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Does the type of weight loss diet affect who participates in a behavioral weight loss intervention? A comparison of participants for a plant-based diet versus a standard diet trial

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Abstract

Studies have found that people following plant-based eating styles, such as vegan or vegetarian diets, often have different demographic characteristics, eating styles, and physical activity (PA) levels than individuals following an omnivorous dietary pattern. There has been no research examining if there are differences in these characteristics among people who are willing to participate in a weight loss intervention using plant-based dietary approaches as compared to a standard reduced calorie approach, which doesn't exclude food groups. The present study compared baseline characteristics (demographics, dietary intake, eating behaviors (Eating Behavior Inventory), and PA (Paffenbarger Physical Activity Questionnaire)) of participants enrolling in two different 6-month behavioral weight loss studies: the mobile Pounds Off Digitally (mPOD) study, which used a standard reduced calorie dietary approach and the New Dietary Interventions to Enhance the Treatments for weight loss (New DIETs) study, which randomized participants to follow one of five different dietary approaches (vegan, vegetarian, pesco-vegetarian, semi-vegetarian, or omnivorous diets). There were no differences in baseline demographics with the exception of New DIETs participants being older (48.5 ± 8.3 years vs. 42.9 ± 11.2, P=0.001) and having a higher Body Mass Index (BMI, 35.2 ± 5.3 kg/m^2 vs. 32.6 ± 4.7 kg/m^2, P=0.001) than mPOD participants. In age- and BMI-adjusted models, there were no differences in EBI scores or in any dietary variables, with the exception of vitamin C (85.6 ± 5.9 mg/d mPOD vs. 63.4 ± 7.4 mg/d New DIETs, P=0.02). New DIETs participants reported higher levels of intentional PA/day (180.0 ± 18.1 kcal/d) than mPOD participants (108.8 ± 14.4 kcal/d, P=0.003), which may have been the result of New DIETs study recommendations to avoid increasing or decreasing PA during the study. The findings of this study demonstrate that using plant-based dietary approaches for weight loss intervention studies does not lead to a population which is significantly different from who enrolls in a standard, behavioral weight loss study using a reduced calorie dietary approach.

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Keywords

diet; weight loss; vegetarian; eating behavior; mHealth

Introduction

People following plant-based dietary approaches, particularly vegan or vegetarian diets, have lower risks of some forms of cancer (Key, Appleby, Spencer, Travis, Allen, et al., 2009; Key, Appleby, Spencer, Travis, Roddam, et al., 2009) and lower body weights (Spencer, Appleby, Davey, & Key, 2003) than omnivores. Vegan and vegetarian diets have been used effectively for weight loss (Barnard, Scialli, Turner-McGrievy, Lanou, & Glass, 2005; Ornish, et al., 1998) and maintenance (G. M. Turner-McGrievy, Barnard, & Scialli, 2007) and slowing the progression of early stage prostate cancer (Ornish, et al., 2005). The Adventist Health Study-2, a longitudinal cohort study which follows participants adhering to different plant-based eating styles, has found differences in demographic characteristics between vegan and vegetarian participants and omnivore participants, such as a higher percentage of black and female participants who are omnivore compared to vegan or vegetarian and higher Body Mass Index (BMI) among omnivore participants (Tonstad, Butler, Yan, & Fraser, 2009; Tonstad, et al., 2011).

An individual's motivation to follow a certain diet can vary by the type of dietary pattern. For example, people choosing to follow vegetarian or vegan diets may do so for health-related or ethical reasons (Hoffman, Stallings, Bessinger, & Brooks, 2013). Those following a vegetarian diet may have more positive attitudes towards health and social relationships (Hoek, Luning, Stafleu, & de Graaf, 2004) and may have healthier eating habits than semi-vegetarians (those who limit meat intake) and omnivores (Timko, Hormes, & Chubski, 2012). Motivation can also change over time for people following vegetarian diets, such as adopting the diet for health reasons but later becoming motivated to continue adherence to the diet for environmental reasons (Fox & Ward, 2008). In nutrition research, not all examined diets are self-selected by participants. For both nutrition and weight loss intervention research, diets are often randomly assigned to study participants, meaning participants must enter the study willing to receive any of the possible dietary choices offered. Motivation to participate in research studies can be influenced by many factors, such as perceived risk of the intervention and financial incentives (Bentley & Thacker, 2004). In weight loss interventions, participants are often motivated to participate in research because of a desire to lose weight and often have unrealistically high weight loss goals (Linde, Jeffery, Finch, Ng, & Rothman, 2004).

