiences with, Baby-Led Weaning: a content analysis study

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Secondary Subject Heading:	Paediatrics, General practice / Family practice
Keywords:	NUTRITION & DIETETICS, Community child health < PAEDIATRICS, PRIMARY CARE

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Healthcare professionals' and mothers' knowledge of, attitudes to, and experiences with, Baby-Led Weaning: a content analysis study

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Key words Healthcare professionals, mothers, complementary feeding, baby-led weaning.
Word count = 4609

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ABSTRACT

Objective: Baby-Led Weaning (BLW) is an alternative approach for introducing complementary foods to infants that emphasizes infant self-feeding rather than adult spoon-feeding. Here we examined healthcare professionals' and mothers' knowledge of, attitudes to, and experiences with, BLW.

Design, setting and participants: Healthcare professionals (n=31) and mothers who had used BLW (n=20) completed a semi-structured interview using one of two tailored interview schedules examining their knowledge of, attitudes to, and experiences with, BLW. Interview notes and transcripts were analysed using content analysis to identify sub-categories and extract illustrative quotes.

Results: Healthcare professionals had limited direct experience with BLW and the main concerns raised were the potential for increased risk of choking, iron deficiency, and inadequate energy intake. Although they suggested a number of potential benefits of BLW (greater opportunity for shared family meal times, fewer mealtime battles, healthier eating behaviours, greater convenience, and possible developmental advantages) most felt reluctant to recommend BLW because of their concern about the potential increased risk of choking. By contrast, mothers who had used this style of feeding reported no major concerns with BLW. They considered BLW to be a healthier, more convenient and less stressful way to introduce complementary foods to their infant and recommended this feeding approach to other mothers. Although mothers did not report being concerned about choking, 30% reported at least one choking episode – most commonly with raw apple.

Conclusion: Given the lack of research on BLW, further work is needed to determine whether the concerns expressed by healthcare professionals and potential benefits outlined by mothers are valid. The current study suggests healthcare professionals should specifically discourage mothers who plan to use, or are using, BLW from offering raw apple.

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ARTICLE SUMMARY

Article focus

- Healthcare professionals are an important source of information for mothers during the complementary feeding period.
- The literature suggests that there is a mismatch between healthcare professionals' and mothers' knowledge and attitudes to infant feeding.
- Baby-Led Weaning (BLW) is an alternative approach for introducing complementary foods to infants that is becoming increasingly popular with mothers.

Key messages

- Healthcare professionals identified a number of potential benefits of BLW including more shared family meals, promotion of healthier eating behaviours and greater convenience for mothers. However, healthcare professionals also had strong concerns about the risk of iron deficiency, inadequate energy intake and choking, and as a result most felt reluctant to recommend it.
- Mothers who had practised BLW reported more benefits and had fewer concerns about BLW than healthcare professionals.
- Healthcare professionals should specifically discourage mothers who plan to use, or are using, BLW from offering raw apple.

Strengths and limitations of this study

- This is the first study to interview healthcare professionals about BLW.
- The healthcare professionals and mothers were self-selected.

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3 **INTRODUCTION**
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5 92 Traditionally the method of infant feeding recommended to mothers in most developed countries, including the United Kingdom and New Zealand, has 94 been to spoon-feed the infant puréed food before moving on to mashed and finger foods as the child grows. [1-3] Recently an alternative approach, 96 known as Baby-Led Weaning (BLW), has emerged [4,5] and anecdotal evidence suggests that many mothers are attempting BLW. [6] Baby-Led 98 Weaning recommends that instead of spoon-feeding, mothers encourage their infant to self-feed, from about six months of age. Although infants following 100 the more traditional method of infant feeding may be offered finger foods, in many countries, including New Zealand, it is recommended that this does not 102 occur until 8-9 months of age, long after the introduction of puréed food. By contrast, BLW, in its purest form, does not include any spoon-feeding by the 104 adult. The infant is only offered pieces of whole food, appropriately prepared, so that the infant can feed themselves right from the start of the 106 complementary feeding period.

108 The small body of existing research suggests that BLW is feasible for most 6-month old infants from a motor development point of view. [7] It also 110 suggests that BLW is associated with lower levels of maternal anxiety, restriction, pressure to eat and monitoring during the complementary feeding 112 period; [8] and perhaps healthier eating patterns and BMI. [9] However, in the absence of any longitudinal or randomized controlled trial data, it is not 114 possible to determine whether these associations are causal.

116 Healthcare professionals are an important source of information for mothers during the complementary feeding period, and can potentially have as much 118 influence on decisions around milk feeding and introducing solids as cultural values or material resources. [10,11] However, healthcare professionals' 120 knowledge and attitudes about infant feeding often differ from those of mothers. [12,13]

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Previous studies on healthcare professionals' knowledge and attitudes

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towards infant feeding have focused on milk feeding or timing of the introduction of complementary food. [14-17] To date no study has examined attitudes to BLW in healthcare professionals working with young families.

The aim of this content analysis study was to examine the knowledge of, attitudes to, and experiences with, BLW of healthcare professionals and of mothers who had used this style of feeding with their infant.

METHODS

Participants

The participants were 31 healthcare professionals who were working with infants and families, and 20 mothers who had used BLW when introducing solids to their infant. Mothers could be part of the study if they considered that they had used BLW, so BLW was self-defined.

Participants were recruited by word of mouth (healthcare professional peer-to-peer networks, parenting groups, La Leche League), email "snowballing", or newspaper advertising. Twelve parenting groups were approached as a starting point to recruit directly mothers who had tried BLW and to commence snowballing. Recruitment of the health professionals was undertaken via established clinical relationships, and via snowballing through practice nurses. The study was approved by the Human Ethics Committee of the University of Otago, Dunedin, New Zealand.

Data collection

The data were collected during 2010 in Dunedin, New Zealand. Healthcare professionals were interviewed at their place of work and mothers in their own home. The same researcher (SC) conducted all interviews, which typically lasted 1 - 1.5 hours.

Interview schedule and process

Two interview schedules, one for health professionals and one for parents, were developed from the existing literature about BLW [7,8,18] and the

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3 expert opinion of the authors (Table 1 and Table 2). As some healthcare
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7 the start of the interview when necessary.
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10 We used a semi-structured interview as outlined in Patton [19] to include, in
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12 162 the first part, a structured framework to cover the same basic lines of inquiry
13
14 around knowledge, attitudes and experiences, for which participants could
15 164 express their own ideas and understandings. The second part of the interview
16
17 followed an unstructured format to allow for probing and further questioning
18
19 166 of ideas or individual circumstances that were not included in the original
20
21 interview outline.
22 168
23

Table 1 Questions used in interviews with healthcare professionals
1. What is your professional role?
2. Have you heard of Baby-led Weaning (BLW)?
3. Where did you hear about BLW?
4. When did you hear about BLW?
5. If somebody asked you what BLW is, how would you describe it?
6. What do you think of BLW as an alternative method for introducing solid foods to infants?
7. Do you consider there may be benefits of BLW?
8. Do you consider there may be disadvantages of BLW?
9. Do you have any concerns about BLW?

170

Table 2 Questions used in interviews with mothers who had used Baby-Led Weaning
1. If someone asked you: "What is Baby-Led Weaning (BLW)?" what would you tell them?
2. How did you hear about BLW?
3. Why did you decide to try BLW?
4. How old was your baby when you started BLW?
5. How old is she now?
6. How much of her food do you feed her and how much does she feed herself?
7. Where did/do you get most of your information about BLW?
8. What were the first foods you offered your baby?
9. What form were the foods in that you first offered your baby?
10. Were there any foods you avoided because you were using BLW?

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11. Did your baby eat at the same time as the rest of the family?
12. Do you think your baby is a fussy or picky eater?
13. Were you worried about BLW in any way?
14. Did your baby gag on food?
15. Was it food she had fed herself?
16. Did your baby ever choke on food?
17. Was it food she had fed herself?
18. Do you consider there were advantages of BLW for you and your baby?
19. Do you consider there were disadvantages of BLW for you and your baby?
20. Overall, do you think BLW worked for you and your baby?
21. Would you recommend other mothers try BLW?
22. Do you have any useful tips for other mothers trying BLW?

NB: "She" or "he" was used appropriately for the sex of the child.

172 **Data analysis**

Field notes were taken during the interviews with healthcare professionals
174 and extended immediately following the meeting. Interviews with mothers
were tape-recorded and transcribed verbatim. The main lines of inquiry
176 (knowledge, attitudes and experiences) from the interviews were used as an
initial guide in a directed content analysis [20], and are referred to here as
178 categories. Content analysis [19] was performed on all interviews by
reviewing all transcripts several times for recurring sub-categories
180 (reviewing the two groups separately). Sub-categories were identified from
manifest content (the visible, obvious components) [21], because the aim was
182 to extract and report on the descriptive level of content and not to provide a
deep level of interpretation and underlying meaning. Participants were
184 recruited until we reached saturation of sub-categories, and we ensured that
sub-categories were, as far as possible, defined so that they were exhaustive
186 and mutually exclusive. Data analysis was led by one member of the research
team (SC); and interpretation was verified during research team meetings
188 (with RWT and ALH) to scrutinise sub-categories as they were identified.
Each category and its sub-categories have been summarized, and illustrative
190 quotes are included.

192 **RESULTS**

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Thirty-one healthcare professionals were interviewed, comprising: practice nurses (n=11), Well-Child providers (a government funded service supporting families with young children and assessing health status, see: http://www.wellchild.org.nz/) (n=4), dietitians (n=4), general practitioners (n=5), paediatricians (n=2), lactation consultants (n=2), midwives (n=2), and a paediatric Speech-Language Therapist (n=1). The mothers were twenty mothers who had a child aged 8 – 24 months (mean=13 months).

Healthcare Professionals

The sub-categories that emerged were remarkably consistent across the interviews with healthcare professionals.

Knowledge

Nearly half (n=13/31) of the healthcare professionals had heard about BLW. Most of these had been introduced to the concept by their colleagues or friends and family (rather than patients). The healthcare professionals who knew about BLW described it as the child feeding themself whole foods, instead of being spoon-fed purées. There was little discussion of other aspects of BLW.

Attitudes

All healthcare professionals considered that BLW could be beneficial for the family and the child.

Healthcare professionals considered that **shared family mealtimes** would be the main advantage of BLW. They were aware of the nutritional and psychological benefits of family meals and they envisaged family mealtimes would be easier and more pleasant with BLW:

> *The best thing is that an adult can eat their meal while the child is having theirs. There's no juggling trying to feed the baby while shoving a spoonful for yourself. (General Practitioner 3)*

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3 Some healthcare professionals thought **mealtime battles** would be less likely
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5 226 with BLW for two reasons: mothers would have an alternative approach to
6
7 try if their child refused to be spoon-fed; and because BLW allows the child to
8 228 eat at their own pace and stop when they have had enough, they would not be
9
10 "*bribed*" or "*forced*" to eat food:
11
12 230 *I think it's healthier that the baby is in control of what they eat… and you*
13
14 *aren't forcing them to eat...there's far too many of us who just finish our*
15 232 *plates instead of stopping when we are full. (Dietitian 2)*
16
17
18 234 Overall, healthcare professionals thought BLW would encourage healthier
19
20 dietary behaviours by promoting a **wider variety of foods** and allowing the
21
22 236 child to explore and learn about food at their own pace:
23
24 *Being able to look at it, hold it and see it as food, instead of slop must*
25 238 *have advantages? (Paediatrician 2)*
26
27
28 240 They also considered BLW would encourage **better appetite and self-**
29
30 **regulation skills**, as mothers would be less able to control the child's food
31
32 242 intake. They saw similarities between BLW and breastfeeding on demand
33
34 and thought the two would complement each other well.
35
36 244
37 A number of healthcare professionals who had children of their own thought
38
39 246 BLW would be **more convenient** than the conventional method of spoon-
40
41 feeding purées:
42 248 *It sounds so much easier. Making purées is time consuming, and then*
43
44 *they hardly eat anything and you have to throw it all out or you buy*
45
46 250 *those jars of food, which are really expensive. (Dietitian 4)*
47
48
49 252 Healthcare professionals suggested two **developmental advantages**: BLW
50
51 might encourage better oral and chewing skills because the child is offered
52
53 254 pieces of food to eat so they may have more opportunity to develop their
54
55 mouth and jaw movements instead of sucking food from a spoon as they do
56 256 with purées; and enhanced fine motor skills as the child has greater
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opportunities to manipulate food with their fingers and practice their fine motor movements:

The BLW method could have real advantages for coping with food and learning to eat i.e. for oral development. If babies are fed purées for too long they miss important windows for introducing different food textures. (Speech-Language Therapist 1)

There must be some sort of fine motor benefits for baby being able to play, essentially, with its food. (General Practitioner 5)

However, in addition to these potential benefits, strong concerns about BLW were also expressed.

Choking was a major concern expressed by many of the healthcare professionals, particularly those who had not observed BLW. The potential risk of choking meant most healthcare professionals felt reluctant to recommend BLW:

The potential for choking would make me feel very hesitant about giving my child whole food at 6 months. As a health professional I'd need to see some sound evidence before I could endorse this method [BLW]. (Dietitian 2)

The specific concerns voiced regarding choking were that a 6 month old infant would not be developmentally ready to chew whole pieces of food and that mothers may leave the infant alone in their highchair with their food. Additionally healthcare professionals considered that mothers may become competitive about their infant's BLW progress, considering that their child is more advanced if they have certain foods or a greater variety of foods earlier than other children, and therefore might be motivated to offer unsafe foods that would increase the child's risk of choking:

Just give the baby that food, she'll be fine. Sometimes it's almost like a challenge to see how they cope, another one of those competitive

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1
2
3 *parenting things…oh look she's eating raw carrot at age 6 months.*
4
5 290 *(Dietitian 1)*
6
7
8 292 However, one healthcare professional considered that BLW may work well
9
10 for parents whose infant experiences feeding problems when spoon-feeding
11
12 294 is used:
13 *I know of similar feeding methods which are often used with children*
14
15 296 *whose parents are having feeding difficulties with spoon-feeding and*
16
17 *these can work very well. (Speech-Language Therapist 1)*
18
19 298
20 Healthcare professionals considered that there were two possible dietary
21
22 300 disadvantages with BLW: the potential for **growth faltering**, and for **poor**
23
24 **iron status**. There was concern that adopting BLW would mean forgoing any
25
26 302 iron-fortified infant cereal, and that a BLW diet would comprise low-energy
27
28 low-iron fruits and vegetables and include very few iron-rich foods. In
29
30 304 addition to low-energy foods, clumsy self-feeding (particularly at the
31
32 beginning of BLW) might lead to growth faltering.
33 306 *"The two parents I know who have chosen BLW are offering only fruits*
34
35 *and vegetables...Although fruits and vegetables are great foods, babies*
36
37 308 *need more nutrients... So I wonder how they would get these [nutrients]*
38
39 *if they were only having fruits and vege...nutrients could be limited..."*
40
41 310 *(General Practitioner 1)*
42
43
44 312 Contrasting this, a few healthcare professionals thought BLW infants could
45
46 consume energy beyond their needs as a result of **poor food choices**:
47 314 *Young children arrive here and they're under two eating twisties [an*
48
49 *extruded cereal snack], chocolate biscuits - would BLW be that for some*
50
51 316 *mothers? (Practice Nurse 2)*
52
53
54 318 At the other extreme, some healthcare professionals commented that mothers
55
56 (especially first-time mothers) are often apprehensive about their infant's
57
58 320 growth and compare it to that of other infants and that a "chubby" or "bonny"
59
60 baby is viewed as healthy even when it reflects overweight or obesity. Some

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healthcare professionals suggested BLW may **increase parental anxiety**. They thought mothers would struggle watching their infant learn to eat, especially at the start when they might eat very little:

> *Parents expect to see their child growing consistently - linear growth - and if they do not this evokes anxiety. How would you know if the child was eating enough? Parents would not cope with the child playing with food and not eating it. (Practice Nurse 7)*

Finally, some healthcare professionals thought BLW would be **messy** and for the mothers and suggested that there would be a lot of food wasted, which many mothers would not tolerate:

> *I could imagine in the first couple of weeks that the infant wouldn't eat much and that there would be an awful lot of playing and squashing. Some mothers may not be able to cope with this. (Practice Nurse 11)*

> *I would be concerned about the mess and wastage of food. Some of our families live on a very tight food budget and I've seen the mess when doing BLW and I think a lot of food gets wasted." (Well Child Provider 1)*

Mothers

The sub-categories that emerged were very consistent across the interviews with mothers.

Most mothers (n=18/20) started BLW when their child was 5.5 - 6 months of age and all mothers had exclusively breastfed their child up until this age. The BLW approach advises mothers to watch for signs of developmental readiness before introducing their child to solid food. However most mothers recalled starting solids at an age based on advice from their healthcare professional or because they were following the WHO guidelines, although a small number (n=2/20) of mothers started solids when their infant started reaching out for food.

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The most commonly offered first foods were vegetables (steamed or boiled
356 pumpkin, potato, kumara (New Zealand sweet potato), broccoli, carrot)
(n=13/20) and fruit (avocado, banana) (n=11/20). Most mothers (n=16/20)
358 reported that their child shared every meal with one or more family
members. Mothers liked that their child could feed themself with BLW,
360 however many (n=15/20) also reported some spoon-feeding, although this
was infrequent or only in unusual circumstances, such as when their child
362 was sick. Mothers reported doing this to avoid mess, to increase iron intake
by spoon-feeding iron-fortified infant cereal, or to increase energy intake
364 especially when their infant was sick or appeared too tired to self-feed.

366 **Knowledge**

The majority of mothers defined BLW as having 3 main components: offering
368 finger-sized pieces of food, allowing the child to be in control of how much
they ate, and not spoon-feeding purées:

370 *Letting your baby lead in terms of the pace and amount of solids*
eaten…offering them whole, safe foods when they are physically ready to
372 *feed themselves... keeping milk [breast/formula] as their main food*
source until they naturally increase the amount they eat and drop milk
374 *feeds on their own. (Mother 2)*

376 Nearly half of the mothers first heard about BLW through a parenting group
while others had discovered it online or were told about it by their Well-Child
378 provider. One mother had not heard of the term "Baby-Led Weaning" but said
"*it was instinctive*" to offer her child pieces of food and allow them to feed
380 themself. The majority of mothers obtained their BLW information from
online sources, drawing on other mothers' experiences through blogs, threads
382 and forums.

384 **Attitudes**

The main reason mothers chose to follow BLW was because it "***made sense***"
386 and "*seemed logical*". Lifestyle reasons also motivated mothers to follow

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BLW. They considered that BLW was **less time consuming** and **less expensive** than making puréed food:

> *With three other children, I was way too busy to prepare special foods i.e. purées and also I didn't want to buy them - they're expensive. (Mother 15)*

Mothers considered that there were advantages of BLW during the complementary feeding period, and also in the future. During the complementary feeding period, mothers reported **less meal preparation** (the baby ate what the family was eating, there was no purée preparation) and **reduced mealtime stress** because they were not spoon-feeding the baby and eating their own meal simultaneously. Some mothers (n=6/20) reported it was liberating that BLW does not include a detailed step-by-step weaning protocol and instead **promotes responding to the infant** and thought that fewer "rules" made the **transition to food less frightening and complicated**:

> *With my first child I became so worried about getting the food [purées] to exactly the right consistency. It [BLW] made sense to me, because she was demand fed so it seemed like the natural progression. (Mother 8)*

In addition mothers believed that BLW had encouraged their child to develop healthier eating behaviours, for example being **able to respond appropriately to hunger and satiety cues**, sharing **family meals** and eating a **wider variety of foods**:

> *I felt it would give my daughter the opportunity to experience, from the outset, everything that is pleasurable about food, the textures, colours, individual tastes…a lovely way to have them be a real participant in the meal – eating what we eat, copying us, and really joining in…not being fed separately. (Mother 2)*

Most mothers had no concerns with BLW (n=15/20). Those mothers who did have concerns were worried about the appropriateness of certain foods, for

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example raw apple. Current guidelines on types of BLW foods to offer are incomplete and some mothers reported **not knowing what foods to offer** at what age:

I wasn't worried but a bit concerned that some of the advice was conflicting e.g. the book says apple is fine and people I've spoken to who have used BLW have said no apples. (Mother 7)

One mother was concerned about her infant's **iron intake**, so she spoon-fed her infant iron fortified rice cereal daily while following BLW. Other mothers felt that the iron from breast milk would be adequate until the infant started eating high iron meat or meat alternatives:

Solids are just a taste and texture thing, breast milk or formula being their main nutrition until 9 months, so don't worry if your baby takes their time adjusting to solids. (Mother 6)

Nearly all mothers (n=19/20) reported that their infant gagged on food. Some mothers had completed a first aid course prior to their infant starting BLW to equip themselves for dealing with gagging or choking. **Gagging was not a concern** to mothers, instead they considered it was a natural part of a child learning to eat and adapting to new textures that are quite different to milk. Mothers were aware that an infant's gag reflex is much further forward on their tongue when they first start eating and because of this, they understood gagging was highly likely:

I felt like I was really prepared, I had read the book [4] so knew about gagging and choking and that mostly it is gagging because the baby's gag reflex is much further forward than an adult's…gagging is a very important learning process. (Mother 12)

Mothers viewed gagging as an innate safety mechanism that is activated when food has not been sufficiently chewed for swallowing. One parent explained that gagging returned the food to the front of the mouth for further chewing and that if the infant did not gag then the food could cause obstruction and possibly choking.

