The effect of palatability on satiety.

Martin R Yeomans

Department of Psychology

University of Sussex

Talk plan

- Summarise nature of effects of palatability on short-term intake
- Discuss 2 alternative models for palatability/satiety interactions
- Consider the role of learning in determining the effects of palatability and satiety on meal-size

University of Sussex

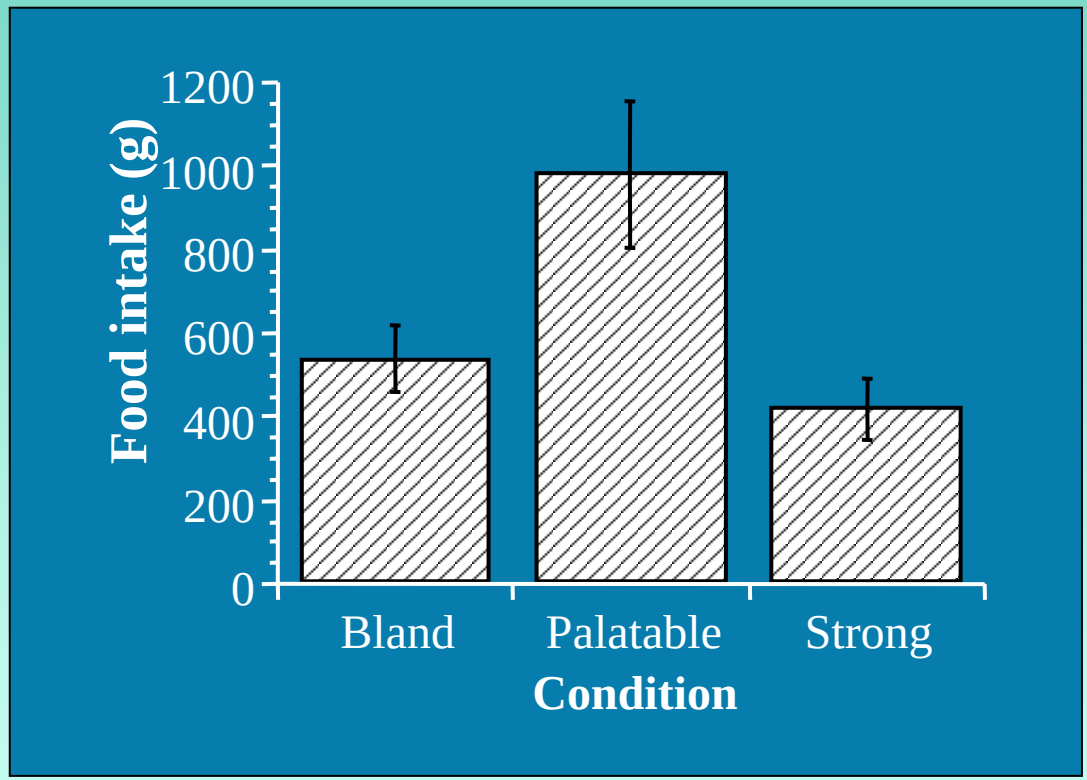
Palatability and the stimulation of appetite.

- Subtle differences in sensory quality impact hedonic evaluation and consequently modify intake
- We eat more of what we like

