



Baby food pouches and Baby-Led Weaning: Associations with energy intake, eating behaviour and infant weight status

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ABSTRACT

Although concern is frequently expressed regarding the potential impact of baby food pouch use and Baby-Led Weaning (BLW) on infant health, research is scarce. Data on pouch use, BLW, energy intake, eating behaviour and body mass index (BMI) were obtained for 625 infants aged 7–10 months in the First Foods New Zealand study. Frequent pouch use was defined as ≥ 5 times/week during the past month. Traditional spoon-feeding (TSF), “partial” BLW and “full” BLW referred to the relative proportions of spoon-feeding versus infant self-feeding, assessed at 6 months (retrospectively) and current age. Daily energy intake was determined using two 24-h dietary recalls, and caregivers reported on a variety of eating behaviours. Researchers measured infant length and weight, and BMI z-scores were calculated (World Health Organization Child Growth Standards). In total, 28% of infants consumed food from pouches frequently. Frequent pouch use was not significantly related to BMI z-score (mean difference, 0.09; 95% CI -0.09, 0.27) or energy intake (92 kJ/day; -19, 202), but was associated with greater food responsiveness (standardised mean difference, 0.3; 95% CI 0.1, 0.4), food fussiness (0.3; 0.1, 0.4) and selective/restrictive eating (0.3; 0.2, 0.5). Compared to TSF, full BLW was associated with greater daily energy intake (BLW at 6 months: mean difference 150 kJ/day; 95% CI 4, 297; BLW at current age: 180 kJ/day; 62, 299) and with a range of eating behaviours, including greater satiety responsiveness, but not BMI z-score (6 months: 0.06 (-0.18, 0.30); current age: 0.06 (-0.13, 0.26)). In conclusion, neither feeding approach was associated with weight in infants, despite BLW being associated with greater energy intake compared with TSF. However, infants who consumed pouches frequently displayed higher food fussiness and more selective eating.

Abbreviations: BLW, Baby-Led Weaning; TSF, Traditional spoon-feeding; BMI, Body mass index; NZ, New Zealand; WHO, World Health Organization; CEBQ, Children’s Eating Behaviour Questionnaire; TPMBQ, Toddler-Parent Mealtime Behavior Questionnaire; PediEAT, Pediatric Eating Assessment Tool.

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1. Introduction

The complementary feeding period is a critical time for establishing optimal eating behaviours, with both *what* and *how* infants are fed contributing to the development of lifelong habits (Schwartz et al., 2011). Typically, infants are introduced to solid foods by being spoon-fed purées, with gradual progression to mashed, chopped, and finally whole finger foods over the course of the complementary feeding period (Ministry of Health, 2021). However, the last decade has seen a shift in infant feeding practices with the invention of baby food “pouches” and the rise in popularity of Baby-Led Weaning (Boswell, 2021; Rapley & Murkett, 2008), both of which may have implications for infant health and development.

Currently, the majority of commercial infant food purées sold in high income countries are packaged in baby food pouches (Beauregard et al., 2019; Garcia et al., 2020; Katiforis et al., 2021). Pouches are squeezable single-use plastic containers with an attached nozzle, which were developed to make food more “kid-friendly” (Adams, 2013), and are favoured by parents for their convenience and potential for less mess, particularly when feeding “on-the-go” (ABC Packaging Direct, 2017; Griggs, 2017). Similarly, many parents perceive pouches to be a safe option that children can eat from independently since the contents can be eaten without the need for utensils (ABC Packaging Direct, 2017; McLean et al., Unpublished results; M. Rowan et al., 2022).

In contrast to their purported benefits, several groups have expressed concern about the potential implications of pouch use for a range of nutrition-related outcomes (Crawley & Westland, 2017; Koletzko et al., 2019; WHO Regional Office for Europe, 2019). Critics suggest the nature of the packaging may increase the risk of overfeeding, leading to inappropriate weight gain. Additionally, pouches prevent the infant from learning about the sensory properties of food (i.e., the look, smell, texture and feel of food) which may have implications for later food acceptance (Harris & Coulthard, 2016). Despite these concerns, only one study has investigated pouch use and weight status in toddlers, showing that fruit pouch consumption was not significantly associated with body mass index (BMI) z-score at 18 months of age (Lundkvist et al., 2021). To date, no research appears to have investigated whether pouch use is related to energy intake, eating behaviours, or BMI in infants.

The use of Baby-Led Weaning as an alternative approach to complementary feeding has also become popular in recent years, with a 2017 survey finding that almost 30% of New Zealand infants followed Baby-Led Weaning at the age of 6–7 months (Fu et al., 2018). In Baby-Led Weaning, finger foods are offered and self-fed from the start of complementary feeding, and the use of purées is discouraged (Rapley & Murkett, 2008). Proponents argue self-feeding helps infants to maintain their natural appetite regulation and leads to healthier weight gain (Rapley & Murkett, 2008), although health professionals have expressed concern that energy intake may be too low, depending on food choice (Cameron et al., 2012; D’Andrea et al., 2016). Most studies report non-significant findings for differences in energy intake between Baby-Led Weaning and traditional spoon-feeding (Alpers et al., 2019; Morison et al., 2016; Pearce & Langley-Evans, 2022; Williams Erickson et al., 2018), apart from one study that found infants who were following Baby-led Weaning consumed around 500 kJ/day less ($p = 0.04$) than infants who were spoon-fed (H. Rowan et al., 2022). However, most of these studies included fewer than 100 participants (Alpers et al., 2019; Morison et al., 2016; Pearce & Langley-Evans, 2022; H. Rowan et al., 2022) limiting power to detect any differences that might exist. Others used a form of Baby-Led Weaning (Williams Erickson et al., 2018) specifically modified to address concerns regarding the under-consumption of energy, making any comparisons difficult. While the research base examining Baby-Led Weaning is growing, current evidence is varied, relies heavily on parent-report of infant anthropometry (Alpers et al., 2019; Brown & Lee, 2011; Fu et al., 2018; Kahraman et al., 2020; Townsend & Pitchford, 2012), uses varying definitions of Baby-Led Weaning (Brown & Lee, 2011; Fu et al., 2018; Townsend &

Pitchford, 2012) or a modified Baby-Led Weaning approach (Dogan et al., 2018; Taylor et al., 2017), and samples are not necessarily reflective of the general population (Boswell, 2021). Further research is thus required before evidence-based recommendations can be made.

Therefore, the aims of this study were to investigate whether the frequent use of baby food pouches, or the use of a Baby-Led Weaning approach to complementary feeding, are associated with differences in infant energy intake, eating behaviours or BMI z-scores.