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Mothers were aware **choking** was a common criticism of BLW, and although most reported that choking did not occur, 30% (n=6/20) reported one or more episodes. Although choking can be very serious, all mothers who reported choking (n=6/20) reported that the infant independently dealt with the choking by expelling the food from their mouth through coughing and mothers did not have to intervene with first aid. All mothers who could recall the food that was responsible (n=4/6) reported that raw apple was the food their infant had choked on. Mothers expressed feeling more relaxed around four weeks after introducing complementary foods; they saw that their infant could manage different textures, and was developing more coordinated eating skills. Mothers also felt that by this time the difference between gagging and choking was more obvious and that they realised it was mostly gagging.

Many of the mothers reported that **mealtime mess** was the main disadvantage of BLW. Infants were able to pick up their food and "squash, smear and throw it". Some mothers were apprehensive about their infant eating in public or at other people's homes because of the mess. Mess was more of a problem in the early phases of BLW when the infant had not mastered the coordination skills needed to get food to their mouth, and mothers said as the level of skill improved the mess declined. Mothers who also had experience with the conventional method of starting solids thought finger foods and self-feeding were messy whatever the age:

> *As someone who's done it both ways [BLW and spoon-feeding], I think they're both pretty messy and wasteful! (Mother 5)*

Some mothers recalled feeling impatient during the first month of BLW as their infant, while learning to eat, could spend **long periods of time at the table** and appear to be "*playing with food*". Additionally mothers reported that **some family meals were not appropriate** for their baby and that at these times knowing what to offer the infant was a challenge:

> *I struggled with the "baby eats what the family eats" concept... Most of what we really eat has a lot of salt, sugar, sauces, etc in it, and it takes*

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work to think of how to adjust it or intervene in the cooking process to fit
486 *baby. (Mother 5)*

488 Mothers recalled encountering both positive and negative experiences during
the BLW period, however all the mothers concluded that they would
490 recommend BLW to other mothers:
I couldn't imagine any other way of introducing solids and will certainly
492 *do BLW with any future children. I think the fact that our son has*
control over eating means that he doesn't have to fight for control…food
494 *is not a battleground here. (Mother 19)*

496 Two mothers added that they would recommend supplementing BLW with
some spoon-feeding for reassurance about nutrients:
498 *I say to people to use a combination. I felt good about this because she*
was able to explore food and learn about it but at the same time get the
500 *nutrients that she needed. (Mother 15)*

502 **Experiences**
Table 3 presents practical recommendations mothers offered for overcoming
504 challenges when using BLW.

506

Table 3 Practical recommendations from mothers for successful Baby-Led Weaning

Practical recommendation	Supporting quote
Place a large cloth under the infant's highchair to collect spilled food - the cloth could be shaken outside and washed in the machine.	*"Prepare for mess with bibs, strip the child, messy mats, have a washcloth handy, a hungry dog to eat scraps helps too and then relax and let them go for it."*
Use full cover (sweatshirt) bibs.	
In the warmer (summer) months the family could try eating outside.	

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Put the infant in their highchair with their nappy on. Then follow with a bath to wash off any food mess.	
Put infant in the highchair in the kitchen so they can begin their meal while the family meal is being prepared and interact with them while they are eating.	*"Watch your baby but don't interfere, I wouldn't like someone picking food off my plate and putting it into my mouth because they thought I was eating too slowly. Not to worry too much about quantities – remembering that milk is still on offer."*
Seek advice from parenting groups and others doing BLW. Collect and share food and recipe ideas.	*Sometimes you get stuck for ideas of what to offer and talking to others doing BLW can get the creativity going again... It's amazing how many ways there are to cook and present food.*
Mothers, whether following BLW or not, should complete a first aid course. This should teach the difference between gagging and choking, and can improve confidence for dealing with choking (if it occurs).	*"Go to a first aid course, preferably one targeted at parents. This will give you confidence to deal with choking if it happens."*
Have realistic expectations about mess and your infant's eating progress. Mothers need to appreciate that starting solids is a transition period which may last many months.	*"Don't think that things will be heaps easier in the short-term than the conventional way. A baby with finger food will still need a lot of support, because they'll drop things a lot and need you to pick them up."*
Try and enjoy the BLW experience by allowing the baby to explore food and have fun with eating.	*"Don't stress about the quantities they eat, the mess they make or the seemingly frequent gagging episodes."*

508

DISCUSSION

510 Although anecdotal reports suggest that the use of BLW is increasing, fewer than half of the healthcare professionals in the current study had heard about
512 this approach. Those who were aware of BLW had limited knowledge of the details and were not aware of all the practices promoted as part of BLW. [4,5]
514 Healthcare professionals suggested potential benefits of BLW (greater opportunity for shared family meal times, fewer mealtime battles, healthier
516 eating behaviours, greater convenience, and possible developmental advantages) but most felt reluctant to recommend it because of their concern

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about the potential increased risk of choking. Most healthcare professionals had not seen BLW in action and therefore had difficultly understanding how a 6-month-old infant could possess the mastication and coordination skills needed to safely manage whole pieces of food.

Overall, mothers reported that using BLW had been a positive experience, that they recommended it to other mothers, and would follow it again if they had another child. Interestingly, many of the mothers in this study did not follow BLW strictly as outlined by Rapley [4]. Although they generally embraced BLW techniques, many also reported using a small amount of spoon-feeding. This suggests that, in practice, many parents following a BLW approach are probably somewhere along the continuum of some spoon-feeding to total self-feeding, albeit much more at the latter end. As well as it being described as the *"logical way"* to introduce complementary foods, mothers reported that BLW was less time consuming, involved less meal preparation, caused less stress, and resulted in fewer mealtime battles. Although some mothers struggled with drawn out mealtimes and the food mess created by the self-feeding infant, these disadvantages did not discourage these mothers from following BLW. Furthermore, mothers who had previously used the conventional method (spoon-feeding purées) with one of their older children considered both approaches (BLW and conventional) to be messy.

Healthcare professionals and mothers' attitudes toward BLW were similar, in some respects. Both agreed that BLW may promote shared family meals, reduce mealtime battles, and be more convenient than spoon-feeding purées, they also agreed that the mess produced when an infant self-feeds could be substantial. Furthermore, both groups considered BLW could encourage healthier eating patterns, including better self-regulation of energy intake. However, there were some noticeable differences in the attitudes of the two groups, particularly concerning safety and nutrient sufficiency. Healthcare professionals had serious concerns about potential choking and low iron intake, as well as the ability of an infant to self-feed at 6 months. Although

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some mothers had considered the potential problems raised by healthcare professionals they were not as concerned by these. Moreover, they reported that these concerns decreased as they followed BLW and their baby appeared happy and healthy.

The healthcare professionals' concern about a possible increased risk of choking aligns with opinions expressed by other healthcare professionals.[5][22,23] Choking is more likely with very hard foods such as raw apple or round coin-shaped foods such as sausage. [24] Children develop the ability to chew before they develop the ability to hold food in their mouth or to move it backwards for swallowing. [25] At about 6 months of age, infants develop a munching type oral-motor action; this movement, in conjunction with the ability to sit unsupported, promotes swallowing of thicker, chunkier pieces of food. [26] The founder of BLW, Gill Rapley, disputes that a healthy 6-month-old infant would be at increased risk of choking with BLW. [4,5] Rapley acknowledges gagging is common with BLW because at 6 months of age the baby's gag reflex is further forward on their tongue than it is at 1 year. [5] However, based on her personal observations, Rapley considers choking is more likely with spoon-feeding because the baby learns to use suction to take the purée from the spoon, which causes food to be taken to the back of the throat where it is swallowed, encouraging the infant to learn to swallow food without chewing first. [5]

Interestingly most mothers in the current study were not concerned about choking. Although some had initial concerns, these quickly diminished when they witnessed how proficient their infant was at bringing food forward and expelling it out of their mouth if needed, and all mothers felt prepared for dealing with a choking incident if it happened. Others have reported similar findings with mothers following BLW initially being concerned about choking but over time becoming less nervous and more able to distinguish between the action of gagging to move food and actual choking. [27] Furthermore 93.5% of the BLW group in the recent study by Townsend and Pitchford[9] reported never having experienced a choking incident. It is of concern,

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however, that in the current study, 30% of mothers reported at least one choking incident, most with raw apple. No serious incidents were reported and this raises the question of whether mothers correctly identified choking or whether they had instead witnessed the less serious action of gagging. However, given that raw apple was the cause of most reported choking incidents, and fulfills the criteria of a high-risk food, being hard and in small pieces when bitten, it would be sensible to discourage parents who are following BLW from offering raw apple to their infant.

Healthcare professionals expressed concern about whether BLW infants would be able to consume sufficient iron. In New Zealand, spoon-feeding iron-fortified baby rice cereal is a popular way for mothers to increase their infant's iron intake. Healthcare professionals in this study quickly recognized that this would not be possible with BLW and they speculated that this would put the infant at risk of suboptimal iron status, which is already a concern for many New Zealand infants (6.9% having iron deficiency anaemia, and a further 12.5% having suboptimal iron status[28]). Most mothers in the present study believed that the breast milk their infant was receiving would supply enough iron until meat or other high-iron meat alternatives were introduced. Similarly, mothers from Brown and Lee[27] were not concerned about iron intake. Although healthy, term, normal birth weight infants are considered to obtain enough iron from their mother's breast milk and from the redistribution of iron from haemoglobin to iron stores during the first six months of life, [29] from six months of age, iron becomes a critical nutrient and all infants should receive iron-rich complementary foods such as meat, meat alternatives or iron-fortified foods. [2,29] [30-32]

Many of the healthcare professionals were not convinced that a 6-month old infant could eat enough to keep pace with growth when self-feeding, particularly in the early days of complementary feeding. Only one study appears to have examined this, and suggested that there may be an increased incidence of underweight in BLW children (3/63) compared to spoon-fed children (0/63), although most children were of normal weight, and as

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acknowledged by the authors, the numbers were small, and the cases and controls drawn from different populations. It has been suggested that purées (which are frequently made of fruit or vegetables and thinned down with water or milk) are often very low in energy, meaning that the small volume of purées typically consumed in the early weeks would contribute relatively little to meeting a conventionally fed infant's nutrient requirements. [7] In contrast, finger foods, if carefully chosen, can be very nutrient dense, so an infant who appears to be eating little when self-feeding may potentially be closer to meeting their nutrient requirements. [7] Only one parent in the current study reported being concerned about her child being able to eat enough, although many mothers reported spoon-feeding their infant at times when they were potentially at greater risk of under eating, i.e. when they were unwell or very tired. Because of the nature of this self-selected sample it is possible that mothers with concerns about this issue may have discontinued or chosen not to follow BLW. At this point, no research has examined the actual food and nutrient intake of children following a BLW approach compared with a more traditional method of infant feeding.

The healthcare professionals and mothers who took part in the current study were self-selected. Furthermore, the sample size was small. Although this study is not intended to present representative results given its qualitative nature, participants were recruited in a number of different ways, and the interviews were continued until well after saturation for both healthcare professionals and mothers, suggesting that the majority of views of BLW in these groups are likely to have been captured. The first author conducted the content analysis of the transcripts, and although the co-authors discussed the interpretation of individual participant quotes, they did not conduct a separate full analysis of the transcripts. However, we consider that this was sufficient to ensure that the findings are trustworthy, both because our aim was to capture manifest (i.e. description of the visible, obvious components), rather than latent (i.e. interpretation of underling meaning) content [33], and because we have provided direct participant quotes for each sub-category so that the reader can judge for themselves the appropriateness of the coding.

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Although there was some agreement between healthcare professionals and mothers that BLW was likely to lead to more shared family meals, fewer mealtime battles, potentially healthier eating patterns, and to be more convenient, although messy, the healthcare professionals were, overall, reluctant to recommend the method. They were concerned that BLW could potentially increase choking and adversely affect the infant's iron status and energy intake. In this context, it is interesting that the UK Department of Health has supported the inclusion of some hand-held first foods in their most recent recommendations for infant feeding. [34,35] Undoubtedly, further research of BLW is warranted especially concerning its potential to positively influence eating behaviours, as well as its safety and nutrient sufficiency. In the meantime, the current study suggests that healthcare professionals should specifically discourage mothers who plan to use, or are using, BLW from offering raw apple.

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REFERENCES

1. World Health Organization. Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. Geneva, Switzerland: World Health Organization, 2009.
2. Ministry of Health. *Food and Nutrition Guidelines for Healthy Infants and Toddlers (Aged 0-2): A background paper (4th Ed)*. Wellington: Ministry of Health, 2008.
3. Department of Health (DoH). *Infant Feeding*. London, UK: Department of Health, 2003.
4. Rapley G, Murkett T. *Baby-Led Weaning: Helping your child love good food*. London: Vermilion, 2008.
5. Rapley G. Baby-led weaning: transitioning to solid foods at the baby's own pace. *Community Pract* 2011;84(6):20-23.
6. Sachs M. Baby-led weaning and current UK recommendations - are they compatible? *Matern Child Nutr* 2011;7:1-2.
7. Wright CM, Cameron K, Tsiaka M, Parkinson KN. Is baby-led weaning feasible? When do babies first reach out for and eat finger foods? *Matern Child Nutr* 2011;7(1):27-33.
8. Brown A, Lee M. Maternal control of child feeding during the weaning period: differences between mothers following a baby-led or standard weaning approach. *Matern Child Health J* 2011;15(8):1265-71.
9. Townsend E, Pitchford N. Baby knows best? The impact of weaning style on food preferences and body mass index in early childhood in a case–controlled sample. *BMJ Open* 2012;2:1.
10. Abel S, Park J, Tipene-Leach D, Finau S, Lennan M. Infant care practices in New Zealand: a cross-cultural qualitative study. *Soc Sci & Med* 2001;53(9):1135-48.
11. Campbell ND, Soeken KL, Rankin EAD. Infant Weaning Patterns and Related Maternal-Infant Health Outcomes. *Public Health Nurs* 1986;3(1):57-63.
12. Arden MA. Conflicting influences on UK mothers' decisions to introduce solid foods to their infants. *Matern & Child Nutr* 2010;6(2):159-73.
13. Wright C, Parkinson K, Drewett R. Why are babies weaned early? Data from a prospective population based cohort study. *Arch Dis Child* 2004;89(9):813-16.
14. Hellings P, Howe C. Assessment of Breastfeeding Knowledge of Nurse Practitioners and Nurse-Midwives. *J Midwifery Womens Health* 2000;45(3):264-70.
15. Freed GL, Clark SJ, Lohr JA, Sorenson JR. Pediatrician involvement in breast-feeding promotion: a national study of residents and practitioners. *Pediatrics* 1995;96(3 Pt 1):490-4.
16. Freed GL, Clark SJ, Sorenson J, Lohr JA, Cefalo R, Curtis P. National assessment of physicians' breast-feeding knowledge, attitudes, training, and experience. *JAMA* 1995;273(6):472-6.
17. Schanler RJ, O'Connor KG, Lawrence RA. Pediatricians' practices and attitudes regarding breastfeeding promotion. *Pediatrics* 1999;103(3):E35.

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18. Brown A, Lee M. A descriptive study investigating the use and nature of baby-led weaning in a UK sample of mothers. *Matern Child Health J* 2011;7(1):34-47.
19. Patton MQ. *Qualitative Research and Evaluation Methods*. 3rd ed. Thousand Oaks, California Sage Publications, Inc., 2002.
20. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qualitative health research* 2005;15(9):1277-88.
21. Kondracki NL, Wellman NS, Amundson DR. Content analysis: review of methods and their applications in nutrition education. *Journal of nutrition education and behavior* 2002;34(4):224-30.
22. Dietitians NZ Paediatric SIG convenor. Dietitians NZ Paediatric Special Interest Group Newsletter. In: NZDA, editor. May ed, 2010.
23. Rowell K and Becker H. baby-led-weaning-or-starting-solids-book-review-and-nutritionist-weighs-in-with-her-7-month-old-daughter. http://thefeedingdoctor.com, 2011.
24. Byard RW, Gallard V, Johnson A, Barbour J, Bonython-Wright B, Bonython-Wright D. Safe feeding practices for infants and young children. *J Paediatr Child Health* 1996;32(4):327-9.
25. Naylor A, Morrow A. *Developmental readiness of normal full term infants to progress from exclusive breastfeeding to the introduction of complementary foods: reviews of the relevant literature concerning infant immunologic, gastrointestinal, oral motor and maternal reproductive and lactational development*. Washington DC: Wellstart International, LINKAGES Project Academy for Educational Development, 2001.
26. Pridham KF. Feeding behavior of 6-to 12-month-old infants: Assessment and sources of parental information. *J Pediatr* 1990;117(2(Pt 2)):S174-80.
27. Brown A, Lee M. An exploration of experiences of mothers following a baby-led weaning style: developmental readiness for complementary foods. *Matern Child Health J* 2011.
28. Soh P, Ferguson EL, McKenzie JE, Homs MY, Gibson RS. Iron deficiency and risk factors for lower iron stores in 6-24-month-old New Zealanders. *Eur J Clin Nutr* 2004;58(1):71-79.
29. Domellof M. Iron requirements in infancy. *Ann Nutr Metab* 2011;59(1):59-63.
30. Leong W-I, Lönnerdal B. Iron Nutrition. In: Anderson G, McLaren G, editors. *Iron Physiology and Pathophysiology in Humans*: Humana Press, 2012:81-99.
31. Kramer MK, R. Optimal duration of exclusive breastfeeding. *Cochrane database of systematic reviews* 2002(1):CD003517.
32. World Health Organization. Guiding Principles For Complementary Feeding of the Breastfed Child. Geneva, Switzerland, 2004.
33. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today* 2004;24(2):105-12.
34. Department of Health. Start4Life: No Rush to Mush. http://www.nhs.uk/start4life/pages/no-rush-to-mush.aspx, 2009.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

35. National Health Service (NHS). Your baby's first solid foods. http://www.nhs.uk/Conditions/pregnancy-and-baby/Pages/solid-foods-weaning.aspx: NHS, 2011.

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Healthcare professionals' and mothers' knowledge of, attitudes to, and experiences with, Baby-Led Weaning: a content analysis study

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ABSTRACT

Objective: Baby-Led Weaning (BLW) is an alternative approach for introducing complementary foods to infants that emphasizes infant self-feeding rather than adult spoon-feeding. Here we examined healthcare professionals' and mothers' knowledge of, attitudes to, and experiences with, BLW.

