

Metabolism Report, Part I

Fundamentals of Energy Metabolism and How Weight Loss Works

By James S. Fell, MBA, CSCS

Introduction

This is a complicated area of study and I'm going to summarize the facts as best I can without turning this into a massive text book.

Among other things, I recently read all 400 pages of *Physical Activity and Obesity*, which was edited by the internationally-renowned obesity researcher Dr. Claude Bouchard, and includes 19 chapters written by 35 contributors with impressive academic credentials. There is a bunch of stuff about respiratory quotient, sympathetic nervous system activity, free fatty acid concentrations, lipolytic response, lipoprotein lipase activity; the list goes on.

It is all interesting and important information... for scientists, but I just don't think you need to know all that because the end result boils down to the same basic solution for losing fat, building muscle and "getting in shape:"

- Eat a healthy, calorie-reduced diet that is low in bad fats, low in processed foods, and high in whole grains, fruits and vegetables, low-fat dairy, and contains moderate amounts of lean meats
- Exercise frequently and at high intensities

That's it. That's what you need to do. There is a crapload of science behind all of it, but the solution to the problem doesn't change.

Nevertheless, there is stuff that is valuable for the non-scientist to know, because knowledge is power. Knowing this makes you more in tune with what's going on with your body and will do wonders for your commitment to reaching your goals. Therefore, I've picked and chosen basic aspects of energy metabolism to relay here that I think will give you a solid understand of how things work to assist you in your weight loss and muscle building goals, as well as armor you against dieting and fitness scams.

What is Metabolism?

According to www.medterms.com, metabolism is "The whole range of biochemical processes that occur within us (or any living organism). Metabolism

consists both of anabolism and catabolism (the buildup and breakdown of substances, respectively). The term is commonly used to refer specifically to the breakdown of food and its transformation into energy.”

In relation to fat loss, you are mostly concerned with that last sentence and the rate at which it takes place.

The First Law of Thermodynamics

This is the one that states: “Energy can neither be created nor destroyed.¹” Energy can, however, change forms. Food contains energy and this energy is measured in the form of a kilocalorie. A kilocalorie equals a thousand calories (lower case “c”) and it can also be represented as a Calorie (upper case “C”).² Whenever someone talks about “calories” and associating a number to it, they are actually talking about “Calories.” Get it? To elaborate, the typical bottle of beer contains:

- 150 Calories
- 150,000 calories
- 150 kilocalories

Now you understand why, being the anal SOB that I am, I write Calories with a capital “C” whenever a number is associated.

Back on track; food does more than taste good and provide us with an excuse to invite attractive people for a night out, it is a vital source of energy for our bodies, and our bodies are constantly burning this energy or utilizing it in other ways. Portions of energy from protein can be synthesized into muscle tissue, and carbohydrates and fat can be utilized as mechanical and heat energy. What it boils down to, quite simply, is that because of the first law of thermodynamics, weight loss is a simple mathematical equation of calories in vs. calories out. The energy you take in can’t be destroyed, only converted. When you take in more calories than you burn you create an energy surplus and this surplus gets stored as fat (a form of energy) or can also be converted to muscle if you are weight training. Conversely, when you take in fewer calories than you burn you are creating an energy deficit, and your body is then going to burn off fat stores to compensate for the energy deficit. If you’re doing it wrong, you’ll also lose muscle.

The vast majority of the scientific health community knows and accepts this. The first law is the most secure of all basic laws of science. Remember, it’s not just a “theory,” but a physical law, like the law of gravity. You can’t dismiss it anymore than you can dismiss the fact that if you jump out of an airplane without a parachute that gravity will not be your friend.

Any “diet guru” who says that weight loss is something other than calories in vs. calories out is contradicting hundreds of years of accepted science. If they could

disprove calories in vs. calories out then they would also disprove the first law of thermodynamics, which would surely garner them a Nobel Prize in physics. That particular Nobel has yet to be awarded.

In other words, these diet gurus are just plain wrong (and I suspect many know they are, yet don't care because sensationalism sells and they've got a product to flog). Unfortunately, many people are buying what they're selling.

There are those in this world who believe weird stuff and outlandish claims. You know some of them. There is a book about them by Michael Shermer called *Why People Believe Weird Things*. In it the author explained, "More than any other, the reason people believe weird things is because they want to... It feels good. It is comforting. It is consoling." What's more, he asserted that "smart people" could be more susceptible to believing in weird things than others.

I'm telling you this because there are a lot of Atkins fans on the Internet who will argue against the first law to the death, and this does not make them bad people.

As far as the proselytizers go, the diet and fitness gurus call themselves "controversial," like being controversial is a good thing. They try to convince you that there is some vast conspiracy that *they* don't want you to know about and that they have the real *secret* to weight loss.

Let me ask you one question: The next time you get on an airplane, would you rather it was designed, built and tested in a "controversial" manner, or in a scientifically proven and accepted one?

I thought so.

Counting calories that go in is easy, it's the calories out part that gets complicated, and this is where metabolism (and genetics) comes in.

Important Caloric Measurements

Below is a list of accepted approximations:

Calories In

- One gram of protein contains 4 Calories (note the capital "C")
- One gram of carbohydrate contains 4 Calories
- One gram of fat contains 9 Calories – this is one of the main reasons why eating too much fat makes you fat. It has a significantly higher caloric density and it does a poor job of satisfying hunger

Calories Out

- One pound of stored body fat contains 3,500 Calories
- One pound of body muscle contains about 600 Calories *when used as fuel* (which is bad). However, because of the complex set of reactions taking place, it requires *approximately 2,500* Calories in order to *build* a pound of muscle.