University of Sussex

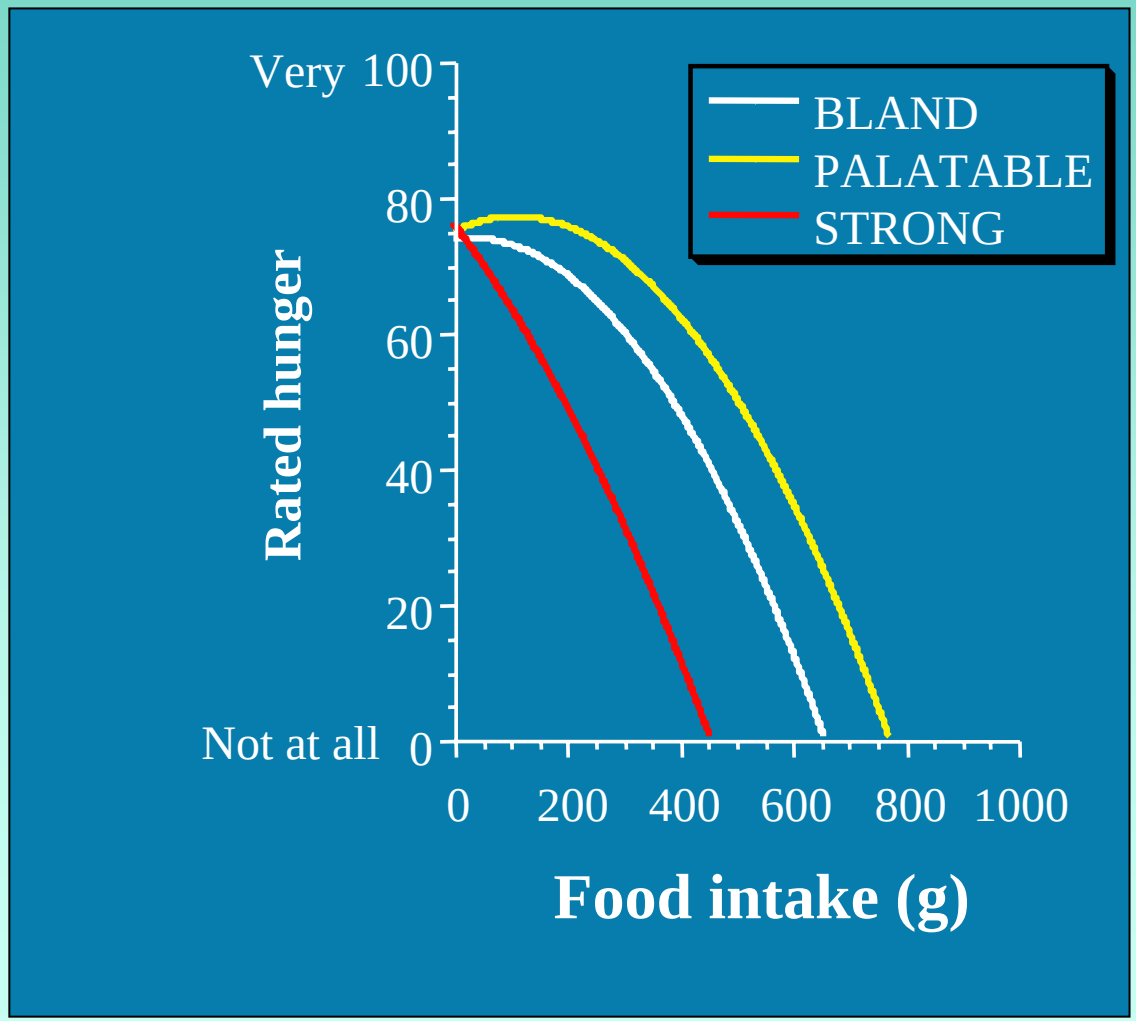
Manipulation of palatability

Small changes in the flavour of a food can have large effects on intake (Yeomans ‘96)



University of Sussex

Appetite increases during the initial stages of consuming palatable foods: *the appetizer effect* *(Yeomans 1996)*



University of Sussex

Two theoretical accounts of the relationship between palatability and satiety

The Homeostatic View

- Palatability reflects need state
- Most evident in alliesthesia concept (Cabanac)
- Accordingly, palatability is reduced by satiety

Hedonic Hunger

- Palatability effects are independent of need state
- Intake of palatable items evolved as a way of maximising use of scarce resources
- Thus palatability is largely unaffected by satiety