Design, setting and participants: Healthcare professionals (n=31) and mothers who had used BLW (n=20) completed a semi-structured interview using one of two tailored interview schedules examining their knowledge of, attitudes to, and experiences with, BLW. Interview notes and transcripts were analysed using content analysis to identify sub-categories and extract illustrative quotes.

Results: Healthcare professionals had limited direct experience with BLW and the main concerns raised were the potential for increased risk of choking, iron deficiency, and inadequate energy intake. Although they suggested a number of potential benefits of BLW (greater opportunity for shared family meal times, fewer mealtime battles, healthier eating behaviours, greater convenience, and possible developmental advantages) most felt reluctant to recommend BLW because of their concern about the potential increased risk of choking. By contrast, mothers who had used this style of feeding reported no major concerns with BLW. They considered BLW to be a healthier, more convenient and less stressful way to introduce complementary foods to their infant and recommended this feeding approach to other mothers. Although mothers did not report being concerned about choking, 30% reported at least one choking episode – most commonly with raw apple.

Conclusion: Given the lack of research on BLW, further work is needed to determine whether the concerns expressed by healthcare professionals and potential benefits outlined by mothers are valid. The current study suggests healthcare professionals should specifically discourage mothers who plan to use, or are using, BLW from offering raw apple.

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ARTICLE SUMMARY

Article focus

- Healthcare professionals are an important source of information for mothers during the complementary feeding period.
- The literature suggests that there is a mismatch between healthcare professionals' and mothers' knowledge and attitudes to infant feeding.
- Baby-Led Weaning (BLW) is an alternative approach for introducing complementary foods to infants that is becoming increasingly popular with mothers.

Key messages

- Healthcare professionals identified a number of potential benefits of BLW including more shared family meals, promotion of healthier eating behaviours and greater convenience for mothers. However, healthcare professionals also had strong concerns about the risk of iron deficiency, inadequate energy intake and choking, and as a result most felt reluctant to recommend it.
- Mothers who had practised BLW reported more benefits and had fewer concerns about BLW than healthcare professionals.
- Healthcare professionals should specifically discourage mothers who plan to use, or are using, BLW from offering raw apple.

Strengths and limitations of this study

- This is the first study to interview healthcare professionals about BLW.
- The healthcare professionals and mothers were self-selected.

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INTRODUCTION

Traditionally the method of infant feeding recommended to mothers in most developed countries, including the United Kingdom and New Zealand, has been to spoon-feed the infant puréed food before moving on to mashed and finger foods as the child grows. [1-3] Recently an alternative approach, known as Baby-Led Weaning (BLW), has emerged [4,5] and anecdotal evidence suggests that many mothers are attempting BLW. [6] Baby-Led Weaning recommends that instead of spoon-feeding, mothers encourage their infant to self-feed, from about six months of age. Although infants following the more traditional method of infant feeding may be offered finger foods, in many countries, including New Zealand, it is recommended that this does not occur until 8-9 months of age, long after the introduction of puréed food. By contrast, BLW, in its purest form, does not include any spoon-feeding by the adult. The infant is only offered pieces of whole food, appropriately prepared, so that the infant can feed themselves right from the start of the complementary feeding period.

The small body of existing research suggests that BLW is feasible for most 6-month old infants from a motor development point of view. [7] It also suggests that BLW is associated with lower levels of maternal anxiety, restriction, pressure to eat and monitoring during the complementary feeding period; [8] and perhaps healthier eating patterns and BMI. [9] However, in the absence of any longitudinal or randomized controlled trial data, it is not possible to determine whether these associations are causal.

Healthcare professionals are an important source of information for mothers during the complementary feeding period, and can potentially have as much influence on decisions around milk feeding and introducing solids as cultural values or material resources. [10,11] However, healthcare professionals' knowledge and attitudes about infant feeding often differ from those of mothers. [12,13]

Previous studies on healthcare professionals' knowledge and attitudes

1
2
3 124 towards infant feeding have focused on milk feeding or timing of the
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5 introduction of complementary food. [14-17] To date no study has examined
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7 126 attitudes to BLW in healthcare professionals working with young families.
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10 128 The aim of this content analysis study was to examine the knowledge of,
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12 attitudes to, and experiences with, BLW of healthcare professionals and of
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14 130 mothers who had used this style of feeding with their infant.
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METHODS

18
19 **Participants**
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21 134 The participants were 31 healthcare professionals who were working with
22
23 infants and families, and 20 mothers who had used BLW when introducing
24
25 136 solids to their infant. Mothers could be part of the study if they considered
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27 that they had used BLW, so BLW was self-defined.
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31 Participants were recruited by word of mouth (healthcare professional peer-
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33 140 to-peer networks, parenting groups, La Leche League), email "snowballing",
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35 or newspaper advertising. Twelve parenting groups were approached as a
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37 142 starting point to recruit directly mothers who had tried BLW and to
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39 commence snowballing. Recruitment of the health professionals was
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41 144 undertaken via established clinical relationships, and via snowballing through
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43 practice nurses. The study was approved by the Human Ethics Committee of
44
45 146 the University of Otago, Dunedin, New Zealand.
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47
48 148 **Data collection**
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50 The data were collected during 2010 in Dunedin, New Zealand. Healthcare
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52 150 professionals were interviewed at their place of work and mothers in their
53
54 own home. The same researcher (SC) conducted all interviews, which
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56 152 typically lasted 1 - 1.5 hours.
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59 154 **Interview schedule and process**
60
Two interview schedules, one for health professionals and one for parents,

156 were developed from the existing literature about BLW [7,8,18] and the

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1
2
3 expert opinion of the authors (Table 1 and Table 2). As some healthcare
4
5 158 professionals had not heard of BLW, a brief description of BLW was given at
6
7 the start of the interview when necessary.
8 160
9
10 We used a semi-structured interview as outlined in Patton [19] to include, in
11
12 162 the first part, a structured framework to cover the same basic lines of inquiry
13
14 around knowledge, attitudes and experiences, for which participants could
15 164 express their own ideas and understandings. The second part of the interview
16
17 followed an unstructured format to allow for probing and further questioning
18
19 166 of ideas or individual circumstances that were not included in the original
20
21 interview outline.
22 168

Table 1 Questions used in interviews with healthcare professionals

Table 1 Questions used in interviews with healthcare professionals
1. What is your professional role?
2. Have you heard of Baby-led Weaning (BLW)?
3. Where did you hear about BLW?
4. When did you hear about BLW?
5. If somebody asked you what BLW is, how would you describe it?
6. What do you think of BLW as an alternative method for introducing solid foods to infants?
7. Do you consider there may be benefits of BLW?
8. Do you consider there may be disadvantages of BLW?
9. Do you have any concerns about BLW?

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Table 2 Questions used in interviews with mothers who had used Baby-Led Weaning
1. If someone asked you: "What is Baby-Led Weaning (BLW)?" what would you tell them?
2. How did you hear about BLW?
3. Why did you decide to try BLW?
4. How old was your baby when you started BLW?
5. How old is she now?
6. How much of her food do you feed her and how much does she feed herself?
7. Where did/do you get most of your information about BLW?
8. What were the first foods you offered your baby?
9. What form were the foods in that you first offered your baby?
10. Were there any foods you avoided because you were using BLW?

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11. Did your baby eat at the same time as the rest of the family?
12. Do you think your baby is a fussy or picky eater?
13. Were you worried about BLW in any way?
14. Did your baby gag on food?
15. Was it food she had fed herself?
16. Did your baby ever choke on food?
17. Was it food she had fed herself?
18. Do you consider there were advantages of BLW for you and your baby?
19. Do you consider there were disadvantages of BLW for you and your baby?
20. Overall, do you think BLW worked for you and your baby?
21. Would you recommend other mothers try BLW?
22. Do you have any useful tips for other mothers trying BLW?

NB: "She" or "he" was used appropriately for the sex of the child.

172 **Data analysis**

Field notes were taken during the interviews with healthcare professionals
174 and extended immediately following the meeting. Interviews with mothers
were tape-recorded and transcribed verbatim. The main lines of inquiry
176 (knowledge, attitudes and experiences) from the interviews were used as an
initial guide in a directed content analysis [20], and are referred to here as
178 categories. Content analysis [19] was performed on all interviews by
reviewing all transcripts several times for recurring sub-categories
180 (reviewing the two groups separately). Sub-categories were identified from
manifest content (the visible, obvious components) [21], because the aim was
182 to extract and report on the descriptive level of content and not to provide a
deep level of interpretation and underlying meaning. Participants were
184 recruited until we reached saturation of sub-categories, and we ensured that
sub-categories were, as far as possible, defined so that they were exhaustive
186 and mutually exclusive. Data analysis was led by one member of the research
team (SC); and interpretation was verified during research team meetings
188 (with RWT and ALH) to scrutinise sub-categories as they were identified.
Each category and its sub-categories have been summarized, and illustrative
190 quotes are included.

192 # RESULTS

Thirty-one healthcare professionals were interviewed, comprising: practice nurses (n=11), Well-Child providers (a government funded service supporting families with young children and assessing health status, see: http://www.wellchild.org.nz/) (n=4), dietitians (n=4), general practitioners (n=5), paediatricians (n=2), lactation consultants (n=2), midwives (n=2), and a paediatric Speech-Language Therapist (n=1). The mothers were twenty mothers who had a child aged 8 – 24 months (mean=13 months).

Healthcare Professionals

The sub-categories that emerged were remarkably consistent across the interviews with healthcare professionals.

Knowledge

Nearly half (n=13/31) of the healthcare professionals had heard about BLW. Most of these had been introduced to the concept by their colleagues or friends and family (rather than patients). The healthcare professionals who knew about BLW described it as the child feeding themself whole foods, instead of being spoon-fed purées. There was little discussion of other aspects of BLW.

Attitudes

All healthcare professionals considered that BLW could be beneficial for the family and the child.

Healthcare professionals considered that **shared family mealtimes** would be the main advantage of BLW. They were aware of the nutritional and psychological benefits of family meals and they envisaged family mealtimes would be easier and more pleasant with BLW:

> *The best thing is that an adult can eat their meal while the child is having theirs. There's no juggling trying to feed the baby while shoving a spoonful for yourself. (General Practitioner 3)*

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Some healthcare professionals thought **mealtime battles** would be less likely with BLW for two reasons: mothers would have an alternative approach to try if their child refused to be spoon-fed; and because BLW allows the child to eat at their own pace and stop when they have had enough, they would not be "*bribed*" or "*forced*" to eat food:

> *I think it's healthier that the baby is in control of what they eat… and you aren't forcing them to eat...there's far too many of us who just finish our plates instead of stopping when we are full. (Dietitian 2)*

Overall, healthcare professionals thought BLW would encourage healthier dietary behaviours by promoting a **wider variety of foods** and allowing the child to explore and learn about food at their own pace:

> *Being able to look at it, hold it and see it as food, instead of slop must have advantages? (Paediatrician 2)*

They also considered BLW would encourage **better appetite and self-regulation skills**, as mothers would be less able to control the child's food intake. They saw similarities between BLW and breastfeeding on demand and thought the two would complement each other well.

A number of healthcare professionals who had children of their own thought BLW would be **more convenient** than the conventional method of spoon-feeding purées:

> *It sounds so much easier. Making purées is time consuming, and then they hardly eat anything and you have to throw it all out or you buy those jars of food, which are really expensive. (Dietitian 4)*

Healthcare professionals suggested two **developmental advantages**: BLW might encourage better oral and chewing skills because the child is offered pieces of food to eat so they may have more opportunity to develop their mouth and jaw movements instead of sucking food from a spoon as they do with purées; and enhanced fine motor skills as the child has greater

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opportunities to manipulate food with their fingers and practice their fine motor movements:

> *The BLW method could have real advantages for coping with food and learning to eat i.e. for oral development. If babies are fed purées for too long they miss important windows for introducing different food textures. (Speech-Language Therapist 1)*

> *There must be some sort of fine motor benefits for baby being able to play, essentially, with its food. (General Practitioner 5)*

However, in addition to these potential benefits, strong concerns about BLW were also expressed.

Choking was a major concern expressed by many of the healthcare professionals, particularly those who had not observed BLW. The potential risk of choking meant most healthcare professionals felt reluctant to recommend BLW:

> *The potential for choking would make me feel very hesitant about giving my child whole food at 6 months. As a health professional I'd need to see some sound evidence before I could endorse this method [BLW]. (Dietitian 2)*

The specific concerns voiced regarding choking were that a 6 month old infant would not be developmentally ready to chew whole pieces of food and that mothers may leave the infant alone in their highchair with their food. Additionally healthcare professionals considered that mothers may become competitive about their infant's BLW progress, considering that their child is more advanced if they have certain foods or a greater variety of foods earlier than other children, and therefore might be motivated to offer unsafe foods that would increase the child's risk of choking:

> *Just give the baby that food, she'll be fine. Sometimes it's almost like a challenge to see how they cope, another one of those competitive*

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1
2
3 *parenting things…oh look she's eating raw carrot at age 6 months.*
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5 290 *(Dietitian 1)*
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8 292 However, one healthcare professional considered that BLW may work well
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10 for parents whose infant experiences feeding problems when spoon-feeding
11
12 294 is used:
13 *I know of similar feeding methods which are often used with children*
14
15 296 *whose parents are having feeding difficulties with spoon-feeding and*
16
17 *these can work very well. (Speech-Language Therapist 1)*
18
19 298
20 Healthcare professionals considered that there were two possible dietary
21
22 300 disadvantages with BLW: the potential for **growth faltering**, and for **poor**
23
24 **iron status**. There was concern that adopting BLW would mean forgoing any
25
26 302 iron-fortified infant cereal, and that a BLW diet would comprise low-energy
27
28 low-iron fruits and vegetables and include very few iron-rich foods. In
29
30 304 addition to low-energy foods, clumsy self-feeding (particularly at the
31
32 beginning of BLW) might lead to growth faltering.
33 306 *"The two parents I know who have chosen BLW are offering only fruits*
34
35 *and vegetables...Although fruits and vegetables are great foods, babies*
36
37 308 *need more nutrients... So I wonder how they would get these [nutrients]*
38
39 *if they were only having fruits and vege...nutrients could be limited..."*
40
41 310 *(General Practitioner 1)*
42
43
44 312 Contrasting this, a few healthcare professionals thought BLW infants could
45
46 consume energy beyond their needs as a result of **poor food choices**:
47
48 314 *Young children arrive here and they're under two eating twisties [an*
49
50 *extruded cereal snack], chocolate biscuits - would BLW be that for some*
51
52 316 *mothers? (Practice Nurse 2)*
53
54
55 318 At the other extreme, some healthcare professionals commented that mothers
56
57 (especially first-time mothers) are often apprehensive about their infant's
58
59 320 growth and compare it to that of other infants and that a "chubby" or "bonny"
60
baby is viewed as healthy even when it reflects overweight or obesity. Some

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healthcare professionals suggested BLW may **increase parental anxiety**. They thought mothers would struggle watching their infant learn to eat, especially at the start when they might eat very little:

Parents expect to see their child growing consistently - linear growth - and if they do not this evokes anxiety. How would you know if the child was eating enough? Parents would not cope with the child playing with food and not eating it. (Practice Nurse 7)

Finally, some healthcare professionals thought BLW would be **messy** and for the mothers and suggested that there would be a lot of food wasted, which many mothers would not tolerate:

I could imagine in the first couple of weeks that the infant wouldn't eat much and that there would be an awful lot of playing and squashing. Some mothers may not be able to cope with this. (Practice Nurse 11)

I would be concerned about the mess and wastage of food. Some of our families live on a very tight food budget and I've seen the mess when doing BLW and I think a lot of food gets wasted." (Well Child Provider 1)

Mothers

The sub-categories that emerged were very consistent across the interviews with mothers.

Most mothers (n=18/20) started BLW when their child was 5.5 - 6 months of age and all mothers had exclusively breastfed their child up until this age. The BLW approach advises mothers to watch for signs of developmental readiness before introducing their child to solid food. However most mothers recalled starting solids at an age based on advice from their healthcare professional or because they were following the WHO guidelines, although a small number (n=2/20) of mothers started solids when their infant started reaching out for food.

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3 The most commonly offered first foods were vegetables (steamed or boiled
4
5 356 pumpkin, potato, kumara (New Zealand sweet potato), broccoli, carrot)
6
7 (n=13/20) and fruit (avocado, banana) (n=11/20). Most mothers (n=16/20)
8 358 reported that their child shared every meal with one or more family
9
10 members. Mothers liked that their child could feed themself with BLW,
11
12 360 however many (n=15/20) also reported some spoon-feeding, although this
13
14 was infrequent or only in unusual circumstances, such as when their child
15 362 was sick. Mothers reported doing this to avoid mess, to increase iron intake
16
17 by spoon-feeding iron-fortified infant cereal, or to increase energy intake
18
19 364 especially when their infant was sick or appeared too tired to self-feed.
20
21
22 366 **Knowledge**
23
24 The majority of mothers defined BLW as having 3 main components: offering
25 368 finger-sized pieces of food, allowing the child to be in control of how much
26
27 they ate, and not spoon-feeding purées:
28
29 370 *Letting your baby lead in terms of the pace and amount of solids*
30
31 *eaten…offering them whole, safe foods when they are physically ready to*
32 372 *feed themselves... keeping milk [breast/formula] as their main food*
33
34 *source until they naturally increase the amount they eat and drop milk*
35 374 *feeds on their own. (Mother 2)*
36
37
38
39 376 Nearly half of the mothers first heard about BLW through a parenting group
40
41 while others had discovered it online or were told about it by their Well-Child
42 378 provider. One mother had not heard of the term "Baby-Led Weaning" but said
43
44 "*it was instinctive*" to offer her child pieces of food and allow them to feed
45
46 380 themself. The majority of mothers obtained their BLW information from
47
48 online sources, drawing on other mothers' experiences through blogs, threads
49 382 and forums.
50
51
52 384 **Attitudes**
53
54 The main reason mothers chose to follow BLW was because it "***made sense***"
55
56 386 and "*seemed logical*". Lifestyle reasons also motivated mothers to follow
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2
3 BLW. They considered that BLW was **less time consuming** and **less**
4
5 388 **expensive** than making puréed food:
6
7 *With three other children, I was way too busy to prepare special foods i.e.*
8 390 *purées and also I didn't want to buy them - they're expensive. (Mother*
9
10 *15)*
11
12 392
13
14 Mothers considered that there were advantages of BLW during the
15 394 complementary feeding period, and also in the future. During the
16
17 complementary feeding period, mothers reported **less meal preparation**
18 396 (the baby ate what the family was eating, there was no purée preparation)
19
20 and **reduced mealtime stress** because they were not spoon-feeding the baby
21
22 398 and eating their own meal simultaneously. Some mothers (n=6/20) reported
23
24 it was liberating that BLW does not include a detailed step-by-step weaning
25 400 protocol and instead **promotes responding to the infant** and thought that
26
27 fewer "rules" made the **transition to food less frightening and**
28 402 **complicated**:
29
30 *With my first child I became so worried about getting the food*
31
32 404 *[purées] to exactly the right consistency. It [BLW] made sense to me,*
33
34 *because she was demand fed so it seemed like the natural*
35 406 *progression. (Mother 8)*
36
37
38
39 408 In addition mothers believed that BLW had encouraged their child to develop
40
41 healthier eating behaviours, for example being **able to respond**
42 410 **appropriately to hunger and satiety cues**, sharing **family meals** and eating
43
44 a **wider variety of foods**:
45
46 412 *I felt it would give my daughter the opportunity to experience, from the*
47
48 *outset, everything that is pleasurable about food, the textures, colours,*
49 414 *individual tastes…a lovely way to have them be a real participant in the*
50
51 *meal – eating what we eat, copying us, and really joining in…not being*
52 416 *fed separately. (Mother 2)*
53
54
55
56 418 Most mothers had no concerns with BLW (n=15/20). Those mothers who did
57
58 have concerns were worried about the appropriateness of certain foods, for
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example raw apple. Current guidelines on types of BLW foods to offer are incomplete and some mothers reported **not knowing what foods to offer** at what age:

> *I wasn't worried but a bit concerned that some of the advice was conflicting e.g. the book says apple is fine and people I've spoken to who have used BLW have said no apples. (Mother 7)*

One mother was concerned about her infant's **iron intake**, so she spoon-fed her infant iron fortified rice cereal daily while following BLW. Other mothers felt that the iron from breast milk would be adequate until the infant started eating high iron meat or meat alternatives:

> *Solids are just a taste and texture thing, breast milk or formula being their main nutrition until 9 months, so don't worry if your baby takes their time adjusting to solids. (Mother 6)*

Nearly all mothers (n=19/20) reported that their infant gagged on food. Some mothers had completed a first aid course prior to their infant starting BLW to equip themselves for dealing with gagging or choking. **Gagging was not a concern** to mothers, instead they considered it was a natural part of a child learning to eat and adapting to new textures that are quite different to milk. Mothers were aware that an infant's gag reflex is much further forward on their tongue when they first start eating and because of this, they understood gagging was highly likely:

> *I felt like I was really prepared, I had read the book [4] so knew about gagging and choking and that mostly it is gagging because the baby's gag reflex is much further forward than an adult's…gagging is a very important learning process. (Mother 12)*

Mothers viewed gagging as an innate safety mechanism that is activated when food has not been sufficiently chewed for swallowing. One parent explained that gagging returned the food to the front of the mouth for further chewing and that if the infant did not gag then the food could cause obstruction and possibly choking.

