

How Rebound Prevents Sustained Weight Loss from Dieting

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ABSTRACT

I hypothesize that calorie restricted diets lead to rebound in body weight. When an individual drastically changes one's caloric intake, the body goes into starvation mode to conserve energy. Resting energy expenditure (REE) is the rate at which the body burns calories when a person is sedentary. When the body goes into starvation mode during a calorie restricted diet, the individual's REE decreases. When one returns to a normal diet, the REE remains at that same decreased rate, thus resulting in weight regain. This is the consequence of short term diet plans. Because of this, most dieters are gaining weight in the long term.

INTRODUCTION

According to the most recent government statistics, obesity, which may be caused by some combination of genetics, food consumption, and low activity levels, is continuing to rise in the United States. Large servings of food and the lack of physical activity, especially due to automobiles, all contribute to more individuals becoming overweight (5). With this rise in obesity, more Americans are in search of an effective diet to lose weight. Experts estimate that at any given time two thirds of women and half of men are on a diet(4). Despite a diet industry that has risen in response to this desire, as shown in Figure 1, I hypothesize that diets based on restricting food intake for only a short time actually cause people to gain weight.

METHOD

My research is based on peer-reviewed articles found in the scientific literature.

RESULTS

Most diets are short lived, and result in ~10% weight loss over a period of six months, which is then generally maintained for under two years (5). In order for someone to lose weight they must reduce their energy intake to below their energy requirements. Because of evolution, human bodies are evolved to shut down when less energy is consumed, so that resting energy expenditure (REE) lowers. The body's metabolic rate slows to adapt to the new starvation conditions. Once caloric intake is increased, the REE does not readjust. It is hypothesized that humans evolved this metabolic strategy to deal with frequent intervals when food was scarce. Thus after dieting, when normal eating habits resume, rapid weight gain results from the slower metabolism.

In a study by the Department of Molecular Biosciences, obese cats that were put on calorie restricted diets did not maintain long-term weight loss (REF). After the cats lost weight and their REE decreased, they were returned to a higher caloric intake. Results showed a mass-adjusted REE in the cats that stayed low after ending their diet.

This table gives an idea of the size and growth of the weight loss industry in the United States

Date	Diet Industry Sales	Source
2002	\$22 billion	CNNMoney.com
2003	\$24 billion	CNNMoney.com
2006	\$35 billion	CBS Evening News
2008	\$60 billion	Alcone Marketing Group

Figure 1: Rough Estimates of Sales in the Weight Loss Industry

RESULTS (cont'd)

In a recent study by Elizabeth A. Delbridge from the Department of Medicine, research was conducted to study the role of dietary composition in weight maintenance (REF). Over a period of fifteen months, overweight male and female subjects were given a high-protein, Atkin's inspired diet or high-carbohydrate diet. After losing an average of 16.5kg, all subjects' maintained weight loss averaged 14.5kg. Results indicated that the dietary composition of the subjects, either high-protein or high-carbohydrate, was arbitrary and had no effect on the success of their long-term weight loss maintenance. Results of the study demonstrate that rebound does not result because of the dietary composition, and therefore the type of diet an individual is on does not increase or decrease their chance of rebound in weight gain.

Figure 2: Weight gain pattern after caloric restriction dieting. These results show how after dieting, weight regain is much faster. This continues beyond what the graph shows.

