Journal of Food Technology and Nutritional Sciences
Received: Jun 07, 2016, Accepted: Apr 08, 2016, Published: Apr 12, 2016
J Food Technol Nutr Sci, Volume 2, Issue 1
http://crescopublications.org/pdf/jftns/JFTNS-2-006.pdf
Article Number: JFTNS-2-006

Research Article Open Access

Nutrient-Dense, Portion-Controlled Meals and Snacks Promote Weight Loss

Stacey J. Bell[1*], Pei-Ra Ling[2] and Charles Marsland[3]

[1]Chief Science Officer, Yevo, 110 Woodland Street, Reno, NV 89523, USA
[2]Consultant, Cambridge, MA 02139, USA
[3]Founder and Vice Chairman, Yevo, 110 Woodland Street, Reno, NV 89523, USA

***Corresponding Author:** Stacey J. Bell, D.Sc., RDN, Chief Science Officer, Yevo, 110 Woodland Street, Reno, NV 89523, USA; Tel: 617 999 6150; E-mail: stacey@nutrientfoods.com

Citation: Stacey J. Bell, Pei-Ra Ling and Charles Marsland (2016) Nutrient-Dense, Portion-Controlled Meals and Snacks Promote Weight Loss. J Food TechnolNutrSci 2: 006.

Abstract

A myriad of commercial and hospital-based programs exists to help people lose weight, yet the percentage of the population who are overweight or obese remains constant. Clearly, new strategies are needed. Diets fail for many reasons, including focusing on energy restriction rather than assuring all essential nutrients are met. The purpose of this pilot study was to determine the effect of weight loss from nutrient-dense, portion-controlled meals and snacks. The study was prospective, single armed,lasting three months. All participants gave informed consent. For the first 21 days, the subjects (n=131) consumed three nutrient-dense meals and two nutrient-dense snacks, plus water. Afterwards (n=89), lasting another nine weeks, one nutrient-dense meal was replaced by one of the participant's own choice. Participants paid for the foods upfront, and were rebated a portion, if they completed the data collection forms. Self-reported data included: anthropometric data, compliance with food intake, exercise, and on a scale of one to five assessments was made of: mood, sleep, hunger, tiredness, and gastrointestinal issues. Subjects lost 7.5 ± 5.1 kg over three months, which were 7.5± 3.7% body weight losses. Women reduced waist circumference by 11 ± 7 cm and men by 12 ± 11 cm. Based on changes in waist circumference, one-third were no longer at risk of disease at the end of the study. Using the self-reported scale with 5 being the best, the participants had at least a score of 4 or higher for each question. Nutrient-dense, portion-controlled meals and snacks promoted weight loss, reductions in waist circumference, and did so with good compliance and without hunger. These benefits were likely a result of providing essential nutrients in portion-controlled foods.

Keywords: Essential nutrients; Individual servings of meals and snacks; Weight loss.

Introduction

Two-thirds of the United States adult population is overweight or obese. Such individuals are at increased risk of heart disease, high blood pressure, type 2 diabetes, osteoarthritis, and some cancers (e.g., breast, colon) [1]. Of those who are overweight, about 15-35% is trying to lose weight at any time [2, 3]. Sadly, recidivism are the norm with nearly everyone regaining the newly lost weight [3, 4]. Those losing large amounts of weight from "The Biggest Loser" televised weight loss show, regained an average of 90% of the weightlost after six years [5].

Clinical research on weight loss diets are numerous, but not promising. A recent meta-analysis of 57 studies on commercial diets found that after six months, average weight loss was 8 kg (~9% weight loss), and after one year, 2 kg (~7% weight loss) were regained[6]. Diets were categorized according to these groups; Low-carbohydrate (e.g., Zone, Atkins); Moderate macronutrients (e.g., Jenny Craig, Nutrisystem); and Low-fat (e.g., Ornish). The Low-carbohydrate diet slightly edged out the Low-fat and Moderate macronutrient diets as far as producing the most weight loss, but all diet programs were better than not using a formal program.

