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Dietary adherence and weight loss success among overweight women: results from the A TO Z weight loss study

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Abstract

Background—Dietary adherence has been implicated as an important factor in the success of dieting strategies; however, studies assessing and investigating its association with weight loss success are scarce.

Objective—We aimed to document the level of dietary adherence using measured diet data and to examine its association with weight loss success.

Design—Secondary analysis was performed using data from 181 free-living overweight/obese women (mean±s.d. age=43±5 years, body mass index=31±4kgm^{-2}) participating in a 1-year randomized clinical trial (the A TO Z study) comparing popular weight loss diets (Atkins, Zone and Ornish). Participants' dietary adherence was assessed as the difference between their respective assigned diet's recommended macronutrient goals and their self-reported intake. Association between dietary adherence and 12-month weight change was computed using Spearman's correlations. Differences in baseline characteristics and macronutrient intake between the most and least adherent tertiles for diet groups were compared using *t*-tests.

Results—Within each diet group, adherence score was significantly correlated with 12-month weight change (Atkins, r_s=0.42, *P*=0.0003; Zone, r_s=0.34, *P*=0.009 and Ornish, r_s=0.38, *P*=0.004). Twelve-month weight change in the most vs least adherent tertiles, respectively, was −8.3±5.6 vs −1.9±5.8 kg, *P*=0.0006 (Atkins); −3.7±6.3 vs −0.4±6.8 kg, *P*=0.12 (Zone) and −6.5±6.8 vs −1.7±7.9 kg, *P*=0.06 (Ornish).

Conclusions—Regardless of assigned diet groups, 12-month weight change was greater in the most adherent compared to the least adherent tertiles. These results suggest that strategies to increase adherence may deserve more emphasis than the specific macronutrient composition of the weight loss diet itself in supporting successful weight loss.

Keywords

dietary adherence; weight loss; overweight/obese premenopausal women; popular diets

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Introduction

One in three US adults report currently trying to lose weight;[1] among overweight and obese individuals the proportion is even higher. Despite the ubiquity of weight loss efforts, obesity rate is far from decreasing; rather, the rate is ever increasing and currently 65% of US adults are overweight or obese,[2] attesting to the ineffectiveness of most weight loss efforts. Indeed, more than half of dieters regain the majority of their weight loss within the first 12 months and less than one-third are able to avoid weight regain over a 3-year period.[3,4] Given the well-recognized benefits of weight loss among overweight and obese individuals,[5–8] these findings are discouraging and threaten efforts to curb the rise in national obesity rates.

The common failure in following traditional weight loss strategies (for example, increasing physical activity and decreasing caloric intake) has prompted a surge in alternative diet approaches. However, these alternative dieting approaches, including extreme carbohydrate restriction (Atkins), extreme fat restriction (Ornish) or replacing carbohydrates with protein (Zone) have led to only modest weight loss.[9–13] Poor dietary adherence has been implicated in the lack of success of popular and traditional dieting strategies. For example, in a recent review on low-calorie diets, the authors stated that the lack of success of such diets was likely due to difficulties with participants adherence.[14] Overall, studies investigating dietary adherence level and its association with weight loss success in randomized clinical trials in a large sample are scarce. Even the few studies that have examined the associations between dietary adherence and weight loss were constrained by a number of limitations such as self-reported measure of adherence measure, small sample sizes, low retention rate and short study follow-up period.[10,15–17] Therefore, to address some of the potential limitations of previous work, we performed the present analyses to determine the level of adherence from a 1-year randomized clinical trial comparing the effectiveness of four popular diets in overweight/obese women using carefully measured diet data and to examine the association between the dietary adherence and magnitude of weight loss.