Because psychosocial, demographic, and dietary characteristics can differ by the type of dietary approach people follow, it is possible that there may be differences in these characteristics among people who choose to join dietary research studies based on the dietary approaches used in the studies. It may be assumed that people who are willing to enroll in a study which could randomize them to a vegan or vegetarian diet may already have different dietary patterns, eating behaviors, and general demographic characteristics than those individuals enrolling in a study where they will receive a diet which is inclusive of all food groups. If this is true, then it would be difficult to compare results across different weight loss studies using different dietary approaches and limits the generalizability of the findings to specific populations. The goal of this paper is to examine the baseline characteristics of two behavioral weight loss studies using a variety of different dietary approaches: standard calorie controlled approach or plant-based dietary approaches. Therefore, the research question examined in this paper is: Do the demographic characteristics, dietary intake, eating behaviors, and physical activity levels of participants

who are willing to be randomized to a vegan or vegetarian diet differ from participants who know they will receive a standard, calorie-controlled approach which does not include any restrictions on food groups?

Materials and Methods

The present analysis used data from two different randomized, controlled, behavioral weight loss interventions. The mobile Pounds Off Digitally (mPOD) study was a six-month randomized weight loss trial among overweight adults, which compared a theory-based podcast (TBP) (guided by Social Cognitive Theory) to the TBP plus self-monitoring of diet and physical activity (PA) using a mobile app and social support delivered via the social network Twitter (TBP+mobile) (G. Turner-McGrievy & Tate, 2011). The dietary approach was the same for both the TBP and the TBP+mobile groups and recommended that participants reduce energy intake by 500-1000 kcal/day and increase energy expenditure through regular PA. Participants met only three times for weight assessments (baseline, three months, and six months) and received the entire intervention through remote means. Participants had to own an internet capable mobile device, such as an iPhone or Android phone, to participate. The mPOD intervention was conducted between 2010-2011 in Chapel Hill, NC with baseline data collected in August 2010.

The second study was the New Dietary Interventions to Enhance the Treatments for Weight Loss (New DIETs) study. New DIETs was a two month weight loss intervention with an optional four month follow-up period. Participants who enrolled in the New DIETs study agreed to be randomized to one of five different dietary approaches for weight loss: a vegan diet (exclude all animal products), vegetarian diet (excludes all meat and seafood), pesco-vegetarian diet (excludes meat except seafood), semi-vegetarian diet (limits meat), or omnivorous diet (no foods excluded). All diets focused on low-glycemic index (GI) (Jenkins, et al., 1981; Ludwig & Eckel, 2002) and low-fat foods. Participants met weekly with their assigned diet group for eight weeks and then monthly for 4 months. Participants were required to have internet and computer access to participate in the study (to complete questionnaires). The New DIETs study was conducted in 2013 in Columbia, SC with baseline data collected in February 2013.

Participants in both studies were recruited through similar methods (university and workplace listservs and newspaper advertisements). Participants provided informed written consent and both studies were approved through a university institutional review board. Similar exclusion criteria were used in both studies, such as excluding participants who have an unstable medical status or uncontrolled thyroid condition, have a BMI outside the range of 25-49.9 kg/m^2, are smokers, are unable to attend required meeting and assessment visits, have a psychiatric illness, are in treatment for alcohol or drug dependency, have an eating disorder, are currently participating in a weight-loss program, or are pregnant, breastfeeding, or planning on becoming pregnant during the study. Participants in both studies received $20 for completion of the initial assessments (at three months for mPOD and two months for New DIETs) with mPOD also receiving $20 for completion of a six-month assessment.

