

Randomised controlled trial of four commercial weight loss programmes in the UK: initial findings from the BBC “diet trials”

Helen Truby, Sue Baic, Anne deLooy, Kenneth R Fox, M Barbara E Livingstone, Catherine M Logan, Ian A Macdonald, Linda M Morgan, Moira A Taylor, D J Millward

Editorial by
Arterburn

Abstract

Objective To compare the effectiveness of four commercial weight loss diets available to adults in the United Kingdom.

Design Six month multicentre randomised unblinded controlled trial.

Setting Community based sample of otherwise healthy overweight and obese adults.

Interventions Dr Atkins’ new diet revolution, Slim-Fast plan, Weight Watchers pure points programme, and Rosemary Conley’s eat yourself slim diet and fitness plan.

Main outcome measures Weight and body fat changes over six months.

Results All diets resulted in significant loss of body fat and weight over six months. Groups did not differ significantly but loss of body fat and weight was greater in all groups compared with the control group. In an intention to treat analysis, average weight loss was 5.9 kg and average fat loss was 4.4 kg over six months. The Atkins diet resulted in significantly higher weight loss during the first four weeks, but by the end was no more or less effective than the other diets.

Conclusions Clinically useful weight loss and fat loss can be achieved in adults who are motivated to follow commercial diets for a substantial period. Given the limited resources for weight management in the NHS, healthcare practitioners should discuss with their patients programmes known to be effective.

Trial registration Clinical trials NCT00327821.

Introduction

Most adults in the United States diet at some time, and trends in the United Kingdom are similar.^{1–3} Long term success rates are poor, with 50% of weight loss being regained within one year.⁴ Although commercial diets provide consumers with a plethora of choice, data on their comparative efficacy are limited.⁵

Our study compared four popular commercial weight loss programmes with a control group. The diets—representative of the main approaches to weight management in the UK today—were the Slim-Fast plan (a meal replacement approach), Weight Watchers pure points programme (an energy controlled diet with weekly group meetings), Dr Atkins’ new diet revolution (a self monitored low carbohydrate eating plan), and Rosemary Conley’s eat yourself slim diet and fitness plan (a low fat diet and a weekly group exercise class). We report the changes in weight and body fat over the six month study and describe dieting behaviour and weight change in the participants at 12 months.

Methods

An unblinded randomised controlled parallel dietary intervention study with a delayed treatment control group was done at five regional centres in the UK.

Recruitment strategy

We identified potential participants via a BBC advertising campaign. Participants lived within 30 miles of a test centre, were aged between 18 and 65, and had a self reported body mass index between 27 and 40. Three hundred people entered baseline testing by the start date of the study (July 2002).

Protocol assignment

At each test centre, we stratified participants by sex and randomly allocated them to a group. It was not possible to blind the participants to the diet regimen and we did not attempt to blind the investigators during the study or data analysis.

Providing dietary programmes to participants

For the group based programmes (Weight Watchers and Rosemary Conley), participants attended classes each week. For Slim-Fast, participants consumed up to two meal replacements each day and received a copy of the Slim-Fast support pack. We gave participants in the Atkins group a copy of *Dr Atkins’ New Diet Revolution*.⁶ We asked the members of the control group to maintain their current diet and exercise pattern.

Study protocol and monitoring

Measures at baseline, two months, and six months included weight, height, waist circumference, blood pressure, and fasting blood and body fat. Monthly test centre measurements recorded weight, blood pressure, and waist circumference. Participants completed a seven day diet and activity diary at baseline, eight weeks, and 24 weeks. We recorded the weight and dieting behaviour from six to 12 months of all willing participants.

Statistical analysis

Analysis was on an intention to treat basis. A secondary analysis focused on the outcomes in the most motivated subjects who provided complete data. We analysed weight loss over time and examined differences between groups.

Results

The mean time spent on the diet was 24.3 (SD 1.56) weeks and did not differ between diet groups ($F=2.0$, $P=0.12$).

