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RESEARCH

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A Reduced-Calorie Dietary Pattern Including a Daily Sweet Snack Promotes Body Weight Reduction and Body Composition Improvements in Premenopausal Women Who Are Overweight and Obese: A Pilot Study

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ABSTRACT

Reduced-calorie diets are difficult to follow because they often require elimination of certain foods, leading to poor compliance and limited success. However, a low-calorie, nutrient-dense diet has the potential to accommodate a daily snack without exceeding energy requirements, even during weight loss. This pilot study evaluated the effects of a reduced-calorie diet including either a daily dark chocolate snack or a non-chocolate snack on anthropometric and body composition measurements. In a randomized clinical trial, 26 overweight and obese (body mass index ≥25 to ≤43) premenopausal women were assigned to a reduced-calorie diet that included either a daily dark chocolate snack or non-chocolate snack (n=13 per group) for 18 weeks. At baseline and end of study, body weight and waist and hip circumferences were measured along with fat mass, lean mass, and body fat percentage by dual-energy x-ray absorptiometry. Energy and macronutrient intakes were estimated from 4-day food records. Within- and between-group changes from baseline were analyzed using paired *t* tests and independent *t* tests, respectively. Women in both snack groups reduced estimated daily energy intake ($P<0.001$). Women in both the dark chocolate snack and non-chocolate snack groups, respectively, experienced decreases ($P<0.001$) in body weight (−5.1 vs −5.1 kg), hip circumference (−5.8 vs −5.4 cm), waist circumference (−5.7 vs −3.5 cm), fat mass (−3.9 vs −3.6 kg), and body fat percentage (−3.4% vs −3.1%), with no change in lean mass. Improvements in anthropometric and body composition measurements among overweight and obese premenopausal women can be achieved with a reduced-calorie diet including either a daily dark chocolate snack or non-chocolate snack.

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Based on cross-sectional observations of adults in the United States, it estimated that one in three individuals is trying to lose weight (1). In spite of this, 68% of American adults are overweight or obese (2), suggesting that current weight-loss interventions are only modestly effective at helping individuals achieve and sustain a healthy weight status (3). The most commonly cited cause of unsuccessful weight loss during active intervention and long-term maintenance of weight loss is poor dietary compliance (4,5). Specifically, diets that promote rapid weight loss are challenging because they typically require dramatic alterations in usual dietary intake, leading to confusion and/or an inability or unwillingness to fully comply in the short term (6,7). Long-term maintenance of restrictive diets is tenuous, and many individuals regain weight over time (8,9) and/or enter into patterns of weight-cycling (10,11), which present additional pathways for adverse health outcomes (12,13). Nutrition interventions that emphasize healthy lifestyle choices, include flexible dietary patterns, and encourage moderate weight reduction may be more compatible with short-term weight loss, successful long-term weight-loss maintenance, and reduction in risk of chronic disease (5).

Individuals who consume a nutrient-dense dietary pattern (rich in high-fiber whole grains, vegetables, fruits, and nonfat fluid milk, and moderate in lean protein) can meet their daily nutrient intake needs with additional energy remaining within their daily caloric recommendations (14). Using these "extra" kilocalories to incorporate a favorite food or snack into an energy-controlled dietary pattern could improve diet satisfaction, thereby reducing the perception of restriction and increasing the likelihood of long-term adherence (15). Dietary compliance over a longer period of time can lead to greater weight loss (4,16)

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and weight stability (17), contributing to sustained improvements in health status (5,17,18).

Incorporating snacks between meals can be appropriate for both appetite and weight control when the energy content of the snack is moderated (19). When asked about their favorite snack, approximately 40% of women in the United States responded that chocolate is their sweet treat of choice (20). Chocolate is favored because of its pleasant sensory properties and ability to temporarily elevate mood (21). The overconsumption of any energy-dense sweet treat can potentially lead to weight gain; therefore, women often abstain from chocolate and other sweet snacks when trying to lose weight. Unfortunately, restriction of a particular food can induce cravings and may lead to an undesirable rebound effect of increased or uncontrollable consumption when the particular food is reintroduced (22,23). Because chocolate is a highly desired snack, examining whether women can include a moderate amount of chocolate into a daily reduced-calorie diet is important. Further, understanding whether chocolate elicits unique effects when incorporated into a reduced-calorie diet requires comparison to a sweet non-chocolate snack.

