Relationships between food variety, habituation, and appetite/eating regulation—implications for metabolic and bariatric surgery

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Conflict of Interest Disclosure

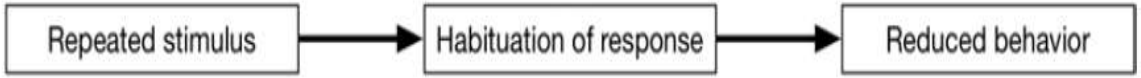
- I have the following potential conflict(s) of interest to report:
  - Employee: University of Tennessee
  - Receipt of grants/research supports from NIH
  - Receipt of honoraria or consultation fees from Academy of Nutrition and Dietetics, Elsevier

Overview

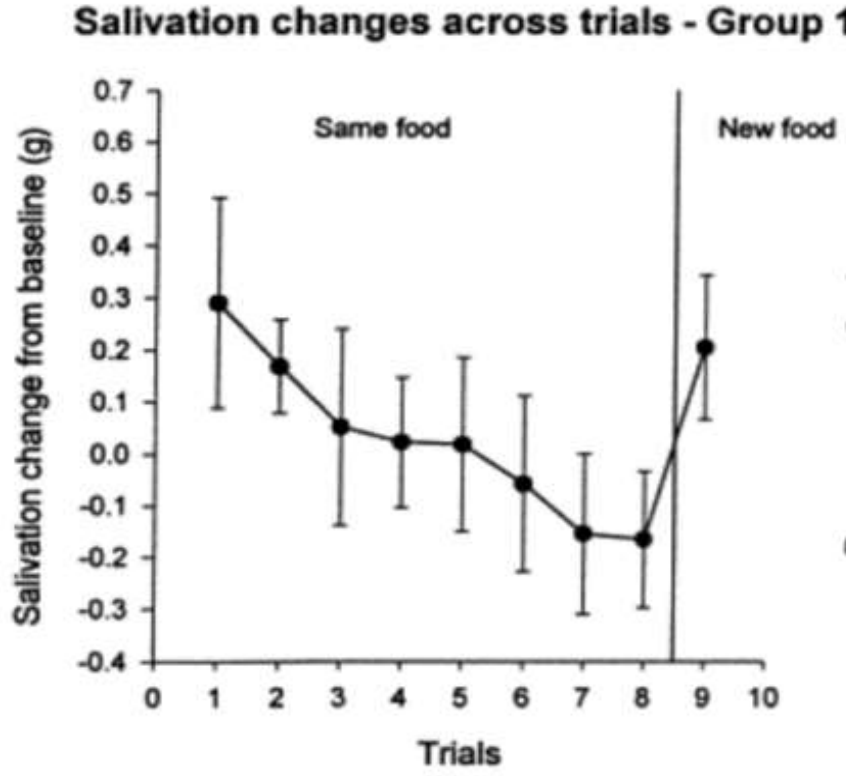
- Dietary goals in treatment of obesity
- Habituation theory
- Developing a limited dietary variety prescription
  - Stimulus specificity
  - Long-term habituation
- Application of dietary variety prescription
- Implications