Methods

Participants

Data for these analyses came from a study originally designed to compare the relative effectiveness of one traditional and three popular weight loss diets in a sample of 311 overweight and obese women. A detailed description of the primary study protocol and results has been reported elsewhere.[9] Participants, recruited primarily through newspaper advertisements, were invited to enroll if they were 25–50 years of age, had a body mass index (BMI) of 27–40 kgm^{-2}, stable weight over the previous 2 months and were stable for ≥3 months on their medications. Women were excluded if they had cardiovascular, metabolic or pulmonary disease; were hypertensive (except those stable on antihypertensive medications); were taking medications known to affect weight/energy expenditure or lipid metabolism; reported an alcohol intake of ≥3 drinks per day; or were lactating, pregnant or planning to become pregnant within the next year. All participants provided written informed consent. The study was approved by the Stanford University Human Subjects Committee.

Following baseline data collection, participants were randomly assigned to follow one of four diet books: *Dr. Atkins' New Diet Revolution*,[18] *Enter the Zone, A Dietary Roadmap*,[19] *Eat More Weigh Less*[20] or The LEARN Program for Weight Management.[21] Each participant was scheduled to attend eight 1-h, weekly evening classes over 2 months. A registered dietitian led the classes and reviewed approximately one-eighth of the assigned books at each class. Participants were instructed to master their assigned diet by the end of the 2-month class, and then to continue following their diets on their own for the subsequent 10 months. Class sizes ranged from 15 to 22 and participants were enrolled in four cohorts, the first of which began in the spring of 2003 and the last of which finished in the fall of 2005.

Unlike the Atkins, Zone or Ornish diets that are based on clearly defined macronutrient manipulations, the LEARN diet is based on total behavior modification and general dietary guidelines. Due to the multiple dimensions of the LEARN program's recommended goals, a measure of dietary adherence comparable with the other diets could not be created for the LEARN diet; therefore, the 79 participants assigned to the LEARN diet group were excluded from the current analyses.

Dietary assessment

Dietary information was obtained at baseline and each of three post-randomization time points (2, 6 and 12 months). Dietary intake data were collected by telephone-administered, 3-day, unannounced, 24-h dietary recalls using Nutrition Data System for Research software (Nutrition Coordinating Center (NCC), University of Minnesota, versions 4.05.33 (2002), 4.06.34 (2003) and 5.0.35 (2004)). Data collectors were trained and certified by the NCC in Minneapolis. The recalls occurred on two weekdays and one weekend day per time point, on nonconsecutive days whenever possible. Local foods not found in the comprehensive database were added to the database manually. A 'Food Amounts Booklet' was used to assist participants with portion size estimation. The dietary intake data were 96.8% complete.

Measure of adherence

Adherence was assessed based on the agreement between the primary macronutrient goal(s) of the assigned diet and a participant's reported dietary intake. An average of all available dietary recalls at each time point was used to calculate adherence scores. For participants assigned to the Atkins diet, adherence was calculated as the difference between the reported and recommended daily carbohydrate intake, which was ≤20 g carbohydrate per day at 2 months for the induction phase and ≤50 g carbohydrate per day for the ongoing weight loss phase of the subsequent 10 months. For example, an estimated intake of 40 g carbohydrate per day at 2 months for participant assigned to the Atkins diet would yield an adherence score of 20 (calculated by subtracting 20 from 40). An estimated intake of 85 g at 6 or 12 months would yield an adherence score of 35 (calculated by subtracting 50 from 85).

For participants assigned to the Zone diet, dietary adherence was calculated as the difference between the reported and recommended distribution of energy intake from carbohydrate:fat:protein, which was 40:30:30. Specifically, this was calculated using a

Mahalanobis distance equation, which can be used to measure the similarity between a set of actual conditions relative to a set of ideal conditions.[22] The equation used to calculate distance from the recommended goal at each of the three post-randomization time points was

$$\sqrt{[(X_{\mathrm{CHO}}-40)^2+(X_{\mathrm{FAT}}-30)^2+(X_{\mathrm{PRO}}-30)^2]/3}$$

where X_{CHO}, X_{FAT} and X_{PRO} were a participant's observed percent of energy from carbohydrate, fat and protein, respectively. For example, dietary adherence score for a participant assigned to the Zone diet with a macronutrient distribution of 45% carbohydrate, 29% fat and 26% protein at any of the three post-randomization time points would be

$$\sqrt{[(45-40)^2+(29-30)^2+(26-30)^2]/3=3.74}$$

For participants assigned to the Ornish group, dietary adherence was calculated as the difference between the observed and recommended daily total fat intake (≤10% of energy from fat) at all three post-randomization time points. For example, an estimated intake of 21% of energy from fat for a participant assigned to the Ornish group would yield an adherence score of 11 (calculated by subtracting 10 from 21).

