

Psychological consequences of food restriction

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ABSTRACT

A review of the literature and research on food restriction indicates that inhibiting food intake has consequences that may not have been anticipated by those attempting such restriction. Starvation and self-imposed dieting appear to result in eating binges once food is available and in psychological manifestations such as preoccupation with food and eating, increased emotional responsiveness and dysphoria, and distractibility. Caution is thus advisable in counseling clients to restrict their eating and diet to lose weight, as the negative sequelae may outweigh the benefits of restraining one's eating. Instead, healthful, balanced eating without specific food restrictions should be recommended as a long-term strategy to avoid the perils of restrictive dieting. *J Am Diet Assoc.* 1996; 96:589-592.

The decision to restrict one's eating, or diet, is usually made in the context of an attempt at self-improvement. For several decades, the North American cultural ethos has been that most of us are too fat (whether this is objectively true or not), and the solution was for the majority of people, especially women, to restrain their eating and follow weight-loss diets. People dieted in the expectation that this would help them achieve enhanced health, appearance, and feelings of well-being. It has become clear, however, that this "solution" did not solve the problem. In fact, given the increase in obesity in the Western world since the 1970s, when the dieting ethic began to dominate societal consciousness, it could be argued that the emphasis on dieting may have contributed to the increase in overweight. Arguments about the efficacy of dieting aside, however, what are the psychological ramifications of dieting or food restriction?

STUDIES OF EFFECTS OF FOOD RESTRICTION

The classic psychological study of food restriction, the World War II study of conscientious objectors by Keys et al (1), provides the most compelling data. Normal-weight (presumably nondieting) men were asked to restrict their eating for 6 months to lose 25% of their initial body weight, so that the effects of starvation could be studied. The men were fed only 75% of their normal intake, and when they stopped losing weight while consuming that intake, their food was further restricted until they achieved a weight loss to approximately 76% of initial body weight.

Careful observations were made of these subjects over several months, and some interesting psychological reactions were noted. One change was that subjects became increasingly focused on food; they collected recipes, hung pinup pictures of food, and changed career plans to food-related activities such as becoming a chef. They also grew increasingly upset and irritable, fighting with each other and their girlfriends. The men appeared apathetic and lethargic and seemed to lose interest in sex (replacing pictures of women with their food pinups!) In some respects, the most striking change occurred during the semistarvation period and after weight was restored to normal and the study had ended: When the men were subsequently allowed to eat as much as they wanted, these previously normal, healthy eaters began to gorge themselves when attractive foods were available (2,3). Moreover, they reported feeling out of control of their eating and obsessed with food; some even stole food or gum. Food restriction actually appeared to produce binge eating in previously normal eaters.

A similar tendency to overeat after food deprivation has been observed in human beings and animals. Canadian soldiers captured and held prisoner by the Germans after the abortive raid on Dieppe, France, during World War II were questioned 50 years later about their postwar feelings and behaviors (4). While prisoners of war, these men had been starved and lost substantial amounts of weight. Not surprisingly, they reported more negative emotions (anxiety and posttraumatic stress

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The following questions refer to your normal eating pattern and weight fluctuations. Please answer accordingly.

Age _____ Height _____
Sex _____ Weight _____

1. How often are you dieting? (Circle one.)
Never Rarely Sometimes Usually Always
2. What is the maximum amount of weight (in pounds) you have ever lost in 1 month? (Circle one.)
0-4 5-9 10-14 15-19 20+
3. What is your maximum weight gain within a week? (Circle one.)
0-1 1.1-2 2.1-3 3.1-5 5.1+
4. In a typical week, how much does your weight fluctuate? (Circle one.)
0-1 1.1-2 2.1-3 3.1-5 5.1+
5. Would a weight fluctuation of 5 lb affect the way you live your life? (Circle one.)
Not at all Slightly Moderately Very much
6. Do you eat sensibly in front of others and splurge alone? (Circle one.)
Never Rarely Often Always
7. Do you give too much time and thought to food? (Circle one.)
Never Rarely Often Always
8. Do you have feelings of guilt after overeating? (Circle one.)
Never Rarely Often Always
9. How conscious are you of what you're eating? (Circle one.)
Not at all Slightly Moderately Very much
10. What is your maximum weight ever? _____
11. How many pounds over your desired weight were you at your maximum weight? (Circle one.)
0-1 1-5 6-10 11-20 21+

The Eating Habits Questionnaire (Restrained Eating Scale). Copyright American Psychological Association (9).

LABORATORY STUDIES OF CHRONIC FOOD RESTRICTERS — EATING STUDIES

For the past 20 years, Peter Herman (University of Toronto, St George Campus) and I, along with assorted students and colleagues, have been investigating the psychological effects of chronic dieting on women attempting to lose weight. As measured by our 10-item restraint scale (9) (see Figure), this personality trait is essentially equivalent to chronic (or at least intermittent) dieting, so we use the terms *restrained eater* and *dieter* fairly interchangeably. The restraint scale asks 10 questions about how often subjects diet, how much their weight fluctuates, and about attitudes toward eating, such as the effects of a 5-lb weight change on one's life, the extent to which one feels guilt after overeating, or the tendency to splurge when alone. People who score high on this scale, that is, chronic, on-again-off-again dieters, behave quite differently from those who score low, in particular in their eating behavior but in other ways as well.

