TODAY'S "HOT TOPICS"

UNDERSTANDING

METABOLISM AND METABOLIC DAMAGE

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UNDERSTANDING METABOLISM AND METABOLIC DAMAGE

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CAN EATING TOO LITTLE ACTUALLY DAMAGE YOUR METABOLISM?

Exploring the truths and fallacies of ‘metabolic damage’.

By Brian St. Pierre

There’s a lot of discussion in the fitness industry about whether crash dieting can cause metabolic damage. In this article, we’ll take on this interesting topic and separate fact from fiction. We’ll also teach you exactly why crash diets might be linked to struggling to maintain your weight in the future.

Despite working out consistently and intensely, plus eating carefully, you're not losing weight (or not losing it as fast as you'd like or expect).

Or you were losing weight consistently... until recently. Now you're stuck — even though you're working as hard as ever.

Or when you were younger, you were super fit. Maybe you did fitness competitions. Maybe you did some crash diets. But now, even when you put in the same effort, you just can't seem to get as lean.

"Is my metabolism damaged?"

Clients ask us this question all the time. (If you're a trainer or coach, you've probably heard it from your clients too.)

Can months or years of dieting do some kind of long-term harm to the way the human body processes food?

Not exactly.

But gaining and losing fat *can* **change the way your brain regulates your body weight.**

To understand this answer let's explore how human metabolism actually works. Then we'll talk about whether the metabolism can actually be damaged.

Note: This post delves into the science of energy balance, thermodynamics, and metabolic regulation. If you love learning this stuff, feel free to really dig.

If, on the other hand, you want to jump right to the "how to" for weight loss, fat loss, and breaking plateaus, feel free to skip to the summary at the end.

Energy balance: The laws of physics still apply

You need a certain amount of energy (in the form of calories) to stay alive, as well as to move around. You can get this energy from food, or you can retrieve it from stored energy (e.g. your fat tissue).

In theory:

- If you eat less energy than you expend, you should lose weight.
- If you do the opposite (i.e. eat more energy than you expend), you should gain weight.

In other words:

Changes in body stores = Energy in – Energy out

*We use the term "body stores" deliberately as it represents the tissues available for breakdown (fat, muscle, organ, bone, etc) and excludes water (which can change body weight independently of energy balance).

This relationship between 'energy in' and 'energy out' is called the **Energy Balance Equation**, and it's the most commonly accepted model for calculating a person's energy balance and how much weight they'll lose or gain over time.

While the Energy Balance Equation determines body weight, it doesn't tell us much about body composition, which is influenced by things like sex hormone levels, macronutrient intake (especially protein), exercise style / frequency / intensity, age, medication use, genetic predisposition, and more.

Understandably, people get really frustrated and confused with the Energy Balance Equation when the numbers don't seem to add up, or their results don't match their expectations. (This is a good lesson, by the way, about the importance of adjusting your expectations to match observable reality.)

And it's a fair frustration. **Most of the time, the numbers** *don't* **add up.**

Importantly:

This mismatch between expectations versus reality is *not* **because the Energy Balance Equation is wrong, or a myth.** Nobody's body defies the laws of physics, even though it seems like that sometimes.

It's because the equation is more complicated than it sounds.

Many factors affect the Energy Balance Equation; they aren't mutually exclusive. What you do to 'energy in' affects what happens to 'energy out'. And vice versa.

"Eat less, move more" is a good start. (Most of us could probably benefit from eating a little less and getting a little more daily activity.)

But that advice *alone* **isn't enough.** It doesn't take all of the complex, intersecting factors into account.

Let's take a look at some of these factors, starting with the 'energy in' part of the equation.

‘Energy in’ is trickier than you think

Reason 1: The number of calories in a meal likely doesn’t match the number of calories on food labels or a menu.

This might sound hard to believe, but it’s true… the way companies (and even the government) come up with calorie and nutrient estimates is incredibly complex, rather imprecise, and centuries-old. As a result, food labels can be off by as much as 20-25 percent.

And even if those food labels were correct:

Reason 2: The amount of energy a food *contains* **in the form of calories is not necessarily the amount of energy we** *absorb, store, and/or use.*

Remember that the food we eat has to be digested and processed by our unique bodies. The innumerable steps involved in digestion, processing, absorption, storage, and use — as well as our own individual physiological makeup — can all change the energy balance game.

So, for instance:

- We absorb **less energy** from minimally processed carbohydrates and fats, because they’re harder to digest.

- We absorb **more energy** from highly processed carbohydrates and fats, because they’re easier to digest. (Think of it this way: The more “processed” a food is, the more digestion work is already done for you.)

For example, research has shown that we absorb more fat from peanut butter than from whole peanuts. The researchers found that almost 38 percent of the fat in peanuts was excreted in the stool, rather than absorbed by the body. Whereas seemingly all of the fat in the peanut butter was absorbed.

In addition:

- We often absorb **more energy** from foods that are cooked (and/or chopped, soaked, blended) because those processes break down plant and animal cells, increasing their bioavailability.

When eating raw starchy foods (like sweet potatoes), we absorb very few of the calories. After cooking, however, the starches are much more available to us, tripling the number of calories absorbed.

Interestingly, allowing starchy foods to then cool before eating them decreases the amount of calories we can extract from them again. (This is mostly due to the formation of resistant starches).

Finally:

- We may absorb **more or less energy** depending on the types of bacteria in our gut.

Some people have larger populations of a Bacteroidetes (a species of bacteria), which are better at extracting calories from tough plant cell walls than other bacteria species.

Here's an interesting example of this whole process at work. Recently, USDA researchers asked test subjects to consume 45 grams (about 1 ½ servings) of walnuts daily for three weeks.

What they found was that, on average, people only absorbed 146 of the 185 calories in the nuts. That's 79 percent of the calorie content on the label.

In similar research, people also absorbed only 80 percent of the calories in almonds, and 95 percent of the calories in pistachios.