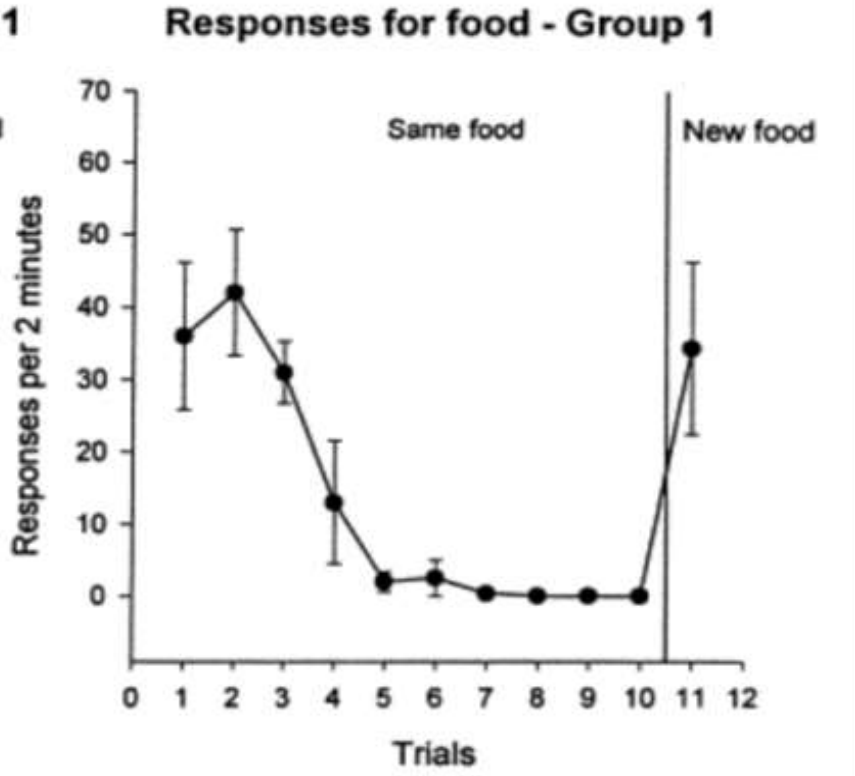
Dietary Goals

Habituation Theory

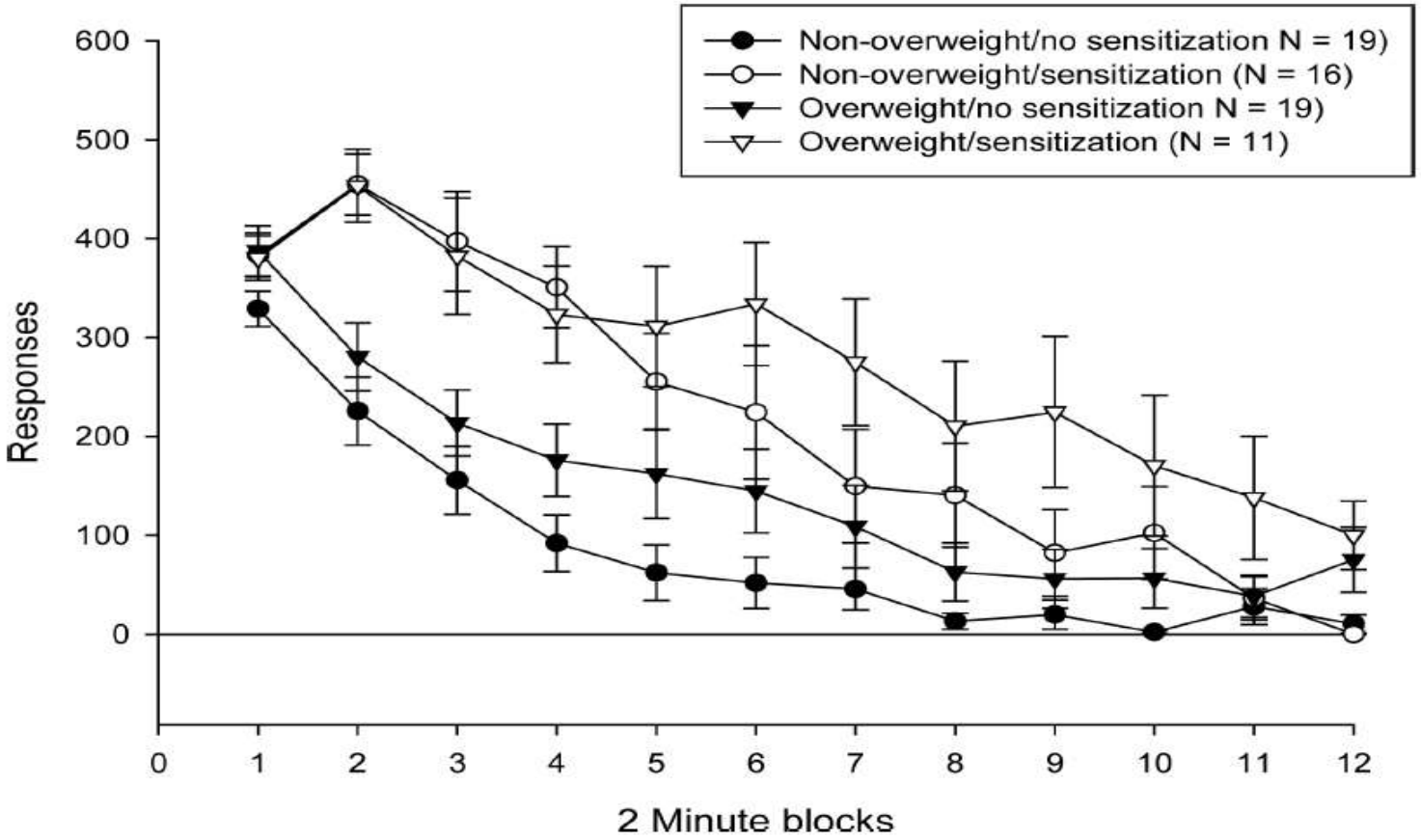


Provides a framework for how repeated presentation of a stimulus influences responding to the stimulus