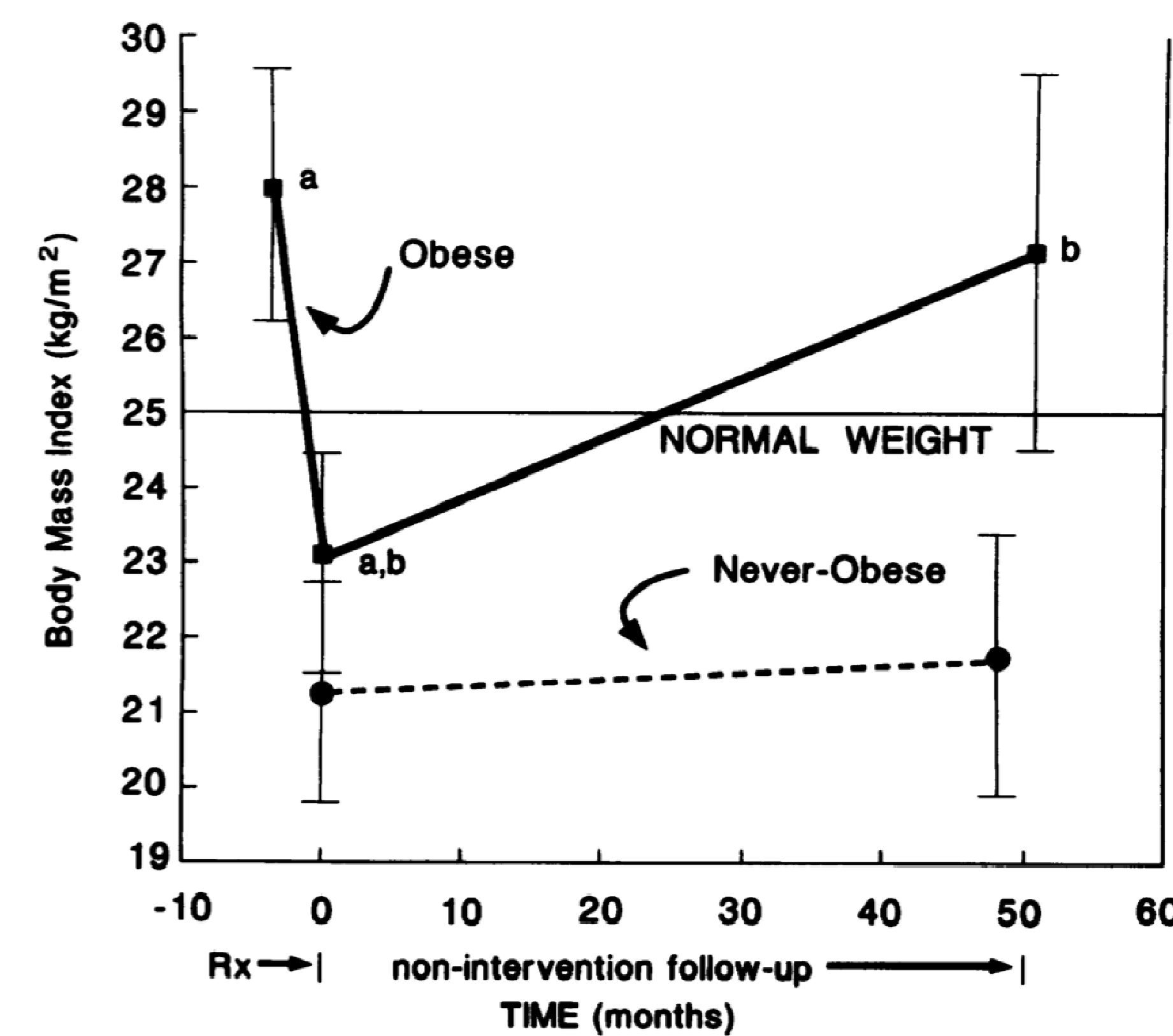


Figure 1. Weight gain pattern (as body mass index, mean±SD) of 24 obese women after being reduced to normal body weight, compared to 23 never-obese women. Corresponding letters indicate differences between means at $P < 0.001$.

Figure 3: REE decreases after dieting. When normal eating behavior resumes, weight is gained.