Participants in both studies were informed about the dietary approaches which would be used to assist them with weight loss prior to enrolling in the study. For mPOD, participants were informed that no matter which group they were assigned to, they would receive a standard, reduced calorie dietary approach with a recommendation to increase PA. This approach would require them to follow a prescribed calorie limit, self-monitor caloric intake, and increase energy expenditure. For New DIETs, participants were informed about the five different diets which would be used as part of the study and were informed that they would not be able to select the diet to which they would be assigned. New DIETs

participants were also told they would need to hold their exercise levels constant over the course of the two month intervention in order to control for the effect of PA.

Interested study participants in mPOD and New DIETs first completed an online screening questionnaire to assess eligibility. If participants qualified on the screening questionnaire, they were contacted by phone to complete remaining screening questions and schedule an orientation session. Participants attended an orientation session to learn more about the study and how to complete baseline questionnaires. For the present paper, only similar measures used in both studies are included for analysis. The following measures were collected in both studies: dietary intake (two, unannounced, 24-hour dietary recalls (one weekday and one weekend day) collected using the web-based Automated Self-Administered 24-hour Dietary Recall (ASA24) developed by the National Cancer Institute (Subar, et al., 2010)); intentional PA (kcal/d) (Paffenbarger Physical Activity Questionnaire, a survey instrument which assesses leisure time activity in adults over the previous week) (Paffenbarger, Wing, Hyde, & Jung, 1983)); and eating behaviors that are associated with weight loss (the 26-item Eating Behaviors Inventory, EBI, which assesses both positive behaviors associated with weight loss and negative behaviors associated with weight gain (O'Neil & Rieder, 2005). The EBI scores range from 26 (very few eating behaviors supporting weight loss) to 130 (many eating behaviors related to weight loss). Participants rate each of the 26 statements on the EBI (e.g., “I eat foods that I believe will aid me in losing weight”) using a scale of one (never/hardly ever) to five (always or almost always). The EBI is then scored to provide a single score of eating behavior related to weight loss. The Paffenbarger questionnaire assesses leisure time activity (which is then calculated to an average kcal/day) by asking participants to recall the number of stairs climbed and blocks walked over the previous week as well as a list of all sports, fitness, or recreational the participant engaged in over the previous week. Both the Paffenbarger questionnaire (Siconolfi, Lasater, Snow, & Carleton, 1985) and the EBI (O'Neil & Rieder, 2005) are validated measures.

The ASA24 uses the USDA Automated Multiple-Pass Method (Subar, et al., 2012), which is a validated method for energy and protein intake (Kipnis, et al., 2003; Moshfegh, et al., 2008). The ASA24 has demonstrated face validity and validation trials are currently underway (Subar, et al., 2012). Participants in both studies were instructed on completing the ASA24 at the orientation session where they viewed a demonstration of completing the ASA24 and were provided with handouts on completing the dietary recalls. After the orientation, participants were prompted by would e-mail and phone to complete a day of dietary recall (unannounced) at which point, a participant log on to the ASA24 website and complete the dietary recall. The ASA24 includes photos of differing amounts of foods to assist with portion size estimation (Subar, et al., 2012). Dietary recalls which had implausible reported energy intakes (determined a priori as <800 or >4200 kcal/d for men and <500 or >3500 kcal/d for women) were excluded. These cut points for defining plausible energy intakes have been used by numerous other studies (Bowen, et al., 2013; Du, et al., 2008; Fung, et al., 2010; Gao, et al., 2007; Lee, et al., 2011; Martinez-Gonzalez, et al., 2009; Michaud, et al., 2005; Muraki, et al., 2013; Willett, 1998). The mean energy intake (for two days of dietary recalls were sorted for all participants and those participants whose energy intake exceeded or were below pre-established cut points were excluded from analysis. All dietary intake results were compared to the U.S. Dietary Reference Intake (DRI) values, with the exception of saturated fat and cholesterol, which does not have a DRI so the American Heart Association recommendations were used for reference (Krauss, et al., 2000).