In order to burn off one pound of fat, you need to consume about 3,500 fewer Calories than you burn. This is called creating a **caloric deficit**. Unlike government budgets, in the case of weight loss a deficit is a good thing. If you were to spread this out over the course of a week, it equals an average daily deficit of 500 Calories to burn off a pound of fat.

When done correctly, it is easy to ensure that (over time) all of the weight you lose comes from fat stores and none from muscle. It is perfectly reasonable to expect that you can build muscle at the same time you burn fat for relatively untrained people. (For the well-trained it is more challenging.) Note that building muscle and burning fat are two different metabolic processes, and the people who focus on muscle-building phases and fat burning phases are often part of the bodybuilding crowd, which I believe represents an unhealthy extreme. I encourage you to focus on building muscle and losing fat at the same time if those are your goals.

Some good news is that weight training causes a portion of your caloric intake to turn into muscle, which you want because it helps in creating an overall negative energy balance (a caloric deficit). Although as I already pointed out the amount of energy used to build a pound of muscle is only 2,500 Calories, so it's not the caloric equivalent of a pound of fat. Also, the vast majority of people gain muscle slowly, so I wouldn't worry too much about calories getting partitioned towards muscle building if you're focusing on losing fat too. Just focus on caloric deficits and note that if you're also doing vigorous resistance training that this is helping a little in terms of redirecting some of your caloric intake in a positive way.

Total Daily Energy Expenditure (TDEE)

When it comes to burning calories, this is the overall number that you need to focus on; it is a function of four different things:

- Resting Metabolic Rate (RMR)
- Thermic Effect of Food (TEF)
- Non-Exercise Activity Thermogenesis (NEAT)
- Voluntary Sport or Exercise (sorry, no acronym for this one)

Resting Metabolic Rate (RMR)

RMR makes up the majority of most people's daily caloric burn. It is the calories you burn doing nothing: just being alive and lazing around. It maintains your body temperature, pumps blood, makes your brain and organs work etc. Every time

you engage in an activity you are burning calories over and above RMR. In most sedentary adults, RMR accounts for 60-70% of their daily caloric burn.³

We're going to use the Muffin equation for calculating RMR, and this is in metric, so since you're going to need a calculator anyway let's start with giving some conversions out to my American friends:

- To calculate weight in kilograms, divide # of pounds you weigh by 2.2
- To calculate height in centimetres, multiply # of inches tall you are by 2.54

Ladies first:

Calculating RMR for women:

$(10 \times \text{weight in kilograms}) + (6.25 \times \text{height in centimetres}) - (5 \times \text{age}) - 161 = \text{RMR}$

Calculating RMR for men:

$(10 \times \text{weight in kilograms}) + (6.25 \times \text{height in centimetres}) - (5 \times \text{age}) + 5 = \text{RMR}$

Let's do me. I weigh 77.3 kg (170 pounds), am 183 cm (6 feet even) and 42-years old. Therefore:

773 (my weight in kg X 10) + **1143.75** (6.25 X my height) – **210** (5 X my age) + **5** = **1712** Calories per day burned via RMR.

When it comes to figuring out the "calories out" portion of weight loss, you'll find that there are a lot of approximations going on, so if you don't want to run through that calculation, then just take your weight in pounds and factor by ten if you are male, and by nine if you are female, and it will give you a good idea of your RMR. Had I done that, 170 pounds X 10 = 1700 Calories, which is pretty damn close to 1712.

Quick (but less accurate) Method for Calculating RMR

I'll repeat what I put in the above paragraph for the skimmers:

- Quick RMR for men = # of pounds X 10 (gives you approximate Calories burned each 24-hours via RMR)
- Quick RMR for women = # of pounds X 9 (gives you approximate Calories burned each 24-hours via RMR)

Thermic Effect of Food (TEF)

Good news for a change, did you know that about 10% of the calories you consume are freebies? This is because TEF burns calories in the act of digesting them. However, not all calories are created equal. The three different macronutrients (carbohydrates, protein and fat) all have different TEF percentages:

- TEF of protein is approximately 25% of its total Calories

- TEF of carbohydrates is approximately 10%
- TEF of fat is a subject for debate, but is likely less than 5%⁴

Overall, about 10% of a typical person's daily energy expenditure will come from TEF.⁵ Also, before you decide to start a high-protein diet because of its high TEF, make sure you read the next chapter on metabolic myth busting, because when you run the numbers it doesn't add up to bugger all.

Non-Exercise Activity Thermogenesis (NEAT)

Thermogenesis is a fancy word for the body creating heat, meaning that it is burning calories. There are two types of NEAT, voluntary and involuntary. Involuntary NEAT has a considerable genetic determinant because it comes from things like fidgeting and toe-tapping. Some people just can't sit still and this means they burn extra calories throughout the day. Twitchy, annoying, lucky bastards.