The weight loss results from these commercially available diets are considered to be medically significant [6]. According to the National Institutes of Health, losing 5-10% body weight reduces the risk of chronic diseases associated with obesity [1, 7]. Others have confirmed that losing just 5% body weight will improve multi-organ insulin sensitivity and beta cell function [8]. Weight loss of more than 10% further increases insulin sensitivity in muscle and reduces systemic and subcutaneous adipose inflammation. Even greater weight loss of 40% affords these health benefits, but is accompanied by a reduction in resting metabolic rate of around 500 calories, which persists, leading to weight regain [5].

Despite the promising weight loss results from selected commercial diets[6], others have questioned the nutritional quality of them [9, 10]. The Alternative Healthy Eating Index (AHEI) was used to rate the nutritional quality of a subset of the popular diets available: The Glucose Revolution, Zone, Atkins, Weight Watchers, South Beach, Ornish, and the 2005 US Department of Agriculture Food Guide Pyramid. Each diet was found to be sub-optimal according to the AHEI[9]. Out of a maximum of 70 points (higher, meaning more favorable for heart health), most popular weight loss diets ranged between 40 and 50 points. Other investigators observed that the over emphasis on energy restriction leads to an inadequate intake of micronutrients [10]. Based on four popular (Atkins, Zone, Ornish, and LEARN), energy-restricted diets, significant micronutrient inadequacies were found for: water-soluble vitamins (e.g., folic acid, vitamin C); fat-soluble vitamins (e.g., vitamin E, vitamin K); and minerals (e.g., magnesium, iron). Paradoxically, the chronic lack of essential nutrients in the diet induces hunger, promotes obesity, and increases the risk of chronic diseases [11].

We postulated that one reason that commercial diets have poor recidivism rates is related to the lack of essential micronutrients. The purpose of this three-month pilot study is to evaluate the effect of nutrient-dense, portion-controlled foods on anthropometric measurements and subjective tests in overweight and obese subjects. To our knowledge, this is the first weight loss study to provide all essential nutrients in single serving units.

Materials and Methods

The pilot study is a non-randomized, prospective study in which subjects consumed nutrient-dense, portion-controlled foods for three months. Overweight and obese subjects granted informed consent and were selected from a group who were selling other foods manufactured by Yevo, Reno, Nevada (hereafter referred to as the Company). For the first 21 days, participants consumed three, nutrient-dense meals and two snacks provided by the Company. For the remaining 9 weeks, subjects were instructed to consume two meals and two snacks provided by the Company, and to prepare one healthy meal on their own. However, the subjects liked the nutrient-dense Company food so much, that enough was made available for the third meal during the final four weeks of the study.

Participants were encouraged to exercise regularly and participate in behavior modification programs through group Facebook pages and weekly calls with the study administrator (SJB).

Dietary Intervention

All single serving meals and snacks contain each essential nutrient with a percentage Daily Value (DV) (Table 1). Foods options included breakfast items (e.g., oatmeal, granola) and complete meals (e.g., macaroni and cheese, beans and rice). Two snacks were available: a brownie and an oatmeal cookie. Meals contained 33% DV and snacks had 20% DV for the nutrients in Table 1.

In addition to these foods, participants were instructed to include water and other non-caloric-containing beverages at amounts of: 3.7 liters for males and 2.7 liters for females [12].Instructions on preparing the third meal starting at Day 22 were provided (Figure 1).