2. Methods

2.1. Participants and sample size

Caregiver-infant dyads were recruited as part of the First Foods New Zealand (FFNZ) study, an observational study of food and health in New Zealand (NZ) infants 7–10 months of age (Fig. 1). The overall aim of the FFNZ study was to assess iron status, growth, nutrient and food intakes, breast milk intake, eating and feeding behaviours, dental health, oral motor skills and choking risk of NZ infants in general, and in those who use baby food pouches or Baby-Led Weaning compared with those who do not. The majority of data were collected at the infant’s current age but some data (Baby-Led Weaning status) were also collected retrospectively for when the infant was 6 months of age. Participants were recruited between July 2020 and February 2022 by advertisement and word-of-mouth. Advertisements did not mention Baby-Led Weaning or baby food pouch use, and care was taken to avoid promoting the study on any social media pages dedicated to specific infant feeding methods. The inclusion criteria for the study were: respondent had an infant aged 6.5–9.5 months (to allow time for scheduling of appointments before 10 months of age), both infant and respondent lived within the Auckland or Dunedin regions of NZ, and the infant had not been recently involved in a nutrition intervention study (that might therefore have influenced their normal diet). Caregivers were not eligible to participate if they were aged <16 years and/or could not communicate in English. Written informed consent was provided by caregivers for themselves and their infant at the first study appointment and participants were reimbursed for their time with a \$150 supermarket gift voucher. The study was approved by the Health and Disability Ethics Committees New Zealand (19/STH/151) and was registered with the Australian New Zealand Clinical Trials Registry (ACTRN12620000459921).

Due to the lack of existing data on pouch use, the sample size calculation was based on the comparison of BMI z-score in infants following Baby-Led Weaning and traditional spoon-feeding (primary outcome). Previous research had suggested that 29% of infants would meet our definition of Baby-Led Weaning (Fu et al., 2018). Recruitment of 625 participants (to meet the requirements of the other primary outcome of the study which was to determine iron status (Taylor et al., 2021)) would therefore allow collection of complete data from at least 125 Baby-Led Weaning and 312 traditionally spoon-fed infants. This number ($n = 437$) would allow detection of a difference of 0.3 in BMI z-score, with power of 80% and a significance level of 5%.

2.2. Procedures

Most participants completed three in-person visits at their home, our clinic or via Zoom when COVID-19 restrictions prevented close contact, and a subset of participants attended two additional visits (to measure breast milk volume). Visits were conducted over a two week period. Data relevant to the aims of this publication were collected using two interviewer-administered 24-h dietary recalls, anthropometric measurements and self-administered electronic questionnaires; the full FFNZ study protocol is detailed elsewhere (Taylor et al., 2021). Data were collected and managed using REDCap (Research Electronic Data Capture).

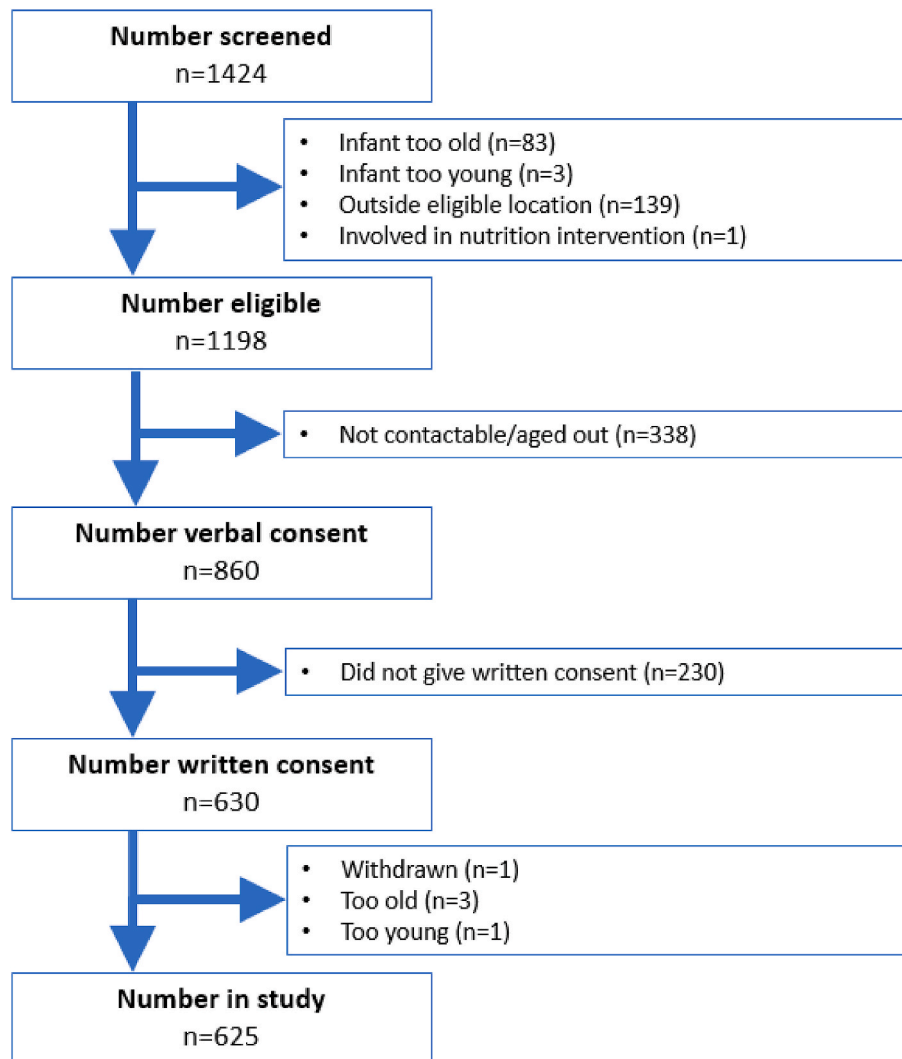


Fig. 1. First Foods New Zealand study recruitment flowchart.

2.3. Measures

2.3.1. Demographic characteristics

At the first visit, caregivers completed a self-administered electronic questionnaire to assess demographic characteristics. Demographic data collected for the infant were: age, sex, ethnicity and gestational age at birth. Demographic data collected for the adult respondent were: age, ethnicity, maternal parity (only collected if the infant's mother was the respondent), as well as the respondent's relationship to the infant, highest level of education, employment status, and self-reported height and weight. Participants who identified with more than one ethnicity were prioritised into one ethnic group, using the following order of priority (from highest to lowest): Māori, Pacific, Asian, Others, European (Ministry of Health, 2008). Respondents were also asked to provide information on the number of adults and children living in the household and use of out-of-home childcare for the infant. Area-level socioeconomic deprivation was estimated using the participant's home address and the NZ Index of Deprivation 2018, which uses a range of Census data to create scores ranging from 1 (low deprivation) to 10 (high deprivation) (Atkinson et al., 2021).

2.3.2. Measurement of baby food pouch use

Caregivers were asked to report the frequency of baby food pouch use (including fed by spoon or directly from the nozzle) by choosing from one of nine answer options for the question "how often has your

baby eaten from a 'ready-to-eat' baby food pouch in the past month?" Infants were defined as "frequent pouch users" if their caregiver specified they were given food from a ready-to-eat baby food pouch (i.e. commercially prepared baby food packaged in a squeezable pouch with an attached nozzle) "5 to 6 times a week", "once a day", or "more than once a day" in the past month. If the caregiver answered "never", "less than once a month", "once a month", "2–3 times a month", "once a week" or "2–4 times a week", infants were defined as "less frequent or non pouch users".