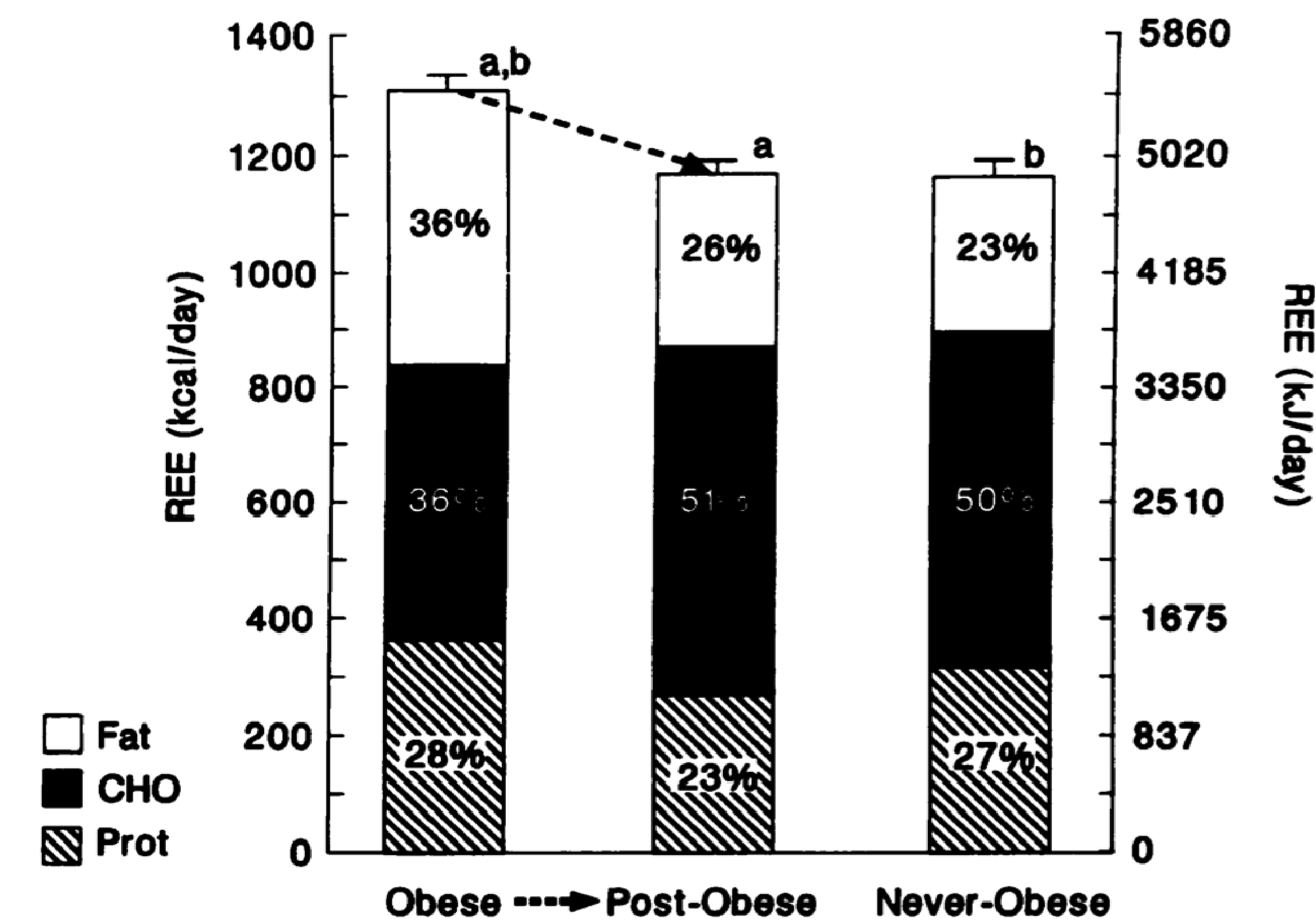


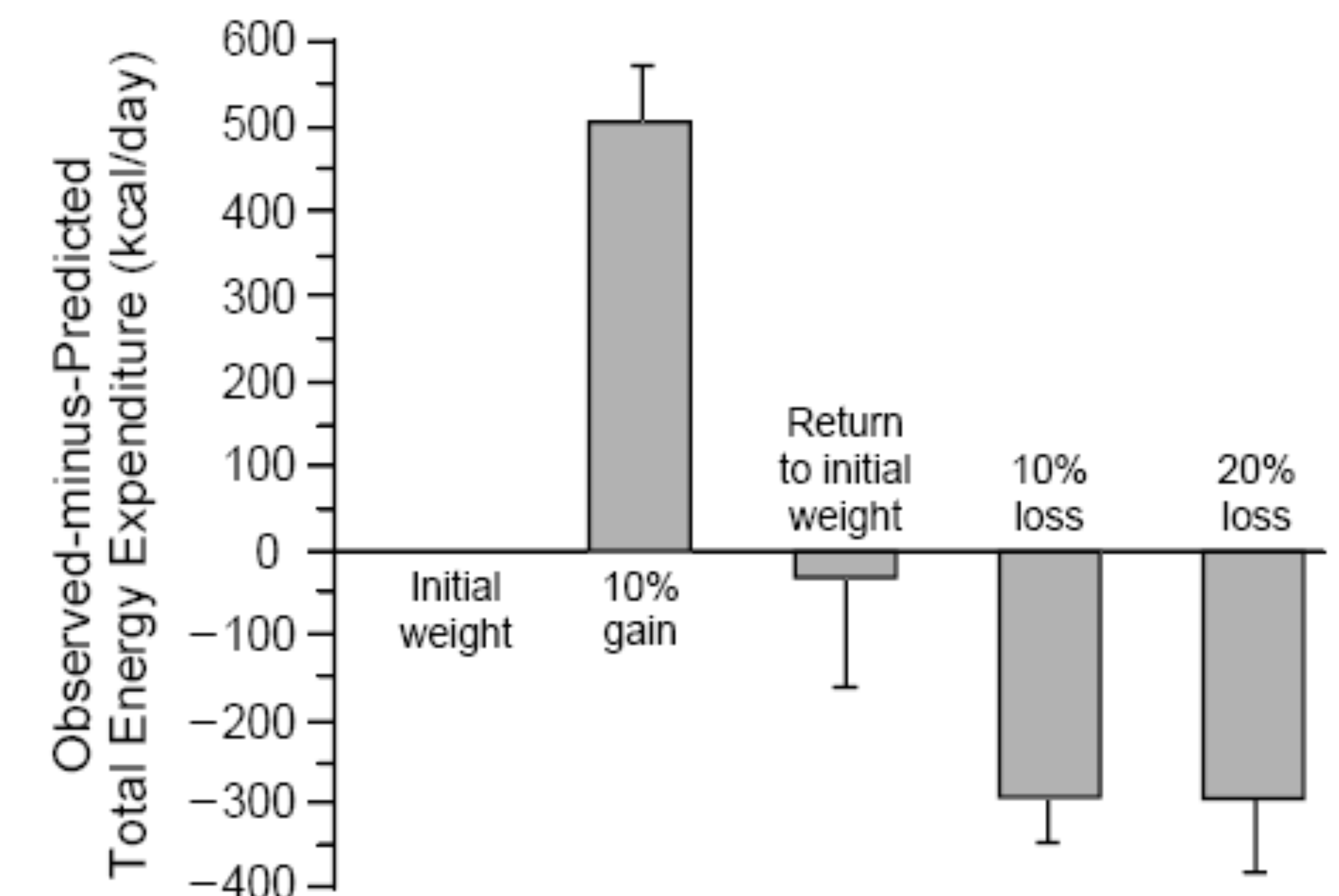
Figure 2. Resting energy expenditure (REE, as mean±SE) and substrate utilization of 24 women in the obese and post-obese states compared to 24 never-obese women. Corresponding letters indicate differences between mean REE values at $P < 0.001$.

DISCUSSION:

The results explain why dieting by restricting calories is normally a strategy that fails, and in fact leads to weight gain. Much research is now being conducted to determine how weight can be controlled effectively (9). Studies currently indicate that a high protein diet is more effective at appetite control.

It has been established that an effective strategy for weight control is exercise. Getting 60 minutes of moderate intensity exercise daily is necessary to maintain weight, and 90 minutes daily is necessary to lose weight (8). Most recently reported, alternate day fasting, where diet is restricted to 25% of normal caloric intake on alternate days, also may allow a person to avoid the REE effect of short term dieting (10).

Figure 4: Regression of total energy expenditure after dieting



REFERENCES

- Villaverde, Cecilia. "Energy Restriction Results in a Mass-Adjusted Decrease in Energy Expenditure in Cats that is Maintained after Weight Regain." *The Journal of Nutrition* (2008). Print.
