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Popular Weight Loss Strategies: a Review of Four Weight Loss Techniques

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Abstract
Purpose of Review The purpose of this paper is to review the epidemiology of obesity and the most recent literature on popular fad diets and exercise regimens that are used for weight loss. The weight loss plans that will be discussed in this article include juicing or detoxification diets, intermittent fasting, the paleo diet, and high intensity training.
Recent Findings Despite the growing popularity of fad diets and exercise plans for weight loss, there are limited studies that actually suggest these particular regimens are beneficial and lead to long-term weight loss. Juicing or detoxification diets tend to work because they lead to extremely low caloric intake for short periods of time, however tend to lead to weight gain once a normal diet is resumed. Both intermittent fasting and the paleo diet lead to weight loss because of overall decreased caloric intake as well. Lastly, studies on short bursts of high intensity training have shown remarkable weight loss and improvements in cardiovascular health.
Summary Review of the literature does suggest that some fad diets and exercise plans do lead to weight loss; however, the studies are quite limited and are all based on the concept of caloric restriction.

Keywords Obesity management · Juicing · Detox diets · Intermittent fasting · Paleo diet · High intensity training

This article is part of the Topical Collection on *Nutrition and Obesity*

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Introduction

Obesity has become one of the most important public health care problems worldwide and is associated with increased morbidity and mortality and high healthcare costs. In the USA alone, according to the Centers of Disease Control, approximately two thirds of the adult population are overweight and roughly one third of those overweight are considered obese. These estimates however were obtained from self-reported surveys and are likely lower than the true prevalence [1•]. Using the National Health and Nutrition Examination Survey (NHANES) where a physical exam and interview were required before data was taken, it showed much higher rates of obesity compared to self-reporting surveys. The NHANES showed that four states exceeded a 40% obesity population and only four states were under 30% obesity rates, suggesting the CDC statistics are lower than the actual obesity rates [1•]. Obesity and its associated conditions cost the US 147 billion dollars in 2008 alone, and costs are projected to continue to rise [2]. Although the overall prevalence of obesity has plateaued since the early 2000s, the percentages of extreme obesity continue to increase in both adults and children [3]. Because obesity has become so prevalent and costly, an entire industry has been formed to create and market fad diets and exercise programs. This review article will explore the current literature behind four popular weight loss programs and include the following: juicing or detoxification diets, intermittent fasting diet, the paleo diet, and high intensity training.

Juicing and Detoxification Diets

Juicing and detoxification diets have been and continue to be a popular weight loss management solution. Juicing or detoxing usually refers to a short period of time, usually less than 2 weeks, where the entirety of the calories consumed is from juices and other supplements determined by the specific juicing diet [4]. Some well-known juicing/detoxification diets include The Master Cleanser, Lemon Detox Diet, the Liver Cleansing Diet, Martha's Vineyard Detox Diet, The Clean Cleanse, Dr. Oz's 48-h Weekend Cleanse, BluePrint Cleanse, Fat Flush, and the Hubbard Purification Rundown. The majority of these diets have very little scientific data to support their various claims. Most of these diets last 2 to 21 days and incorporate juices and supplements which replace all meals. Many of the plans also include the use of laxatives, and the Hubbard Purification Rundown cleanse even requires sitting in a sauna for up to 5 h per day.