Therefore, this randomized clinical trial aimed to test the feasibility of purposefully including two different types of energy-controlled daily sweet snacks into a reduced-calorie diet on selected outcomes. The objective of this pilot study was to examine whether an energy-controlled dark chocolate snack vs a non-chocolate snack produced differential changes in anthropometric and body composition measurements when incorporated into a reduced-calorie diet over 18 weeks. It was hypothesized that premenopausal women who were overweight or obese and who followed a reduced-calorie diet with either a dark chocolate snack or non-chocolate snack incorporated into daily intake could maintain an energy deficit and experience significant positive changes in anthropometric and body composition measurements, despite the type of sweet snack consumed.

METHODS

Participants and Recruitment

Advertised via posted flyers and e-mail notices, the research was described as an 18-week weight-loss study. One hundred thirty-seven women responded to advertisements, of which 33 were eligible and completed baseline measurements (dark chocolate snack group, n=17; non-chocolate snack group, n=16). Remaining women did not meet eligibility criteria, return required forms, or maintain interest in participating in the study. This was a pilot sample of women to test feasibility for a future, larger trial.

Enrolled participants were premenopausal women, age 25 to 45 years, who were overweight or obese (body mass index ≥25 to ≤43). Women were eumenorrheic, engaged in fewer than 5 hours of physical activity per week, and were weight-stable during the 6 months before the study. Exclusion criteria included presence of metabolic disorders or chronic diseases, such as cardiovascular, renal, liver, and bone diseases. The Institutional Review Board for Research Involving Human Subjects at The Pennsylvania State University approved the study. Each participant provided written informed consent before entry into the study.

Data were collected before the dietary intervention (baseline) and after 18 weeks (February 2009 to July 2009) of the reduced-calorie diet (week 18). Women were compensated $80 dollars at the end of the study for their participation.

Dietary Intervention

After stratification by baseline age, body mass index, and physical activity, participants were randomly assigned to either the weight loss with dark chocolate snack group or weight loss with non-chocolate snack group. Participants in both groups followed a reduced-calorie diet designed to induce a 2-lb weight loss per week with a macronutrient composition of approximately 50% carbohydrate, 30% fat, and 20% protein. After baseline testing, energy intake levels were set at 1,500, 1,600, 1,700, or 1,800 kcal/day for each woman, using the Harris-Benedict equation (24).

Participants in the dark chocolate snack group consumed one dark chocolate tasting square (Hershey's Extra Dark, 60% cacao, The Hershey Company, Hershey, PA) at two intervals each day (90 kcal/day) and one 8-oz sugar-free cocoa beverage (The Hershey Company) at the first meal of the day (65 kcal/day) as part of the reduced-calorie diet. Participants in the non-chocolate snack group consumed a non-chocolate sweet snack of fruit-flavored licorice (The Hershey Company) at two intervals each day (90 kcal/day) along with one 8-oz sugar-free non-cocoa beverage (The Hershey Company) at the first meal of the day (65 kcal/day) as part of the reduced-calorie diet. Throughout the study, women refrained from consuming any cocoa or chocolate products unless part of the reduced-calorie diet. Snacks and beverages, as noted earlier, were provided to participants as part of the study protocol.

Participants were instructed on a food exchange system and portion sizes that represented exchanges from each of six exchange groups. Handouts with food choices, dietary patterns, and menu plans were provided. For 18 weeks, women in both groups attended weekly nutrition education sessions that included lessons on basic nutrition knowledge, food purchasing and preparation, portion size moderation, recipe modification, and eating away from home. Compliance with assigned snack intervention was assessed using forms on which women self-recorded weekly intake of snacks and beverages and concurrent confirmation by an investigator via product counts. Compliance was defined as intake of 85% or more of weekly snacks and beverages.

Dietary Measurements

To assess change in food and nutrient intakes, participants completed 4-day food records at baseline and week 18. Participants recorded food and beverage intake on 3 weekdays and 1 weekend day in the week before data collection sessions. Food records were analyzed with the Food Processor dietary analysis software (version 10.6.0, 2010, ESHA Research, Salem, OR) to estimate mean daily intake of total energy (kcal), and carbohydrate, protein, and fat (percentage of total energy intake).

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