2.3.3. Measurement of Baby-Led Weaning status

To determine Baby-Led Weaning status, caregivers were asked to report the way their infants were being fed at two time points: (i) when the infant was around 6 months of age (retrospectively assessed), and (ii) at the infant's current age. Participants could choose from five answer options. Those who selected "spoon fed by an adult" or "mostly spoon fed by an adult, some baby feeding themselves" were classified as traditionally spoon-fed, those who answered "about half spoon feeding by an adult and half baby feeding themselves" were classified as partial Baby-Led Weaning, and those who reported "mostly baby feeding themselves, some adult spoon feeding" or "baby feeding themselves" were classified as full Baby-Led Weaning (Fu et al., 2018).

2.3.4. Dietary assessment and analysis

At the first and second visits trained researchers collected

information about infant dietary intake on the previous day using an interviewer-administered multiple pass 24-h dietary recall. Where possible, each diet recall was administered on a different day of the week to capture daily variation in intake. On the day prior to the visit, caregivers were asked to take photographs of their infant's food to aid the caregiver's memory in recall of foods consumed by the infant. The 24-h recall used a three-pass method. The first pass captured a 'quick-list' of foods and liquids consumed, where the caregiver was asked to simply list each food or liquid (and breast feeding occasions) that had been offered to the infant on the previous day. The second pass captured additional detail, including a description of each food or liquid (including the brand and preparation method used) and both the amount offered and consumed. Visual aids such as dishes and utensils were used to estimate amounts where relevant. During the third pass, researchers reviewed the details with the participant and probed for forgotten items. In instances where the infant was cared for by someone other than the primary caregiver on the day prior to the 24-h recall (e.g., the infant attended childcare), researchers provided a printed copy of an adapted food diary to be used on the day before the recall interview. The food diary was completed by the 'other' caregiver and provided a brief record of the infant's food and liquid intake, including how much the infant ate and details of any recipes used while in care. Quality checks were undertaken at regular intervals during the study to ensure adherence to data collection protocols.

To determine energy intake from breast milk, accurate data on breast milk intake were collected from a subsample of participants ($n = 158$) using the deuterium oxide dose-to-mother stable isotope technique (International Atomic Energy Agency, 2010; Liu et al., 2019a; Liu et al., 2019b). In brief, this requires collection of four saliva samples from the mother and breastfed infant over the course of 14 days. For all other breastfed infants, estimated daily breast milk intake in grams per day was calculated using a predictive equation developed using the dose-to-mother dataset.

Dietary data were analysed using the nutrient analysis software FoodWorks (version 10, Xyris Software) and nutrient data from the New Zealand Food Composition database FOODfiles 2018 Version 01 (The New Zealand Institute for Plant and Food Research Limited and Ministry of Health, 2018). A small team of researchers used standardised procedures to ensure consistent data entry. Nutrient profiles of commercial infant foods available in NZ were previously determined by the research team using an iterative process (Katiforis et al., 2021). Briefly, this involved recipe modelling using the food's ingredient list and nutrition information panel, with repeated (if necessary) reformulation until the recipe nutrient profile matched that of the product's nutrition information panel. For all other commercial foods not already included in FoodWorks, researchers used either an appropriate substitution, or a recipe approach using the food's ingredient list and nutrition information panel. As day-to-day variation in food and nutrient intake is high within participants, the Multiple Source Method (MSM) (Harttig et al., 2011; Haubrock et al., 2011) was applied to the energy intake data from complementary foods reported in the 24-h recalls in order to calculate daily usual energy intake from complementary foods. The MSM uses statistical methods to estimate the within-person variability and apply this to the sample distribution, adjusting intakes to more closely represent 'usual intakes'; this is recommended practice for assessing nutrient intakes in the population from diet recalls (Harttig et al., 2011; Haubrock et al., 2011). Usual daily energy intake from breast milk was calculated by multiplying breast milk intake in grams per day (calculated using either the dose-to-mother technique or the predictive equation) by the mature human milk energy composition data from FOODfiles 2018 (The New Zealand Institute for Plant and Food Research Limited and Ministry of Health, 2018). Average daily energy intake from infant formula was calculated using intake data collected by the 24-h recalls and specific infant formula composition data extracted from product nutrition information panels. Finally, each participant's total usual daily energy intake was calculated by summing each of their (i)

usual daily energy intake from complementary food, (ii) usual daily energy intake from breast milk (if applicable) and (iii) average daily energy intake from infant formula (if applicable).

2.3.5. Infant eating behaviour

At the first visit, caregivers completed three selected subscales ('food responsiveness', 'enjoyment of food', and 'satiety responsiveness') from the validated 35-item CEBQ (Wardle et al., 2001). Caregivers rated their infant according to food approach appetitive traits ('food responsiveness' and 'enjoyment of food' subscales) and a food avoidant appetitive trait ('satiety responsiveness' subscale) using a five-point Likert scale for each item (1 = never, 2 = rarely, 3 = sometimes, 4 = often and 5 = always). One item in the satiety responsiveness subscale was reverse-scored. The food responsiveness subscale uses five items, with higher scores indicating a greater desire to eat in response to external food cues regardless of hunger, and includes items such as "Even if my child is full up s/he finds room to eat his/her favourite food". The enjoyment of food subscale uses four items and includes statements such as "My child is interested in food", where a higher score indicates a greater general interest in food. The satiety responsiveness subscale uses five items, with higher scores indicating a greater ability of the child to regulate the intake of food in response to internal feelings of fullness, and includes statements such as "My child cannot eat a meal if s/he has had a snack just before". All three subscales demonstrated good internal consistency and reliability with Cronbach's α calculated as 0.83 for food responsiveness, 0.90 for enjoyment of food and 0.72 for satiety responsiveness for our sample.

Food fussiness or 'picky eating' was also assessed by self-administered questionnaire at the first visit using the 'Picky eater' subscale from the Toddler-Parent Mealtime Behavior Questionnaire (TPMBQ) (Horodyski et al., 2010) (Cronbach's $\alpha = 0.83$). Caregivers used a 5-point Likert scale (1 = never, 5 = always; with two items reverse scored) to rate infants on five items such as "My child accepts new foods" and "My child tries new foods (for example, will take a bite or taste of a new food)". Scores were calculated as the mean of all items. Only those with less than 20% missing items had a score calculated.