For all diets, a score of zero was awarded if a participant met or exceeded their assigned diet's macronutrient distribution goals. A total dietary adherence score for each participant was then calculated as the average of the three post-randomization time points (2, 6 and 12 month). The adherence scores measured a degree of deviation from the recommended dietary goals; a lower score reflects better adherence and a higher score reflects greater nonadherence.

Anthropometric measurements

Body weight was measured in light clothing to the nearest 0.1 kg using a calibrated clinical scale. Standing height was measured to the nearest millimeter using a standard wall-mounted stadiometer. BMI was calculated as the weight in kilograms divided by the square of the height in meters. Percent body fat was determined by dual-energy X-ray absorptiometry using pencil-beam mode on the Hologic QDR-2000 (first three cohorts) and the array mode on a Hologic QDR 4500 densitometer (last cohort) (Hologic Inc., Waltham, MA, USA).

Statistical analysis

Descriptive data are expressed as means±standard deviations (s.d.). Association between dietary adherence score and 12-month weight change was computed using Spearman's nonparametric correlations, making no assumptions about the distributions. Tertiles of adherence score were determined for each diet group. Statistical testing of differences between the most (Tertile 1) and least (Tertile 3) adherent tertile for each diet group was

conducted using *t*-tests. All analyses were performed separately within each diet group. The metrics used to define dietary adherence scores were dramatically different for the three diet groups; therefore adherence scores were not directly comparable between groups. To create comparable adherence scores, thereby allowing us to assess between-group differences, participants' average adherence scores were converted into *z*-scores. Between-group differences were assessed using a general linear model. All statistical analyses were performed using SAS version 9.1 (SAS Institutes Inc., Cary, NC, USA).

Results

Of the 232 women originally randomized to the Atkins, Zone and Ornish diets (Atkins, *n*=77; Zone, *n*=79 and Ornish, *n*=76), dietary data were available at all four time points for 181 women (78%) (Atkins, *n*=68; Zone, *n*=57 and Ornish, *n*=56). Baseline characteristics are presented in Table 1. Total energy intake was not different among diet groups at any post-randomization time point (Table 2). However, relative to baseline there was a significant decrease in reported energy intake at all post-randomization time points for all groups combined ($P<0.0001$). As expected, at post-randomization time points the diets were statistically different in macronutrient intake. Carbohydrate intake was lowest for the Atkins group, intermediate for the Zone group and highest for the Ornish group. The fat and protein intake trends were in the opposite direction.

Adherence scores for each diet group are presented in Table 3. Overall adherence scores for the Atkins group, averaged over the three post-randomization time points (2, 6 and 12 months), ranged from 2.4 to 204.1. For the Zone group, adherence scores determined using the Mahalanobis distance score ranged between 6.0 and 25.9. For the Ornish group adherence scores ranged from 0 to 40.9. In all three groups, the level of adherence diminished progressively from 2 to 6 to 12 months (that is, adherence score numbers increased).

Twelve-month weight change (kg) was −5.3, −2.3 and −3.0 for the Atkins, Zone and Ornish groups, respectively. Average weight change from baseline for each diet group at each post-randomization time point is presented in Table 3. Within each diet group, overall adherence score (that is, average of the three post-randomization scores) was significantly correlated with 12-month weight change (Atkins, $r_S=0.42$, $P=0.0003$; Zone, $r_S=0.34$, $P=0.009$ and Ornish, $r_S=0.38$, $P=0.004$).

Across all three diet groups, only one participant, in the Ornish group, met the criteria for absolute adherence at all three post-randomization time points. A total of nine participants from the three diet groups met the absolute adherence criteria for at least two of the three post-randomization time points (Atkins, *n*=6; Ornish, *n*=1 and Zone, *n*=2). Given these low numbers, no further data are presented comparing absolutely adherent vs nonadherent participants. Further analyses were based on relative adherence (tertiles).