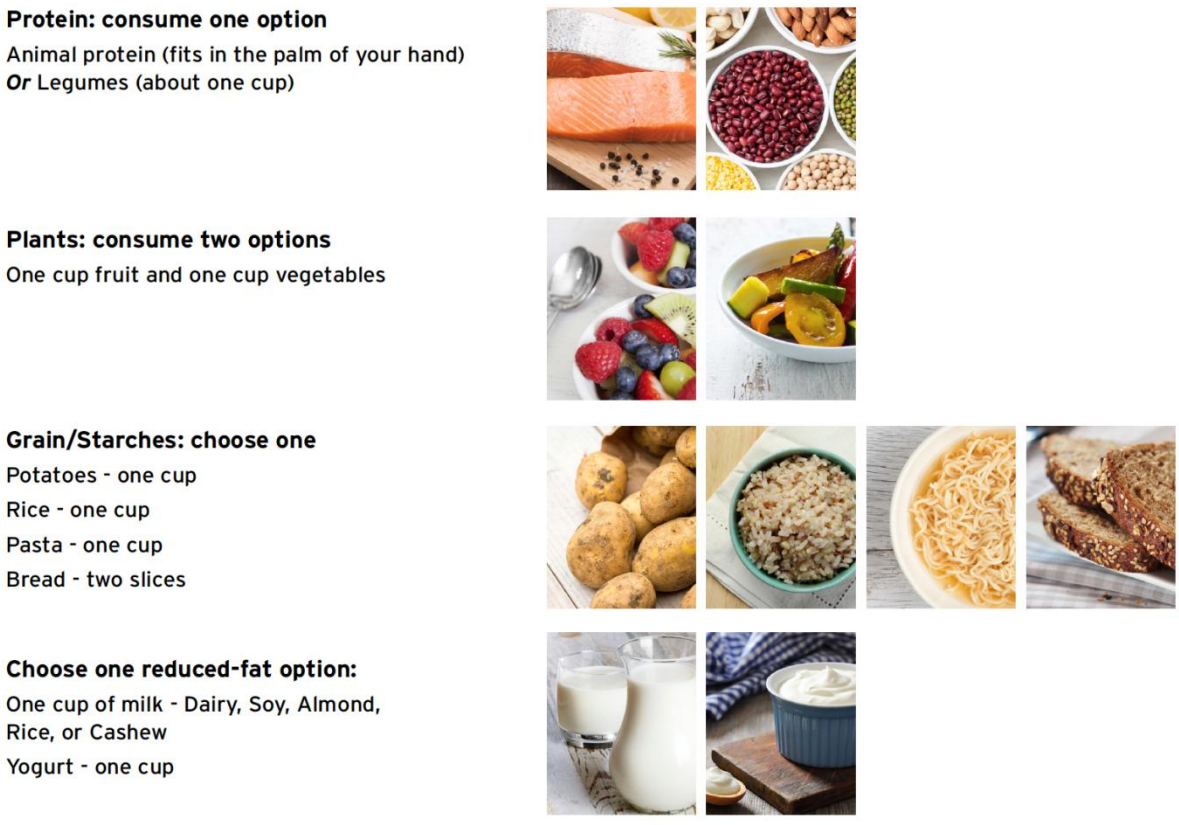
Participants paid $400 on three occasions (late December, middle of January, and middle of February) and were rebated $300 after submitting their data.

Table 1: Nutrients supplied by the foods

Vitamins	**Minerals**
Vitamin A	Chloride*
Vitamin C	Chromium
Vitamin D	Calcium
Vitamin E	Copper
Vitamin K	Iodine
Vitamin B6	Iron
Vitamin B12	Manganese
Biotin	Magnesium
Folic acid	Molybdenum
Niacin	Phosphorus
Pantothenic acid	Potassium
Riboflavin	Selenium
Thiamin	Sodium*
	Zinc

*Not included at the same amount of the other nutrients, because most people over consume them

Figure 1: Instructions for preparing third meal starting on day 22



Data Collection

Baseline demographic and anthropometric data (i.e., weight, height, and waist circumference), and health status information were obtained. During the first 21 days, daily collection of anthropometric data, compliance with meals and snacks, exercise (duration and type), and subjective observations (i.e., mood, energy, hunger, gastrointestinal issues, and sleep) were obtained. The subjective tests were rated using a scale of one to five, with one being the worst and five being the best. The participants provided two weekly short videos about their experience throughout the study, and submitted photos at the start, after 21 days, and the end of the study.

Starting on Day 22 and for the next 9 weeks, these data (except the videos and photos) were obtained weekly. At the end of three months, a post-study survey was administered that probed additional questions related to health changes, clothing size change, and achievement of weight loss goal.