University of Sussex

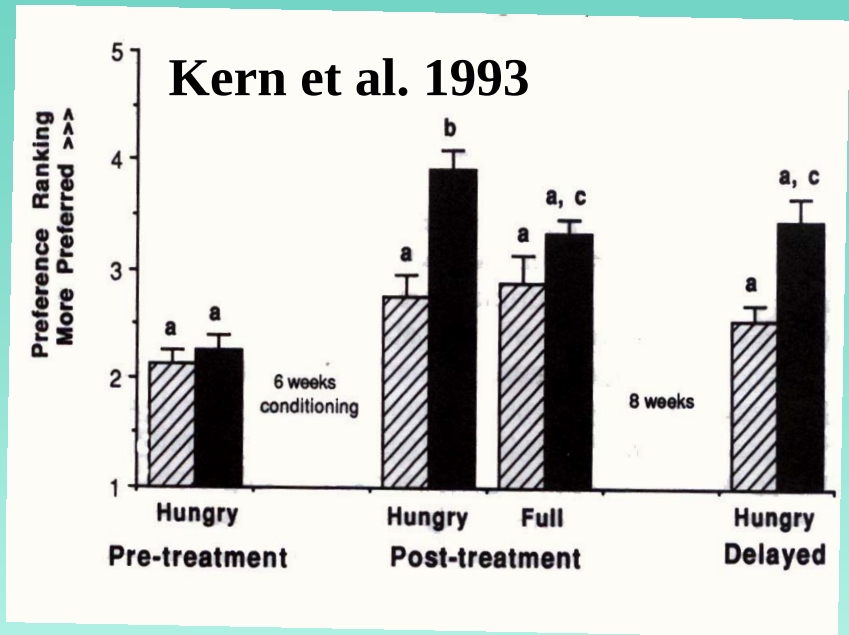
Palatability as a homeostatic response

Evidence that expression of liking can depend on need state:

1. Cabanac's alliesthesia

sweet tastes are rated less pleasant when sated than when hungry

2. Learned liking.
Expression of acquired liking is stronger when hungry than when sated



Liking can be sensitive to needs but still higher liking for energy-associated food even when sated.

University of Sussex

Hedonic hunger (Lowe & Butryn, 2007)

- A distinction between eating in response to needs and eating for sensory pleasure
- Implies that need-state is only weakly linked to liking

Key arguments against homeostatic account of palatability

1. In most studies, liking of next meal is not reduced when sated
2. Liking decreases slower when eating than does desire to eat: they do not reflect the same process
3. Different neural substrates. Homeostatic controls relate primarily to hypothalamic function: palatability appears to involve circuits in orbitofrontal cortex, limbic system and striatum