Baseline demographic and anthropometric measures, for the most (Tertile 1) and least adherent (Tertile 3) individuals within each diet group are presented in Table 4. With the exception of education level for the Ornish group, baseline measures were similar for all

three diet groups. Selected dietary macronutrient intake values, averaged across the three post-randomization time points, are presented for Tertiles 1 and 3 for all three diet groups in Table 5. All reported macronutrient intakes were significantly different between Tertile 1 and 3 for the Atkins group. For Zone, the only macronutrient difference that achieved statistical significance was protein intake, which was higher in Tertile 1. Compared to Tertile 3, Tertile 1 for the Ornish group consumed a diet that was significantly higher in total carbohydrate and dietary fiber but lower in fat. Atkins was the only group with a significant difference in energy intake between Tertile 1 and 3 (estimated energy intake was not significantly different between Tertile 1 and 3 for the other two diet groups). The difference in average caloric deficit (baseline caloric intake–average caloric intake for the three post-randomization time points) between Tertile 1 and 3 within each diet group (Atkins, 21±34, P=0.85; Zone, 70±2, P=0.69 and Ornish, 53±269, P=0.71) was not statistically significant. In the most adherent tertile (Tertile 1), average caloric deficit was significantly correlated to 12-month weight change for the Atkins group (r_s=0.45, P=0.04) but not for the Zone (r_s=0.22, P=0.37) or the Ornish group (r_s=0.34, P=0.17).

Participants in the most adherent tertile for the Atkins, Zone and Ornish groups lost approximately 10, 5 and 7%, respectively, of their baseline body weight. The magnitude of the difference in average weight loss between the least and most adherent tertiles for the Atkins, Zone and Ornish groups was −6.3 kg (P=0.0006), −3.4 kg (P=0.12) and −4.7 kg (P=0.06), respectively (Figure 1). Average adherence score and 12-month weight change were not significantly different between the three diet groups for individuals with average adherence score above or below their respective group mean (P>0.05).

Discussion

The objective of this secondary analysis was to explore the role of dietary adherence on weight loss for three popular diets from a recent weight loss study.[9] Adherence was significantly correlated with 12-month weight change within each of the three diet groups. Mean difference in 12- month weight change between the most and least adherent tertiles was only significant in the Atkins group. The average 12-month weight change, in absolute numbers, was slightly higher for the Atkins group (8.3±5.6 kg) than for Zone (3.7±6.3 kg) or Ornish groups (6.5±6.8 kg) in the most adherent tertile.

Although dietary adherence is an important factor in any dietary weight loss program, few studies have systematically measured dietary adherence and examined its association with weight loss success. Westman *et al.*[16] reported a significant correlation between dietary adherence (assessed through self-report and urinary ketones) and weight loss for 41 participants following a very low carbohydrate diet (<25 g per day) for 6 months. However, the study was limited by a small sample size. Dansinger *et al.*[10] conducted a weight loss study comparing the Atkins, Zone, Weight Watchers and Ornish diets and collected self-reported adherence data using Likert scales. These investigators concluded that adherence was a stronger predictor of weight loss success than diet group assignment, but the 12-month dropout rates of 35–50% among their four diet groups present a limitation. Heshka *et al.*[17] reported a significant association between adherence to the Weight Watcher program and weight loss success but adherence was assessed by self-reported attendance. Finally,

Knauper *et al*.[15] examined the relationship between adhering to self-set dieting rules and weight loss and concluded that adherence was associated with weight loss success. In the current analyses of the A TO Z study, adherence was determined by comparing the dietary goals of each diet and macronutrient intake data collected at three post-randomization time points by three unannounced 24-h recalls per time point, for 181 women. The 12-month retention rate for the three diet groups combined was 80% and the total number of 24-h recalls collected was 2102 for the 181 women, with only 3.2% of 24-h recalls missing. These data allowed for a more extensive assessment of dietary adherence than previous studies.