Statistics

Data were presented as means, standard deviations (S.D.), and ranges. Paired-t test was used to compare baseline with Day 21 and baseline to the end of the study, as both data points were available. Student's t-test (unequal number) was used for comparisons with missing data points, such as between baseline and the end of study. P value of less than 0.05 was used to determine the statistical significance. Chi Square test was used to assess changes in waist circumference and in changes in BMI within different risk categories. Statistical comparisons were analyzed using Excel Microsoft Office, 2011, (Microsoft Corporation, One Microsoft Way, Redmond, WA 98052, USA).

Results

One hundred thirty-one subjects began the study (Table 2).The average ages of the group was 49 ± 10 years (range 18-69 years) and most were female (74%). Males weighed more that females on average (119 ± 33 kg vs. 92 ± 18 kg, respectively). Body mass index (BMI) for the group was considered Class II obesity (35 ± 7 kg/m^2). The baseline waist circumference averages were at the upper end of what is considered healthy for men (95 ± 23 cm; healthy = 102 cm) and women (87 ± 16 cm; healthy = 88 cm).

Table 2: Baseline demographics (n=131)

Parameter	Mean ± standard deviation	Range
Age (years)	49 ± 10	18-69
Height (cm)	168 ± 9	140-190
Body weight (kg)	99 ± 26	62-252
Males	119 ± 33	
Females	92 ± 18	
Body mass index (kg/m^2)	35 ± 7	24-70
Males	37 ± 9	
Females	34 ± 6	
Waist circumference (cm)	89 ± 18	69-216
Males	95 ± 23	
Females	87 ± 16	

Health conditions at baseline were obtained for 88 subjects (67% of the group); 43 (33%) did not response (Table 3). Of those responding, only 19 (22%) participants were good health with no medical conditions, and the other 69 (78%) participants had one or more medical conditions. The most common disorders were hypertension (n=24), thyroid disease (n=24), elevated cholesterol levels (n=11), sleep disorders (n=8), gastrointestinal issues (n=7), and arthritis (n=6).

Table 3: Baseline health conditions (n=88)

Health condition	Number of subjects
No health issues	19
High blood pressure	24
Thyroid disorders	24
High cholesterol levels	11
Sleep disorders	8
Gastrointestinal conditions (heart burn, ulcers, reflux)	7
Arthritis	6
Allergies	5
Asthma	4
Muscle and back pain	3
Reynaud's disease	2
Depression	2
Polycystic ovary disease	2
Guillian-Barre's-syndrome (muscle week and pain)	2
Ankylosing spondylitis stenosis	1
Fibromyalgia	1
Cohn's disease	1
Capillary leak syndrome	1
Varicose vein	1
Previous cardiac failure	1
Previous cancer	1
Parkinson's disease	1

After the first 21 days, 89 subjects continued to the end of the three-month study. Compared to baseline, after 21 days ($P < 0.00001$) and the end of the study ($P < 0.05$), the entire group lost a significant amount of weight (Table 4).Over three months, men lost 11.2 ± 7.5 kg, which was significantly different from Day 21 ($P < 0.03$) (Table 5). Women lost 6.4 ± 3.3 kg during the three months, which was significantly different from Day 21 ($P < 0.0001$). The percentage of weight loss for the group was 5.3 ± 2.1% on Day 21 and 7.5 ± 3.7% at the end, and these values were significantly different from baseline ($P < 0.0001$).Similarly, the percentage of weight loss was significantly different at Day 21 and the end of the study for both men ($P < 0.008$) and women ($P <0.0001$).

Table 4: Body weight changes (kg)

		Baseline (kg)	Day 21 * (kg)		End (kg)
Total	131	99 ± 26	94 ± 24	87	92 ± 23 ^
Men	34	119 ± 33	111 ± 31	22	108 ± 32
Female	97	92 ± 18	88 ± 17	65	87 ± 16 ^^

Mean ± S.D.

