

Understanding and characterising responsive feeding in early life

Marion M Hetherington
University of Leeds



Funded by EU FP7 VIVA - IAPP



Nutrition to Health (*via behaviour*)

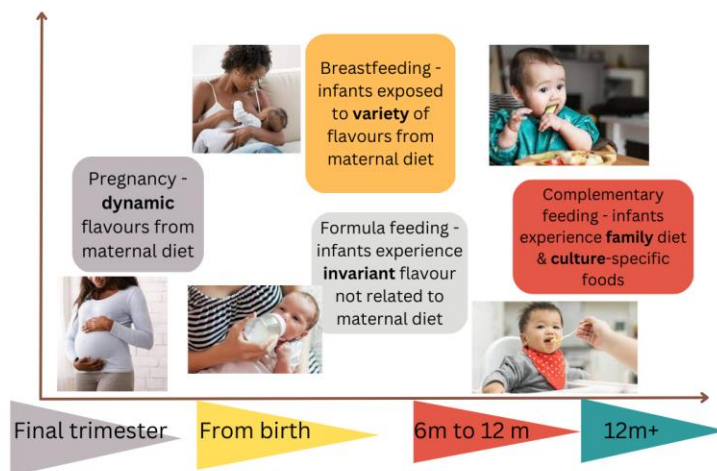
- First experiences with flavour and foods matter
- Transitioning from milk to many other foods
- How infants communicate nutritional needs



First flavours and first foods



Flavour experience and pathways to preference



Adapted from Forestell (2017)

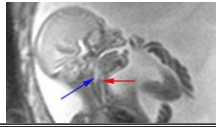
<https://doi.org/10.1159/000478759>

In utero flavour experience

Menella et al (1995)

- Amniotic fluid drawn from 10 pregnant women
- 45 min prior to amniocentesis -5 mothers given garlic and 5 given flavourless capsules
- Sensory panel judged odour **CORRECTLY**
- Foetus swallows 1 litre of amniotic fluid per day in final trimester;

blue arrow = oesophagus



<https://doi.org/10.1093/chemse/20.2.207>



Image =

<https://www.theatlantic.com/family/archive>

Olfaction and taste are possible *in utero*

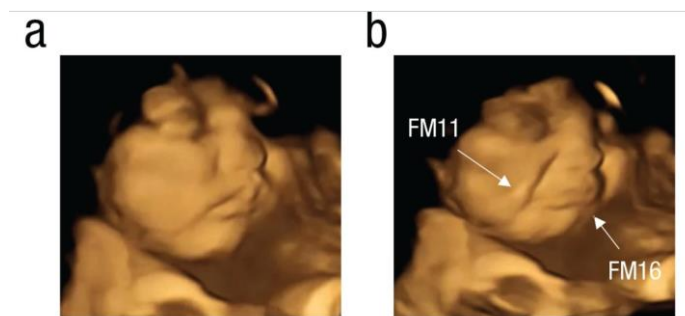


Fig. 1. Example of cry-face gestalt of a kale-exposed fetus: (a) baseline, (b) cry-face gestalt (apex). FM11 = nasolabial furrow; FM16 = lower-lip depressor.



Kale or Carrot or Control capsule given to mothers 20 min before 4D ultrasound scans at 32 to 36 weeks' gestation

Usten, Reissland et al (2022) Psychological Science

Newborn facial expressions in response to basic tastants

Differential Facial Responses to Four Basic Tastes in Newborns

Diana Rosenstein
University of Pennsylvania
Harriet Oster
Adelphi University

Two hours after birth
Stimuli consisted of

- 0.73M (25%) sucrose (**sweet**)
- 0.003M (0.25%) quinine hydrochloride (**bitter**)
- 0.12M (2.5%) citric acid (**sour**)