A separate questionnaire was emailed to participants following their second visit. Caregivers completed the Pediatric Eating Assessment Tool (PediEAT), a 78-item questionnaire that measures current problematic feeding behaviours in children aged from 6 months to 7 years (Thoyre et al., 2014). This study reports the results for two of the four PediEAT subscales: Problematic Mealtime Behaviors and Selective/Restrictive Eating. The Problematic Mealtime Behaviors subscale includes 23 items that measure food acceptance and refusal behaviours, stress behaviours whilst eating, and food preferences (Cronbach's $\alpha = 0.88$). The Selective/Restrictive Eating subscale includes 15 items that assess sensory (texture and temperature) preferences (Cronbach's $\alpha = 0.80$); items include "My child will eat mixed texture foods" and "My child will eat frozen food, like ice cream". Each item is rated on a 6-point Likert scale (0 = never, 1 = almost never, 2 = sometimes, 3 = often, 4 = almost always and 5 = always), with five items on the Problematic Mealtime Behaviors subscale and twelve items on the Selective/Restrictive Eating subscale scored in reverse. The scale for six items was modified to include an additional answer option to allow caregivers to answer the item appropriately if their infant had not yet been offered specific types of foods or textures (e.g., crunchy or frozen foods). For example, for the Problematic Mealtime Behaviors item "My child prefers crunchy foods", the scale was modified to include an answer option of "My child is not offered crunchy foods" in addition to the six existing Likert-scale ratings (from Never to Always). Where caregivers answered any of the six PediEAT items using the additional answer option, the items were scored as follows: Four items in the Selective/Restrictive Eating subscale were given a score of 0, as per instructions in the original PediEAT questionnaire; and two items, one item in the Selective/Restrictive Eating subscale (i.e., "My child will eat mixed texture foods"), and one item in the Problematic Mealtime Behaviors subscale (i.e., "My child

prefers crunchy foods”), were scored as missing (so the questions were not included in the subscale score if the infant was not yet eating mixed texture foods or crunchy foods). Responses for each item were combined to determine a total score for each subscale. Total scores range from 0 to 115 for Problematic Mealtime Behaviors and 0–75 for Selective/Restrictive Eating, with higher scores indicating more symptoms of problematic feeding behaviour.

2.3.6. Infant anthropometric data

Trained researchers following World Health Organization (WHO) protocols (de Onis et al., 2004) obtained duplicate measures of infant weight and length using an electronic scale (Seca models 334 and 354) and a 99 cm measuring mat (Seca model SE210). A third measure was taken if duplicate lengths or weights differed by more than 0.7 cm or 0.1 kg, respectively. The two closest measures were averaged and used to calculate BMI (weight in kg divided by height in meters squared). Age- and sex-specific BMI z-scores were determined using WHO Child Growth Standards (WHO Multicentre Growth Reference Study Group, 2006).

2.4. Statistical analysis

The data were analysed using Stata v.17 (StataCorp, College Station, TX, USA). Those with missing data were excluded listwise. Regression models were used to estimate mean differences in BMI z-scores, usual daily energy intake or eating behaviour scores by frequent pouch use, and Baby-Led Weaning status, at both time points (6 months of age and current age). Estimates were also adjusted for demographic characteristics including infant age, sex, ethnicity and area-level socioeconomic deprivation. Residuals of linear regression models were plotted and visually assessed for homoskedasticity and normality. $P < 0.05$ was considered statistically significant.

3. Results

Table 1 provides an overview of the study sample. Overall, infants had a mean (SD) age of 8.4 (0.8) months, the majority were born at term (92.6%) and they were ethnically diverse. Almost two thirds of adult respondents were highly educated (65% university degrees). The adults had a mean (SD) age of 32.7 (4.9) years and BMI of 27.8 (6.4) kg/m², and the majority (99%) were the infant’s mother (almost half (49%) of whom were primiparous). Less than one quarter of respondents (17%) reported using childcare outside of the home and more than one quarter (26%) of participants came from homes with high area-level socioeconomic deprivation.

In total, 28% of infants were classified as current frequent consumers of food from baby food pouches, consuming them at least five times per week (Table 2). These infants had a mean (SD) energy intake of 3674 (725) kJ/day compared with 3550 (601) kJ/day for “less frequent or non pouch users”. We did not find any evidence of an association between pouch use and energy intake, with no significant difference between “frequent” and “less frequent or non” pouch users (adjusted difference, 92 kJ/day; 95% CI -19 to 202; Table 2). Similarly, no statistically significant differences in BMI z-score were evident between “frequent” and “less frequent or non” pouch users (adjusted difference, 0.09; 95% CI -0.09 to 0.27; Table 3).

However, we did observe some differences in appetitive traits and eating behaviours. Table 4 illustrates that frequent consumption of pouches was associated with significantly higher food responsiveness (adjusted difference, 0.2; 95% CI 0.1 to 0.4), food fussiness (0.2; 95% CI 0.0, 0.3) and selective/restrictive eating scores (symptoms of sensory-related issues) (2.8; 95% CI 0.8, 4.7). By contrast, there was no evidence of differences in satiety responsiveness, enjoyment of food or problematic mealtime behaviour scores according to frequency of pouch use.

The proportion of infants classified as following Baby-Led Weaning (either partial or full) increased from 24% (n = 148) at 6 months of age

Table 1

Demographic characteristics of infants and adult respondents.

	n = 625
Infant age (months), mean (SD)	8.4 (0.8)
Infant sex, n (%) ^a	
Female	289 (46.2)
Infant ethnicity, n (%) ^b	
Māori	131 (21.0)
Pacific	44 (7.0)
Asian	90 (14.4)
Others	16 (2.6)
European	344 (55.0)
Term infant born, n (%) ^c	
Pre-term	46 (7.4)
Term	578 (92.6)
Respondent age (years), mean (SD) ^d	32.7 (4.9)
Highest level of education of adult respondent, n (%) ^e	
School	94 (15.1)
Polytechnic or similar	125 (20.0)
University	405 (64.9)
Adult respondent, n (%)	
Mother	617 (98.7)
Maternal parity, n (%) ^c	
Primiparous	303 (48.6)
Respondent employment status, n (%)	
Employed full time	70 (11.2)
Employed part time	137 (21.9)
Other ^e	418 (66.9)
Respondent BMI (kg/m ²), mean (SD) ^f	27.8 (6.4)
Number of children living in household, n (%) ^g	
One	283 (45.4)
Two	200 (32.1)
Three	95 (15.2)
Four or more	46 (7.4)
Number of adults living in household, n (%)	
One	25 (4.0)
Two	517 (82.7)
Three	42 (6.7)
Four or more	41 (6.6)
Childcare used, n (%) ^g	109 (17.4)
Socioeconomic deprivation, n (%) ^h	
1–3 (Low)	180 (28.8)
4–7	282 (45.1)
8–10 (High)	163 (26.1)

c, d, f Data missing for n = 1^c, n = 2^d, and n = 29^f.

a n = 1 answered ‘I would rather not say’ to the question “Is your baby a girl or a boy?”

b Ethnicity prioritised as listed.

e Not employed or on parental leave.

g Childcare used includes early childcare centre or home-based care.

