Harnessing habituation, via reducing dietary variety, to enhance obesity treatment

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Overview

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

• For treatment of obesity, the goal of all dietary prescriptions is to reduce energy intake
  • Energy-dense, non-nutrient-dense foods are commonly targeted for reduction
• Adherence to reduced energy intake is challenging
Habituation theory

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

• Demonstrated by a reduction in physiological and behavioral responses to repeated presentation of a stimulus

• Reduced response is not due to adaptation or fatigue, as presentation of a new stimulus causes the response to reoccur (dishabituation)
Habituation theory

• Eating involves repeated presentation of food stimuli (visual, olfactory, and gustatory stimuli)
  • Within and across eating occasions
• Provides a model for understanding factors that influence the rate of reduction of responding to repeated food stimuli, within and across eating occasions
• Hastening the rate of reduction should decrease the length of an eating occasion (enhancing satiation), reducing food intake
Salivation changes across trials - Group 1

Responses for food - Group 1

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?
Translating Habituation Research To Pediatric Obesity Treatment: The EATWELL Study

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Basic Behavioral & Social Sciences Research

Significant Clinical Question

Phase I
DEVELOPMENT

A. Define: Years 1 - 4
  Lab 1a Studies 1 - 7
  Year 2
  Lab 2 Pilot

B. Refine: Year 1
  Lab 1b Year 2
  Lab 2

Phase II
PRELIMINARY TESTING

A. Proof-of-Concept: Year 1
  Field 1

B. Pilots: Year 5
  Field 2

Phase III
EFFICACY

Efficacy Trial: Years 3-4
  Clinical 1
  Years 4-5
  Clinical 2

Phase IV
EFFECTIVENESS

Dissemination & Implementation Research

Effectiveness Research:

Optimization
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
Energy intake

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/m²
- 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
Next steps

• Implement to examine effects of long-term weight loss

• Measure habituation during intervention

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

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