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SHORT REPORT

Determinants of weight loss success with alternate day fasting



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Summary This study examined what characteristics predict weight loss success with alternate day fasting (ADF). Four 8-week trials of ADF ($n=121$) were included in the analysis. Subjects aged 50–59 y achieved greater ($P=0.01$) weight loss than other age groups. Males and females achieved similar weight loss. Caucasian subjects achieved greater ($P=0.03$) weight loss than other races. Baseline body weight and baseline BMI did not predict degree of weight loss achieved with the diet. These findings may help clinicians to decide which population groups may benefit most from an ADF approach.

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Introduction

Alternate day fasting (ADF) is effective for weight loss. ADF involves a “fast day” where an individual consumes 25% of their energy needs as a lunch or dinner, alternated with a “feast day” where a person is permitted to eat ad libitum (with no

limitations on type or quantity of food consumed). Other forms of alternate day fasting, which involve a complete fast on the fast day (i.e. consuming water only), have also been examined. Eight short-term ADF trials have been performed to date [1–8]. Results from these studies report body weight decreases of 3–8% after 2–12 weeks of treatment [1–8]. However, in these studies, the distribution of weight loss success varied widely. For instance, in pooling the data, we observed that ~5% of individuals gained weight with ADF, ~5% lost no weight, ~25% lost <4% of weight, ~60% lost 4–8% of weight, and ~5% lost >8% of baseline body weight [1,3,5,6].

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The reason why certain individuals respond better than others to ADF, remains unclear. Accordingly, this pilot study was undertaken to examine if certain key characteristics, namely age, sex, race/ethnicity or baseline body weight/BMI, can predict weight loss success with ADF.

Methods

Study selection

The data used in this analysis are from four separate 8-week trials of ADF performed by our lab group. Full details regarding subject selection, interventions, and outcome measures have been published elsewhere [1,3,5,6]. These four studies [1,3,5,6] were selected because they had similar population groups, and comparable ADF interventions in terms of study diet and trial duration. It should also be noted that, when a study employed multiple intervention arms, only the ADF diet arm (low fat or high fat background diet) was used in the analysis. For the study [1] that combined ADF plus exercise, only the ADF diet arm was used in the present analysis. Moreover, if the study duration exceeded 8 weeks, the 8-week data points were used as the final time points.

Study populations and diets

Subject selection procedures were almost identical between the four studies [1,3,5,6]. In brief, subjects were recruited from the Chicago area by advertisements. Key inclusion criteria were as follows: male or female, age 25–65 y, BMI between 30 and 45 kg/m², weight stable, previously sedentary or lightly active, non-diabetic, non-smoker, and no history of cardiovascular disease. Experimental protocols were approved by the Office for the Protection of Research Subjects at the University of Illinois, Chicago, and all volunteers gave written informed consent. All subjects participated in an 8-week ADF protocol. During the ADF diet, subjects consumed 25% of their baseline energy needs on the fast day (24 h), and ate ad libitum on each alternating feast day (24 h).

Measures

Demographic information, including age, sex, race, and ethnicity, was collected at baseline. For the present analysis, age was subcategorised as 25–29 y, 30–39 y, 40–49 y, 50–59 y, or 60–65 y. Race/ethnicity was categorised as African American, Caucasian, or Hispanic, and sex was

categorised as male or female. A total of $n=2$ Asian subjects were recruited across all studies. Because this number of Asian subjects is so low, these subjects were removed from the analysis of race/ethnicity (Fig. 2A and B). There were no self-reported mixed-race or mixed-ethnicity individuals in any of the studies. Two individuals had participated in more than one study. The data for these subjects was used only once, and was removed from data sets of subsequent studies. Body weight was measured using a balance beam scale (HealthOMeter, Boca Raton, FL) at the research centre at baseline and week 8. Baseline body weight was categorised as 70–84.9 kg, 85–99.9 kg, 100–114.5 kg, or 115–129.9 kg. Baseline body mass index (BMI) was calculated as kg/m², and was subcategorised as 25–29.9 kg/m², 30–34.9 kg/m², 35–39.9 kg/m², and 40–44.9 kg/m². Weight loss was calculated as the absolute change in body weight between week 8 and week 0 (baseline).

Statistics

Results are presented as mean \pm SEM. Shapiro–Wilk tests for normality were included in the model. No variables were found to be not normal. Homogeneity of variance was tested by Levene's test, and the variances were not statistically different from each other. A one-way ANOVA was used to test whether degree of weight loss differed between subcategories for each variable. When a significant difference was found between groups ($P < 0.05$), a Tukey post hoc test was performed to determine the differences between group means. Differences were considered significant at $P < 0.05$. All data was analysed using SPSS software (version 21.0, SPSS Inc, Chicago, IL).

Results

A total of 121 subjects were included in the analysis. The degree of weight loss achieved by subjects of varying age ranges is portrayed in Fig. 1A and B. Results reveal that subjects aged 50–59.9 y achieved greater ($P=0.01$) absolute and percent weight loss than subjects in other age groups. As for sex differences, there were no differences in the degree of weight loss achieved by male versus female subjects (Fig. 1C and D). Amount of weight loss achieved by subjects of varying races is displayed in Fig. 2A and B. Caucasian subjects achieved greater absolute ($P=0.03$) and percent ($P=0.04$) weight loss than African American and Hispanic subjects. When subjects were subcategorised by baseline body weight, there

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