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Research Editorial

Dietary Strategies for Successful Weight Loss and Maintenance: More Evidence Required

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Evaluation of the effects of dietary interventions for weight loss on usual food intakes of individuals participating in clinical trials provides an opportunity to identify eating habits that are amenable to change, and to observe how closely these changes align with the intervention's original dietary prescription. This hinges on a number of assumptions. First, that the study investigators adequately reported the details of the dietary intervention, in terms of the initial key nutrition goals and targets about which the participants were educated. Second, that the changes in dietary intake were measured with sufficient accuracy. Third, that adherence to the prescribed intervention was considered and that the data had appropriate statistical treatment.

Inadequate description of dietary intervention components can make it impossible to differentiate between prescribed approaches. For example a systematic review by Avenell and colleagues (1) found that, based on the limited published dietary intervention details within the Methods section of study protocols, it was not possible to discriminate between those that had prescribed a 600 kcal/day deficit vs those that had prescribed a low-fat diet without a stringent energy reduction. Their meta-analysis included 12 randomized controlled trials and indicated that prescribing a low-fat diet to achieve a daily energy deficit or prescribing a 600 kcal/day deficit leads to a similar median weight reduction of 4.5 kg (95% confidence interval 5.7 to 3.4 kg) after 12 months (1).

Studies that report dietary intake changes secondary to weight loss interventions tend to focus on total energy and/or macronutrient profiles only, rather than describing changes in intakes of food groups, such as type of or number of daily servings of bread; milk; fruit; vegetables; or energy-dense, nutrient-poor foods. For example, in a systematic review of interventions to treat obesity in children (2), only 11 of 37 randomized controlled trials published any details related to change in dietary intake. Of those, seven reported changes in macronutrient intake profiles, four reported changes at an aggregated food group level (based on a traffic light system where red foods were energy-dense and nutrient-poor and green foods were nutrient-dense and lower in kilojoules), and just one reported food group intake changes at the level of fruit and vegetables and high-fat/high-sugar food intakes (2).

Reports of actual consumption by those who are successful in achieving weight loss or subsequent weight loss maintenance are less commonly available. Yet, this information is what dietetics practitioners and their clients want to know and what would assist practitioners in recommending various approaches to treatment.

The article by Champagne and colleagues (3) provides a welcome examination of dietary intake changes associated with successful initial weight loss and subsequent weight loss maintenance. Studies such as this address a gap in the evidence base for dietetics practice. Addressing this omission will allow dietetics practitioners to offer evidence-informed, practical dietary advice to individuals seeking weight management advice.

As part of the discussion on evidence-based diet and food-based recommendations for weight loss and weight loss maintenance, the concept of what is deemed a successful weight outcome, and the predictors of this success, need to be considered. These factors are discussed by Champagne and colleagues in this issue of the *Journal* (3). The investigators examined changes in dietary intake across 3 years within a weight loss and weight loss maintenance trial, as well as evidence on changes in diet and food intake during weight loss and weight loss maintenance from other trials, before drawing a conclusion on current evidence on weight loss and weight loss maintenance food-based recommendations.

SUCCESSFUL WEIGHT LOSS AND WEIGHT LOSS MAINTENANCE

Targeting an initial weight loss of 10% of current body weight is associated with a reduction in chronic disease risk factors and health gain (4). Whereas an initial weight loss of 5% to 10% in those with a body mass index of 25 to 35 is associated with risk reduction for type 2 diabetes and cardiovascular disease, this may increase to 15% to 20% in some individuals with body mass index >35 to obtain improvements in comorbidities (5). Even when the average weight loss is modest, a substantial fraction of participants do achieve clinically meaningful weight loss and the more intensive the intervention, the higher the percentage achieving a 5% or 10% weight loss (6). There is no universal agreement on how much of an initial weight loss must be kept off in the long-term for an

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individual or program to be declared successful. Evidence for what can be termed successful weight loss maintenance comes from a number of long-term type 2 diabetes prevention trials, along with data from a cohort of weight loss maintainers who voluntarily participate in the National Weight Control Registry (NWCR) in the United States. A review of clinical trials studying weight loss with a minimum 1-year follow-up by Franz and colleagues (7) found that in studies extending to 4 years, a mean 3 to 6 kg (3% to 6%) weight loss was maintained. Most data related to successful maintenance of lost weight comes from the NWCR, established in 1994 to examine the characteristics of people who reported that they had successfully maintained an initial weight loss, defined as keeping off at least 13.6 kg (ie, 30 lb) for at least 1 year (8). Data from >5,000 registry members indicates a mean self-reported initial weight loss of 33 kg, with maintenance of a minimum weight loss of 13.6 kg for an average of 5.7 years (8). Success in this group is associated with the six key permanent lifestyle changes of high levels of physical activity; consuming a low-fat, reduced-energy diet; maintaining consistent eating patterns; regularly consuming breakfast; regular self-monitoring of weight; and acting to correct rebounds before they become large weight gains (8).

