The role of learning in expectations about satiation and satiety

Jeff Brunstrom
Satiation, satiety and their effects on eating behaviour
Influences on satiety and satiation

Macronutrient composition

Energy density

Palatability

Food variety

Distraction during eating

Portion size

Social context

All involve measures taken at the end or shortly after a meal

passive over consumers ‘Mindless eaters’
Energy intake is determined by events at the end of a meal.
Energy intake is determined before a meal begins.


So...how do we make decisions about portion size?
Introducing ‘expected satiety’ and ‘expected satiation’

“The extent to which foods are expected to stave off hunger when compared on a calorie-for-calorie basis”

“The extent to which foods are expected to deliver fullness when compared on a calorie-for-calorie basis”
Measuring expected satiety using a ‘method of constant stimuli’

**Standard**

![New potatoes](image1.png)

240 Kcal

**Comparison**

![Fresh pasta + tomato sauce](image2.png)

“Imagine you were having one of these food portions for lunch (around 1 pm) and you know you won’t be eating again until dinner (around 6 pm).

Which of these two food portions would stop you from feeling hungry for the longest?”
Deriving a Point of Subjective Equality (PSE)

Comparisons

Probability of choosing the comparison as offering greater satiety than the standard

Standard  Comparison

Point of subjective equality

Comparisons
Expected satiety in commonly consumed foods

76 participants tested. 40 females, 36 males.

18 comparisons foods
143 kcal  174 kcal  199 kcal  225 kcal
Pasta & tomato sauce  Bread & butter  Banana  Ritz crackers

245 kcal  276 kcal  328 kcal  472 kcal
Fish fingers  Pizza (margherita)  Digestives  KitKats
But just how important are these expectations?

What is the relative role of palatability and expected satiation?
Effects of palatability

- Are effects of palatability observed across a range of foods?
- Does palatability influence the number of calories that we put on our plate?
Participants ($N = 28$), 14 male, 14 female

Tested shortly before lunch
Measuring expected satiation

“Match these foods so that they will fill you up to the same extent”
Measuring ‘expected’ liking

“How much do you LIKE the taste and feel of this food in your mouth?”

not at all | extremely
“Imagine you are having this food for lunch TODAY. Select your IDEAL portion size.”
Self-served ideal portions at lunchtime (kcals)

Expected satiation (method of adjustment)

Expected liking (visual-analogue rating scales)

Measuring ideal portion size

"Imagine you are having this food for lunch TODAY. Select your IDEAL portion size."

"Match these foods so that they will fill you up to the same extent."

"How much do you LIKE the taste and feel of this food in your mouth?"

not at all | | extremely
Liking is a predictor of energy selection

$r = .062, p < .82$
Expected satiation predicts the calories that we put on our plate

Research report

Measuring affective (liking) and non-affective (expected satiety) determinants of portion size and food reward

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So... where do expectations come from?
“Match these foods so that they will fill you up to the same extent”
“Match these foods so that they have the same volume”
Brunstrom & Collingwood (in prep)
Expectations are learned

Expectations depend on familiarity

\[ r = 0.86, \ p < .0001 \]
Familiarity predicts expectations in children

70 children tested (10-12 yrs; mean = 11.2 yrs)

32M 38F
How often do you eat these foods?

1 = Never or rarely
2 = Once every two months
3 = Once every two weeks
4 = 1-2 times a week
5 = Most days
Relationship between expected satiation and familiarity

$r = 0.33, p = .006$
Relationship between expected satiety & familiarity

Mean expected satiation (log)

Mean familiarity score

pasta and tomato
121 kcal
145 kcal
170 kcal
201 kcal
239 kcal

250 kcal

r = 0.33, p = .006
Expectations can be conditioned in the laboratory

56 female participants

Low energy  n = 28

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Control (LED)</th>
<th>Experimental (HED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-set Hartley’s Sugar Free Jelly (mixed with boiling water)</td>
<td>14.55 kcal (219.45g)</td>
<td>n/a</td>
</tr>
<tr>
<td>saccharine based sweetener</td>
<td>0 kcal</td>
<td>n/a</td>
</tr>
<tr>
<td>Strawberry Flavoured Angel Delight (With added semi-skimmed milk and set)</td>
<td>214 kcal (152.5g)</td>
<td>162 kcal (115g)</td>
</tr>
<tr>
<td>Hartley’s Jelly (mixed with boiling water and set)</td>
<td>n/a</td>
<td>149.37 kcal (196.85g)</td>
</tr>
<tr>
<td>Maltodextrin</td>
<td>n/a</td>
<td>246.49 kcal (60.1g)</td>
</tr>
</tbody>
</table>

Total  

Low energy: 228.55 kcal  

High energy: 551.86 kcal
Day 1:

Measure expectations relative to two very familiar foods

Consume dessert

Abstain from eating for 2 hours

Day 2:

Measure expectations again
Learned expected satiety

condition*day: \( F[1,53] = 4.97, p = .03 \)

Summary

- Energy intake is often determined before a meal begins

- Expected satiety/satiation determines the number of calories that we put on our plate

- Expected satiety/satiation is learned over time
Far from being ‘mindless’…

under cognitive control

learned

‘mindful’

Strategies for promoting weight loss should be developed with this in mind
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Thank you
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