

Effect of complementary feeding using the baby-led weaning method on development in toddlers: a narrative review

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ABSTRACT

Background: The baby-led weaning (BLW) approach can introduce complementary food to six-month-old infants. This method offers large pieces of solid foods such as vegetables, meat, and fruit. BLW can encourage children's development, especially motor skills such as chewing and speaking. This literature review aimed to determine the definition and technique of the BLW in giving complementary feeding and identify the effect of using the BLW method on toddler development.

Methods: The type of research was a literature review based on the review process of research articles that discuss the effect of BLW on toddler development. The search for articles was done from the Google Scholar and PubMed databases.

Results: The author found infants were introduced to complementary feeding late from standard weaning. Initially, the baby is offered finger food and allowed to eat alone. BLW significantly affects children's development, especially in helping to form independence, preventing picky eater behaviour, stimulating children's fine motor skills, and improving oral motor skills.

Conclusion: The mother offered late complementary feeding with different types of food and techniques from the standard method. The BLW could significantly influence toddler development.

Keywords: baby-led weaning, child development, complementary feeding, parent-led weaning

Received: January 7, 2024. **Accepted:** March 1, 2024.

Type: Review Article; Doi: 10.62004/kpc.v3i1.27

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Introduction

The child is one of the most essential human resources in developing a nation with higher quality and better living.¹ Development is a maturing process that includes human psychological processes that cannot be evaluated, such as skill acquisition. Several factors influence children's growth rate, including the environment, health, nutrition, stimulation, and parental engagement.² During the first year of life, dietary transitions due to changes in the baby's nutritional needs impact the child's short and long-term growth and development. Therefore, transitioning from milk-based foods to complementary foods for breast milk is crucial, especially in developing practices and behavior related to eating patterns.³

The World Health Organization (WHO) recommends that children be introduced to complementary foods at six months (180 days) but should still be given breast milk. The

food must be varied and sourced from animal sources, fruit, vegetables, nuts, and seeds.⁴ Responsive feeding is based on children's hunger and fullness signals: motor actions, facial expressions, and vocalizations. The caregiver then responds to all these signals with supportive emotions. This method encourages healthier growth and development in children and encourages children's self-regulation, which is essential to prevent overfeeding. From this, responsive feeding models have been established as a preferential means of feeding young children, positively impacting eating behaviors and dietary intake.⁵

A prevalent form of responsive feeding is baby-led weaning (BLW). The introduction of complementary food to babies is generally done by providing soft food and feeding. However, the BLW method introduces solid foods to babies even after introducing complementary foods at six months.⁶ BLW is a complementary feeding approach that serves family

food to children. Unlike the conventional method, BLW allows children to eat independently.⁷ The main difference between the two methods lies in the texture of the food given. The traditional feeding approach at the beginning offered children soft-textured foods. This differs from BLW, which offers large pieces of vegetables, meat, and fruit so children can take them with their hands.⁸ Even though many people doubt that children can chew these forms of food, the fact is that babies can chew and swallow even though they don't yet have teeth. The chewing process is done using the jaw, and this is enough to break down food. At this age, babies can move food to the back of their mouth and then swallow it. The gagging reflex also plays an essential role in introducing complementary food because it prevents eating large foods.⁹

This is supported by research by Hanindita et al. (2019), who reported that the percentage of children categorized as underweight and stunted was more significant in the BLW group. The large number of children classified as underweight in children with BLW is because this method makes children have low responsiveness to food (desire to eat, regardless of hunger) and responsiveness to a high feeling of fullness (controlling food intake is related to feeling full). The BLW approach is associated with more extended breastfeeding, slower introduction of complementary foods, and minimal control from parents regarding children's nutritional intake, which overall is associated with a reduced risk of obesity. However, it cannot be ruled out that BLW increases the risk of underweight in children.¹⁰

Child growth based on Body Mass Index (BMI) status is unrelated to the child's development. The BMI indicator only classifies children as thin and fat, and that indirectly affects the child's development. This is because growth is influenced not only by nutritional status but also by stimulation factors.¹¹ The development of motor skills is related to the maturity of nerves and muscles. Sensory stimulation through the five senses can stimulate this maturity.¹² According to a survey based on mothers' experiences, BLW encourages children's development, especially motor skills, chewing, and speaking. Besides that, BLW enables sensory learning; for example, children learn to recognize smells, tastes, and textures through touch when eating.¹³

Apart from the background above, researchers want to identify further information regarding the definition and technique of the BLW method for providing MP-ASI and the effect of offering MP-ASI using the BLW method on the development of toddlers.