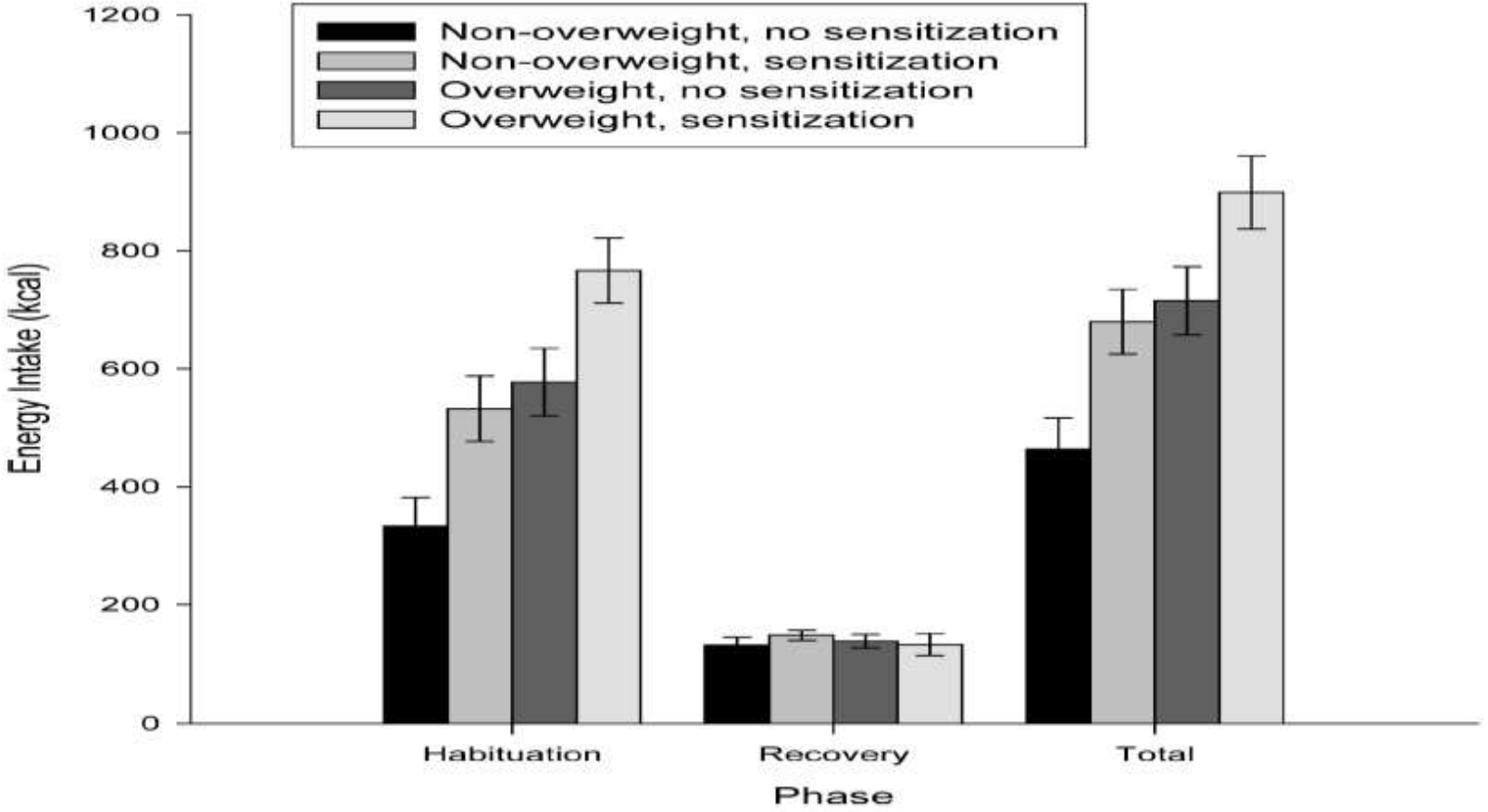




Epstein et al, 2009



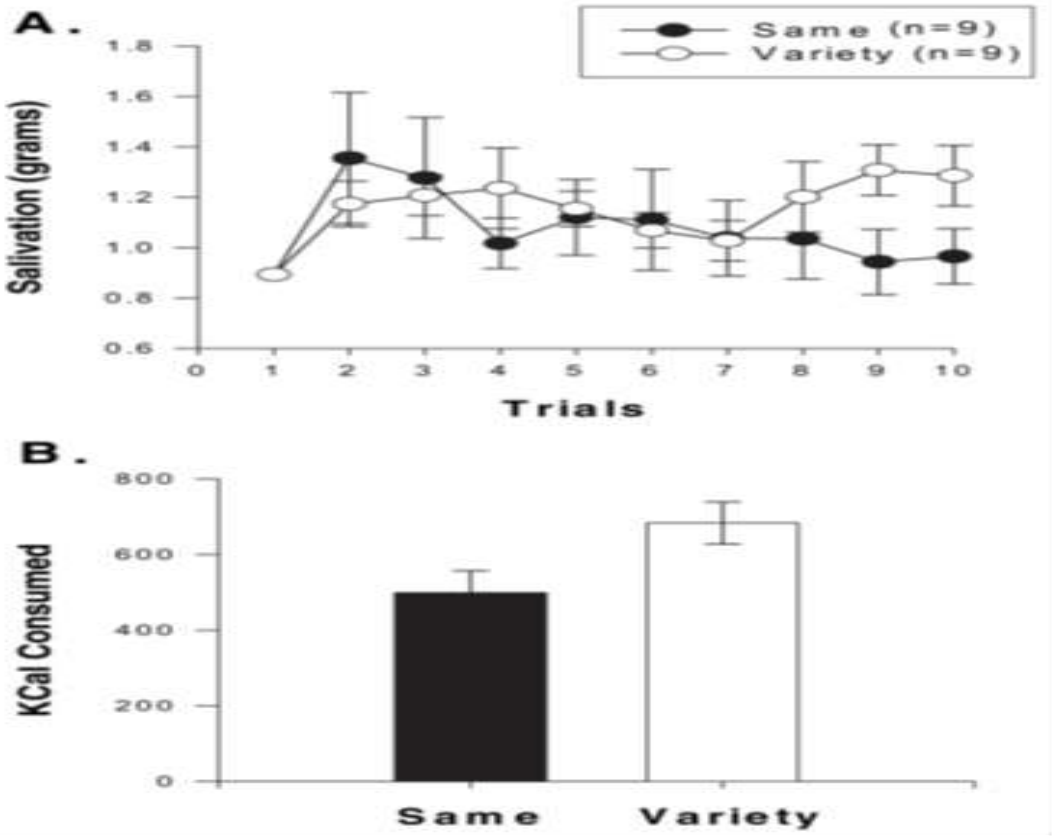
Epstein et al, 2008



Epstein et al, 2008

Food variety, habituation, and food intake

- As a novel food cue produces dishabituation, it would be hypothesized that presenting varied food cues across trials within a laboratory session would slow down the overall rate of habituation
- The difference in habituation rate would occur along with differences in energy intake within an eating occasion