Participants also completed questionnaires assessing demographic characteristics. All questionnaires were completed online. Additionally, participants had height (calibrated

stadiometer) and weight (calibrated digital scale accurate to 0.1 kg) measured. All baseline measurements were obtained prior to revealing randomization assignment.

Statistical Methods

Differences in baseline demographic characteristics between the mPOD and New DIETs study were assessed using between-subjects t tests for differences between continuous variables and chi-square test of independence for categorical variables. General Linear Models were used to examine differences between groups for dietary intake, intentional PA, and the EBI both unadjusted and adjusted for demographic differences between groups. All analyses were conducted using SPSS for Windows software, version 20.0.0, with a p-value of 0.05 used to indicate significant differences.

Results

Baseline demographic characteristics of participants in both studies are presented in Table 1. Participants in New DIETs were significantly older and had a higher mean BMI. There were no differences in gender, race, education, or marital status. Participants were mostly white females with at least a college education. Most of the participants reported not being married. Because of the differences in age and BMI, PA, eating behavior, and dietary intake outcomes were examined unadjusted and adjusted for age and BMI.

Eating behavior and physical activity

Age- and BMI-adjusted results for EBI (means ± SE), PA, and dietary intake are presented in Table 2. EBI scores were significantly different in an unadjusted model with mPOD participants having a higher EBI score than New DIETs participants (P=0.01) but the model was no longer significant after adjusting for BMI and age. Intentional PA (kcal/day) remained significant after adjustment for BMI and age with New DIETs participants reporting greater activity (180.0 ± 18.1 kcal/day) than mPOD participants (108.8 ± 14.4 kcal/day, P=0.003).

Dietary intake

There were three participants who had implausible energy intake (as defined a priori as <800 or >4200 kcal/d for men and <500 or >3500 kcal/d for women) and were excluded from diet analysis. Dietary variables were also examined both adjusted and unadjusted for BMI and age. There was no difference in energy intake by group. Models were not significant for percent energy from fat, saturated fat, protein, or carbohydrate. There were also no differences between groups for cholesterol, fiber, calcium, added sugar, or for servings of fruits, vegetables, or dairy. Iron was significantly different between groups (P=0.03) in unadjusted models with the New DIETs participants consuming more iron per day than the mPOD participants. This was no longer significant after adjustment for BMI and age. Vitamin A was also significantly different (P=0.02) in unadjusted models with New DIETs participants consuming more vitamin A than mPOD participants but this was no longer significant after adjustment for BMI and age. Ounces of meat per day was significantly different (P=0.04) in unadjusted models with New DIETs participants consuming more meat per day than mPOD participants but this was no longer significant after adjustment for BMI and age.

Saturated fat and total fat intake in both groups exceeded current recommendations to maintain intake at or below 10% and 30% respectively (Krauss, et al., 2000). Participants in both groups were not consuming enough dietary fiber, averaging less than 20 g/day. The current DRI for fiber is a minimum of 38 g/day for men and 25 g/day for women ages 31 to 50 years ("Dietary Reference Intakes, Institute of Medicine," 2006). Participants in both

groups had cholesterol intakes close to or above the 300 mg/day recommended limit (Krauss, et al., 2000); however, since these participants were all overweight or obese and many entered the study with elevated LDL cholesterol levels, a cholesterol intake of <200 mg/day may be more advisable (Krauss, et al., 2000). Participants met or exceeded iron and vitamins A and C intakes and were within 100 mg of the recommended calcium levels("Dietary Reference Intakes, Institute of Medicine," 2006). While added sugar intake was high, corresponding to contributing 10-13% of energy to the examined diets, they were below the DRI recommendation to keep added sugars below 25% of total energy ("Dietary Reference Intakes, Institute of Medicine," 2006). Even so, the U.S. Dietary Guidelines recommend added sugars and solid fats make up no more than 5-15% of total energy ("The 2010 Dietary Guidelines for Americans,"). Participants in both groups fell short of the U.S. MyPlate recommendations for fruit (by about ½ - 1 cup/day) and vegetables (by about 1 cup/day) (ChooseMyPlate.gov).

