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How Many Calories to Cut, Part 1

“This is wrong.”

When a scientist makes a bold statement like that, it gets your attention. Such was the case when I read a news report of a new mathematical model for predicting weight loss. The lead author of the research paper (and the quote) is Dr. Kevin Hall of the U.S. National Institutes of Health.

What was wrong? The typical model for predicting weight loss. That model says that reducing your caloric intake by 500 calories a day will result in a weight loss of about a pound a week because a pound of fat contains 3,500 calories. Dr. Hall says that’s wrong and has developed a new formula that he says is much more predictive of how weight loss will occur. As I wrote in Thursday’s 30 Pound Club Message, this is so fascinating that it’s going to take two Saturday messages to explain the physiology behind his formula—and whether it’s right, wrong, or incomplete.

Before I examine the paper, understand that Dr. Hall is an exceptional biophysicist. I’ve read some of his papers, or rather tried to—there’s a lot of calculus in them and I’m not a mathematician. He’s spent 10 years examining the metabolism of weight gain and weight loss in animals and humans; he definitely has the education and experience to do this type of research.

The Paper

The objective of the paper was to present a new mathematical model for predicting weight loss. As stated earlier, Dr. Hall and his research group contend that the 500-calorie-per-day deficit recommended by almost everyone is not really valid, no matter how much sense it makes mathematically. In the initial part of the paper, they present data collected from studies on weight loss programs ranging from 30 days to six months. The actual weight loss was accurately predicted by the formula, but they didn’t use that data in developing the formula. That’s really important because if they did, it wouldn’t be any surprise that it predicted the weight loss.

In reviewing some of his prior research, Hall suggests that the original model was fine in the short term but could not predict weight loss over the long term. He cites two reasons in the article; let’s take a look at them.

Muscle Loss and RMR
Resting metabolic rate (RMR) is the number of calories it takes to run your body at rest—the heart, brain, lungs, etc. Even if you’re lying in bed, your muscles are using energy to repair themselves and force blood back to the heart. Taken all together, these processes account for about 70% of your daily energy use; it’s estimated another 10% of your daily energy expenditure is used digesting food. That leaves 20% for activity.

The first reason the researchers give that the old formula is wrong: differences in RMR due to the loss of muscle tissue. The loss of muscle is inevitable. That’s not all bad; if your weight goes from 250 to 200 pounds, you won’t need as much muscle to haul around 50 pounds less. Weight loss programs try to keep people exercising to sustain as much muscle mass as possible.

A change of 5% in RMR for someone requiring 2,000 calories per day to maintain their weight would be about 70 calories per day. Yes, if we use the old model of 70 calories per day every day of the year, that would lead to a seven-pound error in annual weight loss. However, a person would not need the same RMR if he weighed less—even idling, a smaller engine needs less power.

Because muscle is metabolically more active than fat, a reduction in RMR is likely when you've slowly lost muscle. The question is how much of an impact does this muscle loss really have? There's no way to know how much the loss of one pound of muscle contributes to the decrease in metabolism because long-term research is lacking. Conversely, the research on how much the addition of one pound of muscle adds to metabolism is still unknown as well. (Forget what you read on bodybuilding websites—their claims aren't based on real research.)

Hall contends that the change in RMR due to muscle loss is accounted for in the new formula. It's hard to believe that losing a little muscle would make a huge difference in resting metabolic rate for this reason: the RMR is already proportional to body weight; if you don't weigh as much, you don't need the same RMR as when you weighed more.

Physical Activity
This reason is a little less than clear. The estimation of RMR is calculated via the Harris-Benedict Equation or one similar to it that takes into consideration height, weight, age, and gender. The RMR is multiplied by an activity factor to determine how many calories you will need to eat per day. The Hall equation asks a similar question about daily work activity, but then asks how much you exercise now and how much you'll exercise when you achieve your weight loss goal.

I'm not sure how much more precise the prediction of weight loss would be by adding the additional information. Using the current activity estimates in the old formulae, the difference between Light Exercise and Moderate Exercise works out to be about 150 calories per day. The Hall equation requires you to select your job activity and then add how much you're going to exercise; if you're going to add Light Walking every day for 45 minutes as you start to lose weight, you'll add 200 calories to your baseline intake. The difference is 50 calories per day—and it favors you losing weight faster. We don't know whether it works because those studies haven't been done on the Hall formula.

In my opinion, they missed the single biggest reason why the precise amount of exercise won't improve the estimate's accuracy much more than the current adjustments for activity. They seem to make the assumption that you'll burn the same number of calories the first day you walk lightly for 45 minutes as you will six months later—they haven't acknowledged the training effect. With any type of aerobic activity, your body will learn to use fewer calories to do it. Your cardiovascular system will work better, your muscles will learn to use the fewest number of motor units, and even your brain won't have to be as involved—and that's the biggest calorie user in your body. They don't talk about the training effect in the calculations, so it has to be assumed they didn't include it.

The Bottom Line

I think this formula is a good addition to what's currently available; I'm just not sure it has the implications that the Hall group thinks it does. But there's lot more to the article than I could cover in this message, and I'll finish up next week.

In the meantime, check out what the formula estimates for you. There's a link on the *Lancet* website that allows you to calculate how you'll lose weight through changes in your diet and physical activity. Just go to this link—www.thelancet.com/series/obesity—and you'll see the calculator on the left side of the page. Click on it, and it will ask you to run the Applet. I did it on two of my computers, a Mac and a PC, and it worked fine. You can get an overview of how to do it, or you can just dive in; it won't save your results so either write them down or press the "print screen" button.

My results were very surprising, and I'll talk about them in next week's 30 Pound Club Message. Play around with activity levels to see for yourself how activity affects the calories you get to eat while losing weight. We can compare notes next week.

What are you prepared to do today?

Dr. Chet

Reference: Lancet 2011; 378: 826–37.

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