Before describing differences between restrained and unrestrained eaters, I should point out that the on and off dieting of restrained eaters does not necessarily produce much, if any, weight loss. Follow-up of a group of female restrained eaters over a 6-month period revealed that although their weights fluctuated on a daily and weekly basis significantly more than did the weights of unrestrained controls, these restrained women did not lose any weight during the 6 months that we tracked their weight (10). Others have found similar stability in the weights of restrained eaters over time (11,12). When we investigate differences between restrained and unrestrained eaters, we thus appear to be seeing the effects of erratic dieting that results in little or no net weight change. The deprivation in these subjects may not be long-term food deprivation so much as psychological deprivation caused by avoiding favorite foods or by sporadic (short-term) attempts to restrict total consumption. Despite this caveat, the sorts of behaviors noted in college students who are restrained eaters bear a remarkable resemblance to the behaviors of both experimentally starved subjects such as those in the study of Keys et al (1) and self-starved patients with anorexia nervosa and patients with bulimia nervosa. This suggests that chronic dieters, although not successful at losing weight over the long term, may experience psychological "deprivation" effects similar to those of persons who actually do go hungry. I will thus be discussing normal chronic dieters whose behavior appears to be analogous to that of persons suffering true physiologic deprivation.

There are eating differences between restrained and unrestrained persons, as well as other psychological correlates of restrained eating. Eating is susceptible to serious disruption by dieting. Dieting involves attempting to ignore internal hunger signals and eat less than would normally be eaten, so that one loses weight or maintains an already reduced weight. Unfortunately, willfully training oneself *not* to eat in accord with bodily signals leaves the dieter susceptible to other signals to eat.

Our basic paradigm for studying eating is to present subjects with either no prior food, or a fattening preload of, for example, two milkshakes. All subjects are then given three flavors of a different food (such as ice cream, cookies, nuts) to "taste and rate." The taste and rate phase is actually the ad libitum eating part of the experiment. We surreptitiously measure how much of each food the subject eats while making her taste ratings. What we (and others) find is that unrestrained, nondieting subjects eat less after a high-energy preload than after no preload. This is normal energy regulation and is what any organism could be expected to do; that is, one compensates for the preload by eating less. Restrained eaters do not do this, however. When restrained eaters receive no preload, they eat

reactions) than did soldiers who were not taken prisoner. They also reported, however, that they had had episodes of binge eating after they were released and returned home to Canada (and after their normal weight was restored).

A similar reaction in soldiers kept on short rations during a prolonged military campaign was reported as long ago as in ancient Greece. Xenophon described "boulimos" or "a ravenous hunger" (distinguished from a normal hunger) in these deprived soldiers (5). Likewise, a study of female rats deprived of food, then allowed to refeed back to their normal weight (6), indicated that the rats overate palatable food presented to them ad libitum after their return to a normal diet (and weight). Finally, patients with anorexia nervosa who starve themselves into emaciation frequently become bulimic; thus, they alternate between uncontrollable eating binges and starvation, and often purge themselves (7). Prior deprivation thus appears to produce a tendency to overeat and even binge, despite the restoration of both food availability and weight to their initial levels (8).

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a small amount of the foods given to them to taste; after a fattening preload, however, restrained eaters eat *more* than they do after no preload (13-15). Apparently, once the preload breaks their diets, restrained eaters feel free to indulge in the good-tasting foods we provide them. Further studies have shown that it is, indeed, the belief that one has broken the diet that promotes this overeating. Regardless of the amount of energy in the preload, restrained eaters eat more only after a preload they believe to be both high in energy and "fattening" (16-18). If the preload is seen as a diet-acceptable food such as salad, even though it has the same amount of energy as, for example, a milkshake, it does not cause dieters to overeat (16).

The disinhibition of dieters' food consumption can also occur if dieters drink alcohol (19,20) or are made to feel emotionally upset (21-27). Calm dieters maintain their diets and eat less than dieters made either dysphoric or euphoric (28), who increase their eating, particularly when the emotion aroused is ego relevant (21). The evidence indicates, therefore, that restraining one's eating makes one highly susceptible to bouts of excessive eating. As indicated earlier, in the real world, the situation may amount to episodes of binge eating that alternate with periods of energy restriction. This pattern of starving and stuffing resembles the behavior of patients with bulimia nervosa who also alternate between undereating and overeating (7,29-31). Food restriction thus appears to produce episodes of overeating.