Voluntary NEAT is every act of movement you intentionally make throughout the day that does not qualify as sport or exercise. It is walking, cleaning, job-related activity, yard work, taking out the garbage, and even sex (I assume that when you fornicate it is a voluntary activity). The biggest variable for NEAT is often occupation. I sit on my ass much of the day staring at a computer, talking on the phone, or meeting with clients; I don't burn a lot of extra calories doing this. I do help around the house a fair bit though, so this adds to my total caloric burn above RMR.⁶

Exactly how many calories you burn in a day via NEAT is variable. The more time you spend on your ass, the lower the number. One of the benefits of getting in good shape is that you will find you have higher energy levels and as a result your NEAT calories likely will increase as well because you will want to do more. Doing chores around and outside the house may not seem like such a drag anymore because of your higher energy levels.

Calories Burned via Sport and/or Exercise

This is the one you have the most control over and from a fat loss perspective it is an important tool in creating consistent caloric deficits. The calculation is simple:

Intensity of Exercise X Duration of Exercise X Individual Physiology = Calories Burned

Whenever you hear that [activity "x"] burns such and such calories per hour, they are leaving out the critical aspect of individual metabolic rate. For example, while out for a jog a 120-pound woman isn't going to burn nearly as many calories per hour as a 200-pound man will.

And this is why knowing your RMR is so important. If you didn't do the calculation for it, then go do it now. If you're lazy, then remember the quick method of weight in pounds X 10 for men or X 9 for women.

Calculating Metabolic Equivalents of Activity

So, got your RMR number? Good. Time to put it to use.

The first thing you need to do is take that number and divide it by 24 in order to get how many calories you burn via RMR in an hour. For me, $1712 / 24 = 71$ Calories burned each hour, on average, while sitting on my ass.

Next we need to understand metabolic equivalents, called "METs." Your RMR equals 1.0 MET, and every activity you do can be evaluated in terms of caloric burn by giving it a metabolic equivalent of RMR. For example, a very slow stroll is 2 METs. For me, my per hour RMR is 71 Calories, so if I go for a slow stroll I'm going to burn 142 Calories.

And here is where so many people screw up: "Woo-hoo! 142 Calories is almost a full beer! Drinkin' time!" Remember an important part of this calculation is figuring out the **extra** calories burned. I still would have burned 71 Calories lazing around, so the extra Calories burned was only 71.

Remember this when looking at the METs in the table below. This table gives you the *total* number of METs, but to figure out the actual extra calories burned you need to remove the 1 MET from the number that is you sitting there watching *I Didn't Know I Was Sarah Palin* on cable TV.

Also, remember that the RMR divided by 24 number you got is how many calories you're burning each hour. If you only do these activities for 30 minutes, the calculation gets chopped in half. I know this seems like a lot of math, but it's not so bad, really. Once you understand it then it's a helluva lot easier than balancing a check-book.

METs	Sport, Activity or Exercise
2.5	Slow walking, approximately 2mph
3.0	Weightlifting: Light effort
3.0	Stationary bike: Very light effort
3.3	Walking at 3mph
4.0	Water Aerobics (Aquacize)
5.0	Aerobic classes: Low impact
5.0	Walking at 4mph
6.0	Weightlifting: Intense
7.0	Aerobic classes: High impact
7.0	Stationary bike: Moderate Effort
7.0	Swimming: Moderate effort

8.0	Circuit training, including aerobic stations, with no rest
8.0	Outdoor cycling: Approximately 13mph
8.0	Walking at 5mph (brisk)
9.0	Jogging at 5.2 mph (slow)
10.0	Outdoor cycling at approximately 15mph
10.0	Running at 6mph
10.0	Swimming fast
11.5	Running at 7mph
13.5	Running at 8mph
15.0	Running at 9mph
16.0	Outdoor cycling at >20mph

Adapted from *Essentials of Strength Training and Conditioning, 3rd Edition*. T. Baechle and R. Earle (Eds.), pp. 495-496.

As I already mentioned, there is a lot of guesswork when it comes to “calories out.” Exactly what your definition of “intensity” is plays a role as does your level of coordination (a spastic runner who looks like he’s got a scorpion in his underwear burns more calories than an efficient runner does), as well as other genetic and metabolic rate factors. The above chart is just to give you a general idea of how many calories you might burn in a given activity. I know it’s not a comprehensive list, but it does give you a good idea about intensity, and once you’ve got a good feel for this you can predict how many METs things like snowshoeing, skiing, basketball etc. burn based on how intensely you engage in them. For example, if an hour of hardcore basketball makes you feel like you just ran 8 miles in an hour, then you can guess that the METs were 13.5.

Speaking of running 8mph equalling 13.5 METs, take a look at the METs for walking at 4mph. It’s only 5 METs.

Now think about that math. Say you’re a pretty big person, and your hourly RMR is 100 Calories. Walk at 4mph for an hour and you burn 400 *extra* Calories. Do it for two hours and you burn 800 extra Calories. Now do it for running 8mph in one hour. With METs being 13.5 you would burn 1,250 extra Calories in one hour. Therefore, even though the walking at half the speed over two hours sent you the same total distance (8 miles), you burn 450 fewer extra Calories (not to mention that it took you twice as long).