- Chearskul, Supumpim. "Effect of Weight Loss and Ketosis on Postprandial Cholecystokinin and Free Fatty Acid Concentrations." *The American Journal of Clinical Nutrition* (2008).
- Bosy-Westphal, Anja. "Contribution of individual organ mass loss to weight loss-associated decline in resting energy expenditure" *The American Journal of Clinical Nutrition*
- Laino, Charlene. "Blood Test May Predict Rebound Weight Gain". *Medscape Medical News*, 2003
- Macdonald, Ian "In search of the basis of successful maintenance of weight loss" *Am J Clin Nutr*
- Weinsier, Roland. "Metabolic Predictors of Obesity". *The Journal of Clinical Investigation*, Inc. Volume 95, March 1995, 980-985
- Delbridge, Elizabeth. "One-year weight maintenance after significant weight loss in healthy overweight and obese subjects: does diet composition matter?" *The American Journal of Clinical Nutrition*, 2009.
- Brooks, Gary. "How much exercise", Linus Pauling Diet and Optimal Health Meeting, <http://campus.beloit.edu/nutrition/exercise.htm> (accessed Nov. 2, 2009)
- Ordman, A. B. "Roc's Reading Notes", <http://campus.beloit.edu/nutrition/aln/N409litnotes.htm>, (accessed Nov. 2, 2009)
- Varady Krista et al. "Short-term modified alternate-day fasting: a novel dietary strategy for weight loss and cardioprotection in obese adults." *Am J Clin Nutr* 90: 1138-1143, 2009