* $P< 0.00001$; Day 21 vs. Baseline; ^ $P < 0.05$; End vs. Baseline; and ^^ $P = 0.05$, End vs. Baseline by paired t-test

Table 5: Actual and percentage weight loss changes

	N	Day 21 vs.	Baseline	N	End vs.	Baseline
		Kg	%		Kg	%
Total	131	-5.3 ± 2.7	5.3 ± 2.1	89	-7.5 ± 5.1 *	7.5 ± 3.7 *
Men	34	-7.3 ± 3.4	6.2 ± 2.4	22	-11.2 ± 7.5 **	9.1 ± 4.5 ^^
Female	97	-4.6 ± 1.9	5.0 ± 1.9	67	-6.4 ± 3.3 *	6.9 ± 3.2 *

Mean ± S.D.

*P < 0.0001; ** P < 0.03; and ^^ P < 0.008, End vs. Day 21 by paired t-test

At the end of the study, compared to baseline, the BMI for the group significantly decreased from 35 to 32 kg/m^2, which were still both in Obesity Class I Risk (P < 0.00289) (Table 6). The change in BMI was greater for men (37 to 34 kg/m^2) than women (34 to 32 kg/m^2). However, significant differences between baseline and the end of the study were only observed for women (P < 0.0042) and not for men (P = 0.206). In the Normal and Overweight BMI categories, the percentage of participants significantly increased at Day 21, and continued to increase until the end, particularly in the Overweight category (P < 0.0001) (Table 7). In the Obesity Class I, the percentage of participants significantly increased by Day 21to 37% and to 46 % at the end of study (P<0.0001). However, in the Obesity Class II, the percentage of participants significantly decreased from 65% at the baseline to 17% at the end of study (P<0.0001). For the Extreme Obesity Class III, the changes in percentage of participants varied. The percentage of participants with BMIs between 40 and 45 kg/m^{2}increased; no change occurred in the percentage of those with BMIs from 45 to less than 50 kg/m^2; and the percentage of participants decreased that were in the group with BMIs over 50 kg/m^2.

Table 6: Change in body mass index (BMI; kg/m^2)

		Baseline	Day 21 *		End
Total	131	35 ± 7	33 ± 7	87	32 ± 6 **
Men	34	37 ± 9	35 ± 9	22	34 ± 9 ^
Female	97	34 ± 6	33 ± 6	65	32 ± 5 ***

Mean ± S.D.

*P < 0.00001, Day 21 vs. Baseline; ** P < 0.00289, *** P < 0.0042, and ^ P = 0.206, End vs. Baseline by paired t-test.

Table 7: Classification of body mass index (kg/m^2)

	kg/m^2	Baseline	(N=131)	Day 21	(N=130)	End	(N= 65)
		N	%	N	%	N	%
Normal	<25	1	1	4	3*	3	5#
Overweight	25 - <30	31	24	35	27*	33	51#,^
Obesity: Class I	30 - < 35	48	37	55	42*	30	46#,^
Obesity: Class II	35 - < 40	85	65	14	11*	11	17#,^
Extreme Obesity: Class III	40 - < 45	8	6	14	11*	6	9#
	45 - <50	6	5	4	3*	3	5#
	> 50	5	4	2	1*	1	1#

Mean + S.D.

* P < 0.00001, Day 21 vs. Baseline; # P < 0.0001, End vs. Baseline; and ^ P < 0.00001, End vs. Day 21 by Chi Square test

Waist circumference values decreased significantly for men (118 ± 24to 111 ±22cm) and women (104 ± 14 to 97 ± 13 cm) after 21 days (P <0.00001) (Table 8). Decreases in waist circumference continued to the end of the study for men to 108 ± 23 cm and for women to 93 ± 11 cm (P < 0.001). Compared to baseline, at Day 21(P < 0.001) and the end of the study (P < 0.006), the percentage of men who were at disease risk decreased by one-third, according to the waist circumference measurements (Table 9). The percentage in the disease risk category decreased from 77% to 55% at the end of the study. Women experienced a continual decrease in the percentage of those who had waist circumference measurements at high risk, going from 87% to 71% between baseline and Day 21 (P < 0.07), and further decreased to 59% at the end of the study (P < 0.00001). This was a 32% reduction in disease risk for women at the end of the study. Accordingly, the percentage of normal of waist circumference measurements significantly increased from 23% to 45% in men (P<0.026) and from 13% to 41% in women (P<0.008),for comparisons between baseline and the end of study.