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Mothers were aware **choking** was a common criticism of BLW, and although most reported that choking did not occur, 30% (n=6/20) reported one or more episodes. Although choking can be very serious, all mothers who reported choking (n=6/20) reported that the infant independently dealt with the choking by expelling the food from their mouth through coughing and mothers did not have to intervene with first aid. All mothers who could recall the food that was responsible (n=4/6) reported that raw apple was the food their infant had choked on. Mothers expressed feeling more relaxed around four weeks after introducing complementary foods; they saw that their infant could manage different textures, and was developing more coordinated eating skills. Mothers also felt that by this time the difference between gagging and choking was more obvious and that they realised it was mostly gagging.

Many of the mothers reported that **mealtime mess** was the main disadvantage of BLW. Infants were able to pick up their food and "squash, smear and throw it". Some mothers were apprehensive about their infant eating in public or at other people's homes because of the mess. Mess was more of a problem in the early phases of BLW when the infant had not mastered the coordination skills needed to get food to their mouth, and mothers said as the level of skill improved the mess declined. Mothers who also had experience with the conventional method of starting solids thought finger foods and self-feeding were messy whatever the age:

> *As someone who's done it both ways [BLW and spoon-feeding], I think they're both pretty messy and wasteful! (Mother 5)*

Some mothers recalled feeling impatient during the first month of BLW as their infant, while learning to eat, could spend **long periods of time at the table** and appear to be "*playing with food*". Additionally mothers reported that **some family meals were not appropriate** for their baby and that at these times knowing what to offer the infant was a challenge:

> *I struggled with the "baby eats what the family eats" concept... Most of what we really eat has a lot of salt, sugar, sauces, etc in it, and it takes*

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1
2
3 work to think of how to adjust it or intervene in the cooking process to fit
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5 486 baby. (Mother 5)
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7
8 488 Mothers recalled encountering both positive and negative experiences during
9
10 the BLW period, however all the mothers concluded that they would
11
12 490 recommend BLW to other mothers:
13
14 *I couldn't imagine any other way of introducing solids and will certainly*
15 492 *do BLW with any future children. I think the fact that our son has*
16
17 *control over eating means that he doesn't have to fight for control…food*
18
19 494 *is not a battleground here. (Mother 19)*
20
21
22 496 Two mothers added that they would recommend supplementing BLW with
23
24 some spoon-feeding for reassurance about nutrients:
25 498 *I say to people to use a combination. I felt good about this because she*
26
27 *was able to explore food and learn about it but at the same time get the*
28
29 500 *nutrients that she needed. (Mother 15)*
30
31
32 502 **Experiences**
33
34 Table 3 presents practical recommendations mothers offered for overcoming
35 504 challenges when using BLW.
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37
38
39 506

Table 3 Practical recommendations from mothers for successful Baby-Led Weaning

Practical recommendation	Supporting quote
Place a large cloth under the infant's highchair to collect spilled food - the cloth could be shaken outside and washed in the machine.	*"Prepare for mess with bibs, strip the child, messy mats, have a washcloth handy, a hungry dog to eat scraps helps too and then relax and let them go for it."*
Use full cover (sweatshirt) bibs.	
In the warmer (summer) months the family could try eating outside.	

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Put the infant in their highchair with their nappy on. Then follow with a bath to wash off any food mess.	
Put infant in the highchair in the kitchen so they can begin their meal while the family meal is being prepared and interact with them while they are eating.	*"Watch your baby but don't interfere, I wouldn't like someone picking food off my plate and putting it into my mouth because they thought I was eating too slowly. Not to worry too much about quantities – remembering that milk is still on offer."*
Seek advice from parenting groups and others doing BLW. Collect and share food and recipe ideas.	*Sometimes you get stuck for ideas of what to offer and talking to others doing BLW can get the creativity going again... It's amazing how many ways there are to cook and present food.*
Mothers, whether following BLW or not, should complete a first aid course. This should teach the difference between gagging and choking, and can improve confidence for dealing with choking (if it occurs).	*"Go to a first aid course, preferably one targeted at parents. This will give you confidence to deal with choking if it happens."*
Have realistic expectations about mess and your infant's eating progress. Mothers need to appreciate that starting solids is a transition period which may last many months.	*"Don't think that things will be heaps easier in the short-term than the conventional way. A baby with finger food will still need a lot of support, because they'll drop things a lot and need you to pick them up."*
Try and enjoy the BLW experience by allowing the baby to explore food and have fun with eating.	*"Don't stress about the quantities they eat, the mess they make or the seemingly frequent gagging episodes."*

DISCUSSION

Although anecdotal reports suggest that the use of BLW is increasing, fewer than half of the healthcare professionals in the current study had heard about this approach. Those who were aware of BLW had limited knowledge of the details and were not aware of all the practices promoted as part of BLW. [4,5] Healthcare professionals suggested potential benefits of BLW (greater opportunity for shared family meal times, fewer mealtime battles, healthier eating behaviours, greater convenience, and possible developmental advantages) but most felt reluctant to recommend it because of their concern

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about the potential increased risk of choking. Most healthcare professionals had not seen BLW in action and therefore had difficultly understanding how a 6-month-old infant could possess the mastication and coordination skills needed to safely manage whole pieces of food.

Overall, mothers reported that using BLW had been a positive experience, that they recommended it to other mothers, and would follow it again if they had another child. Interestingly, many of the mothers in this study did not follow BLW strictly as outlined by Rapley [4]. Although they generally embraced BLW techniques, many also reported using a small amount of spoon-feeding. This suggests that, in practice, many parents following a BLW approach are probably somewhere along the continuum of some spoon-feeding to total self-feeding, albeit much more at the latter end. As well as it being described as the *"logical way"* to introduce complementary foods, mothers reported that BLW was less time consuming, involved less meal preparation, caused less stress, and resulted in fewer mealtime battles. Although some mothers struggled with drawn out mealtimes and the food mess created by the self-feeding infant, these disadvantages did not discourage these mothers from following BLW. Furthermore, mothers who had previously used the conventional method (spoon-feeding purées) with one of their older children considered both approaches (BLW and conventional) to be messy.

Healthcare professionals and mothers' attitudes toward BLW were similar, in some respects. Both agreed that BLW may promote shared family meals, reduce mealtime battles, and be more convenient than spoon-feeding purées, they also agreed that the mess produced when an infant self-feeds could be substantial. Furthermore, both groups considered BLW could encourage healthier eating patterns, including better self-regulation of energy intake. However, there were some noticeable differences in the attitudes of the two groups, particularly concerning safety and nutrient sufficiency. Healthcare professionals had serious concerns about potential choking and low iron intake, as well as the ability of an infant to self-feed at 6 months. Although

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2
3 some mothers had considered the potential problems raised by healthcare
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5 552 professionals they were not as concerned by these. Moreover, they reported
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7 that these concerns decreased as they followed BLW and their baby appeared
8 554 happy and healthy.
9
10
11
12 556 The healthcare professionals' concern about a possible increased risk of
13 choking aligns with opinions expressed by other healthcare professionals.[5]
14
15 558 [22,23] Choking is more likely with very hard foods such as raw apple or
16
17 round coin-shaped foods such as sausage. [24] Children develop the ability to
18
19 560 chew before they develop the ability to hold food in their mouth or to move it
20 backwards for swallowing. [25] At about 6 months of age, infants develop a
21
22 562 munching type oral-motor action; this movement, in conjunction with the
23 ability to sit unsupported, promotes swallowing of thicker, chunkier pieces of
24
25 564 food. [26] The founder of BLW, Gill Rapley, disputes that a healthy 6-month-
26
27 old infant would be at increased risk of choking with BLW. [4,5] Rapley
28
29 566 acknowledges gagging is common with BLW because at 6 months of age the
30 baby's gag reflex is further forward on their tongue than it is at 1 year. [5]
31
32 568 However, based on her personal observations, Rapley considers choking is
33 more likely with spoon-feeding because the baby learns to use suction to take
34
35 570 the purée from the spoon, which causes food to be taken to the back of the
36
37 throat where it is swallowed, encouraging the infant to learn to swallow food
38
39 572 without chewing first. [5]
40
41
42 574 Interestingly most mothers in the current study were not concerned about
43
44 choking. Although some had initial concerns, these quickly diminished when
45
46 576 they witnessed how proficient their infant was at bringing food forward and
47 expelling it out of their mouth if needed, and all mothers felt prepared for
48
49 578 dealing with a choking incident if it happened. Others have reported similar
50
51 findings with mothers following BLW initially being concerned about choking
52
53 580 but over time becoming less nervous and more able to distinguish between
54 the action of gagging to move food and actual choking. [27] Furthermore
55
56 582 93.5% of the BLW group in the recent study by Townsend and Pitchford[9]
57
58 reported never having experienced a choking incident. It is of concern,
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however, that in the current study, 30% of mothers reported at least one choking incident, most with raw apple. No serious incidents were reported and this raises the question of whether mothers correctly identified choking or whether they had instead witnessed the less serious action of gagging. However, given that raw apple was the cause of most reported choking incidents, and fulfills the criteria of a high-risk food, being hard and in small pieces when bitten, it would be sensible to discourage parents who are following BLW from offering raw apple to their infant.

Healthcare professionals expressed concern about whether BLW infants would be able to consume sufficient iron. In New Zealand, spoon-feeding iron-fortified baby rice cereal is a popular way for mothers to increase their infant's iron intake. Healthcare professionals in this study quickly recognized that this would not be possible with BLW and they speculated that this would put the infant at risk of suboptimal iron status, which is already a concern for many New Zealand infants (6.9% having iron deficiency anaemia, and a further 12.5% having suboptimal iron status[28]). Most mothers in the present study believed that the breast milk their infant was receiving would supply enough iron until meat or other high-iron meat alternatives were introduced. Similarly, mothers from Brown and Lee[27] were not concerned about iron intake. Although healthy, term, normal birth weight infants are considered to obtain enough iron from their mother's breast milk and from the redistribution of iron from haemoglobin to iron stores during the first six months of life, [29] from six months of age, iron becomes a critical nutrient and all infants should receive iron-rich complementary foods such as meat, meat alternatives or iron-fortified foods. [2,29] [30-32]

Many of the healthcare professionals were not convinced that a 6-month old infant could eat enough to keep pace with growth when self-feeding, particularly in the early days of complementary feeding. Only one study appears to have examined this, and suggested that there may be an increased incidence of underweight in BLW children (3/63) compared to spoon-fed children (0/63), although most children were of normal weight, and as

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acknowledged by the authors, the numbers were small, and the cases and
618 controls drawn from different populations. It has been suggested that purées
(which are frequently made of fruit or vegetables and thinned down with
620 water or milk) are often very low in energy, meaning that the small volume of
purées typically consumed in the early weeks would contribute relatively
622 little to meeting a conventionally fed infant's nutrient requirements. [7] In
contrast, finger foods, if carefully chosen, can be very nutrient dense, so an
624 infant who appears to be eating little when self-feeding may potentially be
closer to meeting their nutrient requirements. [7] Only one parent in the
626 current study reported being concerned about her child being able to eat
enough, although many mothers reported spoon-feeding their infant at times
628 when they were potentially at greater risk of under eating, i.e. when they
were unwell or very tired. Because of the nature of this self-selected sample it
630 is possible that mothers with concerns about this issue may have
discontinued or chosen not to follow BLW. At this point, no research has
632 examined the actual food and nutrient intake of children following a BLW
approach compared with a more traditional method of infant feeding.
634

The healthcare professionals and mothers who took part in the current study
636 were self-selected. Furthermore, the sample size was small. Although this
study is not intended to present representative results given its qualitative
638 nature, participants were recruited in a number of different ways, and the
interviews were continued until well after saturation for both healthcare
640 professionals and mothers, suggesting that the majority of views of BLW in
these groups are likely to have been captured. The first author conducted the
642 content analysis of the transcripts, and although the co-authors discussed the
interpretation of individual participant quotes, they did not conduct a
644 separate full analysis of the transcripts. However, we consider that this was
sufficient to ensure that the findings are trustworthy, both because our aim
646 was to capture manifest (i.e. description of the visible, obvious components),
rather than latent (i.e. interpretation of underling meaning) content [33], and
648 because we have provided direct participant quotes for each sub-category so
that the reader can judge for themselves the appropriateness of the coding.

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5 Although there was some agreement between healthcare professionals and
6 652 mothers that BLW was likely to lead to more shared family meals, fewer
7
8 mealtime battles, potentially healthier eating patterns, and to be more
9
10 654 convenient, although messy, the healthcare professionals were, overall,
11
12 reluctant to recommend the method. They were concerned that BLW could
13 656 potentially increase choking and adversely affect the infant's iron status and
14
15 energy intake. In this context, it is interesting that the UK Department of
16
17 658 Health has supported the inclusion of some hand-held first foods in their most
18
19 recent recommendations for infant feeding. [34,35] Undoubtedly, further
20 660 research of BLW is warranted especially concerning its potential to positively
21
22 influence eating behaviours, as well as its safety and nutrient sufficiency. In
23 662 the meantime, the current study suggests that healthcare professionals
24
25 should specifically discourage mothers who plan to use, or are using, BLW
26
27 664 from offering raw apple.
28
29
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31
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34
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36
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38
39 was responsible for the analysis and interpretation of the data. SC wrote the
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41
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48
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50
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52
53 Ethics Committee.
54 680 **Provenance and peer review** Not commissioned.
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56 **Data sharing statement** No additional data are available.
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1
2
3 **REFERENCES**
4 684
5
6

686 1. World Health Organization. Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. 688 Geneva, Switzerland: World Health Organization, 2009.

2. Ministry of Health. *Food and Nutrition Guidelines for Healthy Infants and* 690 *Toddlers (Aged 0-2): A background paper (4th Ed)*. Wellington: Ministry of Health, 2008.

692 3. Department of Health (DoH). *Infant Feeding*. London, UK: Department of Health, 2003.

694 4. Rapley G, Murkett T. *Baby-Led Weaning: Helping your child love good food*. London: Vermilion, 2008.

696 5. Rapley G. Baby-led weaning: transitioning to solid foods at the baby's own pace. *Community Pract* 2011;84(6):20-23.

698 6. Sachs M. Baby-led weaning and current UK recommendations - are they compatible? *Matern Child Nutr* 2011;7:1-2.

700 7. Wright CM, Cameron K, Tsiaka M, Parkinson KN. Is baby-led weaning feasible? When do babies first reach out for and eat finger foods? 702 *Matern Child Nutr* 2011;7(1):27-33.

8. Brown A, Lee M. Maternal control of child feeding during the weaning 704 period: differences between mothers following a baby-led or standard weaning approach. *Matern Child Health J* 2011;15(8):1265-71.

706 9. Townsend E, Pitchford N. Baby knows best? The impact of weaning style on food preferences and body mass index in early childhood in a case– 708 controlled sample. *BMJ Open* 2012;2:1.

10. Abel S, Park J, Tipene-Leach D, Finau S, Lennan M. Infant care practices in 710 New Zealand: a cross-cultural qualitative study. *Soc Sci & Med* 2001;53(9):1135-48.

712 11. Campbell ND, Soeken KL, Rankin EAD. Infant Weaning Patterns and Related Maternal-Infant Health Outcomes. *Public Health Nurs* 714 1986;3(1):57-63.

12. Arden MA. Conflicting influences on UK mothers' decisions to introduce 716 solid foods to their infants. *Matern & Child Nutr* 2010;6(2):159-73.

13. Wright C, Parkinson K, Drewett R. Why are babies weaned early? Data 718 from a prospective population based cohort study. *Arch Dis Child* 2004;89(9):813-16.

720 14. Hellings P, Howe C. Assessment of Breastfeeding Knowledge of Nurse Practitioners and Nurse-Midwives. *J Midwifery Womens Health* 722 2000;45(3):264-70.

15. Freed GL, Clark SJ, Lohr JA, Sorenson JR. Pediatrician involvement in 724 breast-feeding promotion: a national study of residents and practitioners. *Pediatrics* 1995;96(3 Pt 1):490-4.

726 16. Freed GL, Clark SJ, Sorenson J, Lohr JA, Cefalo R, Curtis P. National assessment of physicians' breast-feeding knowledge, attitudes, 728 training, and experience. *JAMA* 1995;273(6):472-6.

17. Schanler RJ, O'Connor KG, Lawrence RA. Pediatricians' practices and 730 attitudes regarding breastfeeding promotion. *Pediatrics* 1999;103(3):E35.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

18. Brown A, Lee M. A descriptive study investigating the use and nature of baby-led weaning in a UK sample of mothers. *Matern Child Health J* 2011;7(1):34-47.
19. Patton MQ. *Qualitative Research and Evaluation Methods*. 3rd ed. Thousand Oaks, California Sage Publications, Inc., 2002.
20. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qualitative health research* 2005;15(9):1277-88.
21. Kondracki NL, Wellman NS, Amundson DR. Content analysis: review of methods and their applications in nutrition education. *Journal of nutrition education and behavior* 2002;34(4):224-30.
22. Dietitians NZ Paediatric SIG convenor. Dietitians NZ Paediatric Special Interest Group Newsletter. In: NZDA, editor. May ed, 2010.
23. Rowell K and Becker H. baby-led-weaning-or-starting-solids-book-review-and-nutritionist-weighs-in-with-her-7-month-old-daughter. http://thefeedingdoctor.com, 2011.
24. Byard RW, Gallard V, Johnson A, Barbour J, Bonython-Wright B, Bonython-Wright D. Safe feeding practices for infants and young children. *J Paediatr Child Health* 1996;32(4):327-9.
25. Naylor A, Morrow A. *Developmental readiness of normal full term infants to progress from exclusive breastfeeding to the introduction of complementary foods: reviews of the relevant literature concerning infant immunologic, gastrointestinal, oral motor and maternal reproductive and lactational development*. Washington DC: Wellstart International, LINKAGES Project Academy for Educational Development, 2001.
26. Pridham KF. Feeding behavior of 6-to 12-month-old infants: Assessment and sources of parental information. *J Pediatr* 1990;117(2(Pt 2)):S174-80.
27. Brown A, Lee M. An exploration of experiences of mothers following a baby-led weaning style: developmental readiness for complementary foods. *Matern Child Health J* 2011.
28. Soh P, Ferguson EL, McKenzie JE, Homs MY, Gibson RS. Iron deficiency and risk factors for lower iron stores in 6-24-month-old New Zealanders. *Eur J Clin Nutr* 2004;58(1):71-79.
29. Domellof M. Iron requirements in infancy. *Ann Nutr Metab* 2011;59(1):59-63.
30. Leong W-I, Lönnerdal B. Iron Nutrition. In: Anderson G, McLaren G, editors. *Iron Physiology and Pathophysiology in Humans*: Humana Press, 2012:81-99.
31. Kramer MK, R. Optimal duration of exclusive breastfeeding. *Cochrane database of systematic reviews* 2002(1):CD003517.
32. World Health Organization. Guiding Principles For Complementary Feeding of the Breastfed Child. Geneva, Switzerland, 2004.
33. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today* 2004;24(2):105-12.
34. Department of Health. Start4Life: No Rush to Mush. http://www.nhs.uk/start4life/pages/no-rush-to-mush.aspx, 2009.