In general, absolute adherence to all three dietary guidelines was very low. Using the metrics for absolute adherence established for these analyses, only a single participant in the Ornish group was absolutely adherent to the guidelines at all three post-randomization time points. Even after relaxing the definition of absolute adherence to include being adherent at two out of the three time points, the numbers of participants achieving these adherence levels were still very small. Low adherence rates are a likely indication of the difficulty involved in closely following dietary weight loss guidelines from popular diet books. Notably, the participants in the present cohort had eight class sessions of reviewing their assigned diet books with a registered dietitian before they were left to follow the diets on their own for 10 months. This is more help than the average person would receive who simply purchased the book and read through the guidelines completely on their own. Therefore, the adherence levels observed in this study are likely even higher than in the general population. This suggests that a controlled comparison of the relative impacts of the popular weight loss diets used in this trial in which participants achieved close to complete adherence with the different diets would be possible perhaps only by a feeding study where all meals were provided to participants. A feeding study would more effectively address the effect of adherence to weight loss diets as designed by their respective authors. However, such a study would have limited external validity since it is clear that in the real world the typical level of adherence to dietary weight loss guidelines is quite poor. Despite the generally low levels of adherence reported in the present study, we believe these results have more practical public health relevance than a feeding study because the conditions are closer to those experienced in the real world.

Despite our extensive dietary data, there were some limitations in assessing and contrasting adherence for the diet groups. The assessment of dietary adherence was based on extensive self-reported 3-day, unannounced, 24-h dietary recalls. Even though this form of dietary assessment method is regularly used within the literature; similar to all forms of self-reported assessment it is therefore limited. It should be noted that the direct quantification of dietary adherence would have involved measuring participant's urinary ketones, which was not feasible in the present clinical trial. Adherence level for those assigned to follow the Atkins diet was determined by the total grams of reported carbohydrate intake, reflecting the emphasis on carbohydrate restriction for the Atkins diet. However, given that underreporting of total daily intake is common in diet assessment,[23] participants in the Atkins group who underreported carbohydrate intake would have been assigned an erroneously superior adherence score. Adherence level for those assigned to follow the Ornish diet was

determined by the total percentage of calories from fat, proportional to total intake. Underreporting of total intake would have been relatively less prone to misclassification in determining adherence to the Ornish diet than it was for the Atkins diet; misclassification of adherence for someone in the Ornish group would result from disproportionate inaccuracies in reporting, which is less likely, rather than simply underreporting. The Zone adherence score was the most complex of the three. Rather than being based on a single macronutrient, the Zone adherence was based on the combination of proportions of carbohydrate:fat:protein, with 40:30:30 being the goal for optimal adherence.

One of the most interesting issues to address in this exploratory analysis of adherence would have been a statistical comparison of 100% adherence and 12-month weight change among the three diets. However, given the very low number of participants within each diet that were 100% adherent we were unable to carry out this comparison. Instead, focusing qualitatively on the results in Figure 1, we report that the differences in weight loss by adherence score within each diet group were more striking than the weight loss differences among groups at similar tertiles of adherence. Our findings would suggest that differences in dietary macronutrients had only negligible effects on participants' weight loss success. Other investigators have also been able to demonstrate these findings.[24–27] For example, in a 6-week study examining the effects of two low-calorie diets (1000 kcal per day) with different macro-nutrient composition (32% protein, 15% carbohydrate and 53% fat or 29% protein, 45% carbohydrate and 26% fat), Golay *et al*.[24] reported no significant difference in the magnitude of weight loss or changes in body composition between the two diets. The authors concluded that weight loss success was due to energy intake and not macronutrient composition.

If adherence plays an important role in weight loss success, which is both intuitive and supported by the data presented here, it would be useful to know who is more likely to be adherent to a diet. This would allow health care providers to identify those individuals that might need more assistance in trying to follow a weight loss program. Several potential predictors were examined in these analyses, including age, education level, baseline body weight and baseline percent body fat. None of these factors were different between the lowest and the highest tertiles within the diet groups, with the exception of a higher education level for the more adherent individuals in the Ornish group. It is likely that psychosocial characteristics might be predictive of adherence, which warrants further analysis.

