



Dietary adherence and acceptability of five different diets, including vegan and vegetarian diets, for weight loss: The New DIETs study



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ABSTRACT

The goal of the present study was to examine dietary adherence and acceptability among participants from the New DIETs study who were randomized to one of four plant-based diets (vegan, vegetarian, pesco-vegetarian, semi-vegetarian) or an omnivore diet. Primary outcomes at two- and six months included dietary adherence (24-hour dietary recalls), weight loss and changes in animal product intake (mg cholesterol) by adherence status, Three-Factor Eating Questionnaire (TFEQ), Power of Food Scale (PFS), dietary acceptability (Food Acceptability Questionnaire), and impact of diet preference on adherence. No differences were found in dietary adherence or changes in FAQ, TFEQ, or PFS among the groups. At six months, non-adherent vegan and vegetarian participants ($n = 16$) had a significantly greater decrease in cholesterol intake (-190.2 ± 199.2 mg) than non-adherent pesco-vegetarian/semi-vegetarian ($n = 15$, -2.3 ± 200.3 mg, $P = 0.02$) or omnivore participants ($n = 7$, 17.0 ± 36.0 , $P = 0.04$). Non-adherent vegan/vegetarian participants lost significantly more weight at six months ($-6.0 \pm 6.7\%$) than non-adherent omnivore participants ($-0.4 \pm 0.6\%$, $P = 0.04$). Dietary preference had no impact on adherence at six months. Due to equal rates of adherence and acceptability among the diet groups, instructing participants to follow vegan or vegetarian diets may have a greater impact on weight loss and animal product intake than providing instruction in more moderate approaches even among non-adherent participants.

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1. Introduction

Several factors, such as self-efficacy, outcome expectation and perceived value, and social support, can affect adherence to health promotion or dietary interventions (Shay, 2008). In addition, acceptability of the diets prescribed during the intervention may also impact adherence (Barnard et al., 2009). Eating behavior, specifically cognitive restraint (Three Factor Eating Questionnaire (TFEQ) (Stunkard & Messick, 1985)), may also have an effect on adherence levels to dietary change interventions (Barnard et al., 2009; Westerterp-Plantenga, Kempen, & Saris, 1998). Individuals who report high susceptibility for food (Power of Food Scale (PFS)) (Lowe et al., 2009), may have a more difficult time using behavioral coping strategies during a dietary intervention (Forman et al., 2007; Lowe et al., 2009).

While prior studies have examined dietary adherence/acceptability between vegan diets and standard diets (Barnard, Gloede, et al., 2009;

N. D. Barnard, Scialli, Bertron, Hurlock, & Edmonds, 2000; Barnard, Scialli, Turner-McGrievy, & Lanou, 2004; Turner-McGrievy, Barnard, & Scialli, 2007), no studies to date have compared adherence/acceptability among groups assigned to follow a variety of plant-based diets. The present study had the following research questions:

1. What is the difference in dietary adherence/acceptability, TFEQ, and PFS scores among participants randomized to one of four plant-based diets or an omnivorous diet at two months (after an initial intensive intervention) and six months (maintenance)?
 - a. We hypothesized that there would be no differences in dietary adherence/acceptability, TFEQ, or PFS among the five diet groups at either two- or six-months.
2. How does dietary adherence impact weight loss and changes in consumption of animal products (mg cholesterol/day) among participants assigned to meat-free, moderate meat, or unrestricted meat diets?
 - a. We hypothesized that weight loss and animal product intake would not differ among adherent participants but that non-adherent participants assigned to a meat-free diet (vegan or vegetarian) would have greater weight loss and decreases in

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animal product intake at six months compared to those assigned to diets recommending moderate levels of animal intake (pesco-vegetarian or semi-vegetarian) or an omnivorous diet.

3. How do baseline dietary preference and PFS score impact dietary adherence?
 - a. We hypothesized that neither dietary preference nor dislike would be related to dietary adherence but that having higher baseline PFS scores would be associated with non-adherence to the assigned diet at six months.

2. Materials and methods

The methods for conducting the New DIETs study, including description of the groups, are found in detail elsewhere (Turner-McGrievy, Davidson, Wingard, Wilcox, & Frongillo, 2014; Turner-McGrievy, et al., 2014). Overweight and obese adults ($n = 63$; Body Mass Index (BMI) $25\text{--}49.9\text{ kg/m}^2$) were randomly assigned to five different diets: Vegan, Vegetarian (veg), Pesco-vegetarian (pesco-veg), Semi-vegetarian (semi-veg), and Omnivore (omni). The dietary intervention consisted of a two-month intensive dietary intervention with a four-month maintenance phase. At each time point, participants completed two days of unannounced 24-hour dietary recalls collected using the Automated Self-administered 24-hour Dietary Recall (ASA24™) (Subar et al., 2010). In addition, participants completed the Food Acceptability Questionnaire (FAQ) (Barnard et al., 2004), TFEQ, and PFS. The TFEQ (Karlsson, Persson, Sjostrom, & Sullivan, 2000), FAQ (Barnard et al., 2000), and PFS (Cappelleri et al., 2009) have demonstrated validity in prior studies. Prior to the beginning of the study, participants also indicated which diet they wanted and did not want.