Wadden and colleagues (9) identified factors associated with 4-year weight loss success in the Look AHEAD (Action for Health in Diabetes) study in 5,145 men and women with overweight/obesity and type 2 diabetes. Weight loss success was defined as 4.7% of initial weight for those participating in an intensive lifestyle intervention vs 1.1% for those in a usual care diabetes support and education group, and they found that those who maintained their initial ≥5% weight loss (46% intensive lifestyle intervention vs 25% diabetes support and education; $P<0.0001$) attended more treatment sessions and reported consuming less energy per day and expending more energy per day in physical activity (9).

A key feature of a dietary approach associated with successful long-term weight loss, and one that individuals can live with, is a low-fat approach (10). This is likely to be because it facilitates a lower energy intake; achieves a satiating food volume; and/or it has a low energy density, an approach previously demonstrated to be successful (11). Clearly, long-term energy restriction is achievable, but challenging, and so further research into dietary strategies that facilitate this and maintenance of lost weight is important.

Metabolic benefits associated with weight loss appear to remain if weight loss is sustained. The US Diabetes Prevention Program recently indicated (12) that achieving an initial weight loss of at least 7% of baseline and maintaining a loss of at least 5% for 2 years more than halved the risk of developing type 2 diabetes, with a mean body weight still about 2 kg less than baseline after 10 years follow-up. Even though weight regain is common, NWCR data shows that if people are able to maintain their weight loss for 2 years, their risk of subsequent regain is reduced by 50% (8,13).

THE CURRENT STUDY

Because interventions are increasingly focussing on enhancing successful maintenance of lost weight, it is important to examine patterns of dietary intake change associated with success. In this issue of the *Journal*, Champagne and colleagues (3) examine which changes in diet are associated with greater weight loss and weight loss maintenance. The study was conducted in two phases. Phase I was a 6-month intensive behavioral weight loss phase. Phase II was a 36-month maintenance phase in those who achieved an initial 4-kg weight loss during Phase I. The participants in Phase I were instructed on the basic Dietary Approaches to Stop Hypertension (DASH) diet (14) and specifically asked to increase their consumption of fruits and vegetables, low-fat dairy, and whole grains. In Phase II they were encouraged to continue these dietary habits across three groups with differing levels of support. Of the 1,032 participants who lost a minimum of 4 kg in Phase I, all were randomized to Phase II. The authors pooled the data from the 828 who had complete food frequency questionnaire data at all four time points to examine changes in dietary consumption across the 36 months from baseline.

During the weight loss phase participants experienced significant changes in all DASH dietary components and energy intake and percent energy from fat decreased, whereas percent energy from carbohydrate and protein and daily servings of dairy and combined fruit and vegetables increased. During weight loss maintenance dietary changes all relapsed to some degree but compared to baseline participants still consumed less total energy and fat and more carbohydrate, protein, dairy, and combined fruits and vegetables. The investigators found that those who replaced fat with protein sources, or replaced carbohydrates with fat or protein, or those who increased their intake of fruits and vegetables had greater weight loss in both study phases. Increasing dairy intake, presumably low-fat varieties, was associated with significant weight loss during Phase II, whereas increasing dietary fiber had no effect in either. Limitations of the study include that dietary changes are only reported for those subjects who lost at least 4 kg and had completed all four food frequency questionnaires. We are told that this group with complete data was more successful in weight loss overall. It would be of interest to know whether there were any adverse changes in dietary intake reported for those not losing weight, because this information could be used to refine future trials. It has been reported (11) that focussing on positive messages to achieve a long-term energy intake reduction is important. The breakdown of the foods that made up the carbohydrate, fat, and protein food sources was not reported by Champagne and colleagues (3); neither was the quality of the macronutrients, yet recent research indicates this is important (15-17).

The possible influence of misreporting of total energy intake on the outcomes needs to be considered because total energy was included as a covariate in all of the statistical models (3). Because the effect of underreporting may have a lesser influence when results are expressed as a percentage of total energy intake (18), it can be argued that misreporting of energy intake may have influenced the results of Champagne and colleagues' (3) models examining the effects of substituting 1% of macronutrients while keeping the third macronutrient unchanged, to a lesser extent than the results of the models constructed to investigate changes in intakes from food