Methods

The research used a literature review method by reviewing articles that discussed the influence of baby-led weaning on the development of toddlers. Article searches were carried out through Google Scholar and PubMed databases. The keywords used in the Pubmed database were

"baby-led weaning" and "child development." In contrast, the Google Scholar database used the keywords MP-ASI, baby-led weaning, and child development. The articles obtained were then reviewed and synthesized to answer the research questions.

Results

Based on the search, eight pieces of literature were found, with a range of publications from the last ten years that can describe walking styles in older adults, which have been written in Table 1. Morison BJ, et al. Compared to traditional spoon-feeding (TSF) infants, the BLW infants were more likely to feed themselves or most of their food when starting complementary feeding (67% vs 8%, $p < 0.001$). There was no difference in energy intake in either group, but BLW infants appeared to consume more total (48% vs. 42% energy, $p < 0.001$), saturated fat (22% vs 18% energy), less iron (1.6 vs 3.6 mg, $p < 0.001$). BLW infants were likelier to eat with their family at lunch and evening ($p \leq 0.020$).¹⁴

In research conducted by Alpers B et al., there was no difference between the food groups (fruit, vegetables, all fish, meat, sugary or starchy foods) offered between weaning methods. Compared to the baby-led complementary feeding (BLCF) group, the standard weaning (SW) group more often offered baby foods at all ages ($p < 0.001$), fortified infant cereals ($p < 0.001$), and salty snacks at 6–8 months ($p = 0.03$), dairy and dairy-based desserts at 9–12 months ($p = 0.04$). However, the SW group was less often offered oily fish at all ages ($p < 0.001$) and 6–8 months ($p = 0.01$). Processed meats are also less often offered at all ages ($p < 0.001$), 6–8 months ($p = 0.003$), and 9–12 months ($p < 0.001$). Intakes of Na ($p = 0.028$) and fat from food ($p = 0.035$) were significantly more significant in the BLCF group compared to the SW group. Fe intake was lower than the RNI in both groups but significantly so in the BLCF group.¹⁵

Research conducted by Rowan H et al. shows that strict BLW infants at 6 – 8 age were more likely to be exposed to vegetables ($p = 0.000$) and protein ($p = 0.002$) than traditionally weaning at all age groups. The strict BLW was offered significantly fewer portions for composite meals than the traditional group ($p = 0.002$). However, no significant differences were found in reported exposure to iron-containing foods between weaning groups at any age.¹⁶

Research conducted by Widita MP et al. shows that 66.7% of the total sample had good oral motor skills before implementing BLW. This increased to 95.2% after the implementation of BLW. The difference in oral motor skills before and after implementing BLW was 28.5%, with a p -value of 0.031.¹⁷ Research conducted by Utami AF et al. shows that based on the analysis, three themes were obtained: prevent picky eater behavior in children, babies experience gagging and choking of food and eat independently.⁶

Research conducted by Addessi E et al. shows that study stated that babies in the BLW group started finger feeding significantly earlier than those in the non-BLW.

Analysis of the age of introducing finger food with family food feeding shows a p -value of 0.002 and a t -value of 3.18. The relationship between the percentage of family food provided and the age at first sitting showed significant results with a p -value of 0.019 and a t -value of -2.35. A positive relationship exists between the percentage of spoon-feeding and the child's crawling age (p -value 0.037 and t -value 2.25).¹⁸

Research conducted by Yusnita MM et al. shows that 13.33% of people from the control group experienced a behavior change to become less picky eaters. After statistical analysis regarding the pre-test and post-test scores, the p -value = 0.609, meaning no significant change existed. Meanwhile, 15 out of 17 people (83.34%) in the experimental group were not picky eaters. Through analysis, the value obtained was p -value = 0.000.¹⁹

Research conducted by Białek-Dratwa A et al. shows that 88.4% of the M-BLW group, 45.35% of the M-TS group of mothers, and 65.62% of the M-NoBLW group reported that their children had eaten independently under one year (p -value = 0.000).