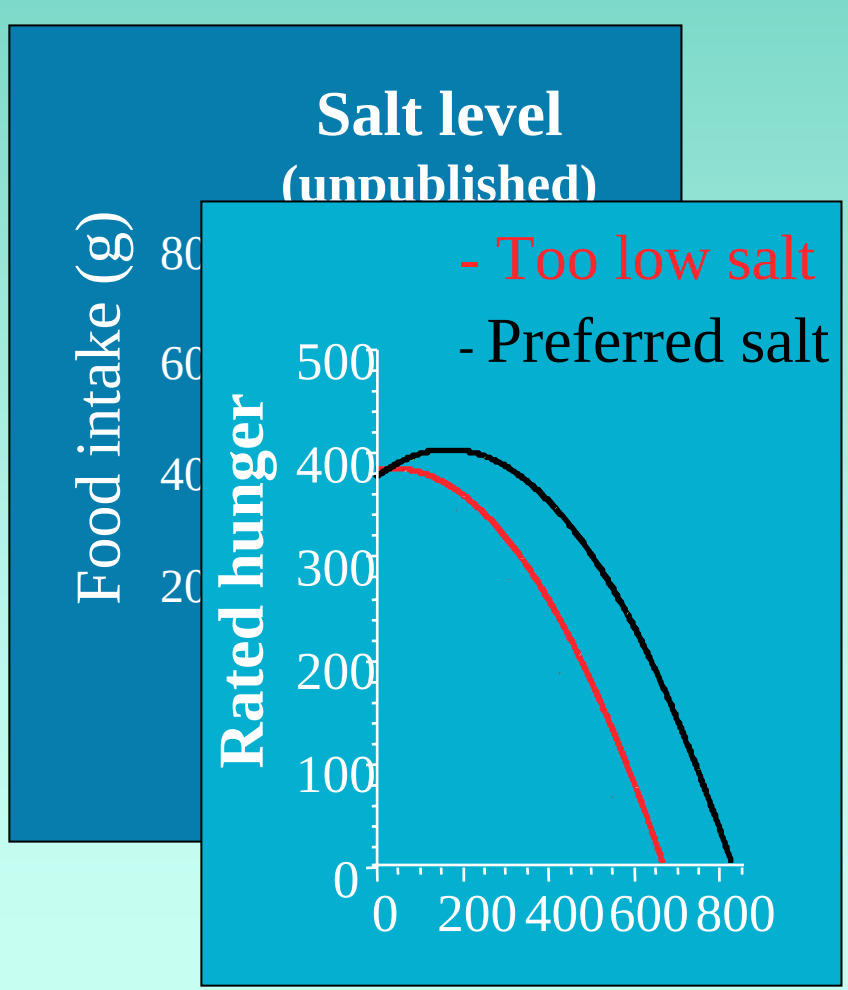
University of Sussex

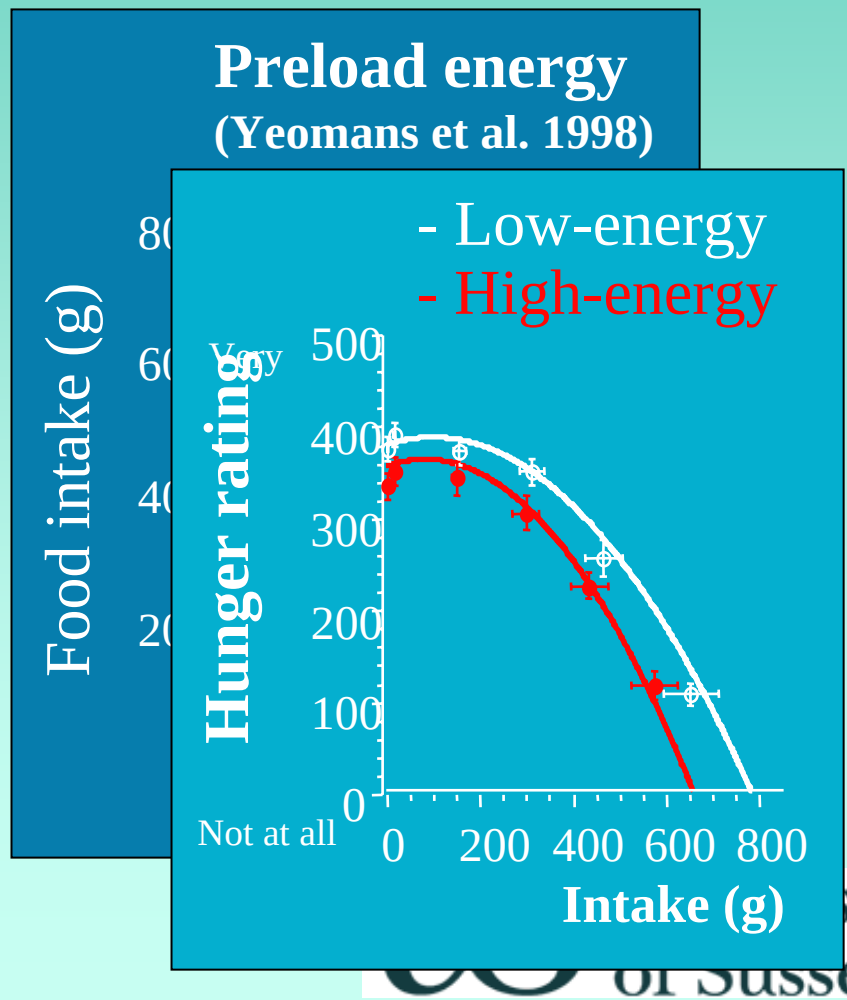
Direct tests of palatability/satiety interactions

1. Does manipulated satiety and palatability have qualitatively similar effects (as would be predicted from homeostatic account?
2. Or do manipulations of palatability and satiety interact?

University of Sussex

The pattern of change in hunger within a meal helps dissociate palatability and satiety effects