Table 8: Waist circumference changes (cm)

		Baseline (cm)	Day 21 * (cm)		End ^ (cm)	Change from Baseline (cm)
Total	131	107 ± 18	101 ± 17	89	97 ± 17	-12 ± 8
Men	34	118 ± 24	111 ± 22	22	108 ± 23	-12 ± 11
Female	97	104 ± 14	97 ± 13	67	93 ± 11 #	-11 ±7

Mean + S.D.

*P < 0.00001, Day 21 vs. Baseline; ^ P< 0.001, End vs. Baseline; and # P= 0.041, End vs. Baseline by paired t-test

Table 9: Disease risk of type 2 diabetes, hypertension, and cardiovascular disease based on waist circumference (cm)

	Baseline		Day 21		End	
Men	> 102 cm	≤102 cm	>102 cm	≤102 cm	>102 cm	≤102 cm
Number	26/34	8/34	21/34 *	13/34	12/22 *,^	10/22 #, &
Percentage	77%	23%	62% *	38%	55% *,^	45% #, &
Female	>88 cm	≤88 cm	>88 cm	≤88 cm	>88 cm	≤88 cm
	84/97	13/97	69/97 @	27/91 !	33/65 **	27/65 %,$
	87%	13%	71% @	29% !	59% **	41% %, $

Male risk is > 102 cm; female risk is > 88 cm

* P < 0.001, Day 21 and End vs. Baseline; ^ P = 0.006, End vs. Baseline; # P= 0.008, End vs. Baseline; & P = 0.026, End vs. Baseline; @ P = 0.07, Day 21 vs. Baseline; ! P = 0.007 Day 21 vs. Baseline; ** P < 0.00001, End vs. Baseline and Day 21; % P< 0.0001, End vs. Baseline; and $ P < 0.008, End vs. Day 21 by Chi Square test

During the first 21 days, participants used a rating system for various aspects of how they felt. For all items, each exceeded 4, with 5 being the highest or best score (Table 10). The subjects sleep better, were less moody, had fewer gastrointestinal complaints, were less tired, and did not experience much hunger. Participants were asked other things. When asked about recommending the weight loss program to a friend, 94% (n=85) said yes. No one said no. Of the 50 participants who answered a question about reaching their weight loss goal, 52% said that they did, and 48% did not. Nearly 70% (n=58) went down a size in their clothing, while another 25% (n=21) said that their clothes fit better. Six people reported no change in clothing. Participants exercised an average of 38 ± 20 minutes each day (5-420 minutes). For exercise choices, most people chose walking followed by biking and running.

Table 10: Subjective ratings during first three weeks

Item rated	Ratings ranging from better (5) to worse (1)
Sleep	4 ± 0.1
Moodiness	4.6 ± 0.5
Gastrointestinal issues	4.1 ± 0.6
Tiredness	4.3 ± 0.6
Hunger	4.3 ± 0.6

Discussion

A medically-significant weight loss (5-10%) was achieved after 21 days and at three months using foods fortified with essential nutrients and provided in individual servings. In addition, the absolute measurement of waist circumference decreased significantly, thereby removing one-third of the subjects from the high risk category for type 2 diabetes, hypertension, and cardiovascular disease. Participants liked the meals and had minimal complaints of hunger, moodiness, and gastrointestinal issues. Most stated that they slept better and had more energy.

The reduction in body weight over the three-month study was commensurate with acceptable rates of weight loss. Participants lost between 5% and 10% body weight [1,7]. Losing too much weight may afford more health benefits, but recidivism is high, mainly due to the obligatory decline in RMR, which persists even during weight regain [7, 8]. Losing more than 10% body weight leads to a metabolic adaptation seen as a decrease in RMR of about 500 kcal. Since many diets are tailored to a 500-kcal reduction in energy, overweight and obese subjects would just maintain, rather than lose weight. Thus, such energy-restricted diets are not a satisfactory approach for many individuals.