51.91% of babies who were fed using the BLW method experienced gagging, and 6.94% experienced choking. Meanwhile, 29.1% of babies who were breastfed experienced gagging, and 5.42% experienced choking (p -value = 0.000).²⁰

Discussion

There are two popular methods of complementary feeding, namely parent-led weaning (PLW) and BLW. Parents feed children using the PLW method. The parents determine the process of providing complementary foods and the time for stopping breast and formula milk.⁵ Conversely, BLW is a method of introducing family food rather than feeding soft foods. BLW tends to give children the opportunity to eat their food.⁷

Misunderstandings often occur in the implementation of BLW. Most parents think that in practice, they only need to put the food in front of the child, and then the child will eat it independently.⁵ Parents should be their children's eating friends.⁶ Through this interaction, children will get the opportunity to learn more about food. Besides that, parental supervision is essential to ensure safety in the child's eating process and prevent choking.⁵

BLW was introduced to complementary food at 6-8 months. The standard feeding method introduces complementary foods starting from 5.5 months of age. Solid food for under six months is not recommended because it decreases the baby's interest in milk. Additionally, solid foods are not as nutrient-rich as breast milk or formula. Solid foods also increase the risk of infections and allergies in children due to an immature immune system.¹⁵

Parents with strict BLW avoid chaos in the BLW approach, so they choose not to feed the baby even though, at this age, the baby can provide using his spoon. The primary sources of dairy products in the strict BLW group

include cheese, toast, and sandwiches. The traditional group still showed higher exposure to composite foods than the severe BLW group. However, children should be directed towards family food at this age rather than relying solely on certain baby foods.¹⁶

The BLW approach is unsuitable for all babies, a disadvantage of the BLW method.²¹ BLW children experience higher iron deficiency than traditional groups, causing children with the BLW approach to consume more fruit and vegetables with lower iron levels of meat.¹⁰ The latest feeding guidelines in Australia state that children should be given iron-rich cereals, meat, poultry, fish, tofu, and nuts. This is followed by providing vegetables, fruit, and dairy products.²²

Children's independence is demonstrated by their ability to manage their own lives when it comes to eating and cleaning themselves.¹² The autonomy of the eating process is formed when children can control it, know their feelings of hunger fullness, and focus on the eating process.⁶ Stages towards independence in the eating process are obtained by providing cognitive stimulation to children. Stimulation is provided by sitting the child with family members. Stimulus is obtained through paying attention to how to take food, putting food in the mouth, and chewing the food. In the associative stage, the child is allowed to try to bring food and put the food in his mouth. At this stage, the child will make corrections to the mistakes made. This process continues to repeat until autonomous movement is formed. At the independent stage, the movements displayed are more efficient.¹²

A poor relationship between children and food causes a behavioral disorder called picky eating. A child is identified as a picky eater if there are behaviors such as consuming a limited variety of foods, limited intake, refusing to try new foods, and showing little interest in food.²³ Parents' concerns regarding the risk of choking are an obstacle to implementing BLW. This worry causes the child to lack the opportunity to eat independently. This opportunity is needed to train children to control these mechanisms.²⁴ Gagging or gag reflex occurs due to a lack of coordination in the chewing process and transfer of food to the back of the mouth. Meanwhile, choking occurs when there is a blockage in the respiratory tract. Gagging and choking are normal reflexes that occur when introducing complementary food, and these two mechanisms are essential in developing and maturing children's oral motor skills.²⁰

The form of food offered is not significantly related to the incidence of choking. However, when given finger and lumpy food, the traditional weaning approach experienced choking significantly more frequently than the BLW group. This is due to the low exposure to finger foods in this group. In contrast, the frequency was standard in the BLW group. In BLW, there is no transition from soft food to solid food.⁸

BLW improves the ability to chew food, manual dexterity, and hand coordination faster than children who are usually fed. Providing a variety of food textures allows

Table 1. Results of articles following the complementary feeding using a baby-led weaning method on development