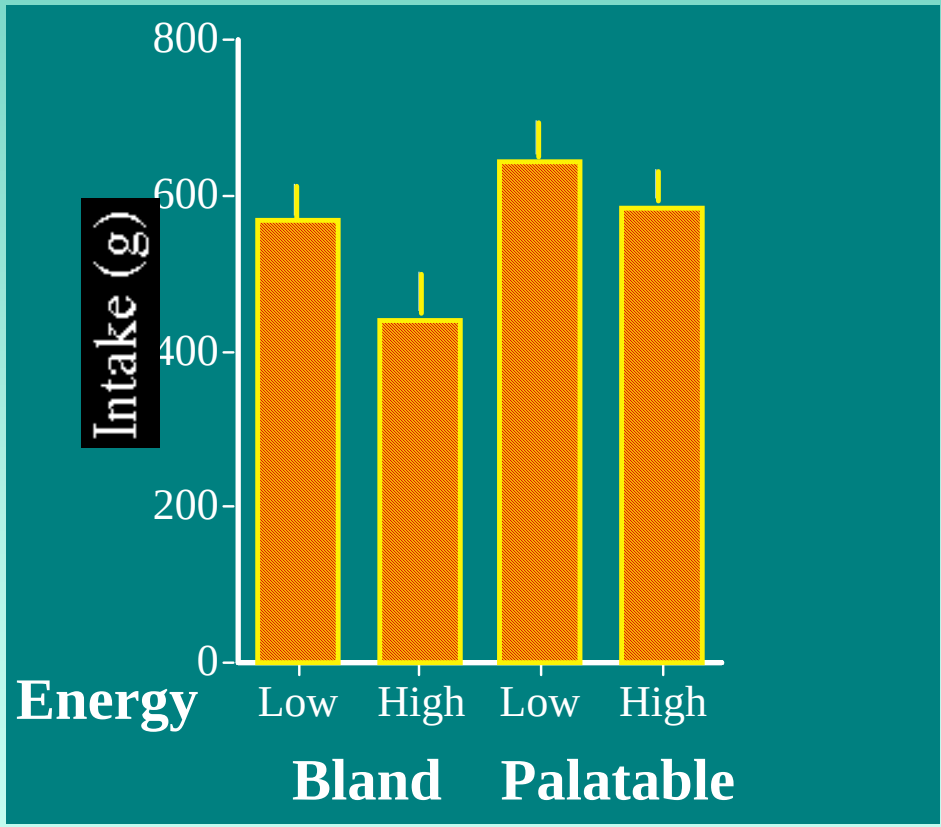




Effects of test meal palatability on the response to low and high energy preloads

(Yeomans et al., 2001)

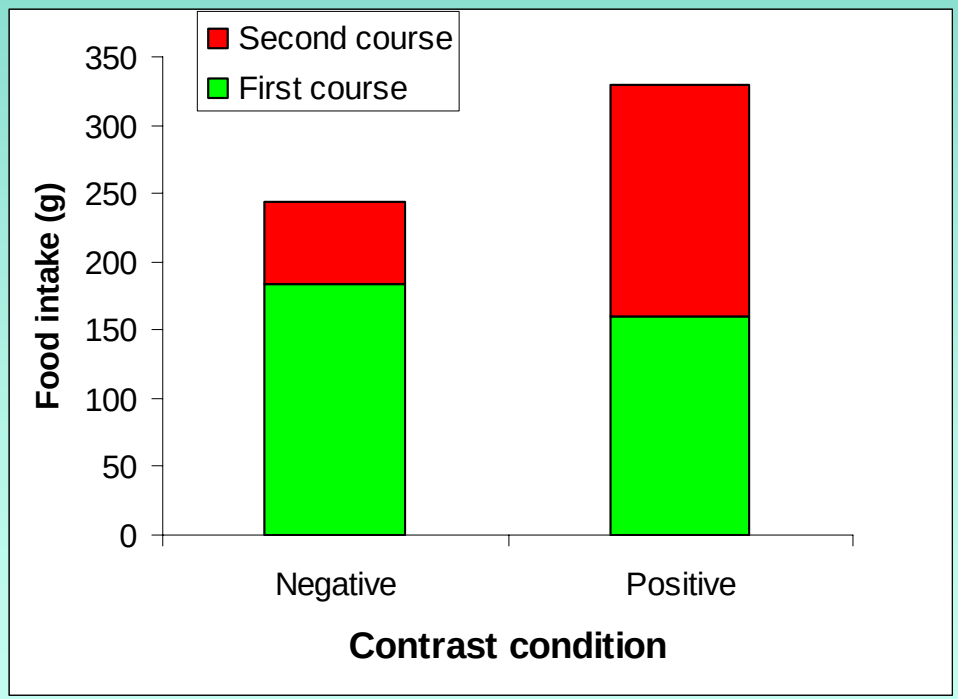
- High energy preloads were much more effective at reducing intake when the test meal was rated BLAND
- Rated appetite at the start depended on preload energy, and within the meal on palatability



University of Sussex

Hedonic contrast

- Western society usually eat meals as a series of courses
- Could relative palatability of courses affect intake?