Temple et al, 2008

Dietary variety and weight management

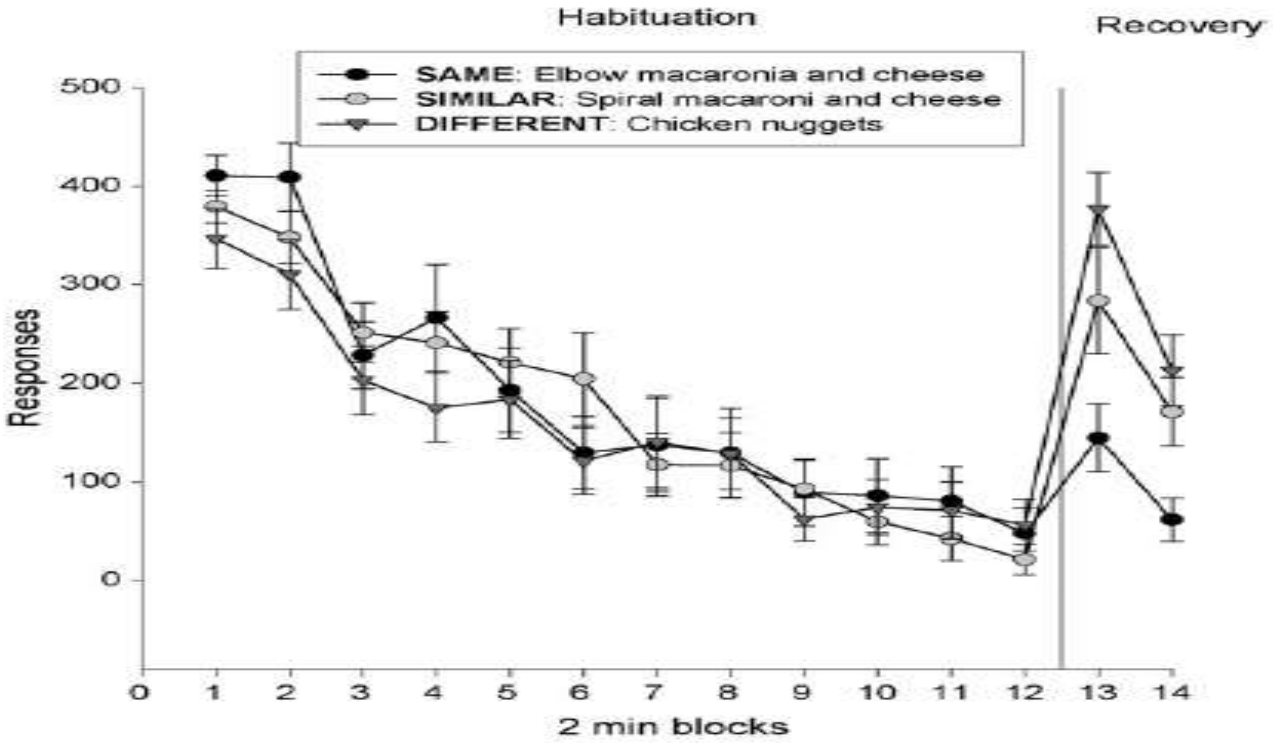
- Lifestyle intervention participants who made the greatest reduction in the number of different energy-dense, non-nutrient-dense, foods (i.e., “snack foods” such as cookies, cake, chips) consumed had greater reductions in caloric and percent dietary fat intake and greater weight loss at 6 months (Raynor et al, 2004)

- National Weight Control Registry participants reported consuming significantly less variety in most food groups, but especially in those food groups higher in fat density than those individuals who had lost 7% of initial weight in the first 6 months of a lifestyle intervention (Raynor et al, 2005)

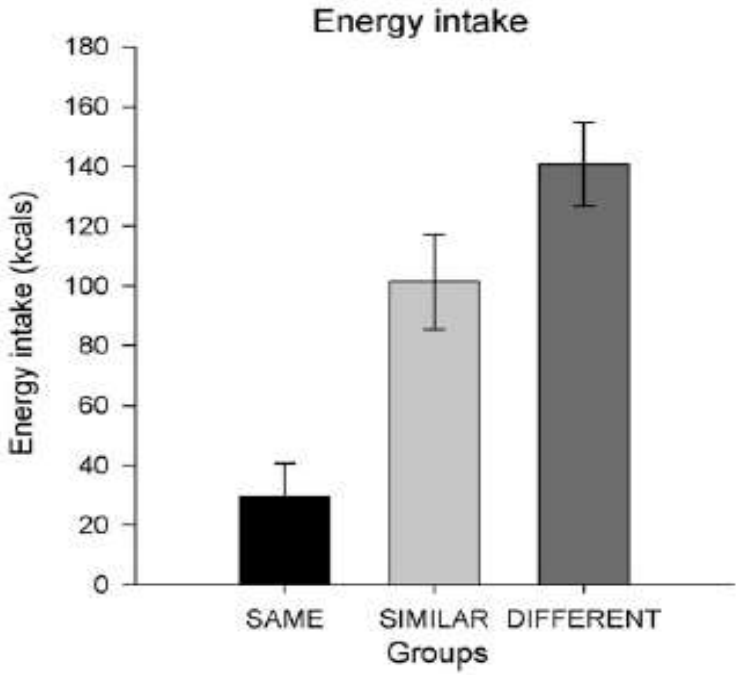
How do you develop a limited dietary variety prescription that harnesses the effects of habituation on satiation and can be implemented within an intervention?

What contributes to variety?