No apparent physiological benefit exists for reducing body weight beyond 10%. In fact, new data from 2003-2013, indicate that the lowest all-cause mortality is a BMI of 27.0 kg/m^2[13]. This is an increase of 3.3 mg/k^2BMI units since 1976-1978. If the higher BMI is adopted as being ideal, then individuals who are trying to lose weight will have a more realistic goal to obtain.

Portion controlled meals and snacks provided in this study likely contributed to weight loss. Participants comments about the ease of use; water was added to all of the meals, and the snacks were ready-to-eat. Others have shown in women [14] and men [15] that more weight loss is achieved using portion-controlled meals compared to those that self-selected foods. In a study of 180, subjects consuming pre-portioned entrees experienced significantly more weight loss and loss of body fat compared to those not having pre-portioned similar meals [16]. However, in each of these studies, unlike the present study, other foods (i.e., fruits, vegetables, dairy, whole grain) needed to be prepared and consumed to meet micronutrient needs. Noncompliance with the added foods could lead to nutrient deficiencies.

The meals and snacks in this present study contain all micronutrients at a set percentage Daily Value. When the participants consumed three meals and two snacks daily, no other foods were needed to meet micronutrient needs. Gardner et al. postulated that not enough attention is paid to assure that micronutrient needs are met when providing energy restricted diets [10]. Based on a four commercially available weight loss diets, both vitamin and mineral deficiencies were identified. Others have shown that simply providing a food bar replete with essential nutrients and no instructions on how to diet produced significant changes in weight loss, waist circumference, blood pressure, and insulin resistance[17].The food bars added 220 kcal each day, indicating that the subjects either altered their food choices or consumed fewer calories. Satiety was not measured in the study, but clearly the subjects consumed fewer calories to achieve a small (0.8 kg), but significant, weight loss over two months. In this present study where essential nutrients were coupled with portion control foods and behavior modification, weight loss was greater.

The study had limitations because all data were self-reported. However, the data were believable, and there was no reason to think that the subjects provided false information. No calorie tracking was done, because the focus compliance with the nutrient-dense foods. Waist circumference measurements are difficult to perform on oneself, and some subjects may have provided inaccurate data. However, that pattern seen of reducing waist circumference values was consistent from this large sample size. Finally, the exact micronutrient content of the foods was not measured, as there is no food manufacturing law that requires this. The meals were developed to contain 33% DV of each nutrient, and the snacks had 20% DV.

In summary, this three-month study demonstrated that medically-significant weight loss and reduction in waist circumference measurements was achievable using nutrient-fortified, portion-controlled foods. The foods promoted satiation and were well accepted. The weight loss was likely attributable to a combination of portion-controlled foods and to meeting the micronutrient needs. Long-term studies are needed to confirm these findings.

Acknowledgements

The authors are grateful to the participants of the study who dutifully, and with grace, recorded all necessary data so that an evaluation of the foods could be made. In addition, we are indebted to Darrell Ieremia, who spent countless hours speaking to the participants making sure that they got their food and rebates on time. Finally, Lea Marsland was instrumental in assuring compliance with data collection; to her, we are most appreciative.

Author Disclosure Statement: Dr. Bell and Mr. Marsland are full-time employees at Yevo, which manufactured and sold the foods used in the study, and currently offers other foods. Yevo and Nutrient Foods are the same company; the former deals with marketing and sales, and the latter, develops and manufactures the foods. Mr. Marsland is a founder and part-owner of Yevo and Nutrient Foods. Dr. Ling was hired as a consultant and was responsible for statistical analyses. No competing financial interest exists for Dr. Ling, although she served on the Scientific Advisory Board of Yevo.