University of Sussex

Interim summary: palatability and control of meal-size

- Palatability enhances intake through stimulation of appetite
- Although the expression of liking may be altered by hunger state, palatability appears more potent as an appetite stimulant when sated
- Thus palatability counter-acts satiety to promote over-consumption

University of Sussex

Learning and control of meal-size

Potential for multiple learned influences

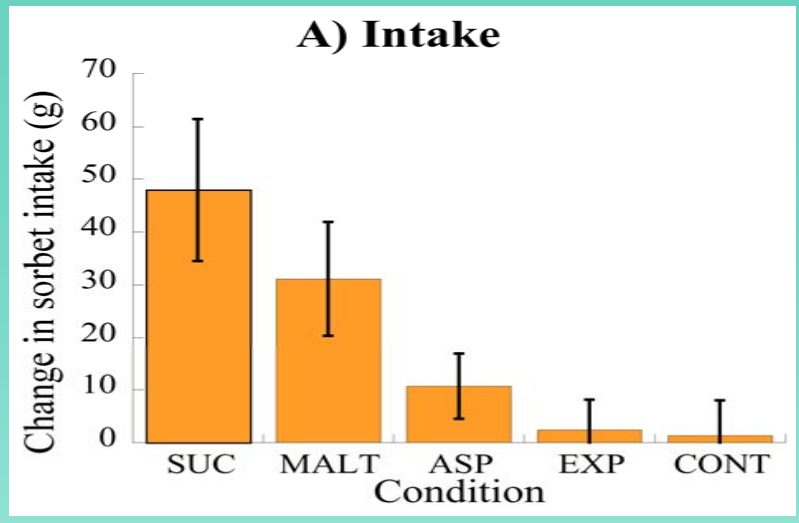
- ***Learned appetite:*** enhanced liking for flavours through flavour-based learning should result in increased intake
- ***Learned satiety:*** associations between flavour and post-meal satiety could lead to acquired control of meal-size (Booth)

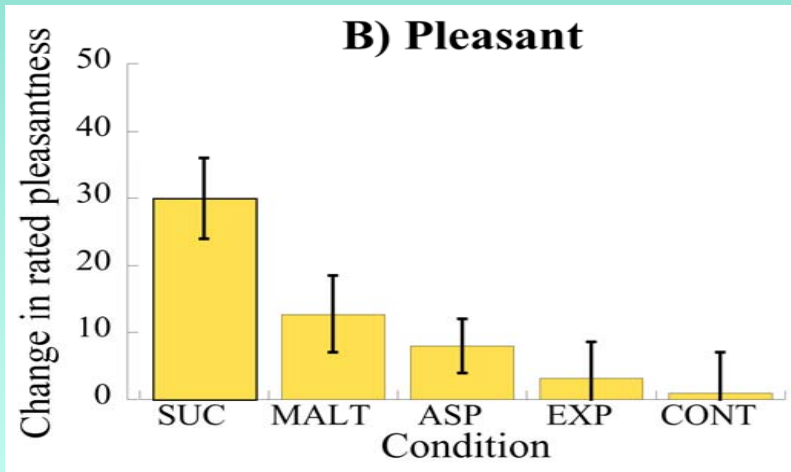
University of Sussex

Acquired liking and increased intake

(Yeomans et al. 2008a)

- Evaluate and consume ***ad libitum*** a novel flavoured fruit sorbet
- 4 training trials with the same flavour in drink form either with added sucrose, maltodextrin, aspartame or nothing
- Re-evaluate and consume the sorbet