The main findings of this weight loss study, presented in a previous report, indicated that while all three diet groups lost modest amounts of weight, the Atkins group at 12 months lost approximately twice the weight of the other groups. The findings presented here indicate that weight loss in the lowest tertile of adherence was negligible in all three diet groups, and more pronounced in the highest tertile of adherence for each diet group. It appears that substantial differences in proportions of dietary macronutrients play only a modest role in weight loss success, and that success is possible on any of these diets provided there is adequate adherence. Getting individuals to adhere to whatever diet they choose to follow deserves more emphasis. It remains to be determined to what extent there

is a need for dietary weight loss programs that are easier to adhere to vs identifying and addressing individual barriers to adherence, or both.

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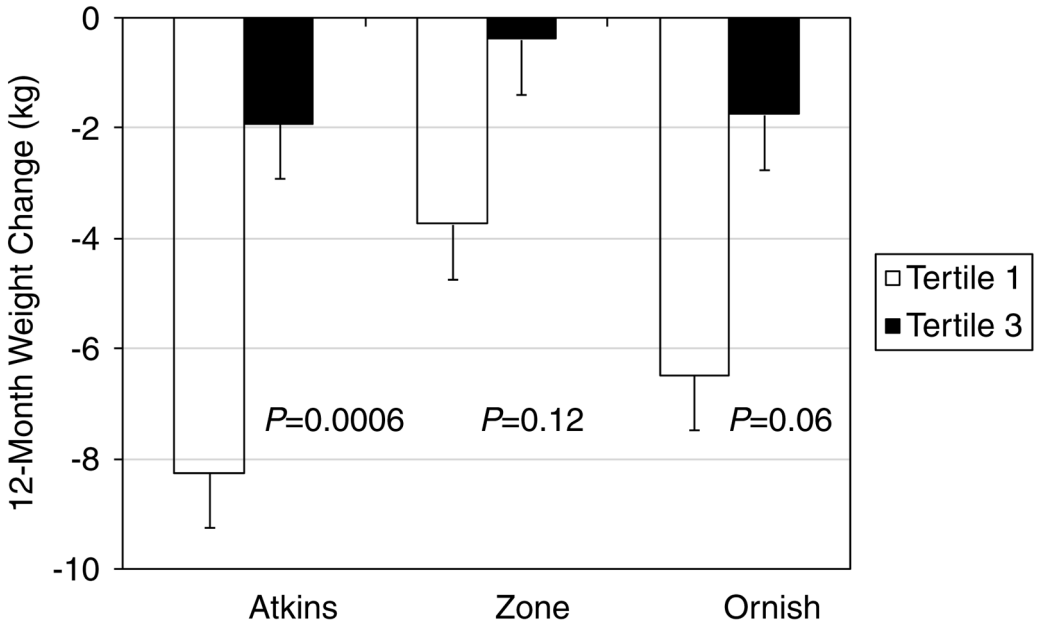

Figure 1.

Weight loss by tertile of dietary adherence. Mean±s.e. Tertile 1=most adherent and Tertile 3=least adherent. Statistical testing of differences between tertiles for each diet group was conducted using *t*-tests.

Table 1

Baseline characteristics

	Atkins (*n*=68)	Zone (*n*=57)	Ornish (*n*=56)
Age (years)	43±5	42±6	42±6
Education (years)	16±2	16±2	16±2
Weight (kg)	83±12	82±12	85±10
Height (cm)	163±6	164±7	165±7
BMI (kgm^{-2})	31±4	31±3	31±4
Body fat (%)	39±5	38±6	39±6

Abbreviation: BMI, body mass index.