School of Biomedical and Molecular Sciences, Centre for Nutrition, Dietetics and Food, University of Surrey, Guildford GU2 7XH

Helen Truby
senior lecturer in nutrition and dietetics

Linda M Morgan
professor of nutritional endocrinology

D Joe Millward
professor of human nutrition

Department of Exercise and Health Sciences, Centre for Sport, Exercise and Health Sciences, University of Bristol, Bristol BSS 1TP

Sue Baic
lecturer in nutrition

Kenneth R Fox
professor of exercise and health science

Faculty of Health and Social Work, University of Plymouth, Plymouth PL4 8AA
Anne deLooy
professor of dietetics

Northern Ireland Centre for Food and Health, University of Ulster, Coleraine BT52 1SA

M Barbara E Livingstone
professor of nutrition
Catherine M Logan
PhD student

Centre for Integrated Systems Biology and Medicine, Institute of Clinical Research and School of Biomedical Sciences, University of Nottingham Medical School, Queen’s Medical Centre, Nottingham NG7 2UH

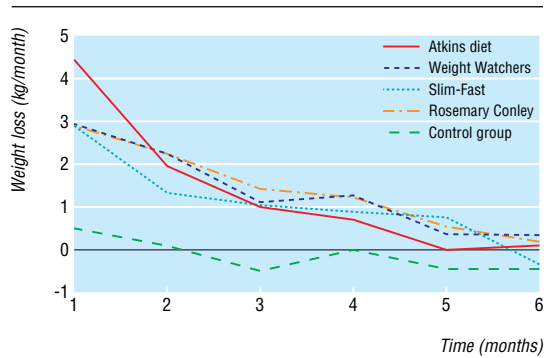
Ian A Macdonald
professor
Moira A Taylor
lecturer in nutrition and dietetics

Correspondence to:
H Truby
h.truby@surrey.ac.uk

BMJ 2006;332:1309–11



This is the abridged version of an article that was posted on bmj.com on 23 May 2006: <http://bmj.com/cgi/doi/10.1136/bmj.38833.411204.80>



Weight loss during the BBC diet trials

Weight and fat loss

Monthly weight loss was high initially but then slowed (fig). Mean weight loss was significantly higher in the Atkins group than in the other diet groups during the first four weeks ($F=6.9$, $df=3$, $P<0.001$): Atkins 4.4 kg (SD 2.45, range 13.5 to 0.3 kg), Weight Watchers 2.86 kg (2.23, 12.9 to -0.9 kg), Slim-Fast 2.68 kg (2.33, 9.4 to -1.8 kg), and Rosemary Conley 3.17 kg (2.02, 8.1 to -2.0 kg). At other time points, mean weight loss did not vary significantly between the diet groups (table 1).

Loss of body fat showed similar patterns (table 1). In the first two months, the greatest loss of body fat was seen in the Atkins group. Between two and six months, fat loss slowed down, and the diet groups did not differ significantly. Between baseline and six months fat loss did not differ between diet groups, but fat loss in all diet groups was significantly greater than in the control group. All diets resulted in a reduction in waist circumference.

Cardiac risk factors

We found few significant differences in cardiac risk factors between the diet groups and the control group

(table 2). Regression analysis showed that total weight loss over time had the greatest influence on systolic and diastolic pressure (adjusted R^2 0.61 for change in systolic pressure and 0.79 for change in diastolic pressure).

Glucose concentrations fell slightly over time; only in the Weight Watchers group was fasting glucose significantly lower than in the control group. By six months, cholesterol had fallen significantly compared with the control group only in the Weight Watchers group (by 0.55 mmol/l).

Analysis of completers

A secondary analysis of data from participants who completed the trial shows the range of weight lost by these highly motivated participants. Some participants lost more than 25 kg over the six month study period, whereas others gained weight (see bmj.com).

After six months all diets resulted in a clinically useful mean reduction in percentage body weight: Rosemary Conley 9.9% (SD 5.6%), Weight Watchers 9.0% (5.6%), Atkins 8.9% (5.6%), and Slim-Fast 6.8% (5.3%); no significant differences were seen between the diets but all were more successful than control (controls gained 0.95%, 3.3%). The proportion of participants who completed the trial and lost at least 10% of their body weight at six months was 46% for the Rosemary Conley group, 45% for the Atkins group, 36% for the Weight Watchers group, and 21% for the Slim-Fast group.