Discussion

Observational studies have found differences in demographic characteristics and PA among people self-selecting plant-based diets, such as vegan and vegetarian diets, and omnivorous diets (Key, et al., 1999; Orlich, Singh, Sabaté, & et al., 2013; Tonstad, et al., 2009). While documented differences exist between people who would choose to follow a plant-based diet and those who would not, no studies have examined whether demographic characteristics of participants who enroll in weight loss studies differ by the potential dietary approaches offered in the study. In addition, no studies have examined if baseline diet is different based on the potential diets which will be used in the upcoming weight loss study. The present study found very few differences in nutrient intake between the two groups. Participants in both groups exceeded recommendations for total fat and saturated fat. Participants also had diets high in cholesterol and added sugar and low in fiber, fruits, and vegetables. This high fat, high sugar, low fiber dietary pattern has been consistently shown to be associated with overweight and obesity in other studies (P. Newby, et al., 2003; P. K. Newby, Weismayer, Åkesson, Tucker, & Wolk, 2006; Quatromani, Copenhafer, D'Agostino, & Millen, 2002). These findings demonstrate that participants who enroll in a study which may assign them to a plant-based eating style do not have significantly different dietary intake at baseline as compared to participants anticipating beginning a standard, calorie-controlled diet approach.

The most significant difference between the groups was reported intentional PA with the New DIETs participants reporting higher energy expenditure per day than the mPOD participants. The mPOD participants were instructed to increase their PA over the course of the study, whereas the New DIETs participants were told to keep PA at the same level as they were doing at enrollment. It is possible the New DIETs participants intentionally increased PA prior to the beginning of the study in order to be able to maintain that level throughout the study. This cannot be known without having a measure of PA prior to participants finding out about the details of the study. However, there are other differences which may be more plausible. This difference in PA could also be an effect of seasonality, since New DIETs baseline data were collected in winter (February; average high during baseline collection was 50°F) and mPOD was collected in summer (August; average high during baseline collection was 91°F) ("Farmer's Almanac. http://www.farmersalmanac.com/,"). However, several studies have found PA levels among adults to be higher in the summer versus the winter (Buchowski, et al., 2009; Matthews, Freedson, et al., 2001; Matthews, Hebert, et al., 2001; Pivarnik, Reeves, & Rafferty, 2003); therefore, if season played a role, then PA levels should have been lower in the New DIETs participants, which had baseline data collected in the winter. Another possibility is that people who were more sedentary were motivated to participate in a study which targets both diet and PA, such as mPOD, versus just diet alone, such as New DIETs. The EBI was not

significantly different between groups after adjustment for age and baseline BMI. The scores for both groups were in line with the findings of 23 other weight loss trials, which found the baseline value for the EBI to range between 65 and 75 (O'Neil & Rieder, 2005). The mean baseline EBI score of both the New DIETs and mPOD combined was 70.7.

There were also few differences in demographic characteristics between the two groups. Both groups reflect the demographics of participants which are commonly found in behavioral weight loss interventions using a variety of different dietary approaches (Dansinger, Gleason, Griffith, Selker, & Schaefer, 2005; Sacks, et al., 2009; Waters, George, Chey, & Bauman, 2012). While these studies reflect the populations of other behavioral weight loss studies, it points to the fact that more needs to be done to increase diversity of study participant populations including ages, ethnicities, and education levels. This study also demonstrates that the type of dietary approach used in weight loss studies does not necessarily impact the range of participants who will enroll in a weight loss study.