Table 2

Macronutrient intake for diet groups

	Atkins (*n*=68)	Zone (*n*=57)	Ornish (*n*=56)
Energy (kcal day^{-1})			
Baseline	1908±507	2031±581	1860±491
2 months	1377±346	1458±497	1402±400
6 months	1525±380	1506±346	1507±507
12 months	1599±494	1594±523	1505±437
Carbohydrates (g)			
Baseline	218±81	234±88	222±66
2 months	55±33	152±63	219±76
6 months	110±67	165±53	201±88
12 months	135±71	180±73	198±75
Carbohydrates (% energy)			
Baseline	45±11	456±9	48±7
2 months	16±9	41±8	63±11
6 months	28±14	44±9	53±14
12 months	34±14	45±11	52±12
Protein (% energy)			
Baseline	17±4	16±3	16±3
2 months	28±5	24±6	17±4
6 months	23±6	20±5	18±5
12 months	21±5	20±5	18±4
Fat (% energy)			
Baseline	36±8	36±7	35±7
2 months	56±7	35±7	21±8
6 months	48±12	36±8	28±11
12 months	44±12	35±8	30±10
Dietary fiber (g)			
Baseline	17±6	18±9	17±7
2 months	11±6	17±7	22±10
6 months	14±6	16±8	19±12
12 months	15±7	17±9	19±9

Table 3

Adherence scores and weight loss by time point and diet group (mean±s.d.)

	Atkins (*n*=68)	Zone (*n*=57)	Ornish (*n*=56)
Adherence score			
2 months	35.2±32.7	11.4±5.6	11.4±7.8
6 months	62.6±64.7	13.7±6.5	18.3±11.0
12 months	85.8±70.5	15.0±6.9	19.8±10.4
Average	61.2±48.7	13.3±4.5	16.5±7.9
Weight loss (kg)			
2 months	−4.9±2.6	−2.9±3.0	−3.0±2.2
6 months	−6.7±5.9	−2.9±5.9	−3.1±4.8
12 months	−5.3±7.2	−2.2±6.3	−3.0±6.8

Table 4

Baseline characteristics for most (Tertile 1) and least (Tertile 3) adherent participants (mean±s.d.)

	Atkins		Zone		Ornish	
	Most adherent	**Least adherent**	**Most adherent**	**Least adherent**	**Most adherent**	**Least adherent**
Adherence score (range)	15.5±8.5 (2.4–31.3)	115.1±42.7 (71.0–204.1)	8.9±1.6 (6.0–10.9)	18.3±3.5 (14.8–25.9)	8.1±4.5 (0–12.6)	24.3±5.8 (19.1–40.9)
Age (years)	43±4	42±7	40±6	40±7	44±5	42±6
Education (years)	16±2	16±2	16±2	16±2	17±1	15±2*
Weight (kg)	86.1±13.9	83.5±11.0	83.2±14.0	85.6±10.9	87.8±8.6	88.1±11.4
BMI (kgm^{-2})	32.1±3.4	31.5±3.6	31.6±3.6	31.0±3.4	32.1±2.6	32.5±4.3
Body fat (%)	42.0±6.7	39.5±6.1	40.6±5.0	39.5±6.4	42.7±6.1	40.2±5.6

Abbreviation: BMI, body mass index.

*Significant difference at $P<0.05$ for least vs most adherent tertiles within each diet group.

Table 5

Average macronutrient intakes for most (Tertile 1) and least (Tertile 3) adherent participants

	Atkins		Zone		Ornish	
	Most adherent	**Least adherent**	**Most adherent**	**Least adherent**	**Most adherent**	**Least adherent**
Energy (kcal day^{-1})	1345±296	1684±327†	1433±266	1534±353	1324±410	1543±330
Carbohydrate (g/CHO)	52±10	155±43‡	150±33	172±64	220±81	181±54
Carbohydrate (% energy)	17±4	36±7‡	42±3	45±12	65±6	47±9‡
Protein (% energy)	27±3	20±4‡	25±3	20±5‡	18±4	18±3
Fat (% energy)	55±6	42±7‡	33±3	36±7	18±5	34±6‡
Dietary fiber (g)	10±3	16±5‡	15±5	18±9	24±8	15±5†

†Significant difference at $P<0.01$.

‡Significant difference at $P<0.0001$.