Beyond the average, there were individual differences: Some people absorbed more of the energy in the nuts, while some absorbed less (likely due to the differing populations of bacteria in their large intestines).

In the end, **by eating a diet rich in whole, minimally processed foods,** the number of calories you absorb can be significantly less than what you expect. Plus they require more calories to digest.

Conversely, **you will absorb more calories by eating lots of highly processed foods,** plus burn fewer calories in the digestive process. (In addition, highly processed foods are less filling, more energy dense, and more likely to cause overeating.)

Since the number of calories someone thinks they're consuming could be off by 25 percent (or more), their carefully curated daily intake of 1,600 calories could really be 1,200… or 2,000.

This means:

Energy in = Actual calories eaten – Calories not absorbed

As you can see, there's a big margin of error for energy input, even if you're a conscientious calorie counter. **This doesn't invalidate the Energy Balance Equation. It just means that if you want an accurate calculation, you probably have to live in a fancy metabolic lab.**

For most people, it's not worth the effort (that's why Precision Nutrition moved to a hand-based measuring model for portions).

'Energy out' varies a lot from person to person

'Energy out' — again, energy burned through daily metabolism and moving you around — is a dynamic, always-changing variable.

There are four key parts to this complex system:

1. Resting metabolic rate (RMR)

RMR is the number of calories you burn each day at rest, just to breathe, think, and live. This represents roughly 60 percent of your 'energy out' and depends on weight, body composition, sex, age, genetic predisposition, and possibly (again) the bacterial population of your gut.

A bigger body, in general, has a higher RMR.

For instance:

- A 150-pound man might have an RMR of 1583 calories a day.
- A 200-pound man might have an RMR of 1905 calories.
- A 250-pound man might have an RMR of 2164 calories.

Crucially, RMR varies up to 15 percent from person to person. If you're that 200-pound guy with an RMR of 1905 calories, another guy just like you on the next treadmill might burn 286 more (or fewer) calories each day with no more (or less) effort.

2. Thermic effect of eating (TEE)

This may surprise you, but it takes energy to digest food. Digestion is an active metabolic process. (Ever had the "meat sweats" or felt hot after a big meal, especially one with lots of protein? That's TEE.)

TEE is the number of calories you burn by eating, digesting, and processing your food. This represents roughly 5-10 percent of your 'energy out'.

In general, you'll burn more calories in your effort to digest and absorb protein (20-30 percent of its calories) and carbs (5-6 percent) than you do fats (3 percent).

And as noted before, you'll burn more calories digesting minimally processed whole foods compared to highly processed foods.

3. Physical activity (PA)

PA is the calories you burn from purposeful exercise, such as walking, running, going to the gym, gardening, riding a bike, etc.

Obviously, how much energy you expend through PA will change depending on how much you intentionally move around.

4. Non-exercise activity thermogenesis (NEAT)

NEAT is the calories you burn through fidgeting, staying upright, and all other physical activities except purposeful exercise. This, too, varies from person to person and day to day.

This means:

Energy out = Resting metabolic rate + Thermic effect of eating + Physical activity + Non-exercise activity thermogeneis

Each of these is highly variable. Which means the 'energy out' side of the equation may be just as hard to pin down as the "energy in" side.

So, while the Energy Balance Equation sounds simple in principle, all these variables make it hard to know or control exactly how much energy you're taking in, absorbing, burning, and storing.

Here's the entire equation:

Changes in body Stores = [Actual calories eaten − Calories not absorbed] − [Resting metabolic rate + Thermic effect of eating + Physical activity + Non-exercise activity thermogenesis]

When you try to outsmart your body and it outsmarts you back.

Even if all the variables in the final equation above were static, the Energy Balance Equation would be complicated enough. But things get crazy when you consider that altering any one of the variables causes adjustments in other, seemingly unrelated variables.

This is a good thing, of course. Our human metabolisms evolved to keep us alive and functioning when food was scarce. One consequence:

When 'energy in' goes down, 'energy out' goes down to match it. (You burn fewer calories in response to eating less.)

Not in everybody. And not perfectly. But that's how the system is supposed to work. That's how our bodies avoid unwanted weight loss and starvation. It's how humans have survived for 2 million years. The body fights to maintain homeostasis.

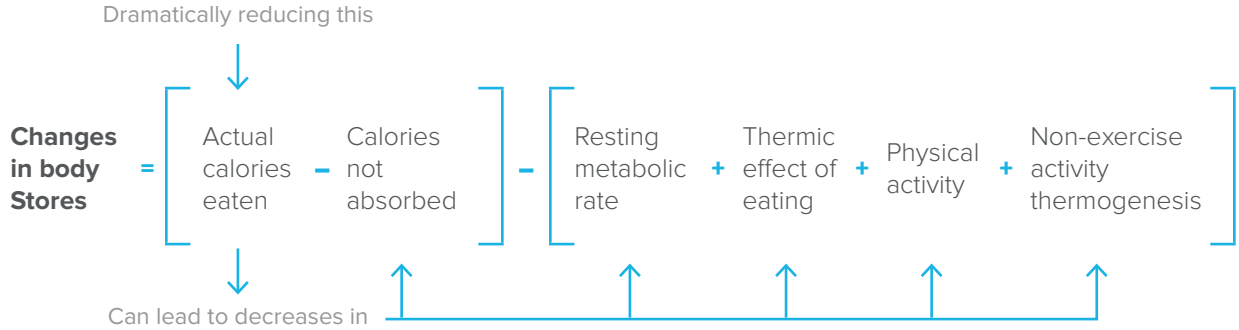
Likewise, when 'energy in' goes up, 'energy out' tends to go up too. (You burn more calories in response to eating more.)