- What degree of stimulus specificity determines response recovery?
  - If tortilla chips are being eaten, will adding salsa recover responding?
  - If chocolate ice cream is being eaten, will tasting vanilla ice cream recover responding?



Epstein et al, 2010



Epstein et al, 2010

Long-term habituation

- Can the effect of increased rate of habituation and enhanced satiation with reduced variety be maintained across time?

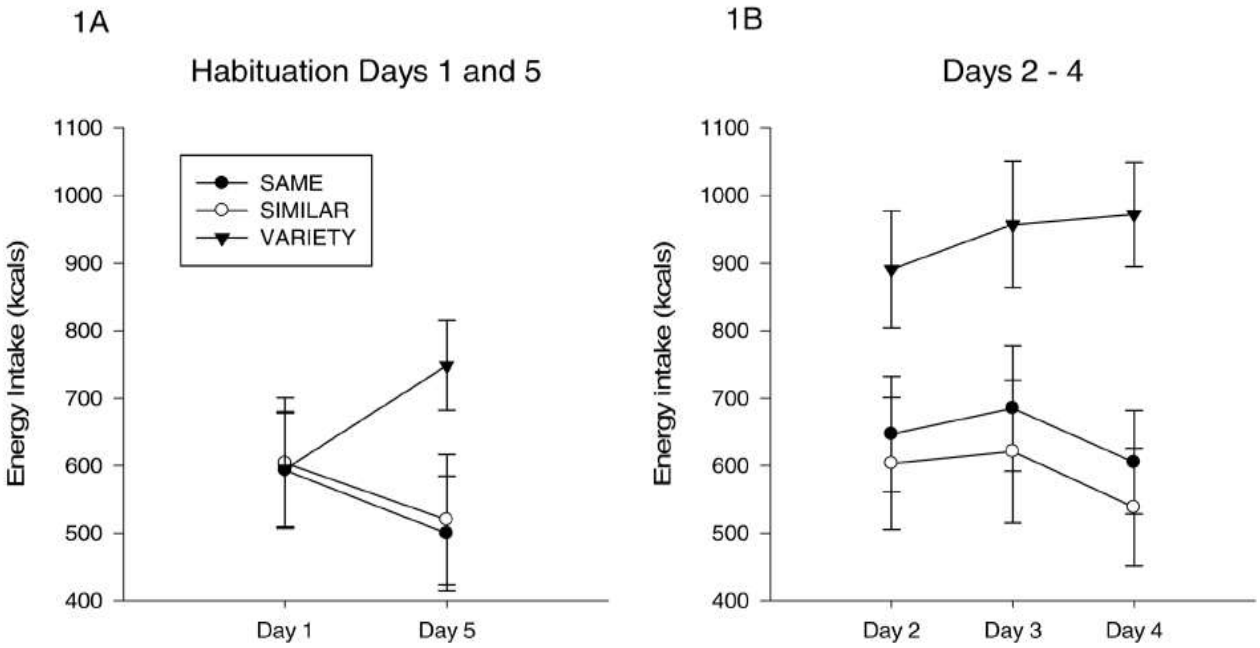


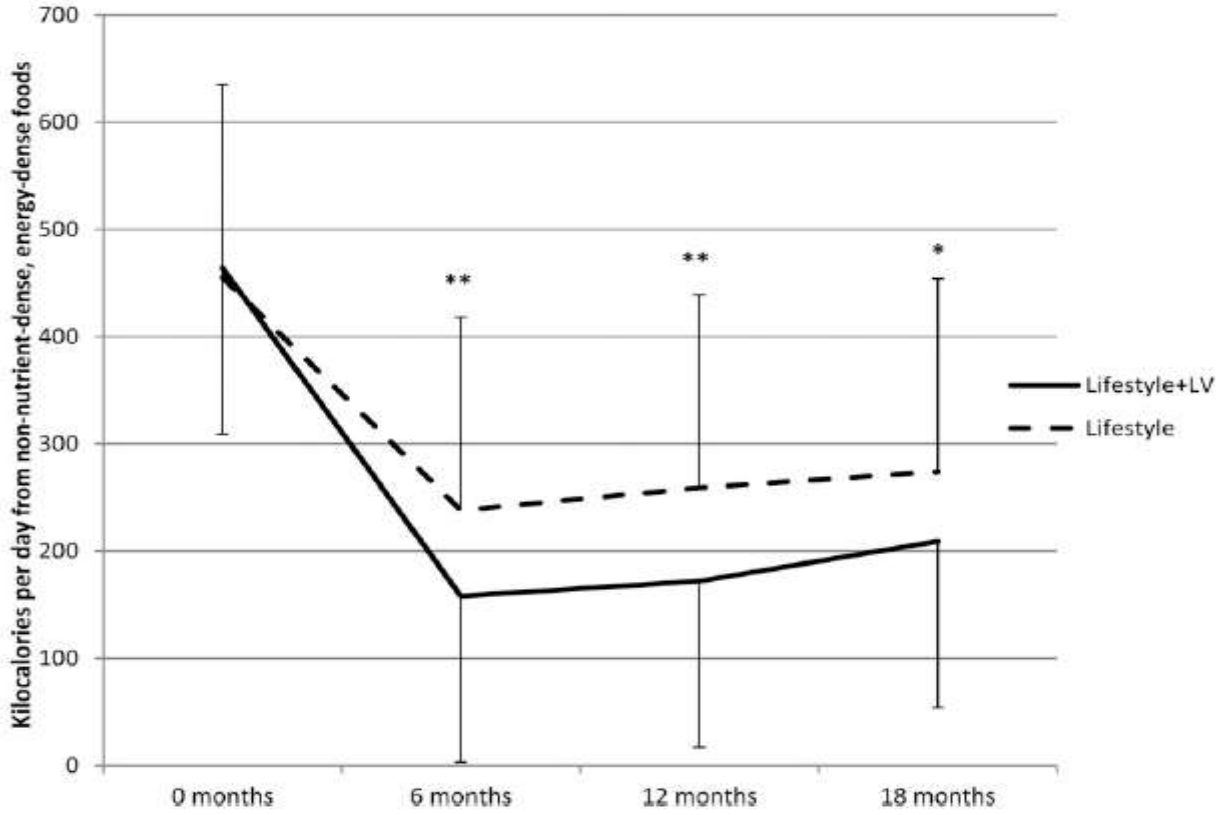
Figure 1.
Energy intake for children randomized to SAME, SIMILAR and VARIETY conditions for macaroni and cheese on days 1 and 5 (1A) and for experimental foods on days 2–4 (1B) (mean ± SEM).

