From stomachs to minds:
Why cognition is key to understanding food intake

Jeff Brunstrom
Disclosure
Appetite and energy balancing

65 kg woman

Energy stored in fat tissue = 55 day’s supply

Mindless eating
Cognitive vs environmental control – a false dichotomy?

Shiffrin and Schneider (1977)
controlled vs automatic processes

Norman and Shallice (1986)
controlled schemas
contention scheduling
supervisory attentional system

Kahneman (2011)
System 1: Fast, automatic, frequent, emotional, stereotypic, subconscious
System 2: Slow, effortful, infrequent, logical, calculating, conscious
Effects of distraction on appetite

Effects of distraction on the development of satiety

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Relative Contributions of Intestinal, Gastric, Oro-sensory Influences and Information to Changes in Appetite Induced by the Same Liquid Meal

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Dissociating ‘actual’ and ‘perceived’ amounts consumed

Episodic Memory and Appetite Regulation in Humans

[Image of a setup with a laptop and a bowl on a table]
Participants are tested in one of four conditions:

- See 500ml / eat 300ml
- See 500ml / eat 500ml
- See 300ml / eat 300ml
- See 300ml / eat 500ml
Actual amount
(F(1,95)=5.57, p<.02)

Perceived amount
(F(1,95)=5.78, p<.02)

Perceived amount
(F(1,95)=4.1, p<.047)

ns
Diminished Ability to Interpret and Report Internal States After Bilateral Medial Temporal Resection: Case H.M.

Nancy Hebben, Suzanne Corkin, Howard Eichenbaum, and Karen Shedlack
Department of Psychology and Clinical Research Center
Massachusetts Institute of Technology

Behavioral Neuroscience
1985, Vol. 99, No. 6, 1031-1039

Sensory-Specific Satiety Is Intact in Amnesics Who Eat Multiple Meals

Flavour-nutrient learning

Robust conditioned flavor preference produced by intragastric starch infusions in rats

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CS US
Novel flavour Food (infusion)

Two-Bottle Test

Intake (ml/day)

CS+ CS−
Meal planning is very common

What determines real-world meal size? Evidence for pre-meal planning
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Computer-based assessments of expected satiety predict behavioural measures of portion-size selection and food intake
Laura L. Wilkinson*, Elanor C. Hinton, Stephanie H. Fay, Danielle Ferriday, Peter J. Rogers, Jeffrey M. Brunstrom
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Using photography in 'The Restaurant of the Future': A useful way to assess portion selection and plate cleaning?

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**Food & Nutritional Research, Dept of Consumer Science & Intelligent Systems, Eindhoven University of Technology, The Netherlands
Introducing expected satiety and expected satiation

‘Expected satiation’ (fullness)
‘Expected satiety’ (lack of hunger)
Using a ‘method of adjustment’ to measure expected satiety

Standard

Comparison

240 kcal

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

“How much curry is needed to stave off hunger as much as the pizza?”
Method of adjustment

**Standard**
Margherita pizza

**Comparison**
Chicken tikka masala
Research report

Computer-based assessments of expected satiety predict behavioural measures of portion-size selection and food intake

Laura L. Wilkinson *, Elanor C. Hinton, Stephanie H. Fay, Danielle Ferriday, Peter J. Rogers, Jeffrey M. Brunstrom

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Meal planning for children

Potter, C.M. et. al. (in prep) “My child is hungry!”: Adiposity in children is predicted by parent’s rather than children’s beliefs about child preferred portion size.
What about palatability and food choice?

How Many Calories Are on Our Plate? Expected Fullness, Not Liking, Determines Meal-size Selection

Jeffrey M. Brunstrom¹ and Peter J. Rogers¹

*Obesity (2009) 17, 1884–1890.*

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


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“I just want a healthy snack that is tasty but which will fill me up until supper”
Portions matched for energy content

100 kcal portions
Portions matched for energy content

200 kcal portions
Portions matched for energy content

300 kcal portions
Portions matched for energy content

400 kcal portions
Portions matched for energy content

500 kcal portions
Portions matched for energy content

600 kcal portions
“Deconstructing food choice: the role of portion size in ‘unhealthy’ dietary decisions.” Brunstrom et al. (in prep)
Relative role of expected satiation and palatability depends on context (what else is being eaten)
Key points

1. Effects portion size on food choice can be ‘deconstructed’

2. Larger portion sizes change our priorities in food choice
You will rate how familiar you are with these foods.

To prepare, please look at each food and consider how familiar you are with the food (from "not at all", to "somewhat" to "very"). When done, press the mouse button to begin.
Deconstructing food choice
Claims about universal determinants of dietary behaviour

Western
Educated
Industrialised
Rich
Democratic

In several fundamental respects the cognitive and motivational responses of Westerners are found to be atypical.
Does our dietary environment change our cognition and make us more responsive to external cues?
Does our dietary environment modify our cognitive controls of meal size?
If our dietary environment makes us MORE sensitive to EXTERNAL cues then we would expect to see LESS evidence for a ‘portion size effect’ in non-WEIRD people.
Remote (very)

A simple and limited diet
-milk, meat, blood
-food is relatively scarce
-little dietary variety
Would Samburu people (who have virtually no exposure to our modern obesigenic food environment) be susceptible to manipulation of an external cue for meal intake, i.e., portion size?
“Smaller” 1.4 kg of food

“Larger” 2.3 kg of food
Omitting 1 male and 1 female “plate cleaner”

**Intake by Serving Size**

- **Females**
  - Smaller: p < .01
  - Larger: p < .01

- **Males**
  - Mean +44%

**A robust effect:**
- 10 out of 11 females
- Mean +44%
- 8 out of 11 males
- Mean +36%
Samburu are more influenced by external cues!

Evidence for LESS (not more) sensitivity to external cues in WEIRD populations?
To appreciate how our obesogenic environment affects cognitive controls of food intake we need to study exposure to external cues (e.g., portion size) outside that environment.
Key take home points

Cognition and memory influence our appetite

Meals are planned

Expected satiety interacts with portion size in food choice

We now have the tools to deconstruct food choice in detail

We are all different. But to understand our obesogenic environment it might be helpful to step outside it every now and then.
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Peter Rogers (University of Bristol)
OH BOY! WE ARE REALLY GETTING SOME DEEP THINKING DONE TODAY. NOBEL PRIZE: HERE WE COME!

IT'S ALL COMING TOGETHER! AT THIS RATE, WE'LL HAVE THE WHOLE THEORY FIGURED OUT BY LUNCHTIME.

OH NO! DON'T THINK ABOUT LUNCH. DON'T THINK ABOUT LUNCH! DON'T THINK ABOUT LUNCH!

MMM