To illustrate this point, here's how your body tries to keep your weight steady when you take in less energy and start to lose weight*:

- **Thermic effect of eating** goes down because you're eating less.
- **Resting metabolic rate** goes down because you weigh less.
- Calories burned through **Physical activity** go down since you weigh less.
- **Non-exercise activity thermogenesis** goes down as you eat less.
- **Calories not absorbed** goes down and you absorb more of what you eat.

* This response is particularly modest at first. But the adaptation really ramps up as you lose more weight. (Or if you're starting out lean and trying to get super-lean.)

Check out what this looks like:



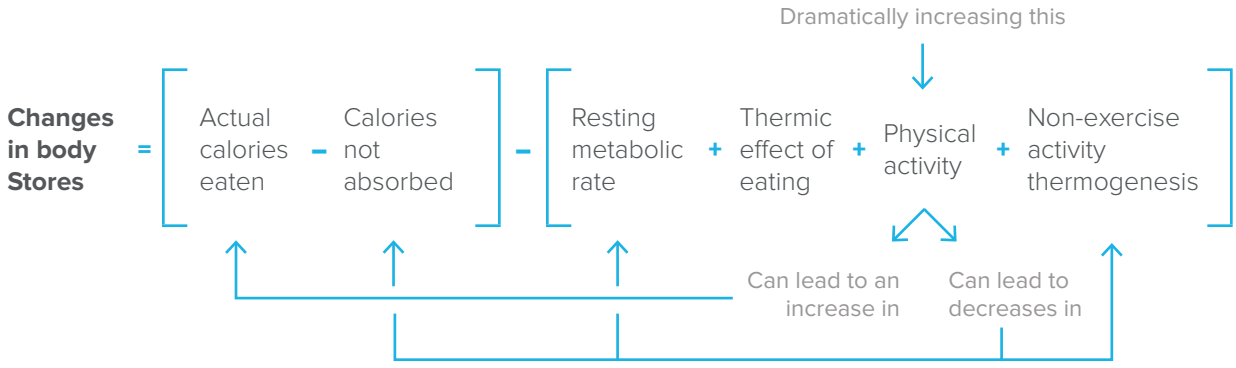
In addition to these tangible effects on the equation, reducing actual calories eaten also causes **hunger signals** to increase, causing us to crave (and maybe eat) more. The net effect leads to a much lower rate of weight loss than you might expect. In some cases, it could even lead to weight re-gain.

To add insult to injury, a rise in cortisol from the stress of dieting can cause our bodies to hold onto more water, making us feel "softer" and "less lean" than we actually are. Interestingly, **this is just one example** of the amazing and robust response to trying to manipulate one variable (in this case, actual calories eaten). There are similar responses when trying to manipulate each of the other variables in the equation.

For example, research suggests that increasing **Physical activity** above a certain threshold (by exercising more) can trigger:

- Increased appetite and more **actual calories eaten**
- Decreased **calories not absorbed** as we absorb more of what we eat
- Decreased **RMR**
- Decreased **NEAT**

In this case, here's what the equation would look like:



In the end, these are just two of the many examples we could share. The point is that metabolism is much more complicated (and interdependent) than most people think.

Understanding energy balance means setting better expectations about body change

It's important to note that if you have lots of body fat to lose, many of these adaptations (i.e. lowered RMR, PA, NEAT, etc) don't happen right away. But, as you become leaner, this "adaptive thermogenesis" kicks in.

It's also important to know that **how your metabolism reacts to changes in energy balance will be unique to you.**

How much you can lose or gain will depend on your age, your genetic makeup, your biological sex, if you've had relatively more or less body fat and for how long, what medications you're taking, the makeup of your microbiome... and probably a whole lot of factors we don't even know about yet.

But let's try to simulate how this could work.

Scientists at the National Institutes of Health have studied the data from people who have lost weight, and created a mathematical model that represents how weight and fat loss actually happens in the real world.

We can play with it, using the Precision Nutrition Weight Loss Calculator.

Let's start with a 40-year-old male, with a starting weight of 235 lbs and a height of 5'10". We'll call him Frank.

Frank works a desk job, and is only lightly active outside of work. This calculates that he needs 2,976 calories of energy per day to maintain his current weight.

By knocking off 500 calories per day, his intake drops to 2,476 calories daily. And he doesn't plan on changing his physical activity.

Now, you've probably heard somewhere that a pound is equivalent to 3,500 calories, which means that if we take away those 500 calories from Frank every day, he should lose 1 pound per week (500 x 7 days = 3500 calories).

He should end up at 183 lbs after one year of consistently eating 500 fewer calories every day. (According to this math, then, he would weigh 0 lbs within 5 years, which should raise some red flags.)

But we know it doesn't exactly work this way in real life.

At the end of a year, Frank gets on the scale. He's 205 lbs.

What the hell?

That's 22 pounds more than I should be!

Frank rages to his wife Maria, who smiles knowingly. She's 40 too, and has been trying to lose weight since having two kids in her mid-30s.

Tell me about it, she says. I've lost and gained the same 10 pounds over and over, even though I've been exercising and eating pretty healthy.

Then they both think:

Maybe I should try that juice cleanse after all. My body is obviously broken.

Nope, nobody is broken. Don't hit that juice cleanse just yet.

Instead, Frank and Maria could both benefit from a clear understanding of how weight loss actually works. Then they can set appropriate behavior goals, and have realistic expectations for their progress.

[Postscript: Frank and Maria decide against the juice fast and enroll in Precision Nutrition Coaching. At the end of a year, Maria's "only" lost a total of 7 lbs, but has gained 5 lbs of muscle (which means she's lost 12 lbs of fat). Her firm arms and glowing skin are the envy of the other moms. Frank is down to a fit 185 lbs and trying to figure out how to convince Maria that he should buy a mountain bike.]

So, does dieting damage the metabolism?

Despite what you may have heard:

Losing weight won't "damage" your metabolism.

