Determining factors and critical periods in food Habit formation: Results from the HabEat project

Sylvie Issanchou
INRA. Center for Taste and Feeding Behaviour, Dijon
HabEat participants

http://www.habeat.eu/
Eating habits

• Core concepts of eating habits
  • The ‘WHICH’ i.e. the qualitative dimension
    ➔ Vegetables & fruit
  • The ‘HOW MUCH’ i.e. the quantitative dimension
    ➔ Control of energy intake
Approach

• Target population
  • Infants and young children (0-6y)

• Methods
  • Observational
  • Experimental

• Different strategies to increase acceptance of
  • Novel vegetables
  • Familiar vegetables
Cohort studies

ALSPAC
1991-1992
n=7269
Follow-up: 0-13y

EDEN
2003-2005
n=1296
Follow-up: 0-5y

Generation XXI
2005-2006
n=8647 (556 with data on early feeding practices)
Follow-up: 0-4y

EuroPrevall
2005-2007
n=800
Follow-up: 0-3y
Feeding practices in infancy
Breastfeeding duration
Breastfeeding duration

de Lauzon-Guillain et al. (2013). AJCN, 98, 804–12

Vegetable intake
(>1 serving/day, except in GENERATION XXI >3 serving/day)

Positive association between breastfeeding duration and later vegetable intake, significant in ALSPAC and EDEN

Logistic regressions adjusted for age of introduction to vegetables, age of introduction to other foods, child’s age and sex, maternal education &, except in EuroPrevall, maternal age and smoking during pregnancy
Breastfeeding duration

*de Lauzon-Guillain et al. (2013). AJCN, 98, 804–12*

Fruit intake
(>1 serving/day)

Positive association between breastfeeding duration and later fruit intake
significant in ALSPAC and EDEN

Logistic regressions adjusted for age of introduction to fruit, age of introduction to other foods, child's age and sex, maternal education & except in EuroPrevall, maternal age and smoking during pregnancy.
Healthy Plate Variety Score


- Modified version of the Variety Index for Toddlers (Cox, 1997, JADA)

- Assessed variety between and within food groups, based on the number of servings recommended for each food group of the Food guide pyramid → indicative of dietary adequacy
Breastfeeding

Positive association between breastfeeding duration and diet quality in ALSPAC and EDEN and a trend in EuroPrevall and Generation XXI

Linear regressions adjusted for age of introduction of solids, age of introduction to vegetable, age of introduction to fruit, child’s sex, maternal education, maternal age and smoking during pregnancy
Feeding practices in infancy
Age of introduction to vegetables/fruit
Negative association between age of introduction to vegetables and later vegetable intake only in ALSPAC

Logistic regressions adjusted for any breastfeeding duration, age of introduction to other foods, child’s age and sex, maternal education, except in EuroPrevall, maternal age and smoking during pregnancy.
Fruit intake
(>1 serving/day)

No consistent association across cohorts between age of introduction to fruit and later fruit intake

Logistic regressions adjusted for any breastfeeding duration, age of introduction to other foods, child’s age and sex, maternal education & except in EuroPrevall, maternal age and smoking during pregnancy
Food acceptance at the beginning of complementary feeding
Complementary feeding

• Complementary feeding period - 'window of opportunity‘:
  Infants are particularly receptive to a variety of foods with different flavours

• Variety of different vegetables at the beginning of complementary feeding increases acceptance of novel foods
  • The more vegetables infants had eaten before starting the study, the greater the artichoke intake at first exposure:
    + 8 ± 2 g per vegetable previously eaten


• Same results in the Opaline cohort
Strategies to increase vegetable acceptance
Early Exposure to variety
Early Exposure to variety


The Taste study

• Aim: impact of parental guidance on early exposure to a variety of vegetables on infant’s consumption and liking
• Sample: Mothers of 4-6 month old infants in the UK, Portugal and Greece
• Design: Intervention vs ‘usual care’
The Taste study

*Fildes et al. (2015). Br J Nutr, 114, 328–36*

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Broccoli" /></td>
<td><img src="image2.png" alt="Cauliflower" /></td>
<td><img src="image3.png" alt="Peas" /></td>
<td><img src="image4.png" alt="Carrot" /></td>
<td><img src="image5.png" alt="Turnip" /></td>
</tr>
<tr>
<td>Day 6</td>
<td>Day 7</td>
<td>Day 8</td>
<td>Day 9</td>
<td>Day 10</td>
</tr>
<tr>
<td><img src="image1.png" alt="Broccoli" /></td>
<td><img src="image2.png" alt="Cauliflower" /></td>
<td><img src="image3.png" alt="Peas" /></td>
<td><img src="image4.png" alt="Carrot" /></td>
<td><img src="image5.png" alt="Turnip" /></td>
</tr>
<tr>
<td>Day 11</td>
<td>Day 12</td>
<td>Day 13</td>
<td>Day 14</td>
<td>Day 15</td>
</tr>
<tr>
<td><img src="image1.png" alt="Broccoli" /></td>
<td><img src="image2.png" alt="Cauliflower" /></td>
<td><img src="image3.png" alt="Peas" /></td>
<td><img src="image4.png" alt="Carrot" /></td>
<td><img src="image5.png" alt="Turnip" /></td>
</tr>
<tr>
<td>Day 16</td>
<td>Day 17</td>
<td>Day 18</td>
<td>Day 19</td>
<td>Day 20</td>
</tr>
<tr>
<td><img src="image6.png" alt="Pear" /></td>
<td><img src="image3.png" alt="Peas" /></td>
<td><img src="image7.png" alt="Apple" /></td>
<td><img src="image8.png" alt="Banana" /></td>
<td><img src="image2.png" alt="Cauliflower" /></td>
</tr>
</tbody>
</table>
Effect of early variety