Compliance with the diets

Reported attendance at slimming clubs was similar at two months (Rosemary Conley 79%, Weight Watchers 66%) and six months (47%, 47%). Slim-Fast recommends 14 meal replacements each week; participants reported 10 each week at two months and eight at six months. With the Atkins diet, reported portions of carbohydrate foods fell from 40 each day at baseline to five at two months and seven at six months.

Withdrawal

Eighty three (28%) participants had withdrawn by six months. No differences in diet, centre, or sex were found between participants who completed or withdrew. Withdrawal in the control group (21; 35%) was mostly because participants did not wish to delay dieting.

Follow-up at 12 months

At 12 months, 158 participants (54% of the original sample) returned data. Only 58 (45%) were still keeping to their allocated diets (nine to Atkins, 20 to Weight Watchers, nine to Slim-Fast, 20 to Rosemary Conley). More participants in the unsupported programmes (Atkins diet and Slim-Fast) withdrew than in the supported programmes ($\chi^2=8.34$, $df=3$, $P=0.04$), and weight rebound after the initial six months was higher in the unsupported programmes. All diets resulted in a clinically useful weight loss of around 10% after 12 months in participants who had kept to their original diet.

Discussion

Clinically beneficial weight loss is possible through commercially available strategies, and reduced blood pressure and waist circumference accompany weight loss. The four different approaches were equally effective after six months.

Table 1 Intention to treat analysis of main outcome indicators in participants in the BBC diet trials allocated to different diet regimens

Outcome	Atkins diet (n=57)	Weight Watchers (n=58)	Slim-Fast (n=58)	Rosemary Conley (n=58)	Controls (n=61)
Weight loss (kg)					
0-2 months	5.2 (4.4)	4.7 (3.2)	3.7 (3.5)	4.0 (3.3)	0.4 (1.8)
2-6 months	1.3 (3.1)	2.2 (3.0)	1.4 (2.8)	2.4 (3.4)	-0.9 (1.6)
0-6 months	6.0 (6.4)	6.6 (5.4)	4.8 (5.6)	6.3 (6.1)	-0.6 (2.2)
Weight loss (%)					
0-2 months	5.5 (4.2)	5.1(3.5)	3.8 (3.4)	4.5 (3.6)	0.4 (2.2)
2-6 months	1.3 (3.1)	2.4 (3.4)	1.3 (2.9)	2.7 (3.7)	-1.2 (1.9)
0-6 months	6.2 (6.2)	7.3 (6.1)	4.9 (5.5)	7.0 (6.6)	-0.6 (2.7)
Fat loss (kg)*					
0-2 months	3.5† (3.0)	3.1 (2.4)	2.3† (2.3)	2.5 (2.1)	0.2 (1.3)
2-6 months	1.2 (2.3)	2.0 (2.3)	1.2 (2.6)	2.1 (2.5)	-0.5 (1.2)
0-6 months	4.6 (4.8)	5.0 (4.3)	3.4 (4.3)	4.5 (4.3)	-0.3 (4.4)
Fat loss (%)					
0-2 months	1.9† (1.9)	1.6 (1.9)	1.0† (1.4)	1.5 (1.5)	0.1 (1.4)
2-6 months	1.3 (1.9)	2.0 (2.0)	1.2 (2.4)	2.1 (2.4)	-0.0 (1.0)
0-6 months	3.1 (3.3)	3.6 (3.3)	2.1 (2.9)	3.4 (3.5)	0.1 (1.6)
Reduction in waist circumference (cm)					
0-2 months	6.7 (6.1)	5.5 (5.1)	4.8 (4.6)	4.5 (5.3)	1.0 (4.0)
2-6 months	2.4 (4.0)	3.0 (3.5)	2.1 (3.4)	3.0 (4.2)	-0.3 (2.4)
0-6 months	8.1 (7.4)	8.3 (7.0)	6.4 (6.3)	7.2 (7.2)	0.8 (3.8)

For all variables reported, the control group was significantly different from all other groups ($P<0.001$). *Not measured in all participants: 57 for Weight Watchers, 56 for Rosemary Conley, 60 for controls. †Pairwise comparison of group means with post hoc Tukey's HSD (honestly significantly different) test found a significant difference between the Atkins' and Slim-Fast groups.