h Determined using the New Zealand Index of Deprivation 2018; Atkinson et al., 2021). NZDep2018 combines 9 variables from the 2018 New Zealand national census to determine a deprivation score for each Statistical Area 1 (a geographic area defined by Statistics New Zealand containing ~100–200 people). The deprivation score estimates the relative material and social deprivation for the area where the participant lives, where decile 1 represents areas with the least deprivation and decile 10 represents areas with the most deprivation.

to 51% (n = 320) at the current age (mean age 8.4 months) (Supplementary Table 1). Mean (SD) energy intake for those who followed traditional spoon-feeding, partial Baby-Led Weaning and full Baby-Led Weaning currently was 3478 (591), 3674 (648) and 3688 (683) kJ/day, respectively. Infants who followed full Baby-Led Weaning at 6 months of age consumed more energy per day at their current age (i.e., at time of data collection, mean age 8.4 months) than infants who were traditionally spoon-fed at 6 months of age (adjusted difference, 150 kJ/day; 95% CI, 4 to 297; Table 2). Similarly, infants who were currently following either partial or full Baby-Led Weaning had a higher current energy intake than spoon-fed infants (current partial Baby-Led Weaning: adjusted difference, 157 kJ/day; 95% CI, 36 to 278; current full Baby-Led Weaning: adjusted difference, 180 kJ/day; 95% CI, 62 to 299; Table 2). Despite these differences in energy intake, there was no

Table 2
Associations between feeding approaches^a and usual daily energy intake.

	n (%)	Unadjusted mean difference (95% CI) ^b energy intake ^c (kJ/day)	Adjusted mean difference (95% CI) ^b energy intake ^c (kJ/day)
Pouch use			
Less frequent or non pouch use	451 (72.2)	Reference	Reference
Frequent pouch use	174 (27.8)	124 (12, 236)	92 (−19, 202)
Baby-Led Weaning status at 6 months of age			
Traditional spoon-feeding	477 (76.3)	Reference	Reference
Partial Baby-Led Weaning	67 (10.7)	69 (−95, 233)	86 (−73, 245)
Full Baby-Led Weaning	81 (13.0)	80 (−72, 231)	150 (4, 297)
Current Baby-Led Weaning status^d			
Traditional spoon-feeding	304 (48.7)	Reference	Reference
Partial Baby-Led Weaning	153 (24.5)	196 (74, 319)	157 (36, 278)
Full Baby-Led Weaning	167 (26.8)	210 (91, 329)	180 (62, 299)

Bold text indicates statistical significance ($p < 0.05$).

^a Pouch use: Less frequent or non pouch use defined as “given baby food from a commercial pouch <5 times per week during the past month, or never”; frequent pouch use defined as “given baby food from a commercial pouch ≥ 5 times per week during the past month”. Baby-Led Weaning status: Traditional spoon-feeding defined as “spoon fed by an adult” or “mostly spoon fed by an adult, some baby feeding themselves”; partial Baby-Led Weaning defined as “about half spoon feeding by an adult and half baby feeding themselves”; full Baby-Led Weaning defined as “mostly baby feeding themselves, some adult spoon feeding” or “baby feeding themselves”.

^b Mean differences & 95% CI estimated with regression models. Adjusted estimates were adjusted for demographic characteristics (infant age, sex, ethnicity and area-level socioeconomic deprivation).

^c Energy intake includes energy from milk feeding (breast milk and/or infant formula) and complementary foods.

^d Data missing for $n = 1$.

evidence of a difference in current BMI z-score according to whether the child followed traditional spoon-feeding or Baby-Led Weaning at either time point (adjusted difference, full Baby-Led Weaning at 6 months: 0.06; 95% CI, −0.18 to 0.30; full Baby-Led Weaning currently: 0.06; 95% CI, −0.13 to 0.26; [Table 3](#)).

However, some differences in appetitive traits and eating behaviours were apparent. Infants who followed a full Baby-Led Weaning approach at 6 months of age ([Table 5](#)) had significantly higher satiety responsiveness (adjusted difference, 0.3; 95% CI, 0.2 to 0.5), lower food responsiveness (−0.4; 95% CI, −0.6 to −0.2), lower food fussiness (−0.2; 95% CI −0.4 to −0.1) and lower selective/restrictive eating scores (−6.0; 95% CI, −8.5 to −3.6) at their current age than their traditionally spoon-fed counterparts. Similar results were evident in infants who followed full Baby-Led Weaning currently ([Table 6](#)), with infants being rated as more satiety responsive (0.3; 95% CI 0.2, to 0.4), less food responsive (−0.2; 95% CI, −0.4 to −0.1), less likely to be fussy eaters (−0.1; 95% CI −0.3 to −0.0) and less likely to have symptoms of selective/restrictive eating behaviours (−7.8; 95% CI, −9.9 to −5.8).

A subset of these associations were apparent for partial Baby-Led Weaning. Compared to traditional spoon-feeding, partial Baby-Led Weaning at both time points (6 months of age and current age) was associated with significantly lower scores for current selective/restrictive eating behaviour (partial Baby-Led Weaning at 6 months: adjusted difference, −5.8; 95% CI, −8.6 to −3.1; partial Baby-Led Weaning currently: −4.89, 95% CI, −7.0 to −2.8; [Tables 5 and 6](#)). Current partial Baby-Led Weaning was also associated with significantly lower food fussiness scores (−0.1; 95% CI, −0.3 to −0.0; [Table 6](#)) when compared to traditional spoon-feeding.

Table 3
Associations between feeding approaches^a and BMI z-score^{b,c}.

	n (%)	Unadjusted mean difference (95% CI) ^d BMI z-score	Adjusted mean difference (95% CI) ^d BMI z-score
Pouch use			
Less frequent or non pouch use	441 (72.4)	Reference	Reference
Frequent pouch use	168 (27.6)	0.13 (−0.05, 0.30)	0.09 (−0.09, 0.27)
Baby-Led Weaning status at 6 months of age			
Traditional spoon-feeding	467 (76.7)	Reference	Reference
Partial Baby-Led Weaning	65 (10.7)	0.12 (−0.14, 0.37)	0.11 (−0.15, 0.37)
Full Baby-Led Weaning	77 (12.6)	0.02 (−0.22, 0.26)	0.06 (−0.18, 0.30)
Current Baby-Led Weaning status^e			
Traditional spoon-feeding	297 (48.9)	Reference	Reference
Partial Baby-Led Weaning	149 (24.5)	0.09 (−0.11, 0.28)	0.06 (−0.14, 0.26)
Full Baby-Led Weaning	162 (26.6)	0.09 (−0.10, 0.28)	0.06 (−0.13, 0.26)

BMI, body mass index.