*Fildes et al. (2015). Br J Nutr, 114, 328–36*

Vegetable intake and liking at 1 month after the intervention for a novel vegetable

<table>
<thead>
<tr>
<th></th>
<th>UK</th>
<th>GREECE</th>
<th>PORTUGAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control (n = 24)</td>
<td>Intervention (n=29)</td>
<td></td>
</tr>
<tr>
<td>Intake (g)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16.3 (12.3)</td>
<td>32.3 (23.4)</td>
<td></td>
</tr>
<tr>
<td>P-value</td>
<td>0.012</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control (n = 15)</td>
<td>Intervention (n=16)</td>
<td></td>
</tr>
<tr>
<td>Liking</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>mother’s rating</td>
<td>4.3 (2.0)</td>
<td>6.7 (1.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;0.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Significant effect only in the UK
- Differing outcome between countries possibly reflects cultural variations in existing weaning practices
- Advice on introducing a variety of vegetables early in weaning may be beneficial for increasing vegetable acceptance in countries where vegetables are not common first foods
Learning by experience

• Different strategies
  • Repeated exposure
  • Flavour-flavour learning (FFL): temporally pairing a new flavour with a liked flavour
  • Flavour-nutrient learning (FNL): temporally pairing a new flavour with energy

• Repeated exposure
  • Is a powerful strategy to increase children’s intake of a novel vegetable even for food avoidant children
  • Don’t give up after 3-5 tries, 8-10 may be needed
  • Does not seem to work with 3-6-year-old children to increase intake of familiar vegetables

Learning by observation

• In Habeat, we tested role modelling by
  • Idols and teachers
  • In school settings
  • With familiar vegetables
• Results
  • Mixed results
  • Many factors into play
  • Counteracting effects:
    • boredom ↓
    • & imitation ↑
  ⇒ offer different vegetables each time
Choice offering

De Wild et al. (2015). Appetite, 91, 1-6

• Self-determination theory: choice should result in positive intrinsic motivation
  ⇒ Higher performance and satisfaction
• In the food domain, choice would elicit an increased motivation to eat, as well as greater food enjoyment
• Choice has potential to positively contribute to children’s vegetable intake
  ⇒ Offer two different vegetables; let the child choose
• Barriers:
  • Cooking two vegetables may cost more and take more preparation time
  • Potentially more food waste
• Involvement of children should result in positive intrinsic motivation
• Do-it-yourself/ IKEA effect: self-prepared ⇒ higher value, better liked
• No effect after an interactive cooking session with 4-6-year-old children in a restaurant setting
• Positive effects on intake may become present if it takes place at home, on the longer-term
• Barriers:
  • If parents are not used to cook or don’t have skills/knowledge to prepare vegetables, it may be difficult to involve their children
Control of energy intake
Control of energy intake


- To study children’s self-ability to regulate their intake in two challenging situations

- When offered an energy-dense food before a lunch
  - 565 kcal vs. 137 kcal + 565 kcal

- When offered palatable foods after a lunch
  - 565 kcal vs. 430 kcal

- Caloric compensation
- Eating in the absence of hunger

- To examine association with parental practices
- To examine if it is possible to train children to focus on their internal cues of hunger/satiation
Key results


- When offered an energy-dense food before a lunch, children ate less. But, on average, they only reduced their lunch intake by half (50%) the calories represented by the snack.
- When offered palatable foods after a lunch, the average intake was the equivalent of 25% of the energy intake of the lunch.
- Mothers who used ‘Food as a reward’ were more likely to have children who ate in the absence of hunger.
- Teaching children to pay attention to their hunger and satiation cues is not easy as we did not observe any impact of an intervention.
Stakeholder brochure

Evidence-based recommendations for the formation of healthy eating habits in children from infancy to 6 years old.

HabEat aimed to identify strategies to promote healthy eating habits in infants and young children. We investigated strategies to facilitate preferences for healthy foods, particularly vegetables, and examined the impact of individual differences in child eating behaviour and parental feeding practices.

Booklet for parents

VEGETABLES AND FRUIT
Help your child to like them

This document presents the findings from HabEat based on the analysis of data from birth cohort studies and experimental work among infants, toddlers and children up to 5 years of age. HabEat has developed recommendations for both policy makers and stakeholders, which promote the formation of healthy eating habits.

A guide for parents of young children

http://www.habeat.eu/
Thank you for your attention
Thanks to all HabEat members

The research leading to these results has received funding from the European Community’s Seventh Framework Programme (FP7/2007-2013) under the grant agreement n° 245012-HabEat