Review of the literature is quite limited in regard to the efficacy and potential risks of juicing and detoxification diets [4]. The weight loss that occurs is based on the premise that there is a significant reduction in caloric intake, as well as the loss of water weight and fecal matter when laxatives and saunas are incorporated. Some of these diets are so restricted that they only allow as much as 400 cal per day. These extremely low calorie diets lead to a rise in stress hormones including cortisol which may cause other negative downstream effects including appetite stimulation which can lead to rebound weight gain from binge eating [4, 5]. Interestingly, increased cortisol levels persist even after 21 days of caloric restriction to 1200 kcal/day [6]. Because of the scarcity of data that specifically evaluates juicing and detoxification diets, the potential short- and long-term consequences are also unknown and mainly involve individual reports of adverse events. For example, The Last Chance Diet which consisted of a low-calorie liquid formula made from leftover byproducts from a slaughterhouse was linked to approximately 60 deaths from cardiovascular-related events. Other detoxification diets have been linked to manganese overdose, laxative abuse, and severe hyponatremia. Furthermore, there have been cases of acute on chronic renal failure from oxalate nephropathy. Because urinary excretion is the only route for oxalate elimination, patients with chronic kidney disease are at increased risk for oxalate crystal deposition in the nephrons in the setting of an oxalate-rich diet [7, 8].

Intermittent Fasting

Intermittent fasting, also known as periodic fasting, is a weight loss strategy that has gained popularity over the past 2 years with movie stars such as Hugh Jackman and Jimmy Kimmel endorsing its effectiveness. Although it has only recently gone mainstream, this diet strategy has actually been around for thousands of years and mimics the eating practices of hunter-gatherers. The intermittent fasting strategy involves fasting for an extended period of time, usually 16–48 h, with little or no calorie intake, followed by periods of normal eating [9]. Depending on the particular intermittent fasting diet, the time spent fasting as well as the allowable caloric consumption during the fasting period can vary significantly. Several metabolic changes occur during this fasting period and include decreased glucose levels, decreased glycogen stores, fatty acid mobilization, decreased leptin, and may also be associated with a heightened level of alertness [10–12]. Intermittent fasting diets lead to weight loss in general because caloric intake tends to be reduced by about 25% when compared to the baseline caloric intake of the individual [13]. There have been some small studies that have compared intermittent fasting diets with calorie restriction diets where each group takes in a similar number of calories. These studies show that overall body mass was similar; however, one study suggested that there was a difference in body composition, and that the intermittent fasting group tended to maintain more lean body mass when compared to the calorie-restricted group [13]. Similar results have been demonstrated in rat models preserving lean body mass and a lower body weight. Rat models have also proposed that intermittent fasting starting at a young age live twice as long compared to rats fed ad libitum [14]. Despite the growing popularity of this weight loss method, there are still very few studies that assess the efficacy and potential side effects of intermittent fasting diets, and there are currently no known human studies that directly compare one intermittent fasting strategy to another.

The Paleolithic (Paleo) Diet

The Paleolithic (Paleo) diet was created to mimic the way cavemen ate in the Stone Ages when only non-processed foods were available for consumption [15••]. The rational behind the creation of this diet is based on a theory that human genes stopped evolving 10,000 years ago during the Stone Age; therefore, human genetics are optimized for this type of diet. Paleo foods include fresh vegetables, fruit, lean meats, poultry, fish, eggs, tofu, nuts, and seeds, and prohibit cereals, grains, legumes, and dairy. At least nine trials have shown short-term benefits of the paleo diet including weight loss, reduction in waist circumference, increased glucose sensitivity, and improvement in lipid profiles; however, these studies are short and underpowered. The largest randomized control trial (RCT) was performed by *Mellberg* et al. and included 70 post-menopausal, obese women that were fed either a paleo diet or a Nordic Nutrition Recommendations Diet. At the end of 6 months, the individuals who followed the paleo diet had a significant improvement in fat reduction and weight loss; however, there was no difference in these parameters at 24 months [16]. One of the critiques of the paleo diet is that