But because of the adaptations your body undergoes in response to fat loss (to prevent that fat loss, in fact), **'energy out' for those who have lost significant weight will always be lower than for people who were always lean.**

Rather:

Losing weight, and keeping it off, is accompanied by adaptive

metabolic, neuroendocrine, autonomic, and other changes.

These changes mean that we expend less energy — around 5-10 percent less (or up to 15 percent less at extreme levels) than what would be predicted based on just weighing less.

Unfortunately, because of this adaptive response, someone who has dieted down will often require 5-15 percent fewer calories per day to maintain the weight and physical activity level than someone who has always been that weight.

(Or even less, potentially, because as we learned in the very beginning, the RMR of people of the exact same age/weight/etc. can still vary by up to another 15 percent.)

This means someone who was never overweight might need 2,500 calories to maintain their weight, while someone who had to diet down to that weight may need only 2,125-2,375 calories to hold steady.

We don't know how long this lowered energy expenditure lasts. Studies have shown that it can hang around for up to 7 years after weight loss (or more, 7 years is as far as it's been studied). This likely means it's permanent, or at least persistent.

This is extra relevant for people who have repeatedly dieted, or for fitness competitors who may repeatedly fluctuate between being extremely lean and being overweight in the off-season.

We don't have data to back this up (to our knowledge no one has studied it), but adaptive thermogenesis seems to react more strongly or more rapidly with each successive yo-yo of extreme body fat fluctuations.

All of this explains why some people can feel like they've "damaged" their metabolism through repeated dieting. (And why some experts suggest "metabolic damage" is a real thing.)

But nothing really has been "damaged".

Instead, their bodies have just become predictably more sensitive to various hormones and neurotransmitters. **Their metabolic rates are understandably lower than predicted by various laboratory equations**.

So, where does this leave us?

Body change is going to be harder for some people, and easier for others.

That can mean all physiological changes: weight loss or gain, fat loss or gain, and muscle loss or gain.

But even if your body might resist weight loss, you *can* still lose weight, gain muscle, and dramatically change your body.

Our men's and women's Finalist Halls of Fame are clear evidence of that.

What to do next:
Some tips from Precision Nutrition

The physiology of weight loss is complicated, but the best strategies for losing fat and keeping it off don't have to be.

1. Eat plenty of protein.

Protein is essential when losing weight / fat for a few reasons.

- Protein helps you keep that all-important lean body mass (which includes connective tissues, organs, and bone as well as muscle).
- Protein significantly increases satiety, which means you feel fuller despite eating less. (And eating more protein often causes people to eat less overall.)
- Just by eating more protein you burn more calories, because of the increased thermic effect of eating.

For example, if you're eating 2,500 calories daily, 15 percent from protein, 50 percent from carbs, and 35 percent from fats (roughly average for US adults), you're burning approximately 185 calories per day through digestion.

Maintain your total calorie intake but increase protein to 30 percent, drop carbs to 40 percent, and whittle fat to 30 percent, and your TEE goes up to roughly 265 calories per day.

- For most active men: 6-8 palm-sized servings of protein per day.
- For most active women: 4-6 palm-sized servings per day.

2. Eat a wide variety of fruits, vegetables, quality carbs, and healthy fats.

Vegetables are loaded with vitamins, minerals, phytonutrients, water, and fiber to help you fill up during meals, stay full between meals, keep you healthy, and recover from your workouts.

- We recommend 6-8 fist-sized servings per day for most active men.
- And 4-6 fist-sized servings per day for most active women.

The carbs will fuel training, boost leptin (a super important hormone that regulates hunger), keep up sex hormones, and prevent feelings of deprivation.

And the fats also keep up sex hormones, boost the immune system, suppress excess inflammation, and make food taste really good.

- For most active men, this would be 6-8 handfuls of quality carbs, and 6-8 thumbs of healthy fats per day.
- For most active women, 4-6 handfuls of quality carbs and 4-6 thumbs of healthy fats per day.

3. Adjust your intake as you plateau, or to prevent plateaus.

As your weight loss progresses, you will need to lower your calorie intake further to continue to progress, as your smaller body will burn fewer calories, and your body is adapting to your diet.

Be ready, willing, and able to adjust portion amounts by removing 1-2 handfuls of carbs and/or 1-2 thumbs of fats from your daily intake. Then reassess and continue to adjust as needed.

However, one study found that weight loss plateaus have less to do with metabolic adaptations and more to do with "an intermittent lack of diet adherence". In other words, not actually sticking to a nutrition plan consistently.

Research shows that we usually think we're eating less and exercising more than we truly are. So do an objective review of your actual energy in and out before assuming your body is blocking your efforts.

4. Understand that this is complex.

So many things influence what, why, and when we choose to eat.

Too often, eating and body size / fatness are blamed on lack of knowledge, lack of willpower / discipline, or laziness. In reality, food intake and body composition are governed by a mix of physiological, biological, psychological, social, economical, and lifestyle influences, along with individual knowledge or beliefs.

One of the simplest ways to make your decision processes easier is to create an environment that encourages good food choices and discourages poor ones. This can mean making changes to your daily routine, who you spend time with, where you spend time, and what food is readily available to you.

But remember that weight loss can and should be relatively slow, so **aim to lose about 0.5-1 percent of your body weight per week.**

This helps to maintain muscle mass and minimize the adaptive metabolic responses to a lower calorie intake and resulting weight loss. Faster weight loss tends to result in more muscle loss without extra fat loss, as well as a larger adaptive response.

5. Cycle calories and carbs.*

For folks who are trying to get quite lean, at some point you can't just rely on linear dieting to get you there. By strategically cycling calories and carbs, you can help to limit how much the metabolism-regulating hormone leptin drops (or temporarily boost it back up) – attenuating the adaptive and hunger response.

*Note: This is a higher-level strategy for fitness competitors and elite athletes who need to get very lean (i.e. ~6-9 percent body fat for men, and ~16-19 percent for women). It's not something for the average person.