Dietary adherence was measured as the absence of any proscribed foods from the dietary recalls at each time point. For the omni group, they were considered to be adherent if their energy from fat was $\leq 40\%$. This method of assessing dietary adherence has been used in previous studies (Barnard, Gloede, et al., 2009; Turner-McGrievy et al., 2007). Percent weight loss at six months among participants who were adherent to their diets ($n = 25$) and those who were non-adherent ($n = 37$) was examined among participants instructed to follow a meat-free diet (vegan or veg groups), a diet that allowed moderate intake of meat (pesco-veg or semi-veg), or a diet with unrestricted animal product intake (omni) at six months.

2.1. Statistical analysis

One-way ANOVA with post hoc Tukey's test was used to examine changes in main variables at two months and six months among the five diets or the collapsed three diets (no meat, moderate meat, or omnivorous groups). For questionnaire outcomes, only participants who had data at each time point were included in the analyses. We

have previously reported on our methods for handling missing data for body weight and dietary intake (Turner-McGrievy, Davidson, Wingard, Wilcox, & Frongillo, 2014; Turner-McGrievy, Wirth, et al., 2014). Chi-square test of independence was used to examine differences in dietary adherence, being matched for diet preference, and being matched for the diet disliked among the five groups. All analyses were conducted using SPSS 22.0 for Windows software with a p value of 0.05 used to indicate statistically significant differences (2014. Chicago: SPSS Inc.).

3. Results

Baseline demographics and study completion rates have been presented elsewhere (Turner-McGrievy, Davidson, & Wilcox, 2014; Turner-McGrievy, Davidson, Wingard, Wilcox, & Frongillo, 2015). Participants had a mean age (\pm SD) of 48.5 ± 8.3 years and were mostly white (79%), college educated (98%) females (73%).

3.1. Adherence

Table 1 presents the adherence rates for each group at two and six months as well as the actual diets participants were following. No differences in dietary adherence among the five groups were found at two ($\chi^2 = 5.2$, $P = 0.27$) or six months ($\chi^2 = 0.47$, $P = 0.98$). Examining non-adherent participants, vegan and veg participants ($n = 16$ non-adherent) had a significantly greater decrease in cholesterol intake at six months ($-190.2 \pm 199.2\text{ mg}$) as compared to non-adherent pesco-veg and semi-veg participants ($n = 15$, $-2.3 \pm 200.3\text{ mg}$, $P = 0.02$) or omni participants ($n = 7$, 17.0 ± 36.0 , $P = 0.04$). Examining adherent participants only, changes in cholesterol intake were not significantly different ($F = 1.68$; $P = 0.21$) among adherent vegan/veg ($n = 9$, -232.0 ± 233.4), pesco-veg/semi-veg ($n = 11$, -81.8 ± 152.4), or omni participants ($n = 5$, -116.2 ± 152.3).

3.2. Weight loss

One participant (vegan group) was diagnosed with insulin-resistant polycystic ovary syndrome and hypothyroidism during the first month of the study and began treatment with levothyroxine and metformin, which excluded her from weight loss analyses. Non-adherent vegan and veg participants lost significantly more weight at six months ($n = 15$; $-6.0 \pm 6.7\%$) compared to non-adherent omni participants ($n = 7$; $-0.4 \pm 0.6\%$, $P = 0.04$) and was approaching significance for differences between the non-adherent vegan/veg and pesco-veg/semi-veg group ($n = 15$; $-1.9 \pm 3.1\%$, $P = 0.06$). There was no difference in weight loss ($F = 2.78$, $P = 0.08$) among adherent vegan and veg participants ($n = 9$, $-8.3 \pm 3.1\%$), pesco-veg/semi-veg ($n = 11$, $-5.0 \pm 3.5\%$), or omni participants ($n = 5$, $-6.9 \pm 1.7\%$).

Table 1
Dietary pattern followed at each time point by each group during a six month, randomized, weight loss intervention.

	Randomized groups									
	Vegan (n = 12)		Vegetarian (n = 13)		Pesco-veg (n = 13)		Semi-veg (n = 13)		Omni (n = 12)	
	2 mo.	6 mo.	2 mo.	6 mo.	2 mo.	6 mo.	2 mo.	6 mo.	2 mo.	6 mo.
Diet participants were following at each time point based on dietary recalls										
Vegan	6 (50%)	4 (33%)	0	0	0	0	0	0	0	0
Vegetarian	6 (50%)	1 (8%)	12 (92%)	5 (38%)	6 (46%)	1 (8%)	0	0	0	0
Pesco-veg	0	1 (8%)	1 (8%)	2 (15%)	7 (54%)	4 (31%)	0	0	0	0
Semi-veg	0	2 (17%)	0	1 (8%)	0	4 (31%)	8 (62%)	6 (46%)	3 (26%)	3 (26%)
Omnivore	0	2 (17%)	0	2 (15%)	0	2 (15%)	0	2 (15%)	1 (8%)	2 (17%)
Non-adherent	0	1 (8%)	0	0	0	0	1 (8%)	1 (8%)	4 (33%)	2 (17%)
No data	0	1 (8%)	0	3 (24%)	0	2 (15%)	4 (30%)	4 (30%)	4 (33%)	5 (40%)

Percentage of participants who were adherent to their diets at two and six months is bolded for each group.

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