 Consuming A Sweet Snack While Following A Reduced-Calorie Diet Lowers Body Weight, Body Fat Percentage and Food Cravings: A Pilot Study

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Disclosure

• Graduate Student
  – The Pennsylvania State University, Graduate Program in Nutrition, University Park, PA

• Research Support
  – The Hershey Center for Health and Nutrition, The Hershey Company, Hershey, PA

Learning Objectives

• Learning Objective #1: Identify one of the reasons for excess energy consumption in the American diet

• Learning Objective #2: Define food cravings and identify methods to manage them

• Learning Objective #3: Apply an innovative dietary technique in practice which uses “extra” calories in the diet to incorporate a favorite food into a reduced-calorie diet to decrease deprivation, improve diet compliance and aid in weight loss.

Background

• A nation of “snackers”
• Meal frequency (i.e., snacking) has increased over time (Popkin, 2010)
• Snack choices are high in fat and refined carbohydrates
• Snacking and snack choices associated with high energy intake
• Excess energy related to overweight and obesity
• Proper snacking can boost nutrient intake (Howarth, 2010)
Background

- Moderate weight loss and weight regulation are important for preventing obesity-related chronic disease.
- Long-term success with weight loss is challenging for many individuals.
- Ability to monitor and regulate energy intake in response to situational or emotional cues, specific food cravings, perception of hunger, and mood state are factors underlying weight management.

Food Cravings

- Overweight women identify excessive caloric intake during episodes of food cravings as a reason for their inability to lose weight (Wurtman, 1986).
- Women who report a greater frequency of cravings tend to consume more energy and have higher BMIs than women who report fewer food cravings (Hill, 1991).
- Individuals report more cravings for foods that they categorize as “forbidden” (Raynor, 2003).
- Reintroduction of “forbidden” foods into dietary intake patterns often results in a rebound effect of overconsumption (Polivy, 2005).
- Food cravings, restriction, and episodic reintroduction of food may lead to increased food intake and subsequent weight gain (Barnes, 2010).

Addressing Food Cravings

- Individuals who were most successful at reducing body weight were those who experienced decreases in hunger and cravings during weight-loss interventions (Stauffer, 2009).
- Effective approaches for managing hunger and reducing cravings:
  - Including more complex carbohydrates (Slavin, 2007).
  - Incorporating frequent small meals in the dietary pattern (Farshchi, 2004).
  - Eating breakfast (Kant, 2008).
  - Including a savory snack (Mattes, 2010).
- The aim of this 18-week intervention was to compare differences in body weight change among women who consumed two different highly palatable, highly craved (Bruinsma, 2003), calorie-controlled sweet snacks in a reduced-calorie diet (RCD).

Hypothesis

- Overweight and obese premenopausal women following an 18-week RCD who incorporated either a dark chocolate snack (DCS) or a non-chocolate snack (NCS) into daily intake could maintain an energy deficit, experience significant positive changes in anthropometric and body composition measurements, and have decreased cravings, despite the type of sweet snack consumed.
Study Design

Participants
- Premenopausal women
  - aged 25 to 45 years
  - BMI ≥ 25 ≤ 43 kg/m²
  - moderately active
  - weight stable
  - generally healthy

Study Design

Dietary Intervention
- Randomized to RCD with dark chocolate snack (DCS) or RCD with non-chocolate snack (NCS)
- Macronutrient composition of RCD: 50% carbohydrate, 30% fat, 20% protein
- Energy intake individualized for each woman (500 kcal deficit/day)
- Both diet groups attended weekly diet sessions with the same registered dietitian
- The DCS group
  - consumed one dark chocolate tasting square (Extra Dark, 60% cacao; The Hershey Company, 10g/serving) twice per day (90 kcals/day)
  - one, 8-ounce sugar-free cocoa beverage at the first meal of the day (65 kcal/day; 11g natural cocoa/serving)
- The NCS group
  - consumed one non-chocolate sweet snack (The Hershey Company) twice per day (90 kcals/day)
  - one, 8-ounce sugar-free placebo beverage (65 kcal/day)

Outcome Measures (Baseline and Week 18)
- Snack compliance and attendance
- 7-day physical activity record
- Dietary Intake
- Body weight (BW; kg)
- Waist (cm) and hip (cm) circumferences
- Body fat mass (FM), fat-free mass (FFM) and body fat percentage (BF%)
- General diet symptoms questionnaire
- Statistical Analysis
  - Within and between group changes in BW, BF%, waist and hip circumferences and questionnaire scores were analyzed using paired t-tests and analysis of variance, respectively.