6. Refeed periodically.**

When getting to extreme levels of leanness, even strategic calorie and carb cycling might not be enough. So take out the big guns, and employ some periodic re-feeds to temporarily boost leptin and insulin and keep fat loss going.

**Note: This is a higher-level strategy for fitness competitors and elite athletes who need to get very lean (i.e. <6 percent body fat for men, and <16 percent for women).

7. Do a mixture of resistance, cardiovascular, and recovery activity.

Resistance training helps you maintain vital muscle mass, burn calories, and improve glucose tolerance. Cardiovascular exercise improves the health of your cardiovascular system, helps you expend energy, and can improve recovery.

But don't overdo either one.

Recovery work (e.g. foam rolling, walking, yoga) helps you maintain consistency and intensity with resistance and cardio training, making them more effective. And it helps to decrease stress (lowering cortisol), which also helps you lose body fat and keep it off.

Aim for 3-5 hours per week of purposeful activity.

8. Find ways to increase NEAT.

Get a stand-up or treadmill desk, fidget, pace when on the phone, take the stairs, park farther away from where you're going, etc. These small increases in activity can make a big difference, and can account for hundreds of daily calories.

9. Develop a solid nightly sleep routine and manage your stress.

Sleep is just as important to your success as nutrition and activity levels. Don't pretend that you can get by with less. It simply isn't true.

Often, when people lower their stress, they lose a lot of body water. Then they also notice that they may have lost fat too. (Plus, they may discover that chronic inflammation goes down — another win.)

This includes mental and emotional stress. Research on cognitive dietary restraint (i.e. worrying and stressing out about food) shows that constantly and negatively fixating on what you eat (or don't) can have the same unhealthy effect as actually dieting stringently.

Yet we need some stress to actually help with progress and growth, so find your stress sweet spot.

10. Have some self-compassion.

There are going to be meals or days where you don't eat as you "should". It's OK. It happens to everyone. Recognize it, accept it, forgive yourself, and then get back on track.

Research actually shows that self-compassion and flexible eating is associated with lower BMI and a healthier body weight, lower self-reported calorie intake, less anxiety and stress, and a better relationship with food.

And make sure that the body you really want aligns with the life you really enjoy. Understand what is required to reach different levels of body composition. Consider the impact that will have on your life, and choose accordingly.

RESEARCH REVIEW: THE BIGGEST LOSER STUDY

Is it impossible to sustain weight loss in the long term?

By Helen Kollias

What happens to the body weights and metabolisms of *The Biggest Loser* contestants after they appear on the show? Why? And what does this mean for everyone else who wants to lose weight and keep it off?

Nine in 10 people want to lose weight. So it's no wonder the NBC reality show *The Biggest Loser* has become wildly popular.

Competitors running on treadmills with tears streaming down their faces.

Trainers screaming motivational slogans… or just screaming.

How-this-happened-to-you montages set to emotive music.

And successful contestants who've lost significant weight — sometimes hundreds of pounds — holding their "before" jeans next to their new bodies.

The Biggest Loser is pure TV gold.

But is it gold for the contestants themselves? A just-released study — shedding not-so flattering light on what happens after the show — suggests not.

Here's the media narrative of what happened:

- *The Biggest Loser* contestants regain most (or all) of the weight once cameras get turned off.
- This is caused by and/or leads to damaged metabolisms, psychological trauma, and shame.
- Trying to lose weight and keep it off is hopeless.

But is this story true?

What does the study prove?

And is it *really* impossible to sustain weight loss?

Let's dig a little deeper.

Research questions:

What happens to the body weights and metabolisms of *The Biggest Loser* contestants in the years after they appear on the show? Why? What does this mean for regular folks who want to lose weight and keep it off?

Here's a study that dug into these questions:

Fothergill E, Guo J, Howard L, Kerns JC, Knuth ND, Brychta R, Chen KY, Skarulis MC, Walter M, Walter PJ, Hall KD. Persistent metabolic adaptation 6 years after "The Biggest Loser" competition. Obesity (Silver Spring). 2016 May 2. doi: 10.1002/oby.21538.

This study looked at three key indicators in 14 men and women who participated in season 8 of *The Biggest Loser* (2009):

- **Body composition** is someone's ratio of fat mass to lean mass (muscle, bone, etc.). For good health and physical function, we want less fat mass and more lean mass in general.
- **Resting metabolic rate (RMR)** is the number of calories a resting body burns in a day, without activity. Weight loss aside, smaller bodies require less energy to maintain and should have lower RMRs. Bigger bodies require more energy and should have higher RMRs.

- **Leptin levels:** Leptin is a hormone that, among other things, gets released after we eat, suppressing our appetite and increasing energy expenditure to help keep our calories in / calories out balanced and our weight stable. In general, the more fat cells in your body, the higher your leptin. Since leptin helps regulate RMR, the two should rise and fall together.

Now, in case you're not caught up on your reality TV watching, here are a few important things to know.

- When the filming starts, *The Biggest Loser* participants are morbidly obese (exceeding their ideal weight by 100 pounds or more).

- Over the course of 30 weeks, they're supervised and coached by the show's trainers and doctors.

- Contestants eat **a diet restricted to about 1200 calories per day.**

- Contestants do *at least* **of 90 minutes of intense exercise per day, 6 days a week**.

- After filming the show, contestants return to "real life" **without continued supervision or guidance as to how to maintain their nutrition and exercise regimen.**

Methods

Initial assessment

Before their first appearance on the show in 2009, contestants went through a battery of tests that assessed things like:

- RMR (in other words, basic metabolic activity of being alive);
- physical activity expenditure (in other words, exercise);
- total energy expenditure (how much energy people were expending in a day through metabolism and physical activity together); and
- blood chemistry.

Follow up

In 2015, six years after their run on the show, subjects returned to the laboratory for a complete follow-up.