^a Pouch use: Less frequent or non pouch use defined as “given baby food from a commercial pouch <5 times per week during the past month, or never”; frequent pouch use defined as “given baby food from a commercial pouch ≥ 5 times per week during the past month”. Baby-Led Weaning status: Traditional spoon-feeding defined as “spoon fed by an adult” or “mostly spoon fed by an adult, some baby feeding themselves”; partial Baby-Led Weaning defined as “about half spoon feeding by an adult and half baby feeding themselves”; full Baby-Led Weaning defined as “mostly baby feeding themselves, some adult spoon feeding” or “baby feeding themselves”.

^b Age- and sex-specific BMI z-scores were determined using World Health Organization Child Growth Standards.

^c BMI data missing for $n = 16$.

^d Mean differences & 95% CI estimated with regression models. Adjusted estimates were adjusted for demographic characteristics (infant age, sex, ethnicity and area-level socioeconomic deprivation).

^e Data missing for $n = 1$.

4. Discussion

To our knowledge, this is the first study to report energy intake, weight status and eating behaviour in commercial baby food pouch users during the complementary feeding period. While we did not find evidence of differences in energy intake or BMI z-score for “frequent pouch users” and “less frequent or non pouch users”, our results suggest that infants who used pouches frequently had higher food responsiveness, food fussiness and selective/restrictive eating. Other differences in child appetitive traits and eating behaviour during complementary feeding were also evident, with infants who were classified as full Baby-Led Weaning perceived as more satiety responsive, less food responsive, less fussy toward food, and showing fewer symptoms of sensory-related eating problems than traditionally spoon-fed infants. While Baby-Led Weaning was not significantly associated with BMI z-score in infants at this age, infants following Baby-Led Weaning did have higher energy intakes than those following more traditional methods.

Our finding that infants who used pouches frequently did not have significantly greater energy intake does not support concerns expressed by several health agencies regarding the risk of overfeeding from these novel feeding devices ([Crawley & Westland, 2017](#); [Koletzko et al., 2019](#); WHO Regional Office for Europe, 2019). However, it should be noted that because of the lack of published research studies, these concerns may not be evidence based, and were largely contingent on children consuming food directly from the pouch (i.e., sucking directly from the nozzle). In our large and diverse sample of 7–10 month old infants, only 5% ($n = 30/625$) of infants consumed pouches frequently and ‘mostly’ or ‘always’ consumed the food directly from the nozzle (McLean et al.,

Table 4
Associations between eating behaviours and current frequent pouch use.

	Mean (SD) in those without current frequent pouch use ^a	Mean difference (95% CI) ^b for those with current frequent pouch use compared to those without ^a
CEBQ subscales		
Satiety responsiveness ^{c,d}	2.8 (0.7)	-0.1 (-0.2, 0.0)
Food responsiveness ^c	2.5 (0.8)	0.2 (0.1, 0.4)
Enjoyment of food ^c	4.2 (0.8)	0.1 (-0.0, 0.2)
Mealtime Behavior Questionnaire		
Food fussiness/ Baby is picky eater ^c	1.6 (0.6)	0.2 (0.0, 0.3)
PediEAT subscales		
Problematic mealtime behaviors ^{f,g}	24.5 (11.7)	1.4 (-0.8, 3.6)
Selective/ Restrictive eating ^{f,h}	26.6 (11.0)	2.8 (0.8, 4.7)

CEBQ, Children's Eating Behaviour Questionnaire; PediEAT, Pediatric Eating Assessment Tool.

Bold text indicates statistical significance ($p < 0.05$).

^{d, g, h} Data missing for $n = 2^d$, $n = 21^g$ and $n = 29^h$.

^a $n = 451$ those without frequent pouch use (less frequent or non pouch user); $n = 174$ those with frequent pouch use. Less frequent or non pouch use defined as "given baby food from a commercial pouch < 5 times per week during the past month, or never"; frequent pouch use defined as "given baby food from a commercial pouch ≥ 5 times per week during the past month".

^b Mean differences & 95% CI estimated with regression models. Adjusted for demographic characteristics (infant age, sex, ethnicity and area-level socioeconomic deprivation).

^c Determined using the Children's Eating Behaviour Questionnaire.

^e Determined using the Toddler-Parent Mealtime Behavior Questionnaire.

^f Determined using the Pediatric Eating Assessment Tool (PediEAT).

Unpublished results). Future studies could investigate whether energy intake differs between pouch users who suck from the nozzle and those who are fed by transferring the pouch contents to a spoon. Alternatively, while infants may eat food from pouches frequently, this may not necessarily translate to consumption of a larger quantity of pouch food. Future studies should measure both frequency and amount eaten. It is important to note that these results do not necessarily apply to older age groups when motor skills will have improved so that self-feeding with a pouch is easier.

Similarly, we found that BMI z-score was not significantly different in infants who used pouches frequently. This finding is consistent with the only study that appears to have measured pouch intakes in toddlers, which reported no statistically significant association between "regular" fruit pouch use and weight in 1499 Swedish 18 month old children, although the magnitude of the difference in the sample was not reported (Lundkvist et al., 2021). The results were similar despite the Swedish study only measuring the intake of fruit pouches (whereas our study included all types of pouches) and "regular" fruit pouch consumption being defined as 1+ times per week (compared to our 5+ times per week) (Lundkvist et al., 2021). While our results suggest that infants aged 7–10 months who use pouches frequently are not significantly different from those who do not use them frequently in terms of weight gain, it is possible that the infants in our study had not been consuming pouches for long enough for meaningful differences in weight gain trajectories to be detected.

In addition to concerns about energy intake and weight, it has been hypothesised that a reliance on pouches during the complementary feeding period may lead to problematic eating or feeding behaviours (Koletzko et al., 2019). Timely progression from puréed textures to lumpy textures by the age of 10 months is important for feeding behaviour development and later food acceptance (Coulthard et al., 2009; Northstone et al., 2001). Therefore, an overreliance on pouches

Table 5
Associations between current eating behaviours and Baby-Led Weaning status assessed at age 6 months (retrospectively).

	Baby-Led Weaning status at 6 months		
	Mean (SD) in the traditional spoon-feeding group ^a	Mean difference (95% CI) ^b partial Baby-Led Weaning compared to traditional spoon-feeding ^a	Mean difference (95% CI) ^b full Baby-Led Weaning compared to traditional spoon-feeding ^a
CEBQ subscales			
Satiety responsiveness ^{c,d}	2.7 (0.7)	0.1 (-0.0, 0.3)	0.3 (0.2, 0.5)
Food responsiveness ^c	2.6 (0.9)	0.0 (-0.2, 0.3)	-0.4 (-0.6, -0.2)
Enjoyment of food ^c	4.2 (0.7)	0.0 (-0.2, 0.2)	-0.0 (-0.2, 0.1)
Mealtime Behavior Questionnaire			
Food fussiness/ Baby is picky eater ^c	1.6 (0.6)	-0.1 (-0.2, 0.1)	-0.2 (-0.4, -0.1)
PediEAT subscales			
Problematic mealtime behaviors ^{f,g}	24.7 (11.9)	0.9 (-2.3, 4.2)	0.3 (-2.5, 3.1)
Selective/ Restrictive eating ^{f,h}	28.4 (10.9)	-5.8 (-8.6, -3.1)	-6.0 (-8.5, -3.6)

CEBQ, Children's Eating Behaviour Questionnaire; PediEAT, Pediatric Eating Assessment Tool.