<https://doi.org/10.2307/1130670>

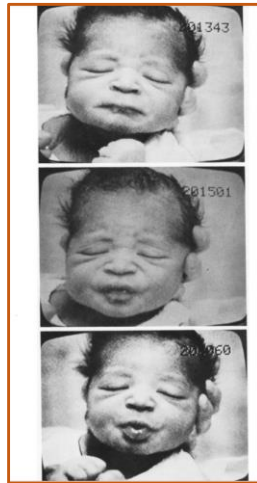
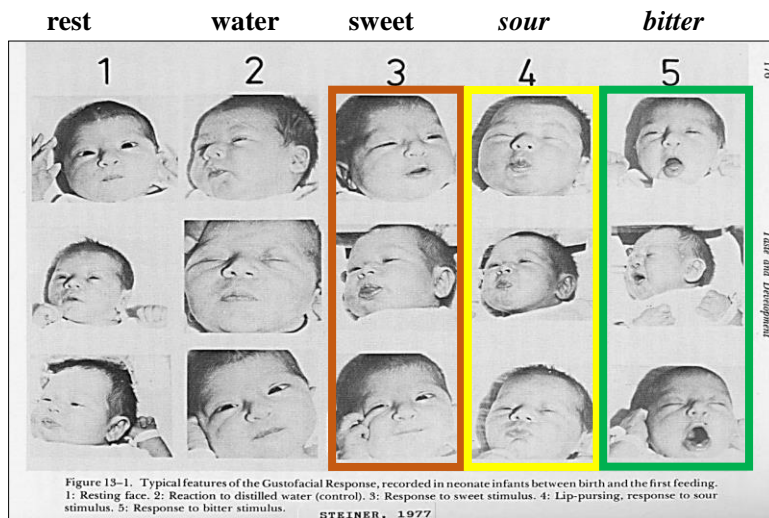


FIG. 2.—Facial expression elicited by the sour solution

Newborn facial expressions indicate positive response to sweet, negative to bitter



See Also Steiner et al (2001) Neuroscience & Biobehavioral Reviews [https://doi.org/10.1016/S0149-7634\(00\)00051-8](https://doi.org/10.1016/S0149-7634(00)00051-8)

Milk to Many Foods (omnivore's dilemma)



univore

**Learning
through
experience**



omnivore

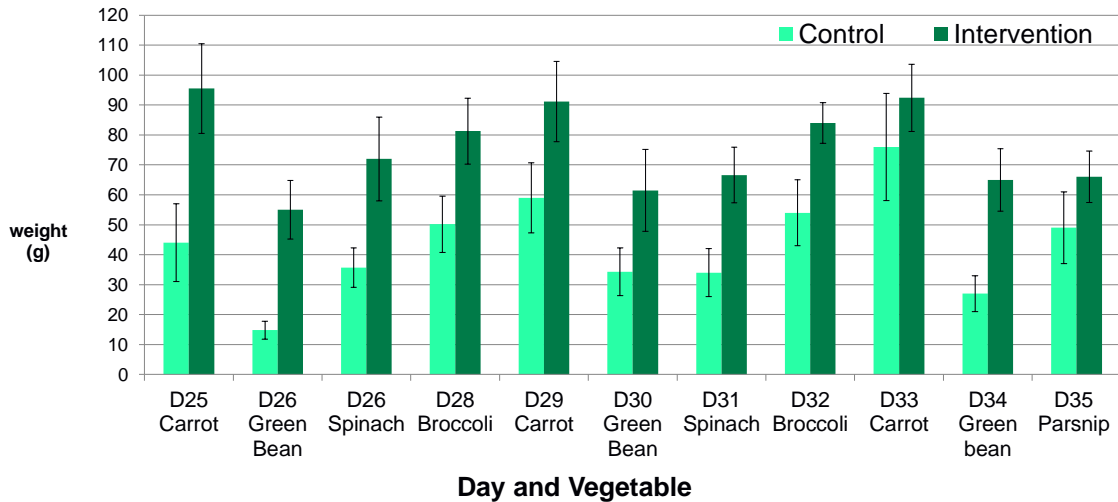


Innate capacities





Intake of vegetable purées



Measurements



- In the laboratory, mothers fed their baby and were asked to stop when they had observed 3 consecutive refusals
- Mothers were given **training** in how to identify refusals



- **Liking** was rated by mother, researcher and an independent rater
- **Facial and behavioural responses** were filmed then coded by independent raters
- **Intake** was weighed in lab and then reported at home in diaries