Table 1 The pros and cons of the four weight loss techniques

	Pros	Cons
Juicing/detoxification diet	Rapid weight loss	Severely restrictive diet
	Short-time frame	Increase cortisol levels
		Rebound weight gain
Intermittent fasting diet	Maintain lean body mass	May be hard to maintain
	Decrease total caloric intake	May lead to binge eating on non-fasting days
	May be sustainable for long periods of time	No difference in weight loss compared to generalized caloric restriction
Paleolithic diet	Rapid weight loss	Expensive
	Improved lipid profiles	No difference in weight loss at 24 months compared to generalized caloric restriction
	Improved glucose sensitivities	Side effects
		Low calcium intake
High intensity training	Short-time commitment	May be difficult to perform in certain populations
	Improved cardiovascular fitness	
	Weight loss benefits	

these foods tend to be more expensive, and the increased cost may make this type of diet impractical for specific populations [17]. Some of the potential side effects reported in study participants include weakness, diarrhea, and headaches [17]. Other consideration to take into account with the paleo diet is that because it prohibits dairy products, it tends to be low in calcium, and may thus predispose individuals to decreased bone density [17].

High intensity training (HIT) has been used by elite athletes for years to optimize athletic performance, but has more recently become a strategy for weight loss in the general population. HIT involves short bursts of maximum intensity work followed by periods of rest. This differs greatly from moderate intensity training (MIT) such as distance running or cycling at a moderate pace.

There are multiple randomized controlled trials (RCTs) that compare the effects of HIT vs MIT. *Hazel* et al. included 20 healthy women that did not exercise more than twice a week at baseline. Study participants performed 20-min sessions of HIT, three times per week, for a total of 6 weeks. Each 20-min session was comprised of four 30-s all-out sprints with 4 min of rest in between. During the study period, no dietary changes from baseline were made. At the end of the 6 weeks, there was an 8% reduction in fat, 3.5% decrease in waist circumference, and 1.3% increase in fat-free mass [18]. One of the limitations to this study is that there was no control group for comparison. *Fisher* et al. randomized 28 obese and overweight men to HIT vs MIT. The HIT group was required to do a 20-min exercise protocol which consisted of the following: four sets of 30-s cycling at 85% peak power followed by 4 min of 15% peak power cycling. The MIT group was required to cycle for 45–60 min at 55–65% peak power 5 days per week. The MIT group was associated with greater improvement in cardiometabolic fitness, but both groups demonstrated improvement in cardiometabolic health [19]. *Bagley* et al. enrolled 24 men and 17 women with normal body fat percentages who did not exercise regularly at baseline. During the study period, participants were required to perform four sets of 20-s max sprints with 2 min of low intensity cycling between, three times per week for 12 weeks. At the end of 12 weeks, participants had a 1.2% reduction in body fat and a 1.2% increase in lean body mass [20]. Interestingly, despite only performing a total of 80 s of sprints and 8 min of low intensity exercise 3 days per week for 12 weeks, beneficial changes in body composition were demonstrated.

HIT appears to be a good alternative to exercise programs to aid in weight loss and maintenance of lean body tissue. Because the required time commitment is quite low, compliance to this type of exercise program could potentially be better when compared to other programs. One of the pitfalls of this program, however, is that it excludes individuals who have physical limitations, or those with significant comorbidities who are unable to perform high intensity training (Table 1).

Conclusions

Obesity has become a major health care problem worldwide and can be difficult to treat with lifestyle modifications. There has been a surge of weight loss strategies that include fad diets and exercise programs, but the strategies often fail because they can be expensive, require a significant time commitment, or are so restricted that it makes compliance an issue. Juicing or detoxification diets lead to weight loss because they require extreme caloric restriction but are not sustainable for

prolonged periods of time. Although individuals may lose weight while on the diet, there tends to be weight gain once the diet has ceased. Intermittent fasting appears to lead to weight loss by decreasing the overall caloric intake throughout the week. It is a more sustainable option than juicing diets, but the literature is still very limited in humans. The paleo diet appears to have significant short-term improvements in weight loss and other metabolic factors, but cost, time commitment, side effects, and unclear long-term benefits may make this diet impractical for some individuals. HIT appears to have considerable benefits in regard to weight loss and requires a short-time commitment, however may not be feasible in those individuals with physical limitations which may include a significant portion of obese individuals.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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- • Of importance
- •• Of major importance

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