Bold text indicates statistical significance ($p < 0.05$).

^{d, g, h} Data missing for $n = 2^d$, $n = 21^g$ and $n = 29^h$.

^a Traditional spoon-feeding, $n = 477$; Partial Baby-Led Weaning, $n = 67$; Full Baby-Led Weaning, $n = 81$. Traditional spoon-feeding defined as "spoon fed by an adult" or "mostly spoon fed by an adult, some baby feeding themselves"; partial Baby-Led Weaning defined as "about half spoon feeding by an adult and half baby feeding themselves"; full Baby-Led Weaning defined as "mostly baby feeding themselves, some adult spoon feeding" or "baby feeding themselves".

^b Mean differences & 95% CI estimated with regression models. Adjusted for demographic characteristics (infant age, sex, ethnicity and area-level socioeconomic deprivation).

^c Determined using the Children's Eating Behaviour Questionnaire.

^e Determined using the Toddler-Parent Mealtime Behavior Questionnaire.

^f Determined using the Pediatric Eating Assessment Tool (PediEAT).

could be expected to delay the introduction of lumpy foods and thus increase the risk of developing problematic behaviours. In the present study, infants who used pouches frequently were significantly more likely to be perceived as food responsive (responding to food more because of taste or desire than hunger), fussy eaters, and to have symptoms of sensory-related problems when compared to those who did not use pouches frequently. The observational nature of our study limits the inference of causality, so it should be noted that while it is plausible that frequent pouch use contributes to the development of these appetitive traits or behaviours, it is also possible that infants who are perceived as more food responsive or fussy towards food are offered pouches more frequently than infants who are not. Future studies should aim to determine the causal pathways of these behaviours.

Our findings that infants classified as following Baby-Led Weaning consumed 6% more energy per day (equivalent to approximately half a slice of bread) than those following traditional spoon-feeding is in contrast to most of the existing literature which has reported no significant difference in energy intake (Alpers et al., 2019; Morison et al., 2016; Pearce & Langley-Evans, 2022), or lower energy intake in infants who follow a Baby-Led Weaning approach (H. Rowan et al., 2022). In these studies, differences have ranged from just 12 kJ to almost 500 kJ but in some cases samples were very small, potentially limiting the ability to detect and appropriately estimate differences. The remaining study, a randomized controlled trial, used an adaptation of Baby-Led

Table 6
Associations between current eating behaviours and current Baby-Led Weaning status.

	Current Baby-Led Weaning status ^a		
	Mean (SD) in the traditional spoon-feeding group ^b	Mean difference (95% CI) ^c for partial Baby-Led Weaning compared to traditional spoon-feeding ^b	Mean difference (95% CI) ^c for full Baby-Led Weaning compared to traditional spoon-feeding ^b
CEBQ subscales			
Satiety responsiveness ^{d,e}	2.7 (0.7)	0.1 (-0.0, 0.3)	0.3 (0.2, 0.4)
Food responsiveness ^d	2.6 (0.9)	-0.0 (-0.2, 0.2)	-0.2 (-0.4, -0.1)
Enjoyment of food ^d	4.2 (0.7)	0.0 (-0.1, 0.2)	0.0 (-0.1, 0.2)
Mealtime Behavior Questionnaire			
Food fussiness/ Baby is picky eater ^f	1.7 (0.6)	-0.1 (-0.3, -0.0)	-0.1 (-0.3, -0.0)
PediEAT subscales			
Problematic mealtime behaviors ^{g,h}	24.7 (11.6)	-0.6 (-3.0, 1.9)	-0.3 (-2.6, 2.0)
Selective/ Restrictive eating ^{g,i}	31.2 (10.9)	-4.9 (-7.0, -2.8)	-7.8 (-9.9, -5.8)

CEBQ, Children's Eating Behaviour Questionnaire; PediEAT, Pediatric Eating Assessment Tool.

Bold text indicates statistical significance ($p < 0.05$).

^{e, h, i} Data missing for $n = 2^e$, $n = 21^h$ and $n = 29^i$.

^a Data for feeding approach at current age missing for $n = 1$ participant.

^b Traditional spoon-feeding, $n = 304$; Partial Baby-Led Weaning, $n = 153$; Full Baby-Led Weaning, $n = 167$. Traditional spoon-feeding defined as "spoon fed by an adult" or "mostly spoon fed by an adult, some baby feeding themselves"; partial Baby-Led Weaning defined as "about half spoon feeding by an adult and half baby feeding themselves"; full Baby-Led Weaning defined as "mostly baby feeding themselves, some adult spoon feeding" or "baby feeding themselves".

^c Mean differences & 95% CI estimated with regression models. Adjusted for demographic characteristics (infant age, sex, ethnicity and area-level socioeconomic deprivation).

^d Determined using the Children's Eating Behaviour Questionnaire.

^f Determined using the Toddler-Parent Mealtime Behavior Questionnaire.

^g Determined using the Pediatric Eating Assessment Tool (PediEAT).

Weaning (Williams Erickson et al., 2018), which specifically modified the resources and support to ensure sufficient energy was consumed, based on concerns that only low energy foods such as fruit and vegetables would be offered to infants following Baby-Led Weaning. This marked difference in approach makes direct comparisons difficult. While a difference of around 150 kJ/day may appear relatively minor, it has been estimated that the median energy gap required for children to go from normal weight at age 2 years to overweight at 5–7 years of age is just 209 kJ/day (van den Berg et al., 2011). Further analyses of our data showed that the greater energy intake was predominantly driven by energy from food, and not by differences in infant milk intake (data not shown). One possible explanation is that infants who feed themselves may be offered foods that are comparatively higher in energy density, such as biscuits or cheese, as these are foods that are easier to grasp and self-feed. It is also feasible that caregivers of infants following Baby-Led Weaning may deliberately offer more energy dense foods due to concerns about adequate energy intake (D'Andrea et al., 2016). Indeed, there is evidence that the types of food offered to infants differs for infants following Baby-Led Weaning (Alpers et al., 2019; Pearce & Langley-Evans, 2022) and that Baby-Led Weaning infants consume a higher proportion of their total energy intake from fat compared to traditionally spoon-fed infants (Alpers et al., 2019; Morison et al., 2016). Another possible explanation is that relative to traditional

spoon-feeding, caregivers of Baby-Led Weaning infants may have under-estimated the amount of food lost to the floor or smeared on clothing and surfaces, and consequently energy intake for Baby-Led Weaning infants was over-estimated.