Communication cues predict liking and intake

Variables	Intake	Maternal Rating	Researcher Rating
Turns head away (THA)	-0.59**	-0.40*	-0.46**
Arches back (AB)	-0.40*	-0.19	-0.22
Leans forward (LF)	0.27	0.29	0.22
Rate of acceptance (RoA)	0.72**	0.62**	0.67**

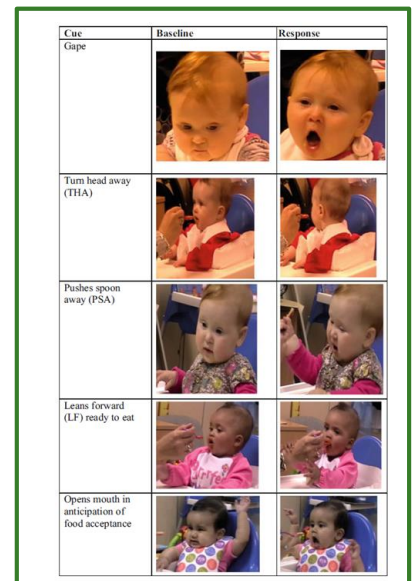


More negative behaviours linked to **lower** intakes and liking
More positive behaviour (RoA) linked to **higher** intakes and liking

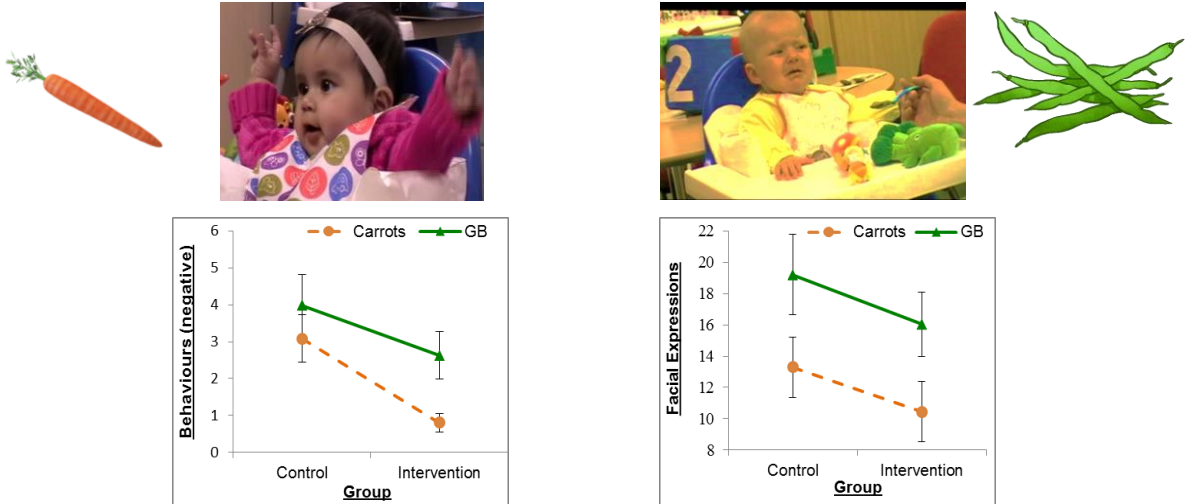
Gaze, facial expressions and behaviours at mealtimes predict food intake

Avoidance/approach behaviours

- Turns head away/looks away/down (THA)
- Push spoon away/becomes playful (PSA)
- Leans forward/pulls spoon to mouth/reaches for food (LF)
- Rate of acceptance (RoA)



Fewer negative overt behaviours and facial expressions to carrots than to green beans (GB)



Infants show interest in food early in the meal and shift towards disinterest (hunger → satiation)



Video recordings of mealtimes during the Veges Study in New Zealand

Rapson et al. *Trials* (2022) 23:488
<https://doi.org/10.1186/s13063-021-05374-7>

STUDY PROTOCOL Open Access

Impact of a “vegetables first” approach to complementary feeding on later intake and liking of vegetables in infants: a study protocol for a randomised controlled trial

Jeanette P. Rapson¹, Pamela R. von Hurst¹, Marion M. Hetherington² and Cathryn A. Conlon^{1*}

*Check for updates

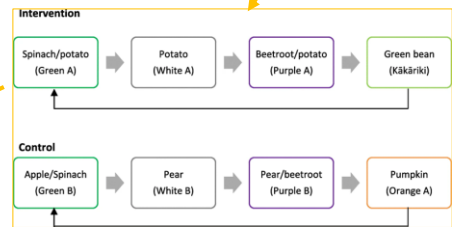


See corresponding editorial on page 13.