Acquired liking drives intake

University of Sussex

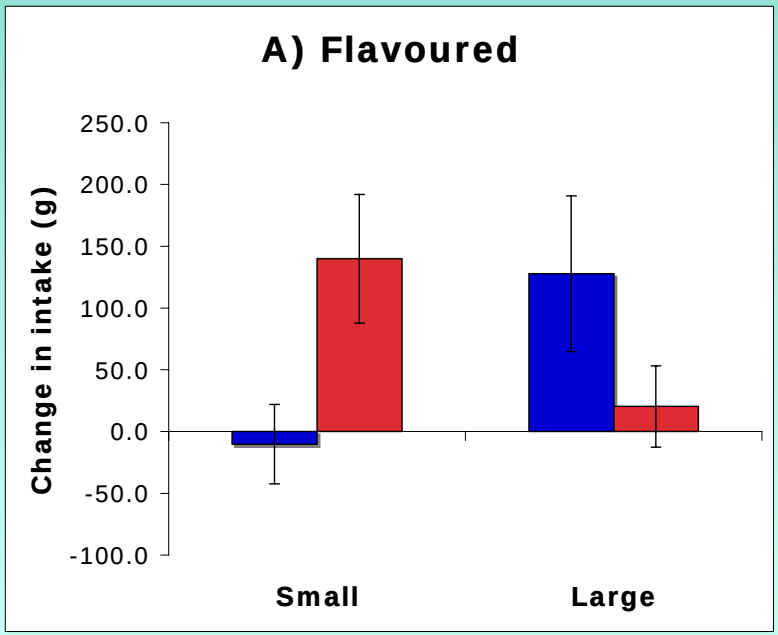
Learned appetite or satiety?

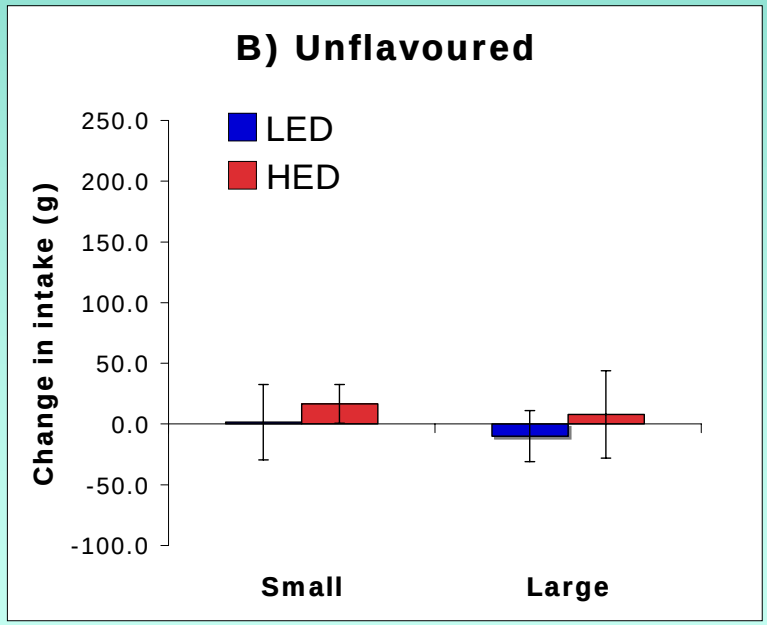
Methods:

Days 1/2 (pre-training) free consumption of two versions of cereal (porridge), one high energy density (HED) and one low (LED), with difference predicted by flavour or not (control group)

Days 3-6 (training) consumed fixed amount (150g or 300g) of one porridge per day

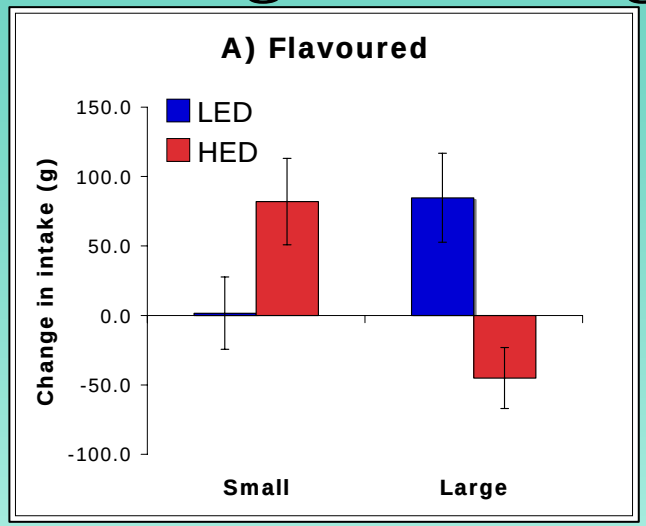
Days 7/8 (post-training) free-intake test