Despite the differences in energy intake between Baby-Led Weaning and traditional spoon-feeding, there was no evidence of an association between Baby-Led Weaning and BMI z-score at this age. However, we do not know if Baby-Led Weaning infants' energy intake was in excess of requirements, as we have only measured intake and not expenditure in the current study. Although our findings are in agreement with other cross-sectional studies that have examined Baby-Led Weaning and infant weight status in New Zealand and the United Kingdom (Alpers et al., 2019; Brown & Lee, 2011; Fu et al., 2018; Jones et al., 2019; H. Rowan et al., 2022), it is possible that differences in weight outcomes do not become evident until a later age. Two studies have reported that children who followed Baby-Led Weaning were less likely to be overweight at age 18–24 months (Brown & Lee, 2013) and 20–78 months (Townsend & Pitchford, 2012) than those who followed traditional spoon-feeding, although not all studies have reported a significant difference in weight outcomes beyond infancy (Watson et al., 2020).

In this sample, infants classified as following 'full' Baby-Led Weaning were perceived to be more satiety responsive and less food responsive than their traditionally spoon-fed counterparts. Both Brown and Lee (2013) and Campeau et al. (2021) reported similar associations between Baby-Led Weaning and satiety responsiveness, while others have reported null findings for both satiety and food responsiveness (Komninou et al., 2019; Watson et al., 2020). One possible explanation for our findings is that the Baby-Led Weaning approach naturally promotes a more responsive feeding style by way of caregiver feeding practices and infant autonomy in feeding. Mothers who use Baby-Led Weaning are less likely to pressure infants to eat, less likely to use food as a reward, and use less emotional feeding (i.e. are less likely to give their child something to eat to make them feel better when they are upset) (Komninou et al., 2019), all of which are in accordance with a responsive feeding style (Black & Aboud, 2011). In turn, this means the caregiver is more likely to rely on the infant's internal appetite signals rather than external cues to guide feeding (DiSantis et al., 2011). However, both of the aforementioned studies found that even after adjusting for maternal control (Brown & Lee, 2013) or maternal pressure to eat (Campeau et al., 2021), the associations between Baby-Led Weaning and satiety responsiveness were still evident. It is also possible that infants who self-feed consume food at a rate that allows them to eat in response to their physiological needs, whereas spoon-fed infants may have less control over the pace of feeding.

In accordance with findings by Fu et al. (2018) and Komninou et al. (2019), our data suggest that Baby-Led Weaning is associated with lower food fussiness scores, albeit in slightly younger children. While Brown and Lee (2013) also found that Baby-Led Weaning was associated with less food fussiness in children aged 18–24 months, the association was no longer significant after maternal feeding control was accounted for. This suggests that maternal feeding practices may be responsible for the association between Baby-Led Weaning and food fussiness, rather than the act of self-feeding itself. Similarly, we found that infants following Baby-Led Weaning had lower scores for selective/restrictive eating when compared to traditionally spoon-fed infants, which suggests that they are less likely to show symptoms of sensory related feeding problems related to the texture and temperature of food (Pados et al., 2018). This finding may be due to differences in exposure to textures during the early stages of complementary feeding, as infants who are exposed to different textures (i.e., textures other than purée) earlier and more often are less likely to reject more complex textures at later ages (Blossfeld et al., 2007). However, it is important to bear in mind that this relationship may be bidirectional, given that feeding during infancy is reciprocal in nature. For example, it is possible that infants who were reluctant to accept more complex textures were more likely to be spoon-fed.

Our study has several strengths. First, the sample size was large, and ethnically and socioeconomically diverse, although respondents (99% mothers) had higher levels of education than the general population (Education Counts, 2022) which may limit the generalisability of these findings. Second, breast milk intake was individually measured in a large subsample of participants ($n = 158$), allowing for accurate estimation of energy intake from breast milk. Lastly, researchers measured infant weight and length using standardised methods rather than relying on parent-report of infant anthropometry. The study also has some limitations, particularly relating to the observational design which limits our ability to establish causal relationships. Furthermore, the majority of the data were based on self-report, including the caregiver's subjective perception of eating behaviours, and the questions used to assess baby food pouch use and Baby-Led Weaning have not been validated. However, this large study has provided the first published evidence in relation to baby food pouch use in this age group. We also used 24-h dietary recalls to measure dietary intake, which may overestimate intake in infants compared to weighed diet records (Fisher et al., 2008), however this method was chosen to minimise participant burden. In addition, we collected duplicate recalls from each participant and the Multiple Source Method was used to determine usual daily intake (Harttig et al., 2011; Haubrock et al., 2011), which improved the validity of our dietary data.

In conclusion, we present the first data internationally to evaluate potential health outcomes of pouch use in infants. We have shown that infants who use pouches frequently do not have significantly different energy intake or weight status than infants aged 7–10 months who do not use pouches frequently, but that frequent pouch use is associated with greater food responsiveness, food fussiness, and symptoms of selective and restrictive eating. Our findings suggest that infants who use a baby-led approach to complementary feeding consume more energy and show some differences in appetitive traits, fussy eating, and symptoms of selective and restrictive eating compared to those who use a spoon-fed approach, however this does not appear to translate to differences in body weight at this age.

Author contributions

Principal Investigators: RWT, ALMH; designed the research: RWT, ALMH, JJH, KLB, PRvH, CAC, LATM, LD; conducted the research: AMC, LD, JM, RP, NHM, EAJ, IK, KJB, MG, MR, EAF, RJ, BRB; performed the statistical analysis: AMC, JJH; prepared the first draft: AMC; had primary responsibility for the final content: RWT, ALMH, JJH. All authors

Appendix

Supplementary Table 1

Baby-Led Weaning status^a at current age^b and 6 months of age.

		Baby-Led Weaning status at current age			
		Traditional spoon-feeding	Partial Baby-Led Weaning	Full Baby-Led Weaning	Total
Baby-Led Weaning status at 6-months of age	Traditional spoon-feeding	299	117	60	476
	Partial Baby-Led Weaning	4	30	33	67
	Full Baby-Led Weaning	1	6	74	81
	Total	304	153	167	624

^a Traditional spoon-feeding defined as “spoon fed by an adult” or “mostly spoon fed by an adult, some baby feeding themselves”; partial Baby-Led Weaning defined as “about half spoon feeding by an adult and half baby feeding themselves”; full Baby-Led Weaning defined as “mostly baby feeding themselves, some adult spoon feeding” or “baby feeding themselves”.

^b Data for Baby-Led Weaning status at current age missing for $n = 1$ participant.

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have read and approved the final manuscript.

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Availability of data statement

The data used and/or analysed in the present study are not publicly available due to ethical restrictions related to the consent provided by participants. An ethically compliant dataset may be made available by the corresponding author upon reasonable request and approval by the Health and Disability Ethics Committee.

Ethical statement

The First Foods New Zealand study was approved by the Health and Disability Ethics Committees New Zealand (Reference # 19/STH/151) and is registered with the Australian New Zealand Clinical Trials Registry (ACTRN12620000459921).

Declaration of competing interest

None.

Data availability

Data will be made available on request.

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