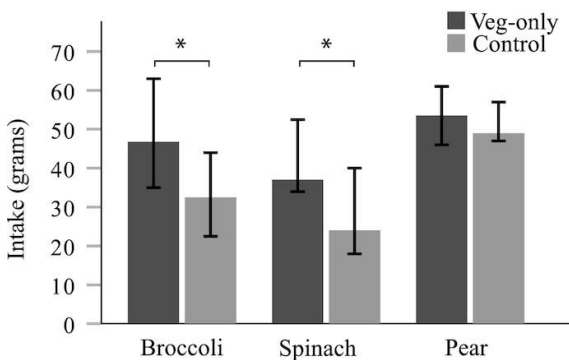
Starting complementary feeding with vegetables only increases vegetable acceptance at 9 months: a randomized controlled trial

Jeanette P. Rapson¹, Pamela R. von Hurst¹, Marion M. Hetherington², Hajar Mazahery¹ and Cathryn A. Conlon¹

¹School of Sport, Exercise and Nutrition, Massey University, Auckland, New Zealand; and ²School of Psychology, University of Leeds, Leeds, England, UK

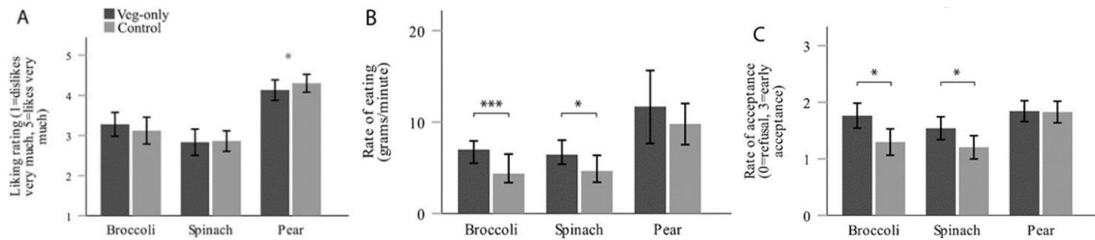


Rapson et al (2022) Intake of broccoli, spinach, and pear at the end of the 4-week intervention



Rapson et al *Am J Clin Nutr*, Volume 116, Issue 1, July 2022, Pages 111–121,
<https://doi.org/10.1093/ajcn/nqac080>

Maternal ratings of liking (A)
 Rate of eating (B)
 Rate of acceptance (C)



Rapson et al *Am J Clin Nutr*, Volume 116, Issue 1, July 2022, Pages 111–121,
<https://doi.org/10.1093/ajcn/nqac080>

Are infant appetite cues
 universally understood?
 Is recognition and response
 dependent on viewer
 characteristics?


- <https://osf.io/vjubk/>



Baby Translator

- Question: Is recognition and response dependent on viewer characteristics?
- Sample: Recruited 200 participants (82.5% White; 9% Asian; 5.5% Black)
- Measures – parental status, interoceptive awareness- appetite, emotion
- Measures - Online survey with embedded video presentations
- Videos – Mealtimes from New Zealand and US (European, Māori, Asian extraction)

Sample	Gender ratio	Age range	BMI	Child(ren) at home
N = 200	70% F 27% M 3% N/A	18 – 60 years Mean = 34.2 ± 9.2 yr Mode = 25 - 34 yr age gp	45% within healthy weight 28% with overweight/obesity 5% underweight; 21% omitted	N = 107 no child at home N = 93 at least one child at home



▶ 0:00 / 0:07

What did you notice by watching the video?