Participants who enroll in health-related clinical trials are often different than then general population (Stein, Bauman, & Ireys, 1991), being potentially more motivated to prevent and treat disease than other people who choose not to enroll. It can then be difficult to generalize findings of these trials to other populations (Bailey, 1994). However, it is beneficial to know that while study populations who enroll in a weight loss trial may differ from the general population, they may not necessarily differ from participants in other weight loss trials which may use varying dietary approaches, allowing for more comparison across different weight loss interventions.

The present study has several strengths. By having two randomized clinical weight loss trials with similar inclusion criteria and measures occurring in similar settings, this research study was able to compare the baseline characteristics of participants in two studies using different dietary approaches to promote weight loss. The high-quality measures used in both weight loss trials represents another strength of the study. The dietary data was collected by two unannounced, 24-hr recalls, which is considered to be an accurate way to measure overall dietary intake (Field, et al., 1998; Kristal, Peters, & Potter, 2005; Lagerros, et al., 2006); the Paffenbarger Physical Activity Questionnaire, used to assess energy expenditure, has been shown to be both valid and reliable (Siconolfi, et al., 1985; Washburn, Smith, Goldfield, & McKinlay, 1991); and eating behaviors were assessed with the EBI, which has been validated and shown to be related to weight loss (O'Neil & Rieder, 2005).

There are also some weaknesses to this study. The majority of participants in both studies were white, educated, females, which reduces the generalizability of the findings. While both studies had similar measures, they were located in similar, but different locations, and were conducted during different years and seasons. Additionally, while both studies required participants to have access to the internet, the mPOD study required all participants to have a mobile phone.

However, mobile phone use is pervasive in the U.S. with almost half of all adults owning a smartphone (Smith, 2012). PA was self-reported and not objectively measured. In addition, while very few participants were excluded due to being outside the pre-determined energy intake cut points, exploratory sensitivity analyses were also conducted using more stringent criteria to examine the frequency of potential under- and over-reporting of energy intake and whether this differed by each group. Total energy expenditure (TEE) was estimated for each individual (McCrory, McCrory, Hajduk, & Roberts, 2002; Vinken, et al., 1999) using the following formula:

Predicted TEE = 7.377 − 0.073 × Age (years) + 0.0806 × Weight (kg) + 0.0135 × Height (cm) − 1.363 × Sex (where 0 is entered for men and 1 for women).

A cutoff point of ±1.4 SD was used to explore under- and over-reporting of energy (Huang, Roberts, Howarth, & McCrory, 2005). Sensitivity analyses revealed that eight participants may have over-reported energy intake (+1.4 SD above TEE) and 54 may have under-reported energy intake (−1.4 SD below TEE). It has been demonstrated in several prior studies that overweight and obese individuals are more likely to under-report dietary intake as compared to normal weight individuals (Braam, Ocke, Bueno-de-Mesquita, & Seidell, 1998; Lichtman, et al., 1992) so it is to be expected that a high proportion of participants in both studies would under-report energy intake. There was no difference, however, in over- and under-reporting between New DIETs and mPOD ($\chi^2 = 2.5$, P=0.29). The sensitivity analyses demonstrate that the nutrition data may be subject to biases inherent in self-reported nutrition intake, particularly among overweight individuals, and should be considered preliminary.

Conclusions

The findings of this study not only provide a general overview of participant characteristics who enroll in behavioral weight loss studies but also demonstrate that there are not major differences in participant demographics and dietary intake by type of diet used in a weight loss trial. The exception to this was a significant difference in reported PA. While dietary intake of participants joining a study examining plant-based diets did not differ as compared to participants joining a study using a standard dietary approach, there was a difference in baseline reported PA. This could be due to seasonal differences or unmeasured differences in this population, such as access to PA resources. Overall, the findings of this paper demonstrate that using plant-based dietary approaches for weight loss intervention studies does not lead to participants who are significantly different from those who enroll in a standard, behavioral weight loss study using a reduced calorie dietary approach. Future research should examine these outcomes in a larger, more diverse sample to see if there are similar results.