Results
- Thirty-three participants began the diet, a total of 26 women (DCS group = 13; NCS group = 13) with mean age of 36.5 ± 4.9 years completed the 18-week intervention.
- Compliance with Snack
  - DCS group: Snack compliance = 93.2%; Beverage compliance = 93.0%
  - NCS group: Snack compliance = 94.7%; Beverage compliance = 94.9%
- Class Attendance
  - DCS group: 78.0%
  - NCS group: 71.4%
- Physical Activity Record
  - All women: PAR significantly decreased (p<0.01)
  - DCS group: PAR significantly decreased (p<0.01)
  - NCS group: PAR significantly decreased (p<0.01).
**Results**

**Table 1. Dietary Intake at Baseline and Week 18 by Diet Group**

<table>
<thead>
<tr>
<th></th>
<th>Dark Chocolate Snack (DCS)</th>
<th>Non-Chocolate Snack (NCS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline (n=13)</td>
<td>Baseline (n=13)</td>
</tr>
<tr>
<td>Estimated daily energy intake (kcal)</td>
<td>$1939$</td>
<td>$334$</td>
</tr>
<tr>
<td>Carbohydrate (% of total energy)</td>
<td>$48.5$</td>
<td>$8.3$</td>
</tr>
<tr>
<td>Fat (% of total energy)</td>
<td>$34.3$</td>
<td>$7.6$</td>
</tr>
<tr>
<td>Protein (% of total energy)</td>
<td>$15.8$</td>
<td>$2.2$</td>
</tr>
</tbody>
</table>

$^*p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$; $p$-value analyzed using paired t-tests for changes from baseline within diet groups. There were no significant differences between the diet groups in dietary intake changes.

**Conclusion**

- Because Americans will rely on quick snacks for energy, we should educate them how to incorporate them properly and **within their calorie requirements**.
- Including a calorie-controlled daily snack will not deter:
  - Energy deficit
  - Reduction in body weight and fat mass
  - Decrease in waist and hip circumferences
- Including a calorie-controlled daily snack can also reduce:
  - Cravings for additional sugar, sweets and fatty foods
  - Perceptions of hunger
- To better assist individuals who struggle with snack cravings, nutrition professionals should not hesitate to **recommend** incorporating a calorie-controlled sweet snack daily to attenuate cravings and feelings of deprivation and prevent excess calorie consumption during a RCD.
Selected References


Extra Graphs

Figure 1. Change from Baseline in Anthropometric and Body Composition Measurements by Diet Group

Results

There were no significant differences between the diet groups in anthropometric or body composition changes.

Figure 1. Changes in Body Weight, Body Mass Index and Waist and Hip Circumferences from Baseline to Week 18 by Diet Group

Results

There were no significant differences between the diet groups in anthropometric changes.
Figure 1. Changes in Body Weight, Body Mass Index, and Waist and Hip Circumferences

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Dark Chocolate Snack Group</th>
<th>Non-Chocolate Snack Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Weight (kg)</td>
<td>84.3</td>
<td>31.5</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>31.8</td>
<td>31.2</td>
</tr>
<tr>
<td>Waist Circumference (cm)</td>
<td>88.9</td>
<td>115.9</td>
</tr>
<tr>
<td>Hip Circumference (cm)</td>
<td>88.9</td>
<td>115.9</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01, ***p<0.001; p-value analyzed using paired t-tests for changes from baseline within diet groups.

Figure 2. Changes in Body Composition by Diet Group

<table>
<thead>
<tr>
<th>Body Composition</th>
<th>Dark Chocolate Snack Group</th>
<th>Non-Chocolate Snack Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat Mass (kg)</td>
<td>32.5</td>
<td>47.5</td>
</tr>
<tr>
<td>Fat Free Mass (kg)</td>
<td>32.5</td>
<td>47.5</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>32.5</td>
<td>47.5</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01, ***p<0.001; p-value analyzed using paired t-tests for changes from baseline within diet groups.

Figure 3. Changes in Scores on the Diet Symptoms Questionnaire (DSQ)

<table>
<thead>
<tr>
<th>Questions on DSQ</th>
<th>Dark Chocolate Snack Group</th>
<th>Non-Chocolate Snack Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have cravings for sugar and sugar foods</td>
<td>-0.61</td>
<td>-0.30</td>
</tr>
<tr>
<td>I have cravings for fatty foods</td>
<td>-0.16</td>
<td>+0.46</td>
</tr>
<tr>
<td>I have cravings for meat</td>
<td>+0.31</td>
<td>-0.31</td>
</tr>
<tr>
<td>I feel tired</td>
<td>+0.30</td>
<td>+0.78</td>
</tr>
<tr>
<td>I feel strong</td>
<td>-0.54</td>
<td>-0.57</td>
</tr>
<tr>
<td>I crave sweets</td>
<td>-0.38</td>
<td>-0.35</td>
</tr>
<tr>
<td>I am still hungry after I eat</td>
<td>-0.35</td>
<td>-0.27</td>
</tr>
<tr>
<td>I feel strong</td>
<td>+0.38</td>
<td>+0.38</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01, ***p<0.001; p-value analyzed using paired t-tests for within diet group changes from baseline. There were no significant differences between the diet groups in DSQ scores.