Two weeks before the study officially started, participants weighed themselves on a special digital scale that transmitted their data to the researchers.

This early start helped ensure that people didn't try to change their weight before the study began, which would skew the results.

Once in the lab, researchers again measured the subjects' RMR, total energy expenditure, and physical activity expenditure. They also performed bloodwork.

They then compared the results of their 2015 testing and their 2009 testing. Here are the results...

Results

Weight

Average weight before filming *The Biggest Loser*: 328 lb.

Average weight after 30 weeks on *The Biggest Loser*: 199 lb.

Average weight six years after final on camera weigh-in: 290 lb.

This means that, on average, participants regained 70 percent of the weight they'd lost. (Although they did keep off 30 percent of it.)

Resting metabolic rate

Average RMR before filming: 2,607 kcal burned / day.

Average RMR after 30 weeks on the show: 1,996 kcal burned / day.

Average RMR six years after final weigh-in: 1,903 kcal burned / day.

Surprisingly, despite their weight regain, participants were burning 700 fewer calories per day at rest vs. when they started the show. This is about 500 fewer calories than we'd expect them to burn based on predictive equations that take into account their body weight.

Lean body mass (an indication of muscle mass)

Average lean body mass before filming: 167 lb.

Average lean body mass after 30 weeks on the show: 142 lb.

Average lean body mass six years after final weigh-in: 155 lb.

Participants lost 25 lbs of lean mass during the filming of the show. They did end up gaining about 13 lbs of it back. However, that didn't help to elevate their RMR, as we might have expected.

Leptin

Average leptin before filming: 41.14 ng/mL

Average leptin after 30 weeks on the show: 2.56 ng/mL

Average leptin six years after final weigh in: 27.68 ng/mL

As you'd expect, participants' leptin levels went down when fat decreased, and went up again when fat came back.

So, why did they regain the weight?

That's a complicated question. But the study's findings give us big clues, and new discoveries for our understanding of metabolism.

Many people assume that weight loss — and sustaining weight loss — is purely *psychological*.

If you don't have the mental strength and willpower to pass on the chili cheese fries, then you're essentially choosing to gain back the weight, right?

But the *Biggest Loser* data illuminate the important *physiological* roadblocks contestants face.

Metabolic adaptation

We already know that when you lose weight, your metabolism slows. **This is called metabolic adaptation, and it's normal.**

Metabolic adaptation is a natural defense mechanism against starvation. When you're dieting, at a certain point, your body will send up a red flag.

Starvation alert!

There's not enough food to go around!

Hold onto the fat reserves!

At that point, your RMR slows.

Metabolic adaptation can make things more complicated (and frustrating) for dieters who hope to continue or maintain their weight loss.

Once their body's red flag goes up, calorie restriction no longer has the same effect it did at the beginning of their diet.

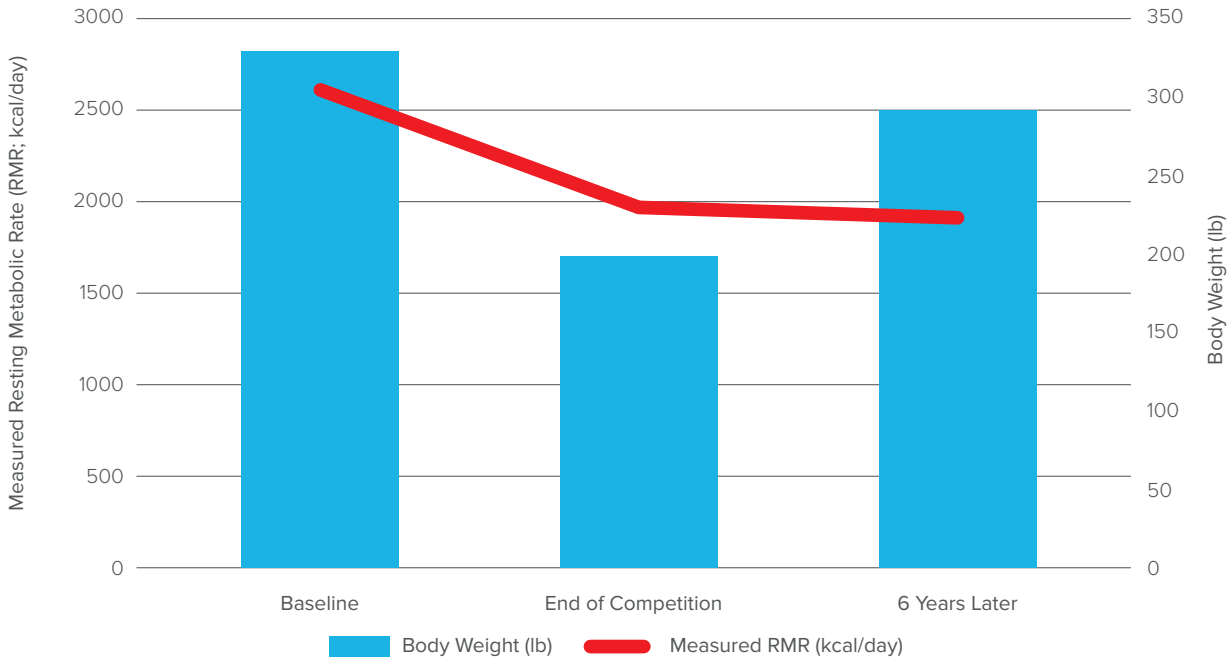
Suddenly, they need to cut *more* calories just to maintain the same weight.

While this is sometimes framed as metabolic damage, it's really just your body's way of trying to keep you alive and well.

What was interesting about this study? It showed that participants' RMR stayed low despite:

- **Weight regain:** Even though participants were larger six years later, they weren't burning more calories at rest.
- **Muscle maintenance:** Theoretically, the more muscle you have, the more calories you burn at rest. But it's not helping these participants' RMR.
- **Time passing:** We used to think that metabolic adaptation may reverse with time, and it might. But here we see that even six years isn't enough.