References

1. Overweight and Obesity Statistics | National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK).http://www.niddk.nih.gov/health-information/health-statistics/Pages/overweight-obesity-statistics.aspx.
2. Tools for Ideal Weight Control | Nutrition & Weight Management | Boston Medical Center, BMC. http://www.bmc.org/nutritionweight/services/weightmanagement.htm.
3. Kassirer JP, Angel M. Losing weight – an ill-fated New Year's resolution. N Engl J Med 1998; 338:52-54. http://www.nejm.org/doi/pdf/10.1056/NEJM199801013380109.
4. Wing RR, Phelan S. Long-term weight loss maintenance. Am J ClinNutr 2005; 82(supp):222S-5S.http://ajcn.nutrition.org/content/82/1/222S.short.
5. Fothergill E, Guo J, Howard L, et al. Persistent Metabolic Adaptation 6 Years after "The Biggest Loser" Competition. Obesity (April, 2016) 00, 00-00. doi:10.1002/oby.21538. http://onlinelibrary.wiley.com/doi/10.1002/oby.21538/full.
6. Johnston BC, Kanters S, Bandayrel K, et al. Comparison of weight loss among named diet programs in overweight and obese adults. JAMA. 2014;312(9):923-933. doi:10.1001/jama.2014.10397. http://jama.jamanetwork.com/article.aspx?articleid=1900510&resultclick=3.
7. Assessing your weight and health risk. https://www.nhlbi.nih.gov/health/educational/lose_wt/risk.htm.
8. Magkos F, Fraterrigo G, Yoshino J, et al. Effects of moderate and subsequent progressive weight loss on metabolic function and adipose tissue biology in humans with obesity. Cell Metab 2016; 23:1-11. http://dx.doi.org/10.1016/j.cmet.2016.02.005.
9. Yunsheng MA, Pagoto SL, Griffith JA, et al. A dietary quality comparison of popular weight-loss plans. J Am Diet Assoc. 2007 October; 107(10): 1786–1791. http://www.andjrnl.org/article/S0002-8223(07)01479-4/abstract?cc=y.
10. Gardner CD, Kim S, Bersamin A, et al. Micronutrient quality of weight-loss diets that focus on macronutrients: results from the A to Z study. Am J ClinNutr 2010; 92:304-12. doi: 10.3945/ajcn.2010.29468. http://ajcn.nutrition.org/content/92/2/304.short.
11. Ames BN. Low micronutrient intake may accelerate the degenerative diseases of aging through allocation of scarce micronutrients by triage.2006; 103: 17589-17594. www.pnas.org_cgi_doi_10.1073_pnas.0608757103PNAS. http://www.pnas.org/content/103/47/17589.short.
12. Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate. These reports may be accessed via www.nap.edu.
13. Afzal S, Tybjaerg-Hansen A, Jensen GB, et al. Change in Body Mass Index associated with lowest mortality in Denmark,

1976-2013. JAMA. 2016;315(18):1989-1996. doi:10.1001/jama.2016.4666. http://jama.jamanetwork.com/article.aspx?articleid=2520627.

14. Hannum SM, Carson LA, Evans EM, et al. Use of portion-controlled entrees enhances weight loss in women. Obes Res 2004; 12:538-546. http://onlinelibrary.wiley.com/doi/10.1038/oby.2004.61/full.
15. Hannum SM, Carson LA, Evans EM, et al. Use of packaged entrees as part of a weight-loss diet in overweight men: an 8-week randomized clinical trial. Diabetes, Obesity and Metabolism. 2006; 8:146-155. Doi: 10.1111/j. 1463-1328.2005.00493.x. http://onlinelibrary.wiley.com/doi/10.1111/j.1463-1326.2005.00493.x/abstract?userIsAuthenticated=false&deniedAccessCustomisedMessage=
16. Rock CL, Flatt SW, Pakiz B, et al. Randomized Clinical Trial of Portion-Controlled Prepackaged Foods to Promote Weight Loss.Obesity (2016) 24, 1230–1237. doi:10.1002/oby.21481. http://onlinelibrary.wiley.com/doi/10.1002/oby.21481/full.
17. McCann JC, Shinenaga MK, Meitus-Snyder ML, et al. A multicomponent nutrient bar promotes weight loss and improves dyslipidemia and insulin resistance in the overweight/obese: chronic inflammation blunts these improvements. FASEB J. 2015; 29:3287-3301. http://www.fasebj.org/content/29/8/3287.full?sid=8469c0f7-28cc-49a3-87ab-924d0fb469ca.