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47
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55
56
57
58
59
60

780 35. National Health Service (NHS). Your baby's first solid foods.
http://www.nhs.uk/Conditions/pregnancy-and-baby/Pages/solid-
782 foods-weaning.aspx: NHS, 2011.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2,3&4
Objectives	3	State specific objectives, including any prespecified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	2&5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	N/A
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5&6
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	6&7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	N/A
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	N/A
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	N/A
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	N/A
Results			

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Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	N/A
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	21
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18-21
Generalisability	21	Discuss the generalisability (external validity) of the study results	21-22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	22

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Healthcare professionals' and mothers' knowledge of, attitudes to, and experiences with, Baby-Led Weaning: a content analysis study

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Healthcare professionals' and mothers' knowledge of, attitudes to, and experiences with, Baby-Led Weaning: a content analysis study

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Key words Healthcare professionals, mothers, complementary feeding, baby-led weaning.
Word count = 4609

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ABSTRACT

Objective: Baby-Led Weaning (BLW) is an alternative approach for introducing complementary foods to infants that emphasizes infant self-feeding rather than adult spoon-feeding. Here we examined healthcare professionals' and mothers' knowledge of, attitudes to, and experiences with, BLW.

Design, setting and participants: Healthcare professionals (n=31) and mothers who had used BLW (n=20) completed a semi-structured interview using one of two tailored interview schedules examining their knowledge of, attitudes to, and experiences with, BLW. Interview notes and transcripts were analysed using content analysis to identify sub-categories and extract illustrative quotes.

Results: Healthcare professionals had limited direct experience with BLW and the main concerns raised were the potential for increased risk of choking, iron deficiency, and inadequate energy intake. Although they suggested a number of potential benefits of BLW (greater opportunity for shared family meal times, fewer mealtime battles, healthier eating behaviours, greater convenience, and possible developmental advantages) most felt reluctant to recommend BLW because of their concern about the potential increased risk of choking. By contrast, mothers who had used this style of feeding reported no major concerns with BLW. They considered BLW to be a healthier, more convenient and less stressful way to introduce complementary foods to their infant and recommended this feeding approach to other mothers. Although mothers did not report being concerned about choking, 30% reported at least one choking episode – most commonly with raw apple.

Conclusion: Given the lack of research on BLW, further work is needed to determine whether the concerns expressed by healthcare professionals and potential benefits outlined by mothers are valid. The current study suggests there is mismatch between healthcare professionals and parents knowledge of, attitudes to and experiences with BLW.

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ARTICLE SUMMARY

Article focus

- Healthcare professionals are an important source of information for mothers during the complementary feeding period.
- The literature suggests that there is a mismatch between healthcare professionals' and mothers' knowledge and attitudes to infant feeding.
- Baby-Led Weaning (BLW) is an alternative approach for introducing complementary foods to infants that is becoming increasingly popular with mothers.

Key messages

- Healthcare professionals identified a number of potential benefits of BLW including more shared family meals, promotion of healthier eating behaviours and greater convenience for mothers. However, healthcare professionals also had strong concerns about the risk of iron deficiency, inadequate energy intake and choking, and as a result most felt reluctant to recommend it.
- Mothers who had practised BLW reported more benefits and had fewer concerns about BLW than healthcare professionals.
- Some parents reported offering raw apple to their infant when they were following BLW. This practice should be discouraged because raw apple is a choking hazard at this age.

Strengths and limitations of this study

- This is the first study to interview healthcare professionals about BLW.
- The healthcare professionals and mothers were self-selected.

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INTRODUCTION

Traditionally the method of infant feeding recommended to mothers in most developed countries, including the United Kingdom and New Zealand, has been to spoon-feed the infant puréed food before moving on to mashed and finger foods as the child grows. [1-3] Recently an alternative approach, known as Baby-Led Weaning (BLW), has emerged [4,5] and anecdotal evidence suggests that many mothers are attempting BLW. [6] Baby-Led Weaning recommends that instead of spoon-feeding, mothers encourage their infant to self-feed, from about six months of age. Although infants following the more traditional method of infant feeding may be offered finger foods, in many countries, including New Zealand, it is recommended that this does not occur until 8-9 months of age, long after the introduction of puréed food. By contrast, BLW, in its purest form, does not include any spoon-feeding by the adult. The infant is only offered pieces of whole food, appropriately prepared, so that the infant can feed themselves right from the start of the complementary feeding period.

The small body of existing research suggests that BLW is feasible for most 6-month old infants from a motor development point of view. [7] It also suggests that BLW is associated with lower levels of maternal anxiety, restriction, pressure to eat and monitoring during the complementary feeding period; [8] and perhaps healthier eating patterns and BMI. [9] However, in the absence of any longitudinal or randomized controlled trial data, it is not possible to determine whether these associations are causal.

Healthcare professionals are an important source of information for mothers during the complementary feeding period, and can potentially have as much influence on decisions around milk feeding and introducing solids as cultural values or material resources. [10,11] However, healthcare professionals' knowledge and attitudes about infant feeding often differ from those of mothers. [12,13]

Previous studies on healthcare professionals' knowledge and attitudes

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towards infant feeding have focused on milk feeding or timing of the introduction of complementary food. [14-17] To date no study has examined attitudes to BLW in healthcare professionals working with young families.

The aim of this content analysis study was to examine the knowledge of, attitudes to, and experiences with, BLW of healthcare professionals and of mothers who had used this style of feeding with their infant.

METHODS

Participants

The participants were 31 healthcare professionals who were working with infants and families, and 20 mothers who had used BLW when introducing solids to their infant. Mothers could be part of the study if they considered that they had used BLW, so BLW was self-defined.

Participants were recruited by word of mouth (healthcare professional peer-to-peer networks, parenting groups, La Leche League), email "snowballing", or newspaper advertising. Twelve parenting groups were approached as a starting point to recruit directly mothers who had tried BLW and to commence snowballing. Parenting groups were SPACE (supporting parenting and child education) groups established to assist mothers (usually first-time mothers) with all aspects of parenting young children, and were not specifically advocators of BLW, although BLW was a topic addressed through out the parenting program. Recruitment of the health professionals was undertaken via established clinical relationships, and via snowballing through practice nurses. The study was approved by the Human Ethics Committee of the University of Otago, Dunedin, New Zealand.

Data collection

The data were collected during 2010 in Dunedin, New Zealand. Healthcare professionals were interviewed at their place of work and mothers in their own home. The same researcher (SC) conducted all interviews, which typically lasted 1 - 1.5 hours. Field notes were taken during the interviews

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3 with healthcare professionals and extended immediately following the
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5 158 meeting. Interviews with mothers were tape-recorded and transcribed
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7 verbatim.
8 160
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10 Interview schedule and process
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12 162 Two interview schedules, one for health professionals and one for parents,
13 were developed from the existing literature about BLW [7,8,18] and the
14
15 164 expert opinion of the authors (Table 1 and Table 2). As some healthcare
16
17 professionals had not heard of BLW, a brief description of BLW was given at
18
19 166 the start of the interview when necessary.
20
21
22 168 We used a semi-structured interview as outlined in Patton [19] to include, in
23
24 the first part, a structured framework to cover the same basic lines of inquiry
25
26 170 around knowledge, attitudes and experiences, for which participants could
27
28 express their own ideas and understandings. The second part of the interview
29
30 172 followed an unstructured format to allow for probing and further questioning
31 of ideas or individual circumstances that were not included in the original
32
33 174 interview outline.
34
35

Table 1 Questions used in interviews with healthcare professionals
1. What is your professional role?
2. Have you heard of Baby-led Weaning (BLW)?
3. Where did you hear about BLW?
4. When did you hear about BLW?
5. If somebody asked you what BLW is, how would you describe it?
6. What do you think of BLW as an alternative method for introducing solid foods to infants?
7. Do you consider there may be benefits of BLW?
8. Do you consider there may be disadvantages of BLW?
9. Do you have any concerns about BLW?

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Table 2 Questions used in interviews with mothers who had used Baby-Led Weaning
1. If someone asked you: "What is Baby-Led Weaning (BLW)?" what would you tell them?
2. How did you hear about BLW?

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3. Why did you decide to try BLW?
4. How old was your baby when you started BLW?
5. How old is she now?
6. How much of her food do you feed her and how much does she feed herself?
7. Where did/do you get most of your information about BLW?
8. What were the first foods you offered your baby?
9. What form were the foods in that you first offered your baby?
10. Were there any foods you avoided because you were using BLW?
11. Did your baby eat at the same time as the rest of the family?
12. Do you think your baby is a fussy or picky eater?
13. Were you worried about BLW in any way?
14. Did your baby gag on food?
15. Was it food she had fed herself?
16. Did your baby ever choke on food?
17. Was it food she had fed herself?
18. Do you consider there were advantages of BLW for you and your baby?
19. Do you consider there were disadvantages of BLW for you and your baby?
20. Overall, do you think BLW worked for you and your baby?
21. Would you recommend other mothers try BLW?
22. Do you have any useful tips for other mothers trying BLW?

NB: "She" or "he" was used appropriately for the sex of the child.

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Data analysis

180 The main lines of inquiry (knowledge, attitudes and experiences) from the interviews were used as an initial guide in a directed content analysis [20],
182 and are referred to here as categories. Content analysis [19] was performed on all interviews by reviewing all transcripts several times for recurring sub-
184 categories (reviewing the two groups separately). Sub-categories were identified from manifest content (the visible, obvious components) [21],
186 because the aim was to extract and report on the descriptive level of content and not to provide a deep level of interpretation and underlying meaning.
188 Participants were recruited until we reached saturation of sub-categories, and we ensured that sub-categories were, as far as possible, defined so that
190 they were exhaustive and mutually exclusive. Data analysis was led by one member of the research team (SC); and interpretation was verified during
192 research team meetings (with RWT and ALH) to scrutinise sub-categories as

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1
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3 they were identified. Each category and its sub-categories have been
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5 194 summarized, and illustrative quotes are included.
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RESULTS

9 Thirty-one healthcare professionals were interviewed, comprising: practice
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11 198 nurses (n=11), Well-Child providers (a government funded service
12
13 supporting families with young children and assessing health status, see:
14 200 http://www.wellchild.org.nz/) (n=4), dietitians (n=4), general practitioners
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16 (n=5), paediatricians (n=2), lactation consultants (n=2), midwives (n=2), and
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18 202 a paediatric Speech-Language Therapist (n=1). The mothers were twenty
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20 mothers who had a child aged 8 – 24 months (mean=13 months).
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Healthcare Professionals

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25 206 The sub-categories that emerged were remarkably consistent across the
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27 interviews with healthcare professionals.
28 208
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30 Knowledge
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32 210 Nearly half (n=13/31) of the healthcare professionals had heard about BLW.
33 Most of these had been introduced to the concept by their colleagues or
34
35 212 friends and family (rather than patients). The healthcare professionals who
36
37 knew about BLW described it as the child feeding themself whole foods,
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39 214 instead of being spoon-fed purées. There was little discussion of other aspects
40 of BLW.
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42 216
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44 Attitudes
45 218 All healthcare professionals considered that BLW could be beneficial for the
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47 family and the child.
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51 Healthcare professionals considered that shared family mealtimes would be
52 222 the main advantage of BLW. They were aware of the nutritional and
53
54 psychological benefits of family meals and they envisaged family mealtimes
55 224 would be easier and more pleasant with BLW:
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> *The best thing is that an adult can eat their meal while the child is*
226 *having theirs. There's no juggling trying to feed the baby while shoving a spoonful for yourself. (General Practitioner 3)*

228

Some healthcare professionals thought mealtime battles would be less likely
230 with BLW for two reasons: mothers would have an alternative approach to try if their child refused to be spoon-fed; and because BLW allows the child to
232 eat at their own pace and stop when they have had enough, they would not be "*bribed*" or "*forced*" to eat food:

234 *I think it's healthier that the baby is in control of what they eat… and you aren't forcing them to eat...there's far too many of us who just finish our*
236 *plates instead of stopping when we are full. (Dietitian 2)*

238 Overall, healthcare professionals thought BLW would encourage healthier dietary behaviours by promoting a wider variety of foods and allowing the
240 child to explore and learn about food at their own pace:

> *Being able to look at it, hold it and see it as food, instead of slop must*
242 *have advantages? (Paediatrician 2)*

244 They also considered BLW would encourage better appetite and self-regulation skills, as mothers would be less able to control the child's food
246 intake. They saw similarities between BLW and breastfeeding on demand and thought the two would complement each other well.

248

A number of healthcare professionals who had children of their own thought
250 BLW would be more convenient than the conventional method of spoon-feeding purées:

252 *It sounds so much easier. Making purées is time consuming, and then they hardly eat anything and you have to throw it all out or you buy*
254 *those jars of food, which are really expensive. (Dietitian 4)*

256 Healthcare professionals suggested two developmental advantages: BLW might encourage better oral and chewing skills because the child is offered

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pieces of food to eat so they may have more opportunity to develop their mouth and jaw movements instead of sucking food from a spoon as they do with purées; and enhanced fine motor skills as the child has greater opportunities to manipulate food with their fingers and practice their fine motor movements:

> *The BLW method could have real advantages for coping with food and learning to eat i.e. for oral development. If babies are fed purées for too long they miss important windows for introducing different food textures. (Speech-Language Therapist 1)*

> *There must be some sort of fine motor benefits for baby being able to play, essentially, with its food. (General Practitioner 5)*

However, in addition to these potential benefits, strong concerns about BLW were also expressed.

Choking was a major concern expressed by many of the healthcare professionals, particularly those who had not observed BLW. The potential risk of choking meant most healthcare professionals felt reluctant to recommend BLW:

> *The potential for choking would make me feel very hesitant about giving my child whole food at 6 months. As a health professional I'd need to see some sound evidence before I could endorse this method [BLW]. (Dietitian 2)*

The specific concerns voiced regarding choking were that a 6 month old infant would not be developmentally ready to chew whole pieces of food and that mothers may leave the infant alone in their highchair with their food. Additionally healthcare professionals considered that mothers may become competitive about their infant's BLW progress, considering that their child is more advanced if they have certain foods or a greater variety of foods earlier than other children, and therefore might be motivated to offer unsafe foods that would increase the child's risk of choking:

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Just give the baby that food, she'll be fine. Sometimes it's almost like a challenge to see how they cope, another one of those competitive parenting things…oh look she's eating raw carrot at age 6 months. (Dietitian 1)

However, one healthcare professional considered that BLW may work well for parents whose infant experiences feeding problems when spoon-feeding is used:

I know of similar feeding methods which are often used with children whose parents are having feeding difficulties with spoon-feeding and these can work very well. (Speech-Language Therapist 1)

Healthcare professionals considered that there were two possible dietary disadvantages with BLW: the potential for growth faltering, and for poor iron status. There was concern that adopting BLW would mean forgoing any iron-fortified infant cereal, and that a BLW diet would comprise low-energy low-iron fruits and vegetables and include very few iron-rich foods. In addition to low-energy foods, clumsy self-feeding (particularly at the beginning of BLW) might lead to growth faltering.

"The two parents I know who have chosen BLW are offering only fruits and vegetables...Although fruits and vegetables are great foods, babies need more nutrients... So I wonder how they would get these [nutrients] if they were only having fruits and vege...nutrients could be limited..." (General Practitioner 1)

Contrasting this, a few healthcare professionals thought BLW infants could consume energy beyond their needs as a result of poor food choices:

Young children arrive here and they're under two eating twisties [an extruded cereal snack], chocolate biscuits - would BLW be that for some mothers? (Practice Nurse 2)

At the other extreme, some healthcare professionals commented that mothers (especially first-time mothers) are often apprehensive about their infant's

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growth and compare it to that of other infants and that a "chubby" or "bonny" baby is viewed as healthy even when it reflects overweight or obesity. Some healthcare professionals suggested BLW may increase parental anxiety. They thought mothers would struggle watching their infant learn to eat, especially at the start when they might eat very little:

Parents expect to see their child growing consistently - linear growth - and if they do not this evokes anxiety. How would you know if the child was eating enough? Parents would not cope with the child playing with food and not eating it. (Practice Nurse 7)

Finally, some healthcare professionals thought BLW would be messy and for the mothers and suggested that there would be a lot of food wasted, which many mothers would not tolerate:

I could imagine in the first couple of weeks that the infant wouldn't eat much and that there would be an awful lot of playing and squashing. Some mothers may not be able to cope with this. (Practice Nurse 11)

I would be concerned about the mess and wastage of food. Some of our families live on a very tight food budget and I've seen the mess when doing BLW and I think a lot of food gets wasted." (Well Child Provider 1)

Mothers

The sub-categories that emerged were very consistent across the interviews with mothers.

Most mothers (n=18/20) started BLW when their child was 5.5 - 6 months of age and all mothers had exclusively breastfed their child up until this age. The BLW approach advises mothers to watch for signs of developmental readiness before introducing their child to solid food. However most mothers recalled starting solids at an age based on advice from their healthcare professional or because they were following the WHO guidelines, although a

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small number (n=2/20) of mothers started solids when their infant started reaching out for food.

The most commonly offered first foods were vegetables (steamed or boiled pumpkin, potato, kumara (New Zealand sweet potato), broccoli, carrot) (n=13/20) and fruit (avocado, banana) (n=11/20). Most mothers (n=16/20) reported that their child shared every meal with one or more family members. Mothers liked that their child could feed themself with BLW, however many (n=15/20) also reported some spoon-feeding, although this was infrequent or only in unusual circumstances, such as when their child was sick. Mothers reported doing this to avoid mess, to increase iron intake by spoon-feeding iron-fortified infant cereal, or to increase energy intake especially when their infant was sick or appeared too tired to self-feed.

Knowledge

The majority of mothers defined BLW as having 3 main components: offering finger-sized pieces of food, allowing the child to be in control of how much they ate, and not spoon-feeding purées:

> *Letting your baby lead in terms of the pace and amount of solids eaten…offering them whole, safe foods when they are physically ready to feed themselves... keeping milk [breast/formula] as their main food source until they naturally increase the amount they eat and drop milk feeds on their own. (Mother 2)*

Nearly half of the mothers first heard about BLW through a parenting group while others had discovered it online or were told about it by their Well-Child provider. One mother had not heard of the term "Baby-Led Weaning" but said "*it was instinctive"* to offer her child pieces of food and allow them to feed themself. The majority of mothers obtained their BLW information from online sources, drawing on other mothers' experiences through blogs, threads and forums.