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Abbreviations

TBP	theory-based podcast
mPOD	mobile Pounds Off Digitally study
New DIETs	New Dietary Interventions to Enhance the Treatments for Weight Loss study
EBI	Eating Behaviors Inventory
PA	Physical activity

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Highlights

- Type of weight loss diet does not impact baseline demographics of who joins a study.
- Type of weight loss diet does not impact baseline diet intake of who joins a study.
- Physical activity levels at baseline may differ by the study's weight loss approach.
- Similar participants across diet studies allows for cross-comparison among studies.

Table 1

Baseline demographics and body mass index of study participants in mPOD and New DIETs weight loss studies

	mPOD	NewDIETs	P-value for difference between groups
n	96	63	
Study location	Chapel Hill, NC	Columbia, SC	
Age (mean years ± SD)	42.9 ± 11.2	48.5 ± 8.3	P=0.001
Sex			P=0.78
Female	72 (75%)	46 (73%)	
Male	24	17	
Race			P=0.65
Black	19 (20%)	12 (19%)	
White	73 (76%)	50 (79%)	
Other	4 (4%)	1 (2%)	
Education			P=0.21
High school, partial or graduate	2 (2%)	1 (2%)	
College, partial or graduate	41 (43%)	36 (57%)	
Graduate degree	53 (55%)	26 (41%)	
Marital Status			P=0.75
Married	39 (41%)	24 (38%)	
Other	57 (59%)	39 (62%)	
Mean BMI (kg/m^2 ± SD)	32.6 ± 4.7	35.2 ± 5.3	P=0.001

Table 2

Age- and BMI-adjusted results (mean ± SE) for the Eating Behavior Inventory, Paffenbarger physical activity questionnaire, and dietary intake by group

	mPOD	**NewDIETs**	**P-value for difference between groups**
n	96	63	
Study location	Chapel Hill, NC	Columbia, SC	
Eating Behavior Inventory score	72.6 ± 1.0	68.8 ± 1.2	N/A
Intentional physical activity (kcals/day)	108.8 ± 14.4	180.0 ± 18.1	P=0.003
Dietary intake[a]			
Energy intake (kcal)	1998.3 ± 82.3	2240.3 ± 102.6	P=0.08
Fat (% kcal)	37.2 ± 0.7	37.3 ± 0.9	N/A
Saturated Fat (% kcal)	11.8 ± 0.3	12.5 ± 0.4	N/A
Protein (% kcal)	16.6 ± 0.4	16.6 ± 0.5	N/A
Carbohydrate (% kcal)	45.5 ± 0.9	43.5 ± 1.1	N/A
Cholesterol (mg/day)	280.7 ± 18.1	313.3 ± 22.6	N/A
Fiber (g/day)	16.2 ± 0.8	18.4 ± 1.0	N/A
Calcium (mg/day)	908.7 ± 48.9	988.3 ± 61.0	N/A
Iron (mg/day)	13.8 ± 0.7	16.4 ± 0.9	N/A
Vitamin A, RAE (mcg RAE/day)	604.2 ± 36.0	741.6 ± 44.9	N/A
Vitamin C (mg/day)	85.6 ± 5.9	63.4 ± 7.4	P=0.02
Added sugar (tsp/day)	15.7 ± 1.3	13.6 ± 1.6	P=0.34
Fruit (cups/day)	1.0 ± 0.1	0.8 ± 0.1	N/A
Vegetables (cups/day)	1.8 ± 0.1	1.7 ± 0.1	N/A
Servings of meat (oz/day)	4.2 ± 0.3	5.3 ± 0.4	N/A
Servings of dairy (cups/day)	1.7 ± 0.1	1.8 ± 0.2	N/A

[a] Excluded from analyses due to under/over-reporting of energy intake: n=1 for mPOD and n=2 for New DIETs