Epstein et al, 2013

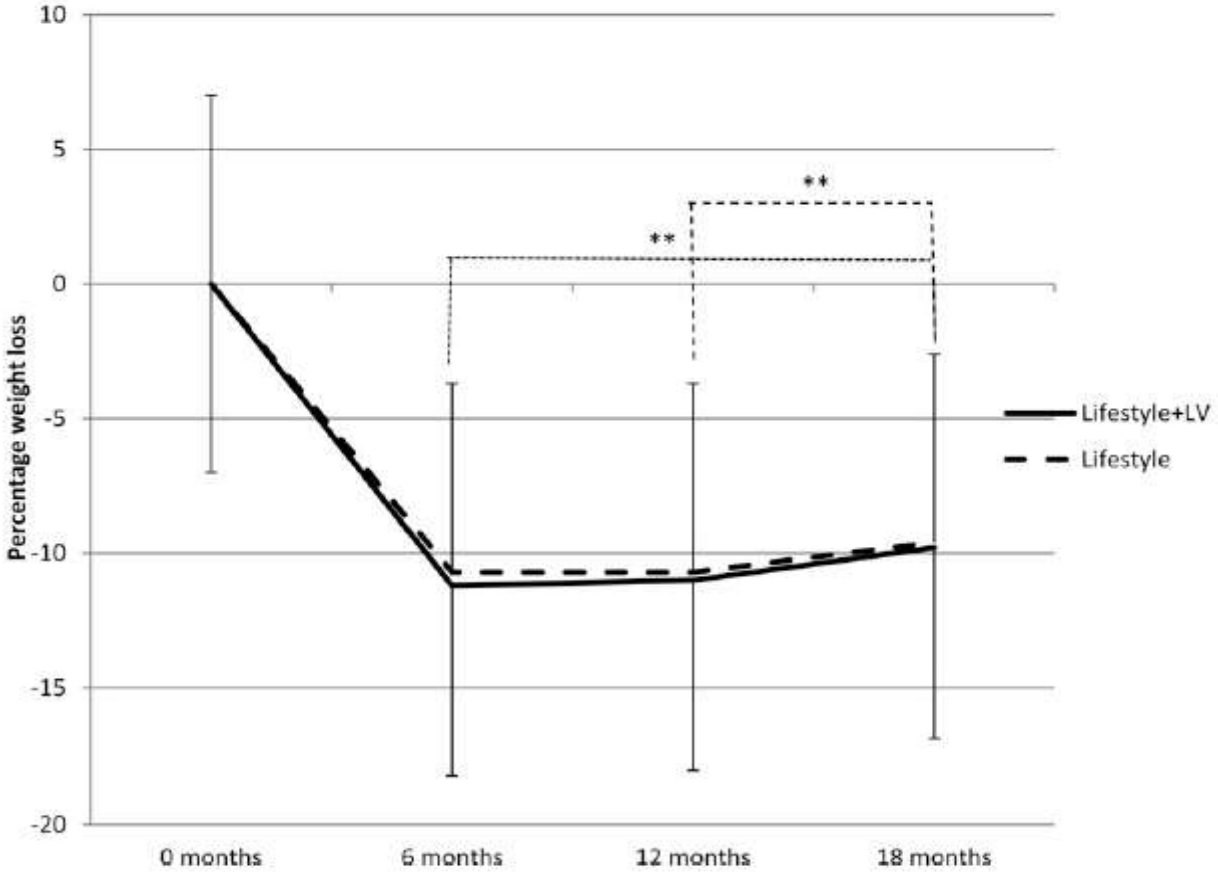
Implementation - adults

Limiting variety in non-nutrient-dense, energy-dense foods during a lifestyle intervention: a randomized controlled trial (Raynor et al, 2012)

- 202 adults, with a BMI 27 – 45 kg/m^2
- Conditions:
  - Lifestyle
    - 1200-1500 kcal/day, ≤ 30% kcal fat
    - > 200 min/wk MVPA; 10,000 steps/day
    - 48 CBT group sessions over 18 months
  - Lifestyle+LV
    - Lifestyle intervention (identical to Lifestyle)
    - Limit variety of non-nutrient-dense, energy-dense foods to 2 (specific by flavor)
    - Consume only these two foods when these types of foods desired