Attitudes

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The main reason mothers chose to follow BLW was because it "*made sense*" and "*seemed logical*". Lifestyle reasons also motivated mothers to follow BLW. They considered that BLW was less time consuming and less expensive than making puréed food:

With three other children, I was way too busy to prepare special foods i.e. purées and also I didn't want to buy them - they're expensive. (Mother 15)

Mothers considered that there were advantages of BLW during the complementary feeding period, and also in the future. During the complementary feeding period, mothers reported less meal preparation (the baby ate what the family was eating, there was no purée preparation) and reduced mealtime stress because they were not spoon-feeding the baby and eating their own meal simultaneously. Some mothers (n=6/20) reported it was liberating that BLW does not include a detailed step-by-step weaning protocol and instead promotes responding to the infant and thought that fewer "rules" made the transition to food less frightening and complicated:

With my first child I became so worried about getting the food [purées] to exactly the right consistency. It [BLW] made sense to me, because she was demand fed so it seemed like the natural progression. (Mother 8)

In addition mothers believed that BLW had encouraged their child to develop healthier eating behaviours, for example being able to respond appropriately to hunger and satiety cues, sharing family meals and eating a wider variety of foods:

I felt it would give my daughter the opportunity to experience, from the outset, everything that is pleasurable about food, the textures, colours, individual tastes…a lovely way to have them be a real participant in the meal – eating what we eat, copying us, and really joining in…not being fed separately. (Mother 2)

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Most mothers had no concerns with BLW (n=15/20). Those mothers who did
422 have concerns were worried about the appropriateness of certain foods, for example raw apple. Current guidelines on types of BLW foods to offer are
424 incomplete and some mothers reported not knowing what foods to offer at what age:

426 *I wasn't worried but a bit concerned that some of the advice was conflicting e.g. the book says apple is fine and people I've spoken to who*
428 *have used BLW have said no apples. (Mother 7)*

430 One mother was concerned about her infant's iron intake, so she spoon-fed her infant iron fortified rice cereal daily while following BLW. Other mothers
432 felt that the iron from breast milk would be adequate until the infant started eating high iron meat or meat alternatives:

434 *Solids are just a taste and texture thing, breast milk or formula being their main nutrition until 9 months, so don't worry if your baby takes*
436 *their time adjusting to solids. (Mother 6)*

438 Nearly all mothers (n=19/20) reported that their infant gagged on food. Some mothers had completed a first aid course prior to their infant starting BLW to
440 equip themselves for dealing with gagging or choking. Gagging was not a concern to mothers, instead they considered it was a natural part of a child
442 learning to eat and adapting to new textures that are quite different to milk. Mothers were aware that an infant's gag reflex is much further forward on
444 their tongue when they first start eating and because of this, they understood gagging was highly likely:

446 *I felt like I was really prepared, I had read the book [4] so knew about gagging and choking and that mostly it is gagging because the baby's*
448 *gag reflex is much further forward than an adult's…gagging is a very important learning process. (Mother 12)*

450 Mothers viewed gagging as an innate safety mechanism that is activated when food has not been sufficiently chewed for swallowing. One parent explained
452 that gagging returned the food to the front of the mouth for further chewing and that if the infant did not gag then the food could cause obstruction and

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possibly choking.

Mothers were aware choking was a common criticism of BLW, and although most reported that choking did not occur, 30% (n=6/20) reported one or more episodes. Although choking can be very serious, all mothers who reported choking (n=6/20) reported that the infant independently dealt with the choking by expelling the food from their mouth through coughing and mothers did not have to intervene with first aid. All mothers who could recall the food that was responsible (n=4/6) reported that raw apple was the food their infant had choked on. Mothers expressed feeling more relaxed around four weeks after introducing complementary foods; they saw that their infant could manage different textures, and was developing more coordinated eating skills. Mothers also felt that by this time the difference between gagging and choking was more obvious and that they realised it was mostly gagging.

Many of the mothers reported that mealtime mess was the main disadvantage of BLW. Infants were able to pick up their food and "squash, smear and throw it". Some mothers were apprehensive about their infant eating in public or at other people's homes because of the mess. Mess was more of a problem in the early phases of BLW when the infant had not mastered the coordination skills needed to get food to their mouth, and mothers said as the level of skill improved the mess declined. Mothers who also had experience with the conventional method of starting solids thought finger foods and self-feeding were messy whatever the age:

> *As someone who's done it both ways [BLW and spoon-feeding], I think they're both pretty messy and wasteful! (Mother 5)*

Some mothers recalled feeling impatient during the first month of BLW as their infant, while learning to eat, could spend long periods of time at the table and appear to be "*playing with food*". Additionally mothers reported that some family meals were not appropriate for their baby and that at these times knowing what to offer the infant was a challenge:

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486 *I struggled with the "baby eats what the family eats" concept... Most of what we really eat has a lot of salt, sugar, sauces, etc in it, and it takes*
488 *work to think of how to adjust it or intervene in the cooking process to fit baby. (Mother 5)*

490

Mothers recalled encountering both positive and negative experiences during
492 the BLW period, however all the mothers concluded that they would recommend BLW to other mothers:

494 *I couldn't imagine any other way of introducing solids and will certainly do BLW with any future children. I think the fact that our son has*
496 *control over eating means that he doesn't have to fight for control…food is not a battleground here. (Mother 19)*

498

Two mothers added that they would recommend supplementing BLW with
500 some spoon-feeding for reassurance about nutrients:

I say to people to use a combination. I felt good about this because she
502 *was able to explore food and learn about it but at the same time get the nutrients that she needed. (Mother 15)*

504

Experiences

506 Table 3 presents practical recommendations mothers offered for overcoming challenges when using BLW.

508

Table 3 Practical recommendations from mothers for successful Baby-Led Weaning

Practical recommendation	Supporting quote
Place a large cloth under the infant's highchair to collect spilled food - the cloth could be shaken outside and washed in the machine.	*"Prepare for mess with bibs, strip the child, messy mats, have a washcloth handy, a hungry dog to eat scraps helps too and then relax and let them go for it."*
Use full cover (sweatshirt) bibs.	
In the warmer (summer) months the family could try eating outside.	

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Put the infant in their highchair with their nappy on. Then follow with a bath to wash off any food mess.	
Put infant in the highchair in the kitchen so they can begin their meal while the family meal is being prepared and interact with them while they are eating.	*"Watch your baby but don't interfere, I wouldn't like someone picking food off my plate and putting it into my mouth because they thought I was eating too slowly. Not to worry too much about quantities – remembering that milk is still on offer."*
Seek advice from parenting groups and others doing BLW. Collect and share food and recipe ideas.	*Sometimes you get stuck for ideas of what to offer and talking to others doing BLW can get the creativity going again... It's amazing how many ways there are to cook and present food.*
Mothers, whether following BLW or not, should complete a first aid course. This should teach the difference between gagging and choking, and can improve confidence for dealing with choking (if it occurs).	*"Go to a first aid course, preferably one targeted at parents. This will give you confidence to deal with choking if it happens."*
Have realistic expectations about mess and your infant's eating progress. Mothers need to appreciate that starting solids is a transition period which may last many months.	*"Don't think that things will be heaps easier in the short-term than the conventional way. A baby with finger food will still need a lot of support, because they'll drop things a lot and need you to pick them up."*
Try and enjoy the BLW experience by allowing the baby to explore food and have fun with eating.	*"Don't stress about the quantities they eat, the mess they make or the seemingly frequent gagging episodes."*

510

512 # DISCUSSION

Although anecdotal reports suggest that the use of BLW is increasing, fewer
514 than half of the healthcare professionals in the current study had heard about
this approach. Those who were aware of BLW had limited knowledge of the
516 details and were not aware of all the practices promoted as part of BLW. [4,5]
Healthcare professionals suggested potential benefits of BLW (greater
518 opportunity for shared family meal times, fewer mealtime battles, healthier
eating behaviours, greater convenience, and possible developmental
520 advantages) but most felt reluctant to recommend it because of their concern

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about the potential increased risk of choking. Most healthcare professionals had not seen BLW in action and therefore had difficultly understanding how a 6-month-old infant could possess the mastication and coordination skills needed to safely manage whole pieces of food.

Overall, mothers reported that using BLW had been a positive experience, that they recommended it to other mothers, and would follow it again if they had another child. Interestingly, many of the mothers in this study did not follow BLW strictly as outlined by Rapley [4]. Although they generally embraced BLW techniques, many also reported using a small amount of spoon-feeding. This suggests that, in practice, many parents following a BLW approach are probably somewhere along the continuum of some spoon-feeding to total self-feeding, albeit much more at the latter end. As well as it being described as the *"logical way"* to introduce complementary foods, mothers reported that BLW was less time consuming, involved less meal preparation, caused less stress, and resulted in fewer mealtime battles. Although some mothers struggled with drawn out mealtimes and the food mess created by the self-feeding infant, these disadvantages did not discourage these mothers from following BLW. Furthermore, mothers who had previously used the conventional method (spoon-feeding purées) with one of their older children considered both approaches (BLW and conventional) to be messy.

Healthcare professionals and mothers' attitudes toward BLW were similar, in some respects. Both agreed that BLW may promote shared family meals, reduce mealtime battles, and be more convenient than spoon-feeding purées, they also agreed that the mess produced when an infant self-feeds could be substantial. Furthermore, both groups considered BLW could encourage healthier eating patterns, including better self-regulation of energy intake. However, there were some noticeable differences in the attitudes of the two groups, particularly concerning safety and nutrient sufficiency. Healthcare professionals had serious concerns about potential choking and low iron intake, as well as the ability of an infant to self-feed at 6 months. Although

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some mothers had considered the potential problems raised by healthcare professionals they were not as concerned by these. Moreover, they reported that these concerns decreased as they followed BLW and their baby appeared happy and healthy.

The healthcare professionals' concern about a possible increased risk of choking aligns with opinions expressed by other healthcare professionals.[5][22,23] Choking is more likely with very hard foods such as raw apple or round coin-shaped foods such as sausage. [24] Children develop the ability to chew before they develop the ability to hold food in their mouth or to move it backwards for swallowing. [25] At about 6 months of age, infants develop a munching type oral-motor action; this movement, in conjunction with the ability to sit unsupported, promotes swallowing of thicker, chunkier pieces of food. [26] The founder of BLW, Gill Rapley, disputes that a healthy 6-month-old infant would be at increased risk of choking with BLW. [4,5] Rapley acknowledges gagging is common with BLW because at 6 months of age the baby's gag reflex is further forward on their tongue than it is at 1 year. [5] However, based on her personal observations, Rapley considers choking is more likely with spoon-feeding because the baby learns to use suction to take the purée from the spoon, which causes food to be taken to the back of the throat where it is swallowed, encouraging the infant to learn to swallow food without chewing first. [5]

Interestingly most mothers in the current study were not concerned about choking. Although some had initial concerns, these quickly diminished when they witnessed how proficient their infant was at bringing food forward and expelling it out of their mouth if needed, and all mothers felt prepared for dealing with a choking incident if it happened. Others have reported similar findings with mothers following BLW initially being concerned about choking but over time becoming less nervous and more able to distinguish between the action of gagging to move food and actual choking. [27] Furthermore 93.5% of the BLW group in the recent study by Townsend and Pitchford[9] reported never having experienced a choking incident. It is of concern,

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however, that in the current study, 30% of mothers reported at least one
588 choking incident, most with raw apple. No serious incidents were reported
and this raises the question of whether mothers correctly identified choking
590 or whether they had instead witnessed the less serious action of gagging.
However, given that raw apple was the cause of most reported choking
592 incidents, and fulfills the criteria of a high-risk food, being hard and in small
pieces when bitten, it would be sensible to discourage parents who are
594 following BLW from offering raw apple to their infant.

596 Healthcare professionals expressed concern about whether BLW infants
would be able to consume sufficient iron. In New Zealand, spoon-feeding iron-
598 fortified baby rice cereal is a popular way for mothers to increase their
infant's iron intake. Healthcare professionals in this study quickly recognized
600 that this would not be possible with BLW and they speculated that this would
put the infant at risk of suboptimal iron status, which is already a concern for
602 many New Zealand infants (6.9% having iron deficiency anaemia, and a
further 12.5% having suboptimal iron status[28]). Most mothers in the
604 present study believed that the breast milk their infant was receiving would
supply enough iron until meat or other high-iron meat alternatives were
606 introduced. Similarly, mothers from Brown and Lee[27] were not concerned
about iron intake. Although healthy, term, normal birth weight infants are
608 considered to obtain enough iron from their mother's breast milk and from
the redistribution of iron from haemoglobin to iron stores during the first six
610 months of life, [29] from six months of age, iron becomes a critical nutrient
and all infants should receive iron-rich complementary foods such as meat,
612 meat alternatives or iron-fortified foods. [2,29] [30-32]

614 Many of the healthcare professionals were not convinced that a 6-month old
infant could eat enough to keep pace with growth when self-feeding,
616 particularly in the early days of complementary feeding. Only one study
appears to have examined this, and suggested that there may be an increased
618 incidence of underweight in BLW children (3/63) compared to spoon-fed
children (0/63), although most children were of normal weight, and as

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acknowledged by the authors, the numbers were small, and the cases and controls drawn from different populations. It has been suggested that purées (which are frequently made of fruit or vegetables and thinned down with water or milk) are often very low in energy, meaning that the small volume of purées typically consumed in the early weeks would contribute relatively little to meeting a conventionally fed infant's nutrient requirements. [7] In contrast, finger foods, if carefully chosen, can be very nutrient dense, so an infant who appears to be eating little when self-feeding may potentially be closer to meeting their nutrient requirements. [7] Only one parent in the current study reported being concerned about her child being able to eat enough, although many mothers reported spoon-feeding their infant at times when they were potentially at greater risk of under eating, i.e. when they were unwell or very tired. Because of the nature of this self-selected sample it is possible that mothers with concerns about this issue may have discontinued or chosen not to follow BLW. At this point, no research has examined the actual food and nutrient intake of children following a BLW approach compared with a more traditional method of infant feeding.

The healthcare professionals and mothers who took part in the current study were self-selected. Furthermore, the sample size was small. Although this study is not intended to present representative results given its qualitative nature, participants were recruited in a number of different ways, and the interviews were continued until well after saturation for both healthcare professionals and mothers, suggesting that the majority of views of BLW in these groups are likely to have been captured. The first author conducted the content analysis of the transcripts, and although the co-authors discussed the interpretation of individual participant quotes, they did not conduct a separate full analysis of the transcripts. However, we consider that this was sufficient to ensure that the findings are trustworthy, both because our aim was to capture manifest (i.e. description of the visible, obvious components), rather than latent (i.e. interpretation of underling meaning) content [33], and because we have provided direct participant quotes for each sub-category so that the reader can judge for themselves the appropriateness of the coding.

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Although there was some agreement between healthcare professionals and mothers that BLW was likely to lead to more shared family meals, fewer mealtime battles, potentially healthier eating patterns, and to be more convenient, although messy, the healthcare professionals were, overall, reluctant to recommend the method. They were concerned that BLW could potentially increase choking and adversely affect the infant's iron status and energy intake. In this context, it is interesting that the UK Department of Health has supported the inclusion of some hand-held first foods in their most recent recommendations for infant feeding. [34,35] Undoubtedly, further research of BLW is warranted especially concerning its potential to positively influence eating behaviours, as well as its safety and nutrient sufficiency.

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Ethical approval Ethical approval was obtained from the University of Otago Ethics Committee.

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REFERENCES

1. World Health Organization. Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. Geneva, Switzerland: World Health Organization, 2009.
2. Ministry of Health. *Food and Nutrition Guidelines for Healthy Infants and Toddlers (Aged 0-2): A background paper (4th Ed)*. Wellington: Ministry of Health, 2008.
3. Department of Health (DoH). *Infant Feeding*. London, UK: Department of Health, 2003.
4. Rapley G, Murkett T. *Baby-Led Weaning: Helping your child love good food*. London: Vermilion, 2008.
5. Rapley G. Baby-led weaning: transitioning to solid foods at the baby's own pace. *Community Pract* 2011;84(6):20-23.
6. Sachs M. Baby-led weaning and current UK recommendations - are they compatible? *Matern Child Nutr* 2011;7:1-2.
7. Wright CM, Cameron K, Tsiaka M, Parkinson KN. Is baby-led weaning feasible? When do babies first reach out for and eat finger foods? *Matern Child Nutr* 2011;7(1):27-33.
8. Brown A, Lee M. Maternal control of child feeding during the weaning period: differences between mothers following a baby-led or standard weaning approach. *Matern Child Health J* 2011;15(8):1265-71.
9. Townsend E, Pitchford N. Baby knows best? The impact of weaning style on food preferences and body mass index in early childhood in a case–controlled sample. *BMJ Open* 2012;2:1.
10. Abel S, Park J, Tipene-Leach D, Finau S, Lennan M. Infant care practices in New Zealand: a cross-cultural qualitative study. *Soc Sci & Med* 2001;53(9):1135-48.
11. Campbell ND, Soeken KL, Rankin EAD. Infant Weaning Patterns and Related Maternal-Infant Health Outcomes. *Public Health Nurs* 1986;3(1):57-63.
12. Arden MA. Conflicting influences on UK mothers' decisions to introduce solid foods to their infants. *Matern & Child Nutr* 2010;6(2):159-73.
13. Wright C, Parkinson K, Drewett R. Why are babies weaned early? Data from a prospective population based cohort study. *Arch Dis Child* 2004;89(9):813-16.
14. Hellings P, Howe C. Assessment of Breastfeeding Knowledge of Nurse Practitioners and Nurse-Midwives. *J Midwifery Womens Health* 2000;45(3):264-70.
15. Freed GL, Clark SJ, Lohr JA, et al. Pediatrician involvement in breast-feeding promotion: a national study of residents and practitioners. *Pediatrics* 1995;96(3 Pt 1):490-4.
16. Freed GL, Clark SJ, Sorenson J, et al. National assessment of physicians' breast-feeding knowledge, attitudes, training, and experience. *JAMA* 1995;273(6):472-6.
17. Schanler RJ, O'Connor KG, Lawrence RA. Pediatricians' practices and attitudes regarding breastfeeding promotion. *Pediatrics* 1999;103(3):E35.

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3 732 18. Brown A, Lee M. A descriptive study investigating the use and nature of baby-led weaning in a UK sample of mothers. *Matern Child Health J* 2011;7(1):34-47.
19. Patton MQ. *Qualitative Research and Evaluation Methods*. 3rd ed. Thousand Oaks, California Sage Publications, Inc., 2002.
20. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qualitative health research* 2005;15(9):1277-88.
21. Kondracki NL, Wellman NS, Amundson DR. Content analysis: review of methods and their applications in nutrition education. *Journal of nutrition education and behavior* 2002;34(4):224-30.
22. Dietitians NZ Paediatric SIG convenor. Dietitians NZ Paediatric Special Interest Group Newsletter. In: NZDA, editor. May ed, 2010.
23. Rowell K and Becker H. baby-led-weaning-or-starting-solids-book-review-and-nutritionist-weighs-in-with-her-7-month-old-daughter. http://thefeedingdoctor.com, 2011.
24. Byard RW, Gallard V, Johnson A, et al. Safe feeding practices for infants and young children. *J Paediatr Child Health* 1996;32(4):327-9.
25. Naylor A, Morrow A. *Developmental readiness of normal full term infants to progress from exclusive breastfeeding to the introduction of complementary foods: reviews of the relevant literature concerning infant immunologic, gastrointestinal, oral motor and maternal reproductive and lactational development*. Washington DC: Wellstart International, LINKAGES Project Academy for Educational Development, 2001.
26. Pridham KF. Feeding behavior of 6-to 12-month-old infants: Assessment and sources of parental information. *J Pediatr* 1990;117(2(Pt 2)):S174-80.
27. Brown A, Lee M. An exploration of experiences of mothers following a baby-led weaning style: developmental readiness for complementary foods. *Matern Child Health J* 2011.
28. Soh P, Ferguson EL, McKenzie JE, et al. Iron deficiency and risk factors for lower iron stores in 6-24-month-old New Zealanders. *Eur J Clin Nutr* 2004;58(1):71-79.
29. Domellof M. Iron requirements in infancy. *Ann Nutr Metab* 2011;59(1):59-63.
30. Leong W-I, Lönnerdal B. Iron Nutrition. In: Anderson G, McLaren G, editors. *Iron Physiology and Pathophysiology in Humans*: Humana Press, 2012:81-99.
31. Kramer MK, R. Optimal duration of exclusive breastfeeding. *Cochrane database of systematic reviews* 2002(1):CD003517.
32. World Health Organization. Guiding Principles For Complementary Feeding of the Breastfed Child. Geneva, Switzerland, 2004.
33. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today* 2004;24(2):105-12.
34. Department of Health. Start4Life: No Rush to Mush. http://www.nhs.uk/start4life/pages/no-rush-to-mush.aspx, 2009.

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35. National Health Service (NHS). Your baby's first solid foods. http://www.nhs.uk/Conditions/pregnancy-and-baby/Pages/solid-foods-weaning.aspx: NHS, 2011.