Authors	Titles	Methods	Results
Morison BJ, Taylor RW, Haszard JJ, Schramm CJ, Erickson LW, Fangupo LJ, et al.	How Different Are Baby-Led Weaning And Conventional Complementary Feeding? A Cross-Sectional Study Of Infants Aged 6–8 Months	Study design: Cross-sectional study Sample size: 51 infants (n=25 BLW, 26 TSF) Measurement tools: questionnaire completed by parents and weighted diet records (WDR) at 1–3 non-consecutive day.	BLW vs TSF infants on feeding outcome (67% vs 8%, $p<0.001$). There was no difference in energy intake in either group, but BLW infants appeared to consume more total (48% vs. 42% energy, $p<0.001$), saturated fat (22% vs 18% energy), less iron (1.6 vs 3.6 mg, $p<0.001$). BLW infants were likelier to eat with their family at lunch and evening ($p\leq 0.020$).
Alpers B, Blackwell V, Clegg ME.	Standard V. Baby-Led Complementary Feeding: A Comparison Of Food And Nutrient Intakes In 6–12-Month-Old Infants In The UK	Design study: population-based study Sample: 134 parents with a child aged 6–12 (n=88, BLCF; n=46, SW). Measurement tools: questionnaire completed by parents, formatted using Qualtrics software (Qualtrics© 2017; Provo, UT, USA) Statistical analysis: Statistical software package IBM SPSS Statistics version 23 with a p -value of <0.05	SW group vs. BLCF group more often offered baby foods at all ages ($p<0.001$), fortified infant cereals ($p<0.001$), and salty snacks at 6–8 months ($p=0.03$), dairy and dairy-based desserts at 9–12 months ($p=0.04$). However, the SW group was less often offered oily fish at all ages ($p<0.001$) and 6–8 months ($p=0.01$). Processed meats are also less often offered at all ages ($p<0.001$), 6–8 months ($p=0.003$), and 9–12 months ($p<0.001$). BLCF group vs SW group intakes of Na ($p=0.028$) and fat from food ($p=0.035$) were significantly more significant. Fe intake was lower than the RNI in both groups but significantly so in the BLCF group.
Rowan H, Lee M, Brown A.	Differences In Dietary Composition Between Infants Introduced To Complementary Foods Using Baby-Led Weaning And Traditional Spoon Feeding	Sample: 178 mothers and two fathers. Participants were split into those following strict BLW, loose BLW, and traditional spoon-feeding. Measurement tools: online survey completed by parents and a 24-hour food recall task.	Strict BLW infants at 6 – 8 age vs traditionally weaning at all age groups were more likely to be exposed to vegetables ($p=0.000$) and protein ($p=0.002$). For composite meals, the strict BLW was offered significantly fewer portions than the traditional group ($p=0.002$).
Widita Muharyani P, Jaji, Nurhayati E. (2018)	Pengaruh Metode Baby Led Weaning terhadap Keterampilan Oral Motor pada Bayi 6-12 Bulan di Desa Sidorejo UPTD Puskesmas Way Hitam IV	Study design: pra experimental with one group pretest-posttest and without a control group. Sample size: 27 infants. Measurement tools: The Schedule For Oral Motor Assessment	BLW had good oral motor skills before implementing 66.7% of the sample. This increased to 95.2% after the implementation of BLW. The difference in oral motor skills before and after implementing BLW was 28.5%, with a p -value of 0.031.
Utami AF, Wanda D, Hayati H, Fowler C. (2020)	Becoming an Independent Feeder": Infant's Transition in Solid Food Introduction Through Baby-Led Weaning	Study design: qualitative study. Sample: 13 mothers who introduced complementary foods used BLW for at least six months. Data collection: semi-structured interviews.	Based on the analysis, three themes were obtained, namely: 1. Prevent picky eater behavior in children (try to accept different foods and learn to accept different food textures); 2. Babies experience gagging and choking on food (gagging and choking response in babies and gagging becomes part of the learning process); 3. Eat independently (learn to be independent and focus while eating).

BLCF, baby-led complementary feeding; BLW, baby led walker; SOMA, The Schedule For Oral Motor Assessment; TSF, traditional spoon-feeding; WDR, weighted diet records;