In the end, as you can see in the following graph, participants' metabolisms were just as low after six years (and after regaining almost 100 pounds) vs. the end of the show, when they were their lightest.



Leptin

As expected, *The Biggest Loser* participants experienced a huge drop in leptin when they lost weight in 2009. When they regained weight, leptin rose accordingly. But there are two sticking points here:

- **"Normal" leptin doesn't mean it's easy to control your appetite.** Pre-Biggest Loser, these folks were used to eating a certain amount; now they need less to stay smaller. Of course, if they (unconsciously) went back to those same amounts, rather than following their natural physical satiety signals, it's easy to understand why they gained weight.

- **The participants' leptin and RMR are no longer linked.** If the two usually rise and fall together, why didn't RMR go back up — as leptin did — when the weight was regained? This could also lead to weight regain. Even if participants followed hunger cues and stopped eating when satisfied, they'd be eating more than needed considering their low RMR.

Putting all this together, in order to sustain their weight loss, *The Biggest Loser* participants would have to:

- **Eat 500 fewer calories per day than their bodies are telling them to eat.** That's 25 percent less than a person who always weighed 199 pounds or never experienced significant weight loss.

Or...

- **Expend 500 more calories a day than their bodies tell them they should.** That's an intense workout — like running fast for an hour.

All while...

- **Feeling hungrier than they should.** Again, the participants' leptin levels may be normal — but since their metabolic rate didn't rise with it, eating with their physical hunger cues may actually cause them to consume more calories than they're burning.

Yea, that sucks. No wonder these folks have trouble keeping the weight off.

Does this mean it's impossible to sustain weight loss?

It's clear that, when you lose a lot of weight, you're up against a lot of very real physiological changes if you want to maintain the weight loss.

But there's a lot of important information we don't have about *The Biggest Loser* contestants.

What goes on behind the scenes?

The Biggest Loser is a television program. It's not itself a controlled research group or scientific experiment. With this study, researchers are trying to make sense of what happened after the fact.

The initial conditions themselves are mostly a mystery. That means all kinds of factors could have influenced the outcomes.

- What kinds of foods were they eating?
- Were they eating whole foods or processed "diet" foods?
- Did they take any supplements or drugs?
- Could psychological stress have played a role?

We just don't know. But all of these factors could affect the contestants' ability to sustain weight loss.

What are the participants' lives like?

The participants reported maintaining *The Biggest Loser*-approved nutrition regimen and exercise level over the six-year period. *But:* Self-reported data are notoriously unreliable. It's not a flaw of these particular people, it's just how humans work.

Some of the participants were able to keep weight off for years before it returned. So questions arise like:

- Is the weight regain the result of unfortunate physiology, exclusively?
- Are they eating more and exercising less than they think they are?
- Is psychological stress from weight regain in a public setting playing a role?

Here again, we don't have answers, and all of this can affect a person's ability to maintain their weight.

Did they regain the weight because they lost it so quickly?

The Biggest Loser program helps contestants lose weight at a rate you rarely see elsewhere. Many people are speculating that this is the reason for the participants' persistent metabolic adaptation and weight regain.

That's a convenient explanation, but not necessarily an accurate one. Another study compared *The Biggest Loser* participants' weight loss with gastric bypass (Roux-en-Y) patients about six months after surgery and found something surprising.

- The two groups lost a comparable amount of weight in half a year, but **the gastric bypass patients experienced** *half* **the metabolic adaptation.**

- After a full 12 months, and after losing even more weight, **the gastric bypass group had a very slightly higher metabolism than predicted** (+8 calories per day).

- What's more, **the gastric bypass group didn't lose any more muscle (lean mass) than** *The Biggest Loser* **group, despite not having structured exercise program.**

Obviously, gastric bypass is about as fast as it gets. So how fast you lose the weight isn't likely the determining factor.

But even if *The Biggest Loser* study suggested that rapid weight loss is not effective, **there's no reliable data indicating that slow weight loss is more effective.**

Nevertheless, it's not impossible to sustain weight loss.

Some people found this study — and its media interpretations — really disappointing. If the body fights back against weight loss, does that mean there's no hope for folks who have a lot to lose?

Others found the results somewhat reassuring. It relieved some of the sense of failure or shame around re-gaining weight. It acknowledged the difficulty and proved that it's not all mind over matter.

But, while this study does reinforce the importance of compassion, it doesn't indicate that long-term weight loss is impossible.

The study suggests that extreme dieting comes with consequences. Reduce your calories to an extreme and your body will likely fight back. Maybe for years. Maybe forever.

But you can sustain weight loss for the long term by effectively controlling your energy intake during (and after) whatever nutrition program you choose.

Five strategies to sustain weight loss

1. Use a habit-based approach.

A more sustainable, habit-based approach that doesn't include a drastic calorie deficit could give you a better chance at adapting — physiologically and psychologically — to a healthier lifestyle, without your metabolism coming to a screeching halt.

This point of view is consistent with *The Biggest Loser* paper, which closes with recommendations to focus on health markers like insulin and triglyceride levels rather than weight loss, and to take a more

moderate approach with exercise and calorie reduction.

In Precision Nutrition Coaching, we use a habit-based approach to gradually — over the course of a full year — introduce our clients to small, manageable daily practices that support healthy eating and movement.

We keep in touch with past clients, and in the overwhelming majority of cases we're hearing that the habits continue working to help them regulate their energy intake after the 12-month coaching program.

We're working on a follow-up study to quantify clients' weight maintenance; early data are promising.

2. Eat slowly.

This is a foundational habit in Precision Nutrition Coaching.

Many studies show that people who eat faster are heavier than people who eat slowly, and that people who train themselves to eat more slowly eat less, and lose weight as a result.