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Healthcare professionals' and mothers' knowledge of, attitudes to, and experiences with, Baby-Led Weaning: a content analysis study

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15 20 25

Key words Healthcare professionals, mothers, complementary feeding, baby-led weaning.

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Word count = 4609

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ABSTRACT

Objective: Baby-Led Weaning (BLW) is an alternative approach for
35 introducing complementary foods to infants that emphasizes infant self-feeding rather than adult spoon-feeding. Here we examined healthcare professionals' and mothers' knowledge of, attitudes to, and experiences with, BLW.

Design, setting and participants: Healthcare professionals (n=31) and
40 mothers who had used BLW (n=20) completed a semi-structured interview using one of two tailored interview schedules examining their knowledge of, attitudes to, and experiences with, BLW. Interview notes and transcripts were analysed using content analysis to identify sub-categories and extract illustrative quotes.

45 **Results:** Healthcare professionals had limited direct experience with BLW and the main concerns raised were the potential for increased risk of choking, iron deficiency, and inadequate energy intake. Although they suggested a number of potential benefits of BLW (greater opportunity for shared family meal times, fewer mealtime battles, healthier eating behaviours, greater
50 convenience, and possible developmental advantages) most felt reluctant to recommend BLW because of their concern about the potential increased risk of choking. By contrast, mothers who had used this style of feeding reported no major concerns with BLW. They considered BLW to be a healthier, more convenient and less stressful way to introduce complementary foods to their
55 infant and recommended this feeding approach to other mothers. Although mothers did not report being concerned about choking, 30% reported at least one choking episode – most commonly with raw apple.

Conclusion: Given the lack of research on BLW, further work is needed to determine whether the concerns expressed by healthcare professionals and
60 potential benefits outlined by mothers are valid. The current study suggests there is mismatch between healthcare professionals and parents knowledge of, attitudes to and experiences with BLW.

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5 **ARTICLE SUMMARY**
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8 Article focus
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10 • Healthcare professionals are an important source of information for
11 mothers during the complementary feeding period.
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13 • The literature suggests that there is a mismatch between healthcare
14
15 70 professionals' and mothers' knowledge and attitudes to infant feeding.
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17 • Baby-Led Weaning (BLW) is an alternative approach for introducing
18 complementary foods to infants that is becoming increasingly popular
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20 with mothers.
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23 75 Key messages
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25 • Healthcare professionals identified a number of potential benefits of
26 BLW including more shared family meals, promotion of healthier
27
28 eating behaviours and greater convenience for mothers. However,
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30 healthcare professionals also had strong concerns about the risk of
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32 80 iron deficiency, inadequate energy intake and choking, and as a result
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34 most felt reluctant to recommend it.
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36 • Mothers who had practised BLW reported more benefits and had
37
38 fewer concerns about BLW than healthcare professionals.
39 • Some parents reported offering raw apple to their infant when they
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41 85 were following BLW. This practice should be discouraged because raw
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43 apple is a choking hazard at this age.
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46 Strengths and limitations of this study
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48 • This is the first study to interview healthcare professionals about BLW.
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50 90 • The healthcare professionals and mothers were self-selected.
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INTRODUCTION

92 Traditionally the method of infant feeding recommended to mothers in most developed countries, including the United Kingdom and New Zealand, has
94 been to spoon-feed the infant puréed food before moving on to mashed and finger foods as the child grows. [1-3] Recently an alternative approach,
96 known as Baby-Led Weaning (BLW), has emerged [4,5] and anecdotal evidence suggests that many mothers are attempting BLW. [6] Baby-Led
98 Weaning recommends that instead of spoon-feeding, mothers encourage their infant to self-feed, from about six months of age. Although infants following
100 the more traditional method of infant feeding may be offered finger foods, in many countries, including New Zealand, it is recommended that this does not
102 occur until 8-9 months of age, long after the introduction of puréed food. By contrast, BLW, in its purest form, does not include any spoon-feeding by the
104 adult. The infant is only offered pieces of whole food, appropriately prepared, so that the infant can feed themselves right from the start of the
106 complementary feeding period.

108 The small body of existing research suggests that BLW is feasible for most 6-month old infants from a motor development point of view. [7] It also
110 suggests that BLW is associated with lower levels of maternal anxiety, restriction, pressure to eat and monitoring during the complementary feeding
112 period; [8] and perhaps healthier eating patterns and BMI. [9] However, in the absence of any longitudinal or randomized controlled trial data, it is not
114 possible to determine whether these associations are causal.

116 Healthcare professionals are an important source of information for mothers during the complementary feeding period, and can potentially have as much
118 influence on decisions around milk feeding and introducing solids as cultural values or material resources. [10,11] However, healthcare professionals'
120 knowledge and attitudes about infant feeding often differ from those of mothers. [12,13]

122

Previous studies on healthcare professionals' knowledge and attitudes

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towards infant feeding have focused on milk feeding or timing of the introduction of complementary food. [14-17] To date no study has examined attitudes to BLW in healthcare professionals working with young families.

The aim of this content analysis study was to examine the knowledge of, attitudes to, and experiences with, BLW of healthcare professionals and of mothers who had used this style of feeding with their infant.

METHODS

Participants

The participants were 31 healthcare professionals who were working with infants and families, and 20 mothers who had used BLW when introducing solids to their infant. Mothers could be part of the study if they considered that they had used BLW, so BLW was self-defined.

Participants were recruited by word of mouth (healthcare professional peer-to-peer networks, parenting groups, La Leche League), email "snowballing", or newspaper advertising. Twelve parenting groups were approached as a starting point to recruit directly mothers who had tried BLW and to commence snowballing. Parenting groups were SPACE (supporting parenting and child education) groups established to assist mothers (usually first-time mothers) with all aspects of parenting young children, and were not specifically advocators of BLW, although BLW was a topic addressed through out the parenting program. Recruitment of the health professionals was undertaken via established clinical relationships, and via snowballing through practice nurses. The study was approved by the Human Ethics Committee of the University of Otago, Dunedin, New Zealand.

Data collection

The data were collected during 2010 in Dunedin, New Zealand. Healthcare professionals were interviewed at their place of work and mothers in their own home. The same researcher (SC) conducted all interviews, which typically lasted 1 - 1.5 hours. Field notes were taken during the interviews

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2
3 with healthcare professionals and extended immediately following the
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5 158 meeting. Interviews with mothers were tape-recorded and transcribed
6
7 verbatim.
8
9 160
10 **Interview schedule and process**
11
12 162 Two interview schedules, one for health professionals and one for parents,
13 were developed from the existing literature about BLW [7,8,18] and the
14
15 164 expert opinion of the authors (Table 1 and Table 2). As some healthcare
16 professionals had not heard of BLW, a brief description of BLW was given at
17
18 166 the start of the interview when necessary.
19
20
21
22 168 We used a semi-structured interview as outlined in Patton [19] to include, in
23 the first part, a structured framework to cover the same basic lines of inquiry
24
25 170 around knowledge, attitudes and experiences, for which participants could
26
27 express their own ideas and understandings. The second part of the interview
28
29 172 followed an unstructured format to allow for probing and further questioning
30 of ideas or individual circumstances that were not included in the original
31
32 174 interview outline.
33
34
35

Table 1 Questions used in interviews with healthcare professionals
1. What is your professional role?
2. Have you heard of Baby-led Weaning (BLW)?
3. Where did you hear about BLW?
4. When did you hear about BLW?
5. If somebody asked you what BLW is, how would you describe it?
6. What do you think of BLW as an alternative method for introducing solid foods to infants?
7. Do you consider there may be benefits of BLW?
8. Do you consider there may be disadvantages of BLW?
9. Do you have any concerns about BLW?

36–49
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Table 2 Questions used in interviews with mothers who had used Baby-Led Weaning
1. If someone asked you: "What is Baby-Led Weaning (BLW)?" what would you tell them?
2. How did you hear about BLW?

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3. Why did you decide to try BLW?
4. How old was your baby when you started BLW?
5. How old is she now?
6. How much of her food do you feed her and how much does she feed herself?
7. Where did/do you get most of your information about BLW?
8. What were the first foods you offered your baby?
9. What form were the foods in that you first offered your baby?
10. Were there any foods you avoided because you were using BLW?
11. Did your baby eat at the same time as the rest of the family?
12. Do you think your baby is a fussy or picky eater?
13. Were you worried about BLW in any way?
14. Did your baby gag on food?
15. Was it food she had fed herself?
16. Did your baby ever choke on food?
17. Was it food she had fed herself?
18. Do you consider there were advantages of BLW for you and your baby?
19. Do you consider there were disadvantages of BLW for you and your baby?
20. Overall, do you think BLW worked for you and your baby?
21. Would you recommend other mothers try BLW?
22. Do you have any useful tips for other mothers trying BLW?

NB: "She" or "he" was used appropriately for the sex of the child.

178

Data analysis

180 The main lines of inquiry (knowledge, attitudes and experiences) from the interviews were used as an initial guide in a directed content analysis [20],
182 and are referred to here as categories. Content analysis [19] was performed on all interviews by reviewing all transcripts several times for recurring sub-
184 categories (reviewing the two groups separately). Sub-categories were identified from manifest content (the visible, obvious components) [21],
186 because the aim was to extract and report on the descriptive level of content and not to provide a deep level of interpretation and underlying meaning.
188 Participants were recruited until we reached saturation of sub-categories, and we ensured that sub-categories were, as far as possible, defined so that
190 they were exhaustive and mutually exclusive. Data analysis was led by one member of the research team (SC); and interpretation was verified during
192 research team meetings (with RWT and ALH) to scrutinise sub-categories as

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they were identified. Each category and its sub-categories have been summarized, and illustrative quotes are included.

RESULTS

Thirty-one healthcare professionals were interviewed, comprising: practice nurses (n=11), Well-Child providers (a government funded service supporting families with young children and assessing health status, see: http://www.wellchild.org.nz/) (n=4), dietitians (n=4), general practitioners (n=5), paediatricians (n=2), lactation consultants (n=2), midwives (n=2), and a paediatric Speech-Language Therapist (n=1). The mothers were twenty mothers who had a child aged 8 – 24 months (mean=13 months).

Healthcare Professionals

The sub-categories that emerged were remarkably consistent across the interviews with healthcare professionals.

Knowledge

Nearly half (n=13/31) of the healthcare professionals had heard about BLW. Most of these had been introduced to the concept by their colleagues or friends and family (rather than patients). The healthcare professionals who knew about BLW described it as the child feeding themself whole foods, instead of being spoon-fed purées. There was little discussion of other aspects of BLW.

Attitudes

All healthcare professionals considered that BLW could be beneficial for the family and the child.

Healthcare professionals considered that **shared family mealtimes** would be the main advantage of BLW. They were aware of the nutritional and psychological benefits of family meals and they envisaged family mealtimes would be easier and more pleasant with BLW:

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3 *The best thing is that an adult can eat their meal while the child is*
4
5 226 *having theirs. There's no juggling trying to feed the baby while shoving a*
6
7 *spoonful for yourself. (General Practitioner 3)*
8 228
9
10 Some healthcare professionals thought **mealtime battles** would be less likely
11 230 with BLW for two reasons: mothers would have an alternative approach to
12
13 try if their child refused to be spoon-fed; and because BLW allows the child to
14
15 232 eat at their own pace and stop when they have had enough, they would not be
16
17 "*bribed*" or "*forced*" to eat food:
18
19 234 *I think it's healthier that the baby is in control of what they eat… and you*
20
21 *aren't forcing them to eat...there's far too many of us who just finish our*
22
23 236 *plates instead of stopping when we are full. (Dietitian 2)*
24
25
26 238 Overall, healthcare professionals thought BLW would encourage healthier
27
28 dietary behaviours by promoting a **wider variety of foods** and allowing the
29 240 child to explore and learn about food at their own pace:
30
31 *Being able to look at it, hold it and see it as food, instead of slop must*
32 242 *have advantages? (Paediatrician 2)*
33
34
35 244 They also considered BLW would encourage **better appetite and self-**
36
37 **regulation skills**, as mothers would be less able to control the child's food
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39 246 intake. They saw similarities between BLW and breastfeeding on demand
40
41 and thought the two would complement each other well.
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44 A number of healthcare professionals who had children of their own thought
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46 250 BLW would be **more convenient** than the conventional method of spoon-
47
48 feeding purées:
49 252 *It sounds so much easier. Making purées is time consuming, and then*
50
51 *they hardly eat anything and you have to throw it all out or you buy*
52 254 *those jars of food, which are really expensive. (Dietitian 4)*
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56 256 Healthcare professionals suggested two **developmental advantages**: BLW
57 might encourage better oral and chewing skills because the child is offered
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pieces of food to eat so they may have more opportunity to develop their mouth and jaw movements instead of sucking food from a spoon as they do with purées; and enhanced fine motor skills as the child has greater opportunities to manipulate food with their fingers and practice their fine motor movements:

The BLW method could have real advantages for coping with food and learning to eat i.e. for oral development. If babies are fed purées for too long they miss important windows for introducing different food textures. (Speech-Language Therapist 1)

There must be some sort of fine motor benefits for baby being able to play, essentially, with its food. (General Practitioner 5)

However, in addition to these potential benefits, strong concerns about BLW were also expressed.

Choking was a major concern expressed by many of the healthcare professionals, particularly those who had not observed BLW. The potential risk of choking meant most healthcare professionals felt reluctant to recommend BLW:

The potential for choking would make me feel very hesitant about giving my child whole food at 6 months. As a health professional I'd need to see some sound evidence before I could endorse this method [BLW]. (Dietitian 2)

The specific concerns voiced regarding choking were that a 6 month old infant would not be developmentally ready to chew whole pieces of food and that mothers may leave the infant alone in their highchair with their food. Additionally healthcare professionals considered that mothers may become competitive about their infant's BLW progress, considering that their child is more advanced if they have certain foods or a greater variety of foods earlier than other children, and therefore might be motivated to offer unsafe foods that would increase the child's risk of choking:

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2
3 *Just give the baby that food, she'll be fine. Sometimes it's almost like a*
292 *challenge to see how they cope, another one of those competitive*
parenting things…oh look she's eating raw carrot at age 6 months.
294 *(Dietitian 1)*

296 However, one healthcare professional considered that BLW may work well for parents whose infant experiences feeding problems when spoon-feeding
298 is used:

I know of similar feeding methods which are often used with children
300 *whose parents are having feeding difficulties with spoon-feeding and*
these can work very well. (Speech-Language Therapist 1)

302

Healthcare professionals considered that there were two possible dietary
304 disadvantages with BLW: the potential for **growth faltering**, and for **poor iron status**. There was concern that adopting BLW would mean forgoing any
306 iron-fortified infant cereal, and that a BLW diet would comprise low-energy low-iron fruits and vegetables and include very few iron-rich foods. In
308 addition to low-energy foods, clumsy self-feeding (particularly at the beginning of BLW) might lead to growth faltering.

310 *"The two parents I know who have chosen BLW are offering only fruits*
and vegetables...Although fruits and vegetables are great foods, babies
312 *need more nutrients... So I wonder how they would get these [nutrients]*
if they were only having fruits and vege...nutrients could be limited..."
314 *(General Practitioner 1)*

316 Contrasting this, a few healthcare professionals thought BLW infants could consume energy beyond their needs as a result of **poor food choices**:

318 *Young children arrive here and they're under two eating twisties [an*
extruded cereal snack], chocolate biscuits - would BLW be that for some
320 *mothers? (Practice Nurse 2)*

322 At the other extreme, some healthcare professionals commented that mothers (especially first-time mothers) are often apprehensive about their infant's

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324 growth and compare it to that of other infants and that a "chubby" or "bonny" baby is viewed as healthy even when it reflects overweight or obesity. Some 326 healthcare professionals suggested BLW may **increase parental anxiety**. They thought mothers would struggle watching their infant learn to eat, 328 especially at the start when they might eat very little:

Parents expect to see their child growing consistently - linear growth - 330 and if they do not this evokes anxiety. How would you know if the child was eating enough? Parents would not cope with the child playing with 332 food and not eating it. (Practice Nurse 7)

334 Finally, some healthcare professionals thought BLW would be **messy** and for the mothers and suggested that there would be a lot of food wasted, which 336 many mothers would not tolerate:

I could imagine in the first couple of weeks that the infant wouldn't eat 338 much and that there would be an awful lot of playing and squashing. Some mothers may not be able to cope with this. (Practice Nurse 11)

340

I would be concerned about the mess and wastage of food. Some of our 342 families live on a very tight food budget and I've seen the mess when doing BLW and I think a lot of food gets wasted." (Well Child Provider 1)

344

346 Mothers

The sub-categories that emerged were very consistent across the interviews 348 with mothers.

350 Most mothers (n=18/20) started BLW when their child was 5.5 - 6 months of age and all mothers had exclusively breastfed their child up until this age. The 352 BLW approach advises mothers to watch for signs of developmental readiness before introducing their child to solid food. However most mothers 354 recalled starting solids at an age based on advice from their healthcare professional or because they were following the WHO guidelines, although a

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small number (n=2/20) of mothers started solids when their infant started reaching out for food.

The most commonly offered first foods were vegetables (steamed or boiled pumpkin, potato, kumara (New Zealand sweet potato), broccoli, carrot) (n=13/20) and fruit (avocado, banana) (n=11/20). Most mothers (n=16/20) reported that their child shared every meal with one or more family members. Mothers liked that their child could feed themself with BLW, however many (n=15/20) also reported some spoon-feeding, although this was infrequent or only in unusual circumstances, such as when their child was sick. Mothers reported doing this to avoid mess, to increase iron intake by spoon-feeding iron-fortified infant cereal, or to increase energy intake especially when their infant was sick or appeared too tired to self-feed.

Knowledge

The majority of mothers defined BLW as having 3 main components: offering finger-sized pieces of food, allowing the child to be in control of how much they ate, and not spoon-feeding purées:

> *Letting your baby lead in terms of the pace and amount of solids eaten…offering them whole, safe foods when they are physically ready to feed themselves... keeping milk [breast/formula] as their main food source until they naturally increase the amount they eat and drop milk feeds on their own. (Mother 2)*

Nearly half of the mothers first heard about BLW through a parenting group while others had discovered it online or were told about it by their Well-Child provider. One mother had not heard of the term "Baby-Led Weaning" but said "*it was instinctive*" to offer her child pieces of food and allow them to feed themself. The majority of mothers obtained their BLW information from online sources, drawing on other mothers' experiences through blogs, threads and forums.

Attitudes

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The main reason mothers chose to follow BLW was because it "***made sense***" and "*seemed logical*". Lifestyle reasons also motivated mothers to follow BLW. They considered that BLW was **less time consuming** and **less expensive** than making puréed food:

> *With three other children, I was way too busy to prepare special foods i.e. purées and also I didn't want to buy them - they're expensive. (Mother 15)*

Mothers considered that there were advantages of BLW during the complementary feeding period, and also in the future. During the complementary feeding period, mothers reported **less meal preparation** (the baby ate what the family was eating, there was no purée preparation) and **reduced mealtime stress** because they were not spoon-feeding the baby and eating their own meal simultaneously. Some mothers (n=6/20) reported it was liberating that BLW does not include a detailed step-by-step weaning protocol and instead **promotes responding to the infant** and thought that fewer "rules" made the **transition to food less frightening and complicated**:

> *With my first child I became so worried about getting the food [purées] to exactly the right consistency. It [BLW] made sense to me, because she was demand fed so it seemed like the natural progression. (Mother 8)*

In addition mothers believed that BLW had encouraged their child to develop healthier eating behaviours, for example being **able to respond appropriately to hunger and satiety cues**, sharing **family meals** and eating a **wider variety of foods**:

> *I felt it would give my daughter the opportunity to experience, from the outset, everything that is pleasurable about food, the textures, colours, individual tastes…a lovely way to have them be a real participant in the meal – eating what we eat, copying us, and really joining in…not being fed separately. (Mother 2)*

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Most mothers had no concerns with BLW (n=15/20). Those mothers who did have concerns were worried about the appropriateness of certain foods, for example raw apple. Current guidelines on types of BLW foods to offer are incomplete and some mothers reported **not knowing what foods to offer** at what age:

I wasn't worried but a bit concerned that some of the advice was conflicting e.g. the book says apple is fine and people I've spoken to who have used BLW have said no apples. (Mother 7)

One mother was concerned about her infant's **iron intake**, so she spoon-fed her infant iron fortified rice cereal daily while following BLW. Other mothers felt that the iron from breast milk would be adequate until the infant started eating high iron meat or meat alternatives:

Solids are just a taste and texture thing, breast milk or formula being their main nutrition until 9 months, so don't worry if your baby takes their time adjusting to solids. (Mother 6)

Nearly all mothers (n=19/20) reported that their infant gagged on food. Some mothers had completed a first aid course prior to their infant starting BLW to equip themselves for dealing with gagging or choking. **Gagging was not a concern** to mothers, instead they considered it was a natural part of a child learning to eat and adapting to new textures that are quite different to milk. Mothers were aware that an infant's gag reflex is much further forward on their tongue when they first start eating and because of this, they understood gagging was highly likely:

I felt like I was really prepared, I had read the book [4] so knew about gagging and choking and that mostly it is gagging because the baby's gag reflex is much further forward than an adult's…gagging is a very important learning process. (Mother 12)

Mothers viewed gagging as an innate safety mechanism that is activated when food has not been sufficiently chewed for swallowing. One parent explained that gagging returned the food to the front of the mouth for further chewing and that if the infant did not gag then the food could cause obstruction and

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possibly choking.