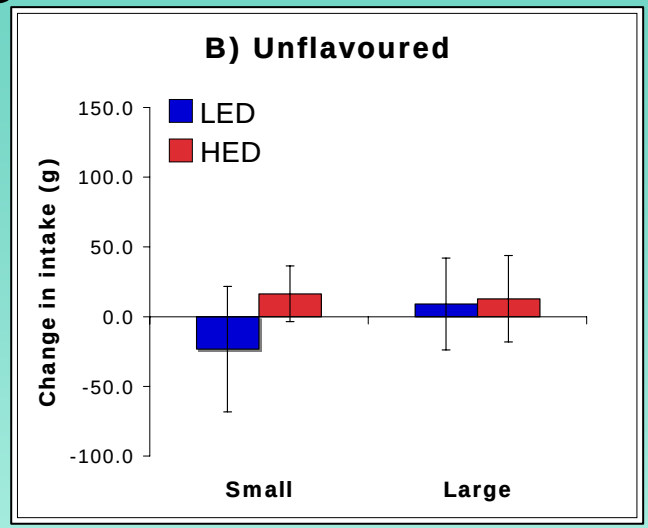




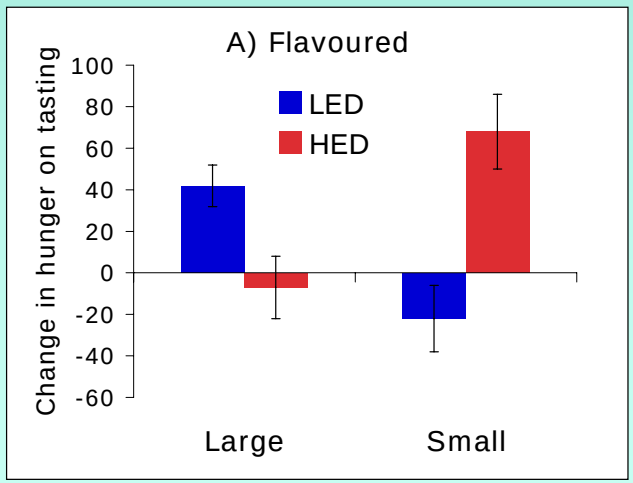
University of Sussex

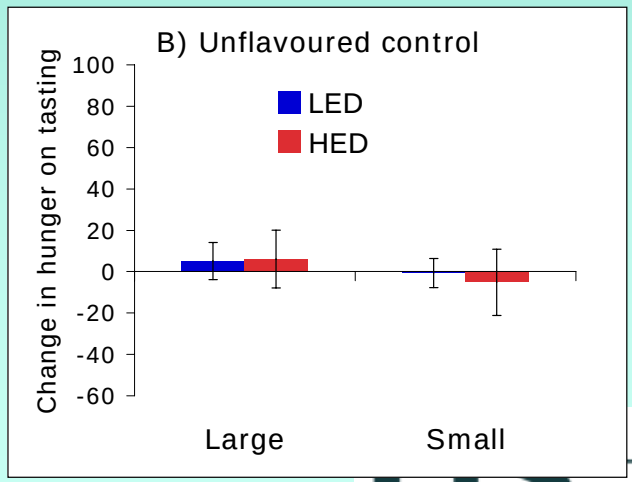
Learned changes in liking





… and a conditioned appetizer effect at post-training





University of Sussex

Summary

- Palatability is a major driver of short-term over-eating
- For most foods, this may be learned: learned increases in flavour pleasantness result in appetizing effects which drive short-term over-consumption
- High energy density should promote increased liking: liking then enhances intake and leads to both ***passive*** and ***active*** overconsumption

University of Sussex

Acknowledgements

Thanks to:

Post-docs/RAs:

Richard Gray, Sirous Mobini, Emma Bertenshaw, Lucy Chambers, Margie Leitch, Natalie Gould

Collaborators:

Steve French (Mars), John Prescott (Newcastle), Bob Boakes (Sydney), Dick Stevenson (Macquarie)

IFF and Firmenich for flavours and BBSRC for funding

University of Sussex