Raynor et al, 2012

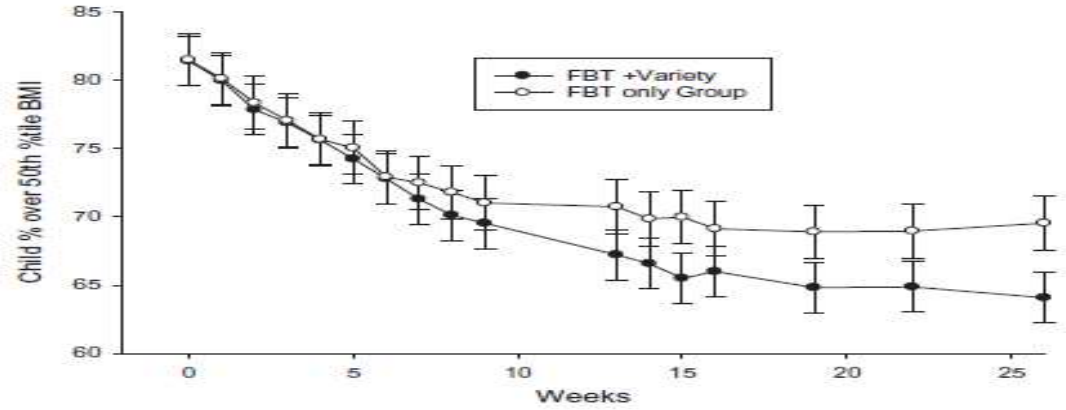


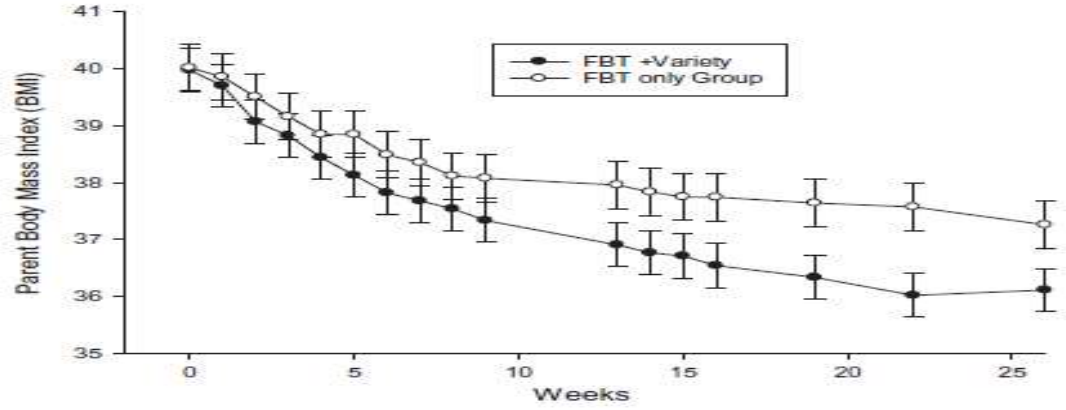
Raynor et al, 2012

Implementation - children

Limiting dietary variety in family-based treatment: 6-month pilot study (Epstein et al, 2015)

- 24 families, with a child ≥ 85th percentile BMI and aged 8 to 12 years
- Conditions:
  - FBT
    - Family-based treatment
    - Traffic Light Diet (1000-1500 kcal/day, ≤ 2 servings/day of RED foods)
    - Developed meal plans
    - ≥ 60 min/day of MVPA prescription
  - FBT+Variety
    - Family-based treatment (identical to FBT)
    - Identified two RED foods to consume during the intervention: one dinner entrée and one snack food
    - Developed meal plans that repeated dinner entrees and included leftovers from the dinner entrees and reduced variety of RED foods
- Outcomes:
  - Child percent overweight: FBT+Variety −15.4% vs. FBT − 8.9%, p = 0.017
  - Variety of RED foods consumed by family: FBT+Variety = 20.2 to 12.6 vs. FBT = 19.7 to 16.8, p = 0.01