COGNITIVE AND EMOTIONAL EFFECTS OF RESTRAINED EATING

The participants in the study by Keys et al (1) and others undergoing semistarvation exhibited cognitive and emotional changes or differences when their food intake was restricted. Restrained college students who are presumably limiting their eating to some extent at least some of the time, show similar differences from nondeprived, unrestrained students. Patients with anorexia and bulimia nervosa, another group of food-deprived persons, exhibit similar differences from nondeprived normal persons. For example, like food-deprived subjects, restrained eaters and patients with anorexia nervosa and bulimia nervosa are more focused on food and weight than are normal, unrestrained eaters. When presented with information about a fictitious person, restrained eaters and patients with anorexia nervosa remembered more food and weight-related information about the person and less of other types of information than did unrestrained controls (32). Similarly, studies using the Stroop color-naming cognitive task indicate that the performance of patients with eating disorders (33-36), fasting/hungry normal persons (37), and restrained eaters (38-40) is disrupted by food- and/or weight-related words, particularly after a high-energy preload, which indicates that these subjects are all more cognitively concerned with food and weight.

The starving men in the study by Keys et al (1) reported difficulty concentrating on a task. Chronic dieters are also more distractible than are nondieters. Given a boring task such as proofreading, restrained eaters actually focus well on the task and perform better than do unrestrained eaters, as long as they are in a quiet, nondistracting environment. If, however, distracting audiotapes are played while subjects are performing, restrained subjects' performance deteriorates markedly, and it is significantly worse than that of their unrestrained counterparts (41).

Irritability and negative emotionality were observed in the starving subjects studied by Keys et al and appear to characterize patients with eating disorders. Restrained eaters have also been found to exhibit heightened affective responsiveness,

responding more strongly than unrestrained eaters to emotion-eliciting slides (9), audiotapes (41), and fear-inducing situations (23). Moreover, restrained eaters score as more emotionally labile or neurotic than unrestrained eaters on personality measures such as anxiety measures (23), self-esteem scales (42), narcissism scales (43), and more general measures such as the California Personality Inventory (44).

Physiologic differences are also brought about by food deprivation. Taste perception has been shown to differ from normal in starving, weight-reduced normal persons, patients with anorexia nervosa, and dieters. All these groups show negative alliesthesia, which is a failure to reject sweet tastes after consuming a high-energy intensely sweet preload. In addition, salivary changes in response to palatable food have been reported in dieters (45). Moreover, patients with anorexia nervosa show a variety of hormonal changes, and even normal dieters have been found to have elevated levels of free fatty acids in their blood (14).

CONCLUSIONS AND IMPLICATIONS FOR DIETITIANS

The consequences of food deprivation are extraordinarily similar in animals and in human beings. This appears to be true whether the food restriction for human beings is involuntary, that is, controlled by external forces, or a voluntary choice to restrain one's eating, either for the benefit of science (as in the starvation study by Keys et al [1]) or for personal goals (eg, those of dieters or patients with eating disorders). Both display a tendency toward excessive eating or even bingeing when restrictions are lifted, heightened emotional responsiveness, and cognitive disruptions, including distractibility and a focus on food and eating. This is true despite the fact that most human dieters do not appear to be particularly successful at depriving themselves — at least not successful enough to reduce their weight on any long-term basis (10-12). In fact, persons whose weights fluctuate over time (self-defined "yo-yo" dieters) appear to have lower general well-being and eating self-efficacy and higher stress levels than nonfluctuators (46).

These negative changes thus seem to reflect the effects of either repeated episodes of short-term deprivation, psychological deprivation (refraining from eating one's preferred but fattening foods except when the diet is broken), or the stress of not being able to eat enough or what one desires. Persons who are food deprived for whatever reason suffer more than simply not getting sufficient or preferred food; they exhibit a variety of cognitive, emotional, and behavioral changes as reviewed here. These consequences cannot be prevented in those whose food deprivation is the involuntary result of insufficient supplies of comestibles. However, we can certainly warn those about to subject themselves to voluntary restrictions through ill-advised dieting that there are a variety of consequences of food restriction, and weight loss is among the least likely of these.

What then can we do to help restrained eaters? The first thing is to recognize which dieters should be advised to give up their energy restrictions and learn to eat a balanced, healthful diet. Those whose weights are within the normal range — body mass index (kg/m²) up to 25, or even 27 according to some studies (47,48) — and who are already eating in a reasonably healthful manner are unlikely to experience medical problems related to weight and should be so advised. These persons need to be helped to establish a healthful lifestyle that incorporates moderate exercise, balanced diet, and no restrictions on any particular food (except to maintain total fat intake under 30% daily). Those whose weights are even lower than normal should be educated more vigorously about the hazards of dieting, as well as being encouraged to eat and exercise in a

healthful manner. For those persons whose weights fall into the obese range, and in particular for those who show some signs of developing health problems associated with weight, some restriction of intake may be necessary. Even with obese patients, however, the dangers of psychological deprivation leading to overindulgence must be remembered. These people should be taught to incorporate their favorite foods into more moderate levels of intake, as well as increasing their energy expenditure through gradual increments in physical activity. The goal for all should be a healthful lifestyle that can be maintained indefinitely, rather than a short-term "diet" that will most likely be abandoned and produce more overweight and psychological discomfort. A reduction in counterproductive "restraint" seems likely to produce both physical and psychological well-being.

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