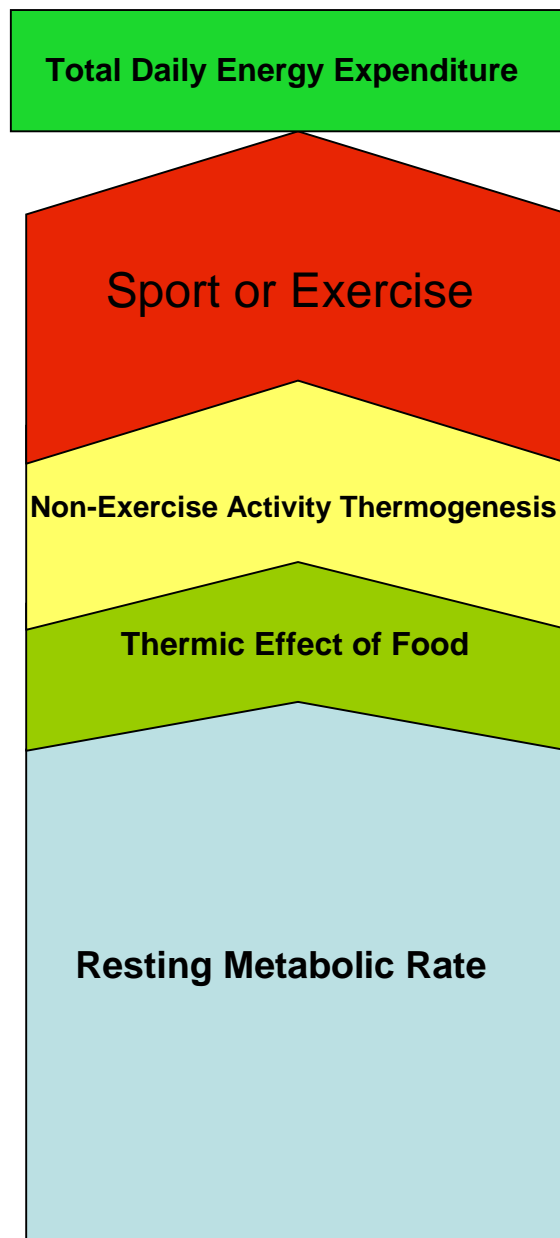
What this means is that ***intensity matters, so don’t be a pansy.***

Many say (even many doctors, according to wife, who is a family physician) that you burn the same number of calories walking a mile as you do running it, but that’s a crock. So find a high-intensity you can sustain for a long time and push your ass if you want to maximize caloric burn *and* get an overall improvement in physical ability. Note that intense exercise is a lot better for your cardiovascular health as well. Just don’t overdo it.

Finally, all this talk of burning calories needs to be put in perspective. Note that the most important and largest effect of exercise comes in terms of improving physical performance. You get a training effect, and this is awesome. Second most important is that it builds up your overall health-specific willpower. Stress goes down and ability to make healthier and calorie-aware food choices go up.

Also, you burn calories. Remember this, because just focusing on the caloric burn isn't that motivating, and motivation is all-important.

Here's a picture to put TDEE into perspective:



Again, I'll use me as a representation:

- RMR = 1,712 Calories per day +
- TEF = Approximately 250 Calories per day (10% of daily caloric intake) +
- NEAT = Approximately 300 Calories (unless toilets need scrubbing or lawns need mowing, which can bump this up)

Subtotal TDEE = 2,262 Calories – This is roughly what I burn in a day with no exercise.

But of course, I do exercise. I exercise a crapload. If I didn't, I wouldn't be able to drink beer and cheat on my diet with pizza and potato chips and ice cream. Most of the time, however, I still have a good diet. You can't be a 40-something guy and be able to see your abs if you have a terrible diet even if you do exercise a lot. In terms of calories, I would say my diet is 85%% really good, and 15% total crap.

The "total crap" portion often means a lot of extra running to stay lean, but I can live with that, because I like running and I'm *not* giving up beer.

In Case You Hate Math

Here is a simple way to figure out a not bad approximation of how many non-exercise calories a day you burn. To quickly estimate RMR+TEF+NEAT:

- If you have a desk job and do very little activity during the day, take your weight in pounds and times by 13 for men and by 12 for women.
- If your job is more active and/or you have to engage in some physical labor throughout the day then take your weight in pounds and factor by 15 for men and by 14 for women.
- If you are consistently moving for much of the day, engaged in a lot of non-exercise physical activity, then I'm wondering why you're reading this. Still, if this is you, factor your weight in pounds by 17 for men and by 16 for women.

Close enough. Remember that these figures don't include calories burned via exercise, which you really should do.

Creating a Consistent Caloric Deficit

It bears repeating that this is the critical component of losing weight. In order to lose weight you must consistently burn more calories than you take in. Measuring how many calories you take in is pretty simple, just read labels and/or use an online calorie counter (Google it). And avoid eating out because calories become very difficult to track and that screws everything up (not to mention that restaurant food is notoriously high-calorie and over-consumption is encouraged).

I'd like to point out that religiously counting calories is not a critical factor for success. Many people lose significant amounts of weight through adding lots of

intense exercise, eating healthy and controlling their portions. They follow the rule of eating until they are “satisfied” rather than “full.”

You can try following the old Chinese adage of, “Eat until you are eight-tenths full.” This strategy works just fine, to a point. You can probably lose most of the weight you want following this model. However, if your goal is more ambitious then you are probably going to want to start counting calories at some point. I don’t keep a rigid written log of everything I eat in a day, but I keep a pretty good track in my head that I figure is close enough. At the very least, I recommend that people be “calorie aware.” You have to know how many calories are in most things so you don’t accidentally order the fettuccini Alfredo with garlic toast twice a week and not realize it’s actually got 2,500 Calories in it.

Overall, I prefer the method of establishing a weekly caloric deficit because you don’t want to have a significant deficit every single day or there is the possibility that your metabolism will slow down in what is referred to as a “starvation response.” Even more important is that it’s no fun if you don’t get to take a day off once in a while.