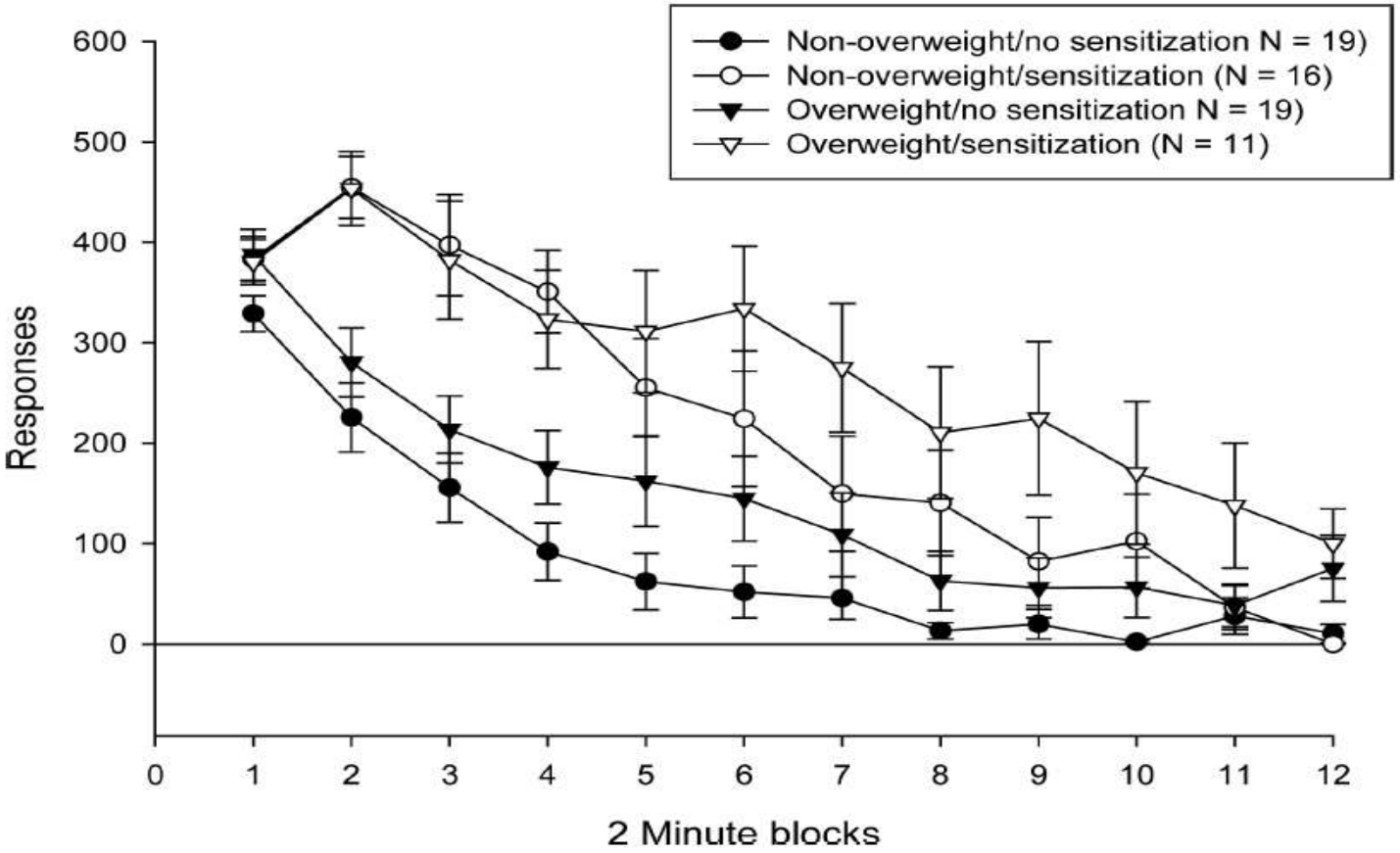


Epstein et al, 2015

Additional applications

Individual differences

- Examine individual differences on treatment effects (sensitizers vs. non-sensitizers)
  - Identify behavioral phenotype that may have greater benefit from limited variety prescription



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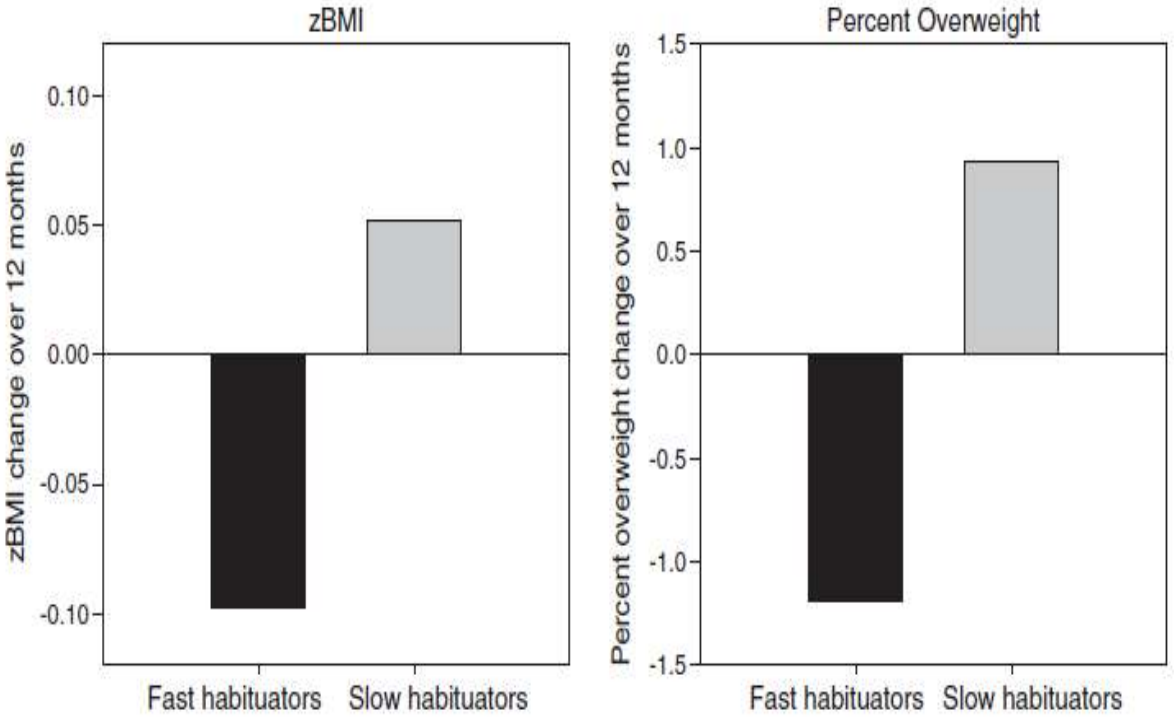

Epstein et al, 2011

Implications

- Given that habituation to food cues is also impaired in candidates for metabolic surgery might a limited variety prescription be helpful post-surgery?
- Might changes in gut hormones following surgery enhance habituation, increasing the effectiveness of this dietary intervention in this population?
- Does change in gut hormones following surgery influence if someone is a sensitizer?

Thank you!

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