Mothers were aware **choking** was a common criticism of BLW, and although most reported that choking did not occur, 30% (n=6/20) reported one or more episodes. Although choking can be very serious, all mothers who reported choking (n=6/20) reported that the infant independently dealt with the choking by expelling the food from their mouth through coughing and mothers did not have to intervene with first aid. All mothers who could recall the food that was responsible (n=4/6) reported that raw apple was the food their infant had choked on. Mothers expressed feeling more relaxed around four weeks after introducing complementary foods; they saw that their infant could manage different textures, and was developing more coordinated eating skills. Mothers also felt that by this time the difference between gagging and choking was more obvious and that they realised it was mostly gagging.

Many of the mothers reported that **mealtime mess** was the main disadvantage of BLW. Infants were able to pick up their food and "squash, smear and throw it". Some mothers were apprehensive about their infant eating in public or at other people's homes because of the mess. Mess was more of a problem in the early phases of BLW when the infant had not mastered the coordination skills needed to get food to their mouth, and mothers said as the level of skill improved the mess declined. Mothers who also had experience with the conventional method of starting solids thought finger foods and self-feeding were messy whatever the age:

> *As someone who's done it both ways [BLW and spoon-feeding], I think they're both pretty messy and wasteful! (Mother 5)*

Some mothers recalled feeling impatient during the first month of BLW as their infant, while learning to eat, could spend **long periods of time at the table** and appear to be "*playing with food*". Additionally mothers reported that **some family meals were not appropriate** for their baby and that at these times knowing what to offer the infant was a challenge:

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I struggled with the "baby eats what the family eats" concept... Most of what we really eat has a lot of salt, sugar, sauces, etc in it, and it takes work to think of how to adjust it or intervene in the cooking process to fit baby. (Mother 5)

Mothers recalled encountering both positive and negative experiences during the BLW period, however all the mothers concluded that they would recommend BLW to other mothers:

I couldn't imagine any other way of introducing solids and will certainly do BLW with any future children. I think the fact that our son has control over eating means that he doesn't have to fight for control…food is not a battleground here. (Mother 19)

Two mothers added that they would recommend supplementing BLW with some spoon-feeding for reassurance about nutrients:

I say to people to use a combination. I felt good about this because she was able to explore food and learn about it but at the same time get the nutrients that she needed. (Mother 15)

Experiences

Table 3 presents practical recommendations mothers offered for overcoming challenges when using BLW.

Table 3 Practical recommendations from mothers for successful Baby-Led Weaning

Practical recommendation	Supporting quote
Place a large cloth under the infant's highchair to collect spilled food - the cloth could be shaken outside and washed in the machine.	*"Prepare for mess with bibs, strip the child, messy mats, have a washcloth handy, a hungry dog to eat scraps helps too and then relax and let them go for it."*
Use full cover (sweatshirt) bibs.	
In the warmer (summer) months the family could try eating outside.	

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Put the infant in their highchair with their nappy on. Then follow with a bath to wash off any food mess.	
Put infant in the highchair in the kitchen so they can begin their meal while the family meal is being prepared and interact with them while they are eating.	*"Watch your baby but don't interfere, I wouldn't like someone picking food off my plate and putting it into my mouth because they thought I was eating too slowly. Not to worry too much about quantities – remembering that milk is still on offer."*
Seek advice from parenting groups and others doing BLW. Collect and share food and recipe ideas.	*Sometimes you get stuck for ideas of what to offer and talking to others doing BLW can get the creativity going again... It's amazing how many ways there are to cook and present food.*
Mothers, whether following BLW or not, should complete a first aid course. This should teach the difference between gagging and choking, and can improve confidence for dealing with choking (if it occurs).	*"Go to a first aid course, preferably one targeted at parents. This will give you confidence to deal with choking if it happens."*
Have realistic expectations about mess and your infant's eating progress. Mothers need to appreciate that starting solids is a transition period which may last many months.	*"Don't think that things will be heaps easier in the short-term than the conventional way. A baby with finger food will still need a lot of support, because they'll drop things a lot and need you to pick them up."*
Try and enjoy the BLW experience by allowing the baby to explore food and have fun with eating.	*"Don't stress about the quantities they eat, the mess they make or the seemingly frequent gagging episodes."*

DISCUSSION

Although anecdotal reports suggest that the use of BLW is increasing, fewer than half of the healthcare professionals in the current study had heard about this approach. Those who were aware of BLW had limited knowledge of the details and were not aware of all the practices promoted as part of BLW. [4,5] Healthcare professionals suggested potential benefits of BLW (greater opportunity for shared family meal times, fewer mealtime battles, healthier eating behaviours, greater convenience, and possible developmental advantages) but most felt reluctant to recommend it because of their concern

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about the potential increased risk of choking. Most healthcare professionals had not seen BLW in action and therefore had difficultly understanding how a 6-month-old infant could possess the mastication and coordination skills needed to safely manage whole pieces of food.

Overall, mothers reported that using BLW had been a positive experience, that they recommended it to other mothers, and would follow it again if they had another child. Interestingly, many of the mothers in this study did not follow BLW strictly as outlined by Rapley [4]. Although they generally embraced BLW techniques, many also reported using a small amount of spoon-feeding. This suggests that, in practice, many parents following a BLW approach are probably somewhere along the continuum of some spoon-feeding to total self-feeding, albeit much more at the latter end. As well as it being described as the *"logical way"* to introduce complementary foods, mothers reported that BLW was less time consuming, involved less meal preparation, caused less stress, and resulted in fewer mealtime battles. Although some mothers struggled with drawn out mealtimes and the food mess created by the self-feeding infant, these disadvantages did not discourage these mothers from following BLW. Furthermore, mothers who had previously used the conventional method (spoon-feeding purées) with one of their older children considered both approaches (BLW and conventional) to be messy.

Healthcare professionals and mothers' attitudes toward BLW were similar, in some respects. Both agreed that BLW may promote shared family meals, reduce mealtime battles, and be more convenient than spoon-feeding purées, they also agreed that the mess produced when an infant self-feeds could be substantial. Furthermore, both groups considered BLW could encourage healthier eating patterns, including better self-regulation of energy intake. However, there were some noticeable differences in the attitudes of the two groups, particularly concerning safety and nutrient sufficiency. Healthcare professionals had serious concerns about potential choking and low iron intake, as well as the ability of an infant to self-feed at 6 months. Although

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some mothers had considered the potential problems raised by healthcare professionals they were not as concerned by these. Moreover, they reported that these concerns decreased as they followed BLW and their baby appeared happy and healthy.

The healthcare professionals' concern about a possible increased risk of choking aligns with opinions expressed by other healthcare professionals.[5][22,23] Choking is more likely with very hard foods such as raw apple or round coin-shaped foods such as sausage. [24] Children develop the ability to chew before they develop the ability to hold food in their mouth or to move it backwards for swallowing. [25] At about 6 months of age, infants develop a munching type oral-motor action; this movement, in conjunction with the ability to sit unsupported, promotes swallowing of thicker, chunkier pieces of food. [26] The founder of BLW, Gill Rapley, disputes that a healthy 6-month-old infant would be at increased risk of choking with BLW. [4,5] Rapley acknowledges gagging is common with BLW because at 6 months of age the baby's gag reflex is further forward on their tongue than it is at 1 year. [5] However, based on her personal observations, Rapley considers choking is more likely with spoon-feeding because the baby learns to use suction to take the purée from the spoon, which causes food to be taken to the back of the throat where it is swallowed, encouraging the infant to learn to swallow food without chewing first. [5]

Interestingly most mothers in the current study were not concerned about choking. Although some had initial concerns, these quickly diminished when they witnessed how proficient their infant was at bringing food forward and expelling it out of their mouth if needed, and all mothers felt prepared for dealing with a choking incident if it happened. Others have reported similar findings with mothers following BLW initially being concerned about choking but over time becoming less nervous and more able to distinguish between the action of gagging to move food and actual choking. [27] Furthermore 93.5% of the BLW group in the recent study by Townsend and Pitchford[9] reported never having experienced a choking incident. It is of concern,

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however, that in the current study, 30% of mothers reported at least one choking incident, most with raw apple. No serious incidents were reported and this raises the question of whether mothers correctly identified choking or whether they had instead witnessed the less serious action of gagging. However, given that raw apple was the cause of most reported choking incidents, and fulfills the criteria of a high-risk food, being hard and in small pieces when bitten, it would be sensible to discourage parents who are following BLW from offering raw apple to their infant.

Healthcare professionals expressed concern about whether BLW infants would be able to consume sufficient iron. In New Zealand, spoon-feeding iron-fortified baby rice cereal is a popular way for mothers to increase their infant's iron intake. Healthcare professionals in this study quickly recognized that this would not be possible with BLW and they speculated that this would put the infant at risk of suboptimal iron status, which is already a concern for many New Zealand infants (6.9% having iron deficiency anaemia, and a further 12.5% having suboptimal iron status[28]). Most mothers in the present study believed that the breast milk their infant was receiving would supply enough iron until meat or other high-iron meat alternatives were introduced. Similarly, mothers from Brown and Lee[27] were not concerned about iron intake. Although healthy, term, normal birth weight infants are considered to obtain enough iron from their mother's breast milk and from the redistribution of iron from haemoglobin to iron stores during the first six months of life, [29] from six months of age, iron becomes a critical nutrient and all infants should receive iron-rich complementary foods such as meat, meat alternatives or iron-fortified foods. [2,29] [30-32]

Many of the healthcare professionals were not convinced that a 6-month old infant could eat enough to keep pace with growth when self-feeding, particularly in the early days of complementary feeding. Only one study appears to have examined this, and suggested that there may be an increased incidence of underweight in BLW children (3/63) compared to spoon-fed children (0/63), although most children were of normal weight, and as

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acknowledged by the authors, the numbers were small, and the cases and controls drawn from different populations. It has been suggested that purées (which are frequently made of fruit or vegetables and thinned down with water or milk) are often very low in energy, meaning that the small volume of purées typically consumed in the early weeks would contribute relatively little to meeting a conventionally fed infant's nutrient requirements. [7] In contrast, finger foods, if carefully chosen, can be very nutrient dense, so an infant who appears to be eating little when self-feeding may potentially be closer to meeting their nutrient requirements. [7] Only one parent in the current study reported being concerned about her child being able to eat enough, although many mothers reported spoon-feeding their infant at times when they were potentially at greater risk of under eating, i.e. when they were unwell or very tired. Because of the nature of this self-selected sample it is possible that mothers with concerns about this issue may have discontinued or chosen not to follow BLW. At this point, no research has examined the actual food and nutrient intake of children following a BLW approach compared with a more traditional method of infant feeding.

The healthcare professionals and mothers who took part in the current study were self-selected. Furthermore, the sample size was small. Although this study is not intended to present representative results given its qualitative nature, participants were recruited in a number of different ways, and the interviews were continued until well after saturation for both healthcare professionals and mothers, suggesting that the majority of views of BLW in these groups are likely to have been captured. The first author conducted the content analysis of the transcripts, and although the co-authors discussed the interpretation of individual participant quotes, they did not conduct a separate full analysis of the transcripts. However, we consider that this was sufficient to ensure that the findings are trustworthy, both because our aim was to capture manifest (i.e. description of the visible, obvious components), rather than latent (i.e. interpretation of underling meaning) content [33], and because we have provided direct participant quotes for each sub-category so that the reader can judge for themselves the appropriateness of the coding.

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5 Although there was some agreement between healthcare professionals and
6 656 mothers that BLW was likely to lead to more shared family meals, fewer
7 mealtime battles, potentially healthier eating patterns, and to be more
8 658 convenient, although messy, the healthcare professionals were, overall,
9 reluctant to recommend the method. They were concerned that BLW could
10 660 potentially increase choking and adversely affect the infant's iron status and
11 energy intake. In this context, it is interesting that the UK Department of
12 662 Health has supported the inclusion of some hand-held first foods in their most
13 recent recommendations for infant feeding. [34,35] Undoubtedly, further
14 664 research of BLW is warranted especially concerning its potential to positively
15 influence eating behaviours, as well as its safety and nutrient sufficiency.
16 666

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668 professionals who contributed to this study.

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670 design of the study, the analysis and interpretation of the data and the writing
and editing of this paper. SC conducted the interviews with participants and
672 was responsible for the analysis and interpretation of the data. SC wrote the
first draft of the paper, and A-L H and RWT made important intellectual
674 contributions to the content and approved the final version.

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678 **Competing interests** None.

Ethical approval Ethical approval was obtained from the University of Otago
680 Ethics Committee.

Provenance and peer review Not commissioned.

682 **Data sharing statement** No additional data are available.

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1. World Health Organization. Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. Geneva, Switzerland: World Health Organization, 2009.
2. Ministry of Health. *Food and Nutrition Guidelines for Healthy Infants and Toddlers (Aged 0-2): A background paper (4th Ed)*. Wellington: Ministry of Health, 2008.
3. Department of Health (DoH). *Infant Feeding*. London, UK: Department of Health, 2003.
4. Rapley G, Murkett T. *Baby-Led Weaning: Helping your child love good food*. London: Vermilion, 2008.
5. Rapley G. Baby-led weaning: transitioning to solid foods at the baby's own pace. *Community Pract* 2011;84(6):20-23.
6. Sachs M. Baby-led weaning and current UK recommendations - are they compatible? *Matern Child Nutr* 2011;7:1-2.
7. Wright CM, Cameron K, Tsiaka M, Parkinson KN. Is baby-led weaning feasible? When do babies first reach out for and eat finger foods? *Matern Child Nutr* 2011;7(1):27-33.
8. Brown A, Lee M. Maternal control of child feeding during the weaning period: differences between mothers following a baby-led or standard weaning approach. *Matern Child Health J* 2011;15(8):1265-71.
9. Townsend E, Pitchford N. Baby knows best? The impact of weaning style on food preferences and body mass index in early childhood in a case–controlled sample. *BMJ Open* 2012;2:1.
10. Abel S, Park J, Tipene-Leach D, Finau S, Lennan M. Infant care practices in New Zealand: a cross-cultural qualitative study. *Soc Sci & Med* 2001;53(9):1135-48.
11. Campbell ND, Soeken KL, Rankin EAD. Infant Weaning Patterns and Related Maternal-Infant Health Outcomes. *Public Health Nurs* 1986;3(1):57-63.
12. Arden MA. Conflicting influences on UK mothers' decisions to introduce solid foods to their infants. *Matern & Child Nutr* 2010;6(2):159-73.
13. Wright C, Parkinson K, Drewett R. Why are babies weaned early? Data from a prospective population based cohort study. *Arch Dis Child* 2004;89(9):813-16.
14. Hellings P, Howe C. Assessment of Breastfeeding Knowledge of Nurse Practitioners and Nurse-Midwives. *J Midwifery Womens Health* 2000;45(3):264-70.
15. Freed GL, Clark SJ, Lohr JA, Sorenson JR. Pediatrician involvement in breast-feeding promotion: a national study of residents and practitioners. *Pediatrics* 1995;96(3 Pt 1):490-4.
16. Freed GL, Clark SJ, Sorenson J, Lohr JA, Cefalo R, Curtis P. National assessment of physicians' breast-feeding knowledge, attitudes, training, and experience. *JAMA* 1995;273(6):472-6.
17. Schanler RJ, O'Connor KG, Lawrence RA. Pediatricians' practices and attitudes regarding breastfeeding promotion. *Pediatrics* 1999;103(3):E35.

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18. Brown A, Lee M. A descriptive study investigating the use and nature of baby-led weaning in a UK sample of mothers. *Matern Child Health J* 2011;7(1):34-47.
19. Patton MQ. *Qualitative Research and Evaluation Methods*. 3rd ed. Thousand Oaks, California Sage Publications, Inc., 2002.
20. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qualitative health research* 2005;15(9):1277-88.
21. Kondracki NL, Wellman NS, Amundson DR. Content analysis: review of methods and their applications in nutrition education. *Journal of nutrition education and behavior* 2002;34(4):224-30.
22. Dietitians NZ Paediatric SIG convenor. Dietitians NZ Paediatric Special Interest Group Newsletter. In: NZDA, editor. May ed, 2010.
23. Rowell K and Becker H. baby-led-weaning-or-starting-solids-book-review-and-nutritionist-weighs-in-with-her-7-month-old-daughter. http://thefeedingdoctor.com, 2011.
24. Byard RW, Gallard V, Johnson A, Barbour J, Bonython-Wright B, Bonython-Wright D. Safe feeding practices for infants and young children. *J Paediatr Child Health* 1996;32(4):327-9.
25. Naylor A, Morrow A. *Developmental readiness of normal full term infants to progress from exclusive breastfeeding to the introduction of complementary foods: reviews of the relevant literature concerning infant immunologic, gastrointestinal, oral motor and maternal reproductive and lactational development*. Washington DC: Wellstart International, LINKAGES Project Academy for Educational Development, 2001.
26. Pridham KF. Feeding behavior of 6-to 12-month-old infants: Assessment and sources of parental information. *J Pediatr* 1990;117(2(Pt 2)):S174-80.
27. Brown A, Lee M. An exploration of experiences of mothers following a baby-led weaning style: developmental readiness for complementary foods. *Matern Child Health J* 2011.
28. Soh P, Ferguson EL, McKenzie JE, Homs MY, Gibson RS. Iron deficiency and risk factors for lower iron stores in 6-24-month-old New Zealanders. *Eur J Clin Nutr* 2004;58(1):71-79.
29. Domellof M. Iron requirements in infancy. *Ann Nutr Metab* 2011;59(1):59-63.
30. Leong W-I, Lönnerdal B. Iron Nutrition. In: Anderson G, McLaren G, editors. *Iron Physiology and Pathophysiology in Humans*: Humana Press, 2012:81-99.
31. Kramer MK, R. Optimal duration of exclusive breastfeeding. *Cochrane database of systematic reviews* 2002(1):CD003517.
32. World Health Organization. Guiding Principles For Complementary Feeding of the Breastfed Child. Geneva, Switzerland, 2004.
33. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today* 2004;24(2):105-12.
34. Department of Health. Start4Life: No Rush to Mush. http://www.nhs.uk/start4life/pages/no-rush-to-mush.aspx, 2009.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

35. National Health Service (NHS). Your baby's first solid foods. http://www.nhs.uk/Conditions/pregnancy-and-baby/Pages/solid-foods-weaning.aspx: NHS, 2011.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2,3&4
Objectives	3	State specific objectives, including any prespecified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	2&5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	N/A
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5&6
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	6&7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	N/A
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	N/A
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	N/A
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	N/A
Results			

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Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	N/A
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	21
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18-21
Generalisability	21	Discuss the generalisability (external validity) of the study results	21-22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	22

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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