What is already known about this topic

The prevalence of obesity and overweight with its subsequent comorbidities is growing in the UK

Commercial diets are an increasingly popular option for weight management

What this study adds

The comparative efficacy of four commercial diets was similar

The health benefits associated with a modest loss of weight (5-10% body weight) can be gained by people following a range of dietary regimens for six months with little support from health professionals

The range of absolute weight loss in participants who completed the study was wide. The mean absolute weight loss of around 8 kg is comparable to other studies.^{7,8} Compliance with each diet varied greatly. More information is needed to enable health professionals to decide which dietary approach may suit their patients. Currently, we cannot predict the dietary approach best suited to each person, but it is clear that "one size does not fit all."

Our study was used to make the BBC series on diet trials, which featured a small number of people. Since motivation to meet goal weights and patients' expectations of weight loss are key determinants of success,⁹ participants may have been influenced by the media interest. Excluding data from the 15 filmed participants had no effect on the overall statistical outcomes. The withdrawal rate was comparable to other longitudinal studies of weight loss.¹⁰⁻¹²

No dietary differences were apparent at six months, but behaviour from six to 12 months points towards an advantage of programmes based on group support. People who had kept to their allocated diet lost about 10% of their weight, despite some weight rebound, but some regression to the mean effect was seen. These results provide information on the "best effect" that the most highly motivated subjects may hope to achieve over one year.

Our study provides data on how much weight patients can expect to lose by dieting. These data could help practitioners in managing patients' expectations of weight loss targets.

Contributors: See bmj.com.

Competing interests: KRF receives consulting fees for serving on the scientific advisory panel of Slimming World, a company that offers a support service for weight loss. This company was not involved in this trial but as it is similar to Rosemary Conley and Weight Watchers, the conclusions may have implications for the company.

Funding: The study was sponsored by the BBC. The BBC had no role in the study design; collection, analysis, or interpretation of data; or report writing.

Ethical approval: South East multicentre research ethics committee, approval number MREC 01/01/44. Local ethics committee approval was also obtained at each centre.

- French SA, Jeffery RW, Murray D. Is dieting good for you? Prevalence, duration and associated weight and behaviour changes for specific weight loss strategies over four years in US adults. *Int J Obes Relat Metab Disord* 1999;23:320-7.
- Offer A. Body weight and self control in the United States and Britain since the 1950s. *Soc Hist Med* 2001;14:79-106.

Table 2 Intention to treat analysis of changes in cardiac risk factors in participants in the BBC diet trials allocated to different diet regimens. Values are mean (SD)