What is Starvation Response and How to Avoid It

This is rare, and I include it just to discourage you from going on an extended, ultra-low-calorie diet.

Seriously cutting back calories (below 1,500 per day for a man and below 1,200 per day for a woman) day after day can cause it. Several days of moderate to moderately high caloric deficits, and even the occasional short fast, are NOT going to cause a starvation response, especially if your caloric deficits are at least partially attributed to adding in a bunch of physical activity.

So what is it? Back in the 1940s when people were more tolerant of being guinea pigs Ancel Keys conducted the Minnesota Starvation Study (actually, the participants were conscientious objectors to WWII). Thirty-six men were subject to an extended period of 50% of their maintenance level caloric needs (the purpose was to learn about how to medically deal with impending starvation as a result of the war – it wasn’t just a lark). As a result of participation, the men’s metabolic rates dropped significantly partially due to loss of body mass, but also due to an evolutionary advantage where the body uses fewer calories during lean times.⁸

The starvation response doesn’t sound like much of an advantage these days, but back when the hunt failed or there was a drought it sure came in handy: it kept people alive. Another metabolic response programmed in by natural selection is “Poststarvation hyperphagia.” I asked my wife (the doctor) what hyperphagia meant, and she replied with: “pigging out.”

After a period of starvation a hormonal response causes people to overeat way past what it takes to replace the lost weight, usually gaining more than what they lost in the first place. In the bad old days, this extra fat protected them against the next time that food was in short supply, but today it just causes yoyo dieting where the dieter ends up fatter than when they started.⁹

So how do you prevent the starvation response?

- Don't cut calories too drastically. An average-sized man should take in minimum of 1,800 Calories per day, and the average woman 1,200. The minimum I take in on a daily basis is about 2,000, except for this one day after a draft beer bender when I felt like, uh, never mind.
- Make your caloric deficits largely the result of activity. As I mentioned, when focusing on dropping fat I take in at least 2,000 Calories a day, which is only 262 below my TDEE if I don't get any exercise. Most of my big caloric deficits come from adding a bunch of exercise into the equation.
- Don't restrict calories every single day. I'm guessing that when you start off that won't be a problem, but when you get serious about seeing those abs or at least getting a flat belly remember to take one day a week where at minimum you break even calorically. Better yet, go a couple of hundred Calories over maintenance for the day. DO NOT use your "binge" day to go nuts. You can wipe out three or four days of caloric deficits in one day of drunken gluttony. Not restricting calories once a week is largely about the psychological benefits of not feeling deprived. If you're being careful you can have caloric deficits every single day as long as it's not making you crazy. Having a day where you go over a little isn't critical to preventing starvation response. Remember that starvation response comes from actually starving yourself, not cutting calories wisely.
- On the above note, I love Saturday because I run nine miles that day and therefore have a TDEE of about 3,300 Calories. On that same day I take in about 3,500 or so Calories, a significant portion of which is from beer. If I didn't get to do that once a week I'd lose my mind.

Nutrient Partitioning

To significant degree this is genetically determined. Dr. Claude Bouchard had this to say about nutrient partitioning: "...studies indicate that insulin; steroid, thyroid and growth hormones; and various growth factors all influence the fate of ingested energy... This line of research suggests that being a 'fat storer' as opposed to a 'lean tissue storer' is a risk factor for obesity."¹⁰

Some people are destined to store fat and others build muscle, and that's good for some and sucks for others. However, engaging in vigorous weightlifting can definitely tip these scales in your favor, so make sure you do that.

“My Friend Cut Calories and He/She Didn’t Lose Weight. Why?”

If you’ve ever listened to anyone talk about weight loss, you’ve probably heard someone say that “I only ate 1,200 hundred Calories of celery and tuna fish a day and I still didn’t lose weight. Oh, woe is me!”

How could this be?

Answer: They suck at math.

A number of studies have proven two simple facts that explain this “phenomenon:”

1. Obese people drastically underreport the number of calories they take in. The more obese they are, the more they underestimate food consumption. They have a tendency to “forget” about all the high sugar and high fat snacking they do during the day.
2. Obese people overestimate the amount of physical activity they engage in.¹¹ They think they’re burning a lot more calories each day than they really are.

When you underreport consumption by several hundred Calories and overestimate activity by several hundred Calories, then your math is pooched and you stay fat. Solution: Know that this can happen and make a commitment to being honest. If you still aren’t losing weight, then get a calorie journal and make the decision to write every little thing down. If you choose to forget about a bunch of calories then you’re only screwing yourself.

Actually, I’m being too harsh, because...

Everyone is Different

Yes, weight loss is a numbers game of calories in vs. calories out, pure and simple, but this game gets much less simple when you consider individual differences.

So no, some people do not just “suck at math.” There can be a lot of other things going on here that affect caloric intake as well as what happens to those calories once ingested. At present (2011), researchers have identified approximately 45 different genes that affect bodyweight, and each of them can contribute a few pounds. Get enough of them, and you really can get screwed in the genetic lottery as far as obesity is concerned.

Some people are born to fidget; lacking the ability to sit still for long and this genetic preponderance for activity makes them more likely to be leaner than others who are programmed to be still. I also mentioned above about how some are more inclined to be fat-storers while others are better at building muscle. Some genes alter taste preferences, set point of satiety, hunger hormones, the

amount of sleep we get (less sleep negatively affects food choices), and even genetically programmed psychiatric disorders can influence food intake and activity levels.