Is this baby showing any signs of agitation? (1 = Not at all agitated; 9 = Extremely agitated)

1 2 3 4 5 6 7 8 9

Which statement best describes the infant in the video clip?

This baby is interested in eating.

This baby is disinterested in eating.

Neither of these.

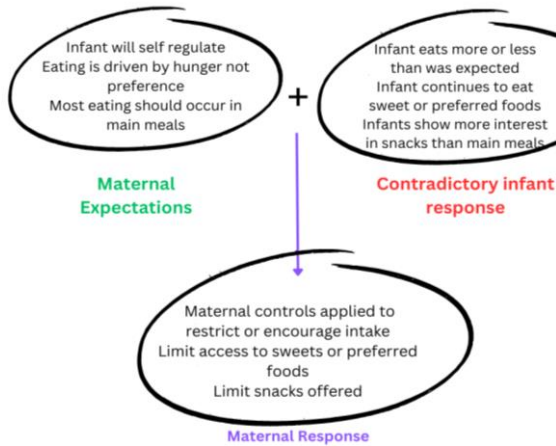
I am not sure.

How interested is the baby in eating? (1 = Not at all interested; 9 = Extremely interested)

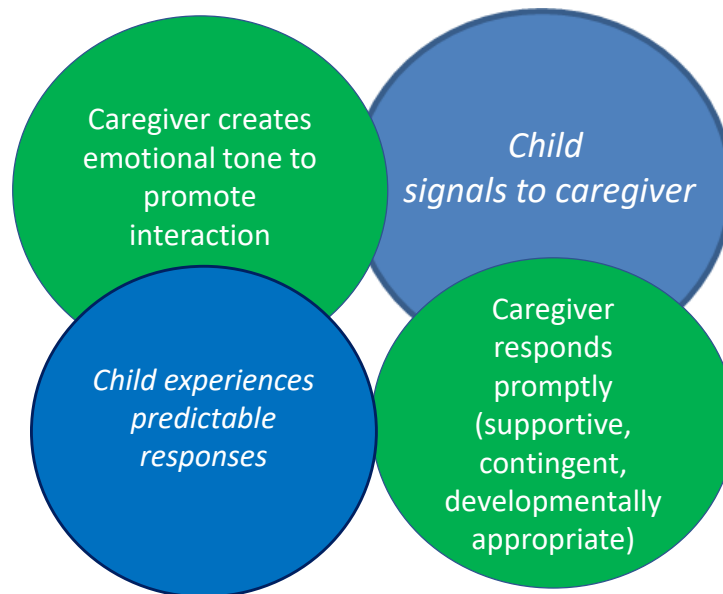
1 2 3 4 5 6 7 8 9

Recognising and responding to infant cues

- Mothers watched video footage of themselves feeding infants during complementary feeding
- Interviews– how they determined hunger/fullness in babies; how they decided what was “enough”; how they decided when to end the meal
- Mothers using traditional spoon feeding identified many more “fullness” cues; both baby led weaning and traditional spoon feeding mothers decided on “enough” based on expectations and concerns about sufficiency, under and overeating



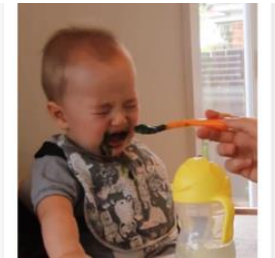
Four stages of Responsive Parenting



Black & Hurley (2017)
Complementary feeding: building the foundations for a healthy life, vol. 87, pp. 153-165. Karger


Conclusions

- First flavours and first foods are important
- Transitioning to solids presents a window of opportunity to develop preferences for vegetables since at 6m babies are ready to accept new flavours
- Responsive feeding involves "tuning in" to babies' communication
- Parental motives to avoid food waste and/or ensuring intake is adequate will influence responsiveness to cues



Thank you and questions?

m.hetherington@leeds.ac.uk

 @marion_mh



With thanks to Shihui Yu –
PhD student
University of Leeds
[@ShihuiYu0523](https://twitter.com/ShihuiYu0523)



Brexit-result
face



Happy



Angry



Sad



Contempt



Disgust



Fear