There's a 20-minute delay in satiety hormone signaling when you eat, so if you plow through a huge plate of food in 10 minutes, you're liable to eat it all before you realized you're actually stuffed.

In fact, it's proven that simply reducing the number of bites you take per minute by half is effective at reducing your energy intake by 40 percent, particularly in big eaters. That's why we coach our clients to eat slowly.

Play a game with yourself: Try to be the last one eating — even after your slow-as-molasses toddler). Tune into hunger and satiety cues, which tell you how much food you really need.

3. At meals, eat until you're satisfied, not stuffed.

If you're saying, "I'm stuffed!" after your meals, you're probably overeating and/or eating for the wrong reasons, which will make it very challenging to control your energy intake.

Another keystone from Precision Nutrition Coaching: Eat until 80 percent full. This helps ensure that you're not eating more than you need by:

- Helping you connect with your physical hunger cues (good old leptin!)
- Decoupling eating from emotions
- Breaking the deprivation/binge pattern and mindset
- Regulating your appetite

Feeling full, anxious, lethargic, foggy-headed, heavy, or extremely thirsty are signs of overeating that warrant an 80-percent experiment.

Next time you eat lunch, eat slowly, take a good break after each bite, and ask yourself, "Am I still truly, *physically* hungry?"

If the answer is yes, take another bite, chew slowly, and repeat. If the answer is no, end the meal and start monitoring fullness/hunger cues until dinner.

4. Reduce stress.

The Biggest Loser study authors didn't look at the stress hormone cortisol, which is a shame.

When you experience psychological stress, cortisol shoots upward.

Research has linked increased cortisol with weight gain, likely due to poorer food choices and physiological changes.

It's conceivable *The Biggest Loser* participants experience considerable psychological stress: Undergoing an intense weight-loss program on national TV; airing their traumas to the world; regaining the weight when everyone knew they'd appeared on the show; feeling the shame of "failure".

Every day, take steps to reduce your stress level and recover from all the hard work you do — physical and otherwise.

Some ideas:

- Sit and read a book
- Go for a walk
- Play with your cat
- Get a massage
- Take a warm bath
- Meditate
- Do yoga

Of course, what you find rejuvenating might be unique to you. Just be honest with yourself: Some activities that have the reputation for being relaxing — say, watching TV or throwing back shots at the bar — may be more escapism than true stress reducers.

5. Put your environment to work.

Change is hard for most people, and it's partly due to our hardwiring. Research shows that most of the decisions we make are automatic, based on patterns and brain shortcuts as opposed to rational thought.

We react to what's in front of us, and our actions are often impulsive and/or the result of motivations we're not fully conscious of.

That means our environment powerfully shapes our decisions — including food decisions — more than we realize.

We eat whatever's in front of us, finish all the food regardless of portion size, consume more when we're multitasking… and more.

Tough to change your eating habits when those habits are based on thoughts you didn't know you were having, huh?

But you can use this hardwiring to your advantage by putting your environment to work to control your energy intake:

- Keep fresh fruits and vegetables within view
- Park far from the office so you have to walk
- Don't keep junk food at home
- Get a dog that needs walking

Precision Nutrition coaches are full of environment changing tips — they're truly ingenious.

What to do next:

Shifting your mindset from “this is impossible” to “I can do this” will take time. But there are steps you can take today to get on the path to achieving — and sustaining — a healthy weight.

Let it be.

So you’ve struggled to lose weight, or you’ve struggled to keep it off.

So what?

For many people, a sense of shame, failure and fault is caught up in weight gain. When we can remove these from the equation, we can have a better experience, and possibly better results.

Don’t beat yourself up. Losing weight and keeping it off is challenging and complicated — especially in the context of real human life.

Precision Nutrition Coaching clients hear this over and over: Each day is a clean slate. It’s yours for the taking.

Aim for healthy, not ripped.

The Biggest Loser participants lose enough weight to appear on the cover of *People*. For the vast majority of people, getting magazine-cover ready is a goal neither realistic nor worthwhile — and luckily, you don’t have to turn yourself into a reality TV marketing machine.

More realistic expectations usually mean better long-term adherence to healthy eating and movement and help mitigate your stress response to a weight loss program.

Telling yourself yet again that "today is the day" you're going to start eating and looking like Jessica Biel / Brad Pitt / whoever?

Dial it back.

Pick one, simple health-supporting habit you want to concentrate on and put your effort towards that for 2-3 weeks before adding anything else to your list.

Talk to your people.

What we do know about *The Biggest Loser* participants' lives? They went from 30 weeks of intensive support to... zilch.

Research shows that a supportive social environment makes weight loss and maintenance more likely.

Of course, as you probably already know, getting family, friends, coworkers, and others "on board" with any new lifestyle habits comes with its own challenges and doesn't happen overnight.

A great place to start? Connect with them. Talk to them about what you're trying to do with your focused nutrition and exercise practices. Listen to what's going on in their lives.

Having understanding and compassion for yourself and the people around you will become the foundation of a healthy lifestyle that lasts.

Want to learn more?

If you'd like to learn more about helping people find the best way of eating for them, check out our Precision Nutrition Level 1 Certification program; the next group kicks off soon.

The Precision Nutrition Level 1 Certification gives you the knowledge, systems, and tools you need to build a rewarding career as a fitness and nutrition coach.

Developed over 10 years, and proven with more than 100,000 clients, our curriculum stands alone as the authority on the science of nutrition and the art of coaching.

Whether you're already mid-career, or just starting out, the Level 1 Certification is your springboard to a deeper understanding of nutrition, the authority to coach it, and the ability to turn what you know into results.

Visit this link for more information:
http://get.pn/level-1

[Of course, if you're already a student or graduate of the Level 1 Certification, check out our Level 2 Certification, an exclusive year-long Master Class for elite professionals looking to take their nutrition knowledge and coaching techniques to the highest possible level.]