We're all scattered along the typical bell curve in terms of our genetics, and when it comes to obesity some people are way to the left in the "screwed beyond screwed" field, whereas others are all the way to the right in the "you lucky bastard" section. Most of us are clumped around the middle in typical standard deviation fashion.

But it goes beyond genetics; there are emotional and psychological issues that can affect bodyweight as well. People who have been abused can see food as a comfort, and be more likely to see the pleasure of eating highly palatable (yummy) choices instead of healthier options. What's more, crippling depression can make the thought of exercise unimaginable. For many it's all they can do to get out of bed in the morning.

A combination of unfavorable genetics and emotional trauma can make weight loss exceptionally difficult. So again, they do not just suck at math, and this report is not intended to vilify anyone. Trying to guilt trip the overweight and obese into weight loss is an exercise in folly. It's about providing support and encouragement to achieve one's individual potential.

Conclusion

And my approach to providing support and encouragement is being honest so you understand what you're in for. People don't turn into fitness models in a month. Some are luckier than others. There are no quick fixes to losing weight and being healthy. This takes serious, sustained effort to become a person who loves exercise and healthy, calorie-restricted eating. You need to ignore the miracle cures and myths and just focus on slowly changing your lifestyle to one that gradually integrates ever more activity and makes incremental improvements in diet and caloric intake.

So in the interest of honesty, and separating more metabolic fact from fiction, read the next section on metabolic myth busting.

Notes to Part I

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Metabolism Report, Part II

Metabolism Myth Busting

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Introduction

I enjoyed writing Part II because the subject of metabolism is the source of a tremendous amount of misinformation in the diet and exercise industry, and I love pointing out how people are full of crap. My kids and I like watching *MythBusters* and you can tell that the people on that show love their jobs. I don't have a multimillion dollar budget to crash cars into each other and blow stuff up, but I found the whole aspect of the way metabolism really works to be fascinating in its logic.

Most of the “miracle cures” and fantastical new weight loss “secrets” revolve around boosting your resting metabolism. When I Google “boost metabolism” here are snippets of ads that I see:

- “These three diet pills really work”
- “Which weight loss pills work?”
- “Amazing Chinese weight loss secret”
- “Lose 25 pounds in 2 weeks”
- “You can lose 30 pounds in 30 days”

Hopefully I've made you skeptical enough that you can see through this by now. The fact is that you can't boost your *resting* metabolism; not enough to make a difference or without using dangerous chemicals. Once you understand human metabolism and how it works you see that it makes sense from an evolutionary perspective.

Part 1 of this report gave you the basics of energy metabolism, and now I'm going to crush your spirit once again, because most of what I'm about to tell you is bad news. If you think you have a slow metabolic rate now, just wait until you get in shape – it's going to get even slower. It will be elevated during exercise, but overall your *resting* metabolism is going to go down. I guess the good news in all this is that you will know the difference between metabolic fact and fiction, and will have a realistic understanding of what it takes to achieve your goals.

You're welcome.

Myth #1

A pound of muscle burns 50 or more Calories a day while at rest.

Lots of people tell this one, although I'm not the first person to bust it. Popular fitness writers are waking up to the fact that this is a myth. Some writers who perpetuate this report that you don't need to do aerobic training at all because weight training adds muscle which burns more fat at rest than you can through something like running or intense cycling.

I wish it was true, but it isn't.

In fact, according to Dr. Claude Bouchard (yeah, him again), muscle has a relatively low resting metabolic rate. Dr. Bouchard told me in an interview that, on average, a pound of muscle will only burn an extra six Calories per day, and that this is marginally better than what a pound of fat burns in a day, which is two Calories. Bouchard told me that the vast majority of our RMR caloric burn comes from function of the brain, heart, liver, kidneys and lungs. "When you account for everything that isn't skeletal muscle, it makes up about 75-80% of RMR, so skeletal muscle only accounts for 20-25% of resting metabolic rate."¹

In other words, adding even a considerable amount of muscle isn't going to do much to boost resting metabolism, because skeletal muscle plays such a small role in the number of calories you burn each day while sitting around.

If we believe the 50 Calories per pound of muscle myth I should be burning another 1,000 Calories a day because of the extra 20 pounds of muscle I've gained from weight training. I've run the numbers on my total daily energy expenditure based on my RMR, TEF and activity levels and I can tell you that it just isn't happening. Again, I would love it if were true, because those extra thousand Calories a day would taste really good, but it just drive's home Bouchard's point that this myth is a total crock.

So let's use Bouchard's numbers and do the math on what actually is happening. Since I started working out and changing my diet I've lost about 50 pounds of fat and gained around 20 pounds of muscle (both of which took a long time). The fat loss means I am burning 100 (50 X 2) *fewer* Calories per day and the muscle gain means I am burning 120 (20X6) additional Calories per day. Net increased caloric burn = 20 Calories per day, or one-third of an Oreo cookie. Crud.

Why train with weights then? Well, it makes you look pretty from the neck down, makes you strong, increases bone density and strength of your connective tissues, hardens you against injury from other activities such as running or team sports, improves overall physical performance for a host of activities, it does burn calories during the activity (although not nearly as much as intense aerobic

training does in the same period of time – see Part 1), and it is good for your cardiovascular system. Did I mention that it makes you pretty?

In other words, I strongly recommend intense weightlifting for both males and females. Especially the latter, because muscular women are hot.