Table 1. -Continued

Authors	Titles	Methods	Results
Addressi E, Galloway AT, Wingrove T, Brochu H, Pierantozzi A, Bellagamba F, et.al. (2021)	Baby-Led Weaning in Italy and Potential Implications for Infant Development	Sample: 1245 mothers with 6-12 month-old infants. Independent variable: spoon-feeding percentage, puree-feeding percentage, and family-food feeding percentage. Dependent variable: infant development Data collection: Survey based on two previous surveys (Brown & Lee, 2011; Cameron et al., 2013). Surveys questionnaire completed by mothers.	This study stated that babies in the BLW group started finger feeding significantly earlier than non-BLW. Analysis of the age of introducing finger food with family food feeding shows a <i>p</i> -value of 0.002 and a <i>t</i> -value of 3.18. The relationship between the percentage of family food provided and the age at first sitting showed significant results with a <i>p</i> -value of 0.019 and a <i>t</i> -value of -2.35. A positive relationship exists between the percentage of spoon-feeding and the child's crawling age (<i>p</i> -value 0.037 and <i>t</i> -value 2.25.)
Yusnita Maelani M, Pertiwi S, Wulandara Q. (2021)	Pengaruh Pemberian MP-ASI Metode BLW (Baby Led Weaning) terhadap Perilaku Picky Eater pada Balita Usia 12-24 Bulan di RW 015 dan RW016 Kelurahan Kahuripan Kecamatan Tawang Kota Tasikmalaya Tahun 2020	Design study: quick experiment with the non-equivalent control group. Sample size: 34 toddlers with picky eaters. Measurement tools: questionnaires were given to mothers and analyzed using the Wilcoxon Signed test with a <i>p</i> -value $\leq \alpha$ 0.1 and a confidence level of 90%	Based on the data analysis, 13.3% of people from the control group experienced a behavior change to become less picky eaters. After statistical analysis regarding the pre-test and post-test scores, the <i>p</i> -value = 0.609, meaning no significant change existed. Meanwhile, 15 out of 17 people (83.34%) in the experimental group were not picky eaters. Through analysis, the value obtained is <i>p</i> -value = 0.000.
Białek-Dratwa A, Kowalski O, Szczepańska E. (2022)	Traditional, complementary feeding or BLW (Baby Led Weaning) method? – A cross-sectional study of Polish infants during complementary feeding.	Design study: <i>cross-sectional study</i> Sample (n): 646 mothers with a child aged 6 – 36. Subjects are divided into groups: a. BLW was used (M-BLW) b. BLW was not used (M-TS) c. Don't know BLW (M-No BLW)	88.4% of the M-BLW group, 45.35% of the M-TS group of mothers, and 65.62% of the M-NoBLW group reported that their children had eaten independently under one year (<i>p</i> -value = 0.000). 51.91% of babies who were fed using the BLW method experienced gagging, and 6.94% experienced choking. Meanwhile, 29.1% of babies who were breastfed experienced gagging, and 5.42% experienced choking (<i>p</i> -value=0.000).

Measurement tools; survey questionnaire

BLCF, baby-led complementary feeding; BLW, baby led walker; SOMA, The Schedule For Oral Motor Assessment; TSF, traditional spoon-feeding; WDR, weighted diet records;

children to learn safe and efficient food chewing patterns.²⁴ Also, providing variations in taste and texture of food can stimulate the baby's sensory and motor coordination. Coordination between these two systems is seen through the emergence of coordination between the baby's hands and eyes. When the baby can put food into the mouth, the movement of the oral motor muscles will be stimulated to form stable oral motor movements.²⁵

The baby's oral motor skills increased. This increase in oral motor skills can occur because, since the beginning of BLW implementation, children have not been introduced to fine-textured foods. Food with a fine texture will be swallowed directly without going through the chewing process.¹⁷ Babies who follow BLW are offered family food in finger food. Finger foods can provide sensory stimulation to children's hands. This stimulation is obtained through holding, throwing, sniffing, licking, and tasting various foods independently. Also, when children can feed food with their hands, their fingers' balance and flexibility will naturally develop.¹²

A child's interaction with food before swallowing provides experiences that can influence their cognitive and motor development. Before implementing the BLW method, babies must be able to sit independently, reach or pick up something, and put it in their mouth. Therefore, the ability to sit upright is one of the predictors of giving complementary feeding. In the process of eating, a child must be able to sit upright, not slump or lean backward. This position is essential to ensure the baby's safety during feeding.⁵

There were some limitations in this study. First, the inclusion criteria were restricted to eight relevant journals, potentially leaving out similar research from other sources. Second, rely on a literature review design that uses secondary data from published literature. Furthermore, limitations may come from methodological differences across the research included in this literature review.

Conclusion

Mothers who use the BLW approach offer complementary feeding more slowly with a different food composition than the standard method. Children are provided finger foods that they can hold and allow to eat themselves. Giving the BLW method can significantly influence the development of toddlers in the aspect of independence in the eating process, preventing picky eater behavior and improving children's oral and motor skills.

Ethical consideration

The researchers carried out a literature review on the subject. The study did not require ethical approval because it only reviewed existing data and did not include human beings or acquire new data.

Funding

This study received no grants from any institution.

Conflict of interest

This study has no conflicts of interest.

Author contributions

PEW creates study designs, collects data, processes the data, and writes publications. AANTND IDGAK and MHSN are responsible for data gathering and manuscript revision.

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