Outcome	Atkins diet (n=57)	Weight Watchers (n=58)	Slim-Fast (n=58)	Rosemary Conley (n=58)	Controls (n=61)	P value (ANOVA)
Fall in blood pressure (mm Hg)						
0-2 months:						
Systolic	5.7* (12.7)	3.5 (9.6)	0.5* (11.4)	2.4 (11.2)	3.3 (11.0)	0.05
Diastolic	3.6 (8.4)	4.1 (6.8)	3.1 (7.8)	2.8 (7.1)	2.0 (7.0)	0.61
2-6 months:						
Systolic	1.3 (9.8)	0.9 (10.3)	2.9 (12.4)	2.1 (9.2)	-0.9 (8.3)	0.23
Diastolic	1.1 (6.3)	0.8 (6.7)	-0.3 (8.6)	1.0 (5.5)	-0.4 (5.7)	0.51
0-6 months:						
Systolic	7.2 (11.6)	4.1 (11.7)	2.7 (10.7)	4.5 (9.8)	2.8 (11.8)	0.19
Diastolic	4.9 (8.1)	4.4 (8.6)	2.5 (8.6)	3.6 (6.0)	1.6 (7.4)	0.13
Fall in total glucose (mmol/l)						
0-2 months	0.04 (0.4)	0.14 (0.5)	0.13 (0.5)	0.15 (0.5)	0.02 (0.4)	0.44
2-6 months	0.13 (0.5)	0.29 (0.6)	0.12 (0.5)	0.17 (0.5)	0.13 (0.4)	0.34
0-6 months	0.19 (0.5)	0.46* (0.6)	0.19 (0.6)	0.27 (0.5)	0.14* (0.5)	0.013
Fall in cholesterol (mmol/l)						
0-2 months	0.08 (0.7)	0.44* (0.6)	0.26* (0.6)	0.35* (0.8)	0.08 (0.5)	0.001
2-6 months	0.19 (0.5)	0.11 (0.5)	0.07 (0.5)	0.08 (0.6)	0.24 (0.24)	0.24
0-6 months	0.29 (0.8)	0.55* (0.7)	0.35 (0.6)	0.5 (0.5)	0.5* (0.18)	0.013

*Pairwise comparison of group means using post hoc Tukey's HSD (honestly significantly different) test showed a significant difference in systolic blood pressure at 2 months between the Atkins and Slim-Fast groups; in the fall in glucose at 6 months between the control and Weight Watchers groups; in the fall in total cholesterol at 2 months between the Weight Watchers, Rosemary Conley, and Slim-Fast groups; and in the fall in total cholesterol at 6 months between the Weight Watchers and control groups.

- Serdula MK, Mokdad AH, Williamson DF, Galuska DA, Mendelin JM, Heath GW. Prevalence of attempting weight loss and strategies for controlling weight. *JAMA* 1999;282:1353-8.
- Perri MG. The maintenance of treatment effects in the long term management of obesity. *Clin Psychol Sci Pract* 1998;5:526-43.
- Freedman M, King J, Kennedy E. Popular diets: a scientific review. *Obes Res* 2001;9(suppl 1):1-40.
- Atkins R. *Dr Atkins' new diet revolution*. South Dakota: Vermillion, 1999.
- Harvey-Berino J. The efficacy of dietary fat vs. total energy restriction for weight loss. *Obes Res* 1998;6:202-7.
- Karvetti RL, Halka P. A seven year follow up of a weight reduction programme in Finnish primary health care. *Eur J Clin Nutr* 1992;46:743-52.
- Foster GD, Wadden TA, Vogt RA, Brewer G. What is a reasonable weight loss? Patients' expectations and evaluations of obesity treatment outcomes. *J Consult Clin Psychol* 1997;65:79-85.
- Lean M, Han T, Prvan T, Richmond PR, Avenell A. Weight loss with high and low carbohydrate 1200 kcal diets in free living women. *Eur J Clin Nutr* 1997;51:243-8.
- Stern L, Iqbal N, Seshadri P, Chicano KL, Daily DA, McGrory J, et al. The effects of low carbohydrate versus conventional weight loss diets in severely obese adults: one year follow-up of a randomized trial. *Ann Int Med* 140:769-77.
- Foster GD, Wyatt HR, Hill JO, McGuckin BG, Brill C, Mohammed BS, et al. A randomized trial of a low-carbohydrate diet for obesity. *N Engl J Med* 2003;348:2082-90.

(Accepted 24 March 2006)

doi 10.1136/bmj.38833.411204.80

Endpiece

What's in a name

Language is as vital to the physician's art as the stethoscope or the scalpel. A doctor begins by examining the words of his patient to determine their clinical significance. He then translates the words into medical language, describing how the condition came to be, what it means, and how it may evolve. Of all the words the doctor uses, the name he gives the illness has the greatest weight. It forms the foundation of all subsequent discussion, not only between doctor and patient but also between doctor and doctor and between patient and patient.

Groopman J. Hurting all over.
New Yorker 2000 Nov 13;76(34):78-92

Submitted by Helen Mary Worthington, clinical fellow, Royal Manchester Children's Hospital