Since we're on the subject of lifting weights, I want to express that it is not critical that you become a weightlifter in order to be healthy. However, I do encourage at least some form of resistance exercise. This can be done with a host of body weight exercises (including Pilates and martial arts), but the reasons why I endorse weight training are that it is the best route towards achieving vanity goals (which are not a bad thing as long as you don't overboard) and it allows for greater strength improvements than exercises that only use your own body weight. Even more importantly, however, is the fact that I think it an activity that most people can really get into. It takes time to learn it and gain confidence, but once you do you'll quite likely enjoy it and want to keep doing it. I think that compared to some other sports it is something that is easy to become passionate about if you approach it with the right attitude.

As much as I endorse weightlifting, aerobic exercise is more important for fat loss. For a guy my size, very intense aerobic exercise can burn up to 1,000 Calories an hour. Comparatively, all-out weight training is closer to 500 per hour. If you want to be trim, you need to spend some time on the former because it helps create a larger daily caloric deficit. It is better for your heart, lungs and cholesterol levels too.

Myth #2

You can lose weight on a high protein diet through the thermic effect of food (TEF).

Fat burns almost nothing when getting stored as fat, but protein burns 25% of its calories getting absorbed into your body via TEF.² Kick ass, you say, but run the numbers and it's not much as you might think.

Take two camps. One guy eats 20% of his calories as protein, which is more than enough for building muscle and controlling appetite (protein has a high satiety factor). The other guy makes himself eat 40% from protein because he incorrectly assumes it builds more muscle and he likes the thermic effect of food he gets from the extra protein (and maybe he believes all the low-carb crap out there). Now, run the numbers on a 2,500-Calorie a day diet. The guy that eats 40% protein is getting an extra 500 Calories a day as protein and 25% of this is burning through TEF as part of the absorption process, but then you have to assume that these protein calories replaced carbohydrate calories (because many meat products contain fat, so he probably isn't reducing that), which have a TEF of about 10%, so the total TEF gained on that 500 Calories shrinks to 15%.

That works out to only burning an extra 75 Calories a day, which means he earned half a beer. Sounds like a party.

The above scenario also only holds true if all other things are equal, which they wouldn't be. Carbohydrates are a vital source of energy and if he dramatically cut his carb intake then he wouldn't have as much energy to engage in activity. That extra 75 Calories and then some would be wiped by him spending more time sitting on his ass. He'd be better served by eating more carbs to fuel protein synthesis into muscle and provide more energy for exercise. As well, cutting fat is always a good idea because of its high energy density (9 Calories per gram as opposed to 4 for protein and carbs).

Myth #3

Getting in shape boosts your metabolism.

Nope. The exact opposite is true. First off, remember the calorie calculator for RMR in Part 1? The less you weigh the lower your metabolic rate, not just RMR but the rate at which you burn calories for *all* activities.³ I'm working on the assumption that you want to lose weight; doing so is going to lower your metabolic rate.

But that's not all; by getting in shape you are making your body work better – you are making it more efficient. Think of this: You're in lousy shape and you run a mile. You sweat like crazy, your heart races, your lungs burn etc. Your metabolism is operating at a high level because it's not used to this kind of crap, and your heart and breathing rates stay elevated for a while even after you stop running.

Next scenario: Six months later you are in much better shape and you run that same mile. You hardly sweat, your heart rate isn't that high and you aren't breathing very heavy. Also, your metabolic rate returns to normal not long after you stop. Ergo, your metabolism isn't working that hard because it has become accustomed to the exercise (called a training response). There is also the fact that your running stride has become more efficient because of all the practice.

Guess which mile burned more calories?

That's the sucky part. The better shape you achieve, the harder you have to work to burn calories because your metabolism becomes more efficient at doing work; any kind of work. Even sitting at your desk or going to the bathroom you will be burning fewer calories once you are in shape than if you're out of shape.

Evolution is a real bitch sometimes.

The good news about the mile-running analogy above is that, once you get in shape, you can run a lot further than just one mile and burn far more calories that way.

Yes, evolution is a bitch, so make it your bitch. Take advantage of the training response by continually pushing your capabilities, burning more calories, and getting in even better shape.

Back to the main point: The fatter and worse physical condition you are in, the higher your metabolism and vice versa. Your body doesn't want you to be too fat, so it speeds up your metabolism and decreases nutrient absorption when you are overweight and consistently take in too many calories. There is also the fact that carrying around a lot of extra weight conducting daily activities requires more effort and therefore burns more calories. Nevertheless, lots of folks manage to beat this higher metabolism into submission and still gain more weight by eating way too many calories and doing the square root of bugger all for exercise.

Conversely, your body doesn't want you to be too thin either because it likes to hang on to some fat stores in case of future famine, so when body fat stores drop and calories are consistently restricted then it slows down the metabolism and makes sure it grabs as much of the calories and nutrients out of ingested food that it can. Again, being lighter in weight also means that a person can move about with less energy expenditure because you're carrying a lighter load. The axiom about losing the last ten pounds being the hardest is very true.

There is an interesting study that drives this point home. We have Dr. Claude Bouchard to thank for convincing study participants to engage in some pretty rigorous experiments all in the name of science. These are the positive and negative energy balance experiments using identical twins.

The Positive Energy Balance Experiments

Twelve pairs of male identical twins were put on a diet that was 1,000 Calories per day above weight maintenance level for six days a week for 100 days (remember that there are 3,500 Calories in one pound of fat). Of course, these guys gained a lot of weight, but not as much as the calculations predicted, and there was a lot of variation among non-twin participant responses to the extra calories (some gained more weight than others, proving that there indeed are genetic factors involved in weight gain – the twins gained close to the same amount of weight).

At the beginning of the experiment all the extra calories translated at a one-to-one ratio of weight gain, but by the end of the 100 days this percentage had dropped to only 60% of extra calories turning into weight gain.⁴

The Negative Energy Balance Experiments

I much rather would have been in this group. This experiment used seven pairs of male identical twins and did not decrease calories (it carefully measured and kept them constant at a “no exercise” maintenance level), but rather added a thousand Calories of activity (stationary bicycle) for nine out of every ten days for a 93 day period. This rigorously controlled experiment estimated that the participants were creating a 58,000 Calorie deficit over the course of the experiment, but in reality the average weight loss represented the equivalent of only 46,000 Calories. Running the numbers, they lost only 79% of the weight they would have expected had metabolic rates stayed the same. The good news is that, even though they weren't weight training (just cycling), ALL of the weight loss was from fat. No muscle tissue was lost.⁵ However, other research has shown that you do need to include resistance exercise during weight loss in order to ensure that all the weight lost is from fat and none from muscle.⁶ There are so many benefits to weight training, however, that regardless of which is correct I still recommend it.

Myth #4

The best way to burn fat is to keep your heart rate in the “fat burning zone.”

Well, this is kind of true, but totally irrelevant. Yes, you do “oxidize” more body fat at moderate intensity levels, and burn more carbohydrate fuel at higher intensities, but think of your energy stores as one big soup and it all comes out as a wash.

If you've ever seen a heart rate chart in a gym or on a aerobic training machine then you've seen labels that read “fat-burning zone” at a moderate heart rate (about 60% of maximum) and “cardiovascular training zone” at a higher heart rate (75% of maximum or greater).

The logic works this way: at the moderate intensity your muscles burn more of the body's fat stores than carbohydrates for fuel, and at the higher intensity muscles get most of their energy from carbohydrates rather than fat. As you near your maximum heart rate, less than 10% of the calories you burn come from bodyfat⁷ and this leads many to think that exercising at a moderate intensity causes more fat to be burned. While technically factual, it ignores the bigger picture.

Again, weight loss is all about fewer calories in than calories out. This needs to be viewed from the perspective of what is called the 24-hour energy balance. If energy (calories) is negative, then weight is lost; if energy is positive weight is gained. Period. Yes, you may use more body fat for fuel while exercising at a moderate intensity, but in the grand scheme of the 24-hour energy balance equation this means bugger all. If you exercise and have a negative energy balance, you are going to burn those fat stores at some point in the day, no

matter what you happen to be doing: eating, sleeping, working or having wild and crazy trapeze sex. The fact that the *ratio* of fat burned *during* moderate exercise was higher for fat than carbs *does not matter*.⁸

This is important because I don't want you thinking that high-intensity exercise is a bad thing. High-intensity is a good thing. It's a great thing.

Here's why:

- An hour of exercise at a high intensity burns substantially more calories than an hour at a moderate intensity. As a result, this contributes to creating a larger caloric deficit and more fat loss over time.⁹
- If you remember the walking vs. running example in Part 1, higher intensities training burns considerably more total calories than lower intensity for the same amount of distance traveled.
- To the above point, high-intensity exercise is a great time saver. You can burn the same number of calories in 40 minutes of high intensity exercise that it would take an hour to burn at a moderate intensity.
- Higher intensity aerobic exercise makes you more capable of working harder during weight training sessions and other sports and activities.
- It is better at boosting HDL (good) cholesterol.
- It is good for your heart and lungs.
- It temporarily boosts metabolism after the exercise (although not to a large degree – see myth #5).¹⁰

When you are just getting started it isn't a good idea to push intensity so much that you hurt or wear yourself out. The idea is gradual progression so that eventually you routinely engage in lengthy exercise that keeps your heart rate above 75% of maximum (maximum is about 220 minus your age for men, and **for women there is a new formula:** 206 minus 88% of your age, so grab a calculator ladies).

Myth #5

Certain types of exercise burn significant extra Calories via Excess Post-exercise Oxygen Consumption (EPOC).

The EPOC myth states that after intense exercise your metabolism stays revved up for a prolonged period of time and burns lots of extra calories – some say far more than what you burned during the actual exercise.

EPOC does exist, but I refer to it is a myth because many have overblown it. EPOC accounts for anywhere from about 6%-15% of additional “oxygen cost” (which translates into extra calories burned).¹¹ For example, if you burn 1,000 Calories via intense exercise (it is a subject for debate as to whether or not level of intensity affects EPOC¹²) then you can expect to burn an extra 60 to 150 Calories over the next 24 hours or so because of that exercise. Big deal. Not only

that, but the better shape you get in, the lower the percentage because being in good shape means your body's metabolism returns to normal much quicker. One study found that in highly trained individuals EPOC was as low as 1% above the net total energy expenditure, and the mean among trained people was 4.8%.¹³

High-Intensity Interval Training (HIIT)

We have Bill Phillips (*Body-for-LIFE*) to thank for popularizing HIIT, and since then it has been lauded by many as the ultimate fat-burning exercise, but several studies prove it to be no better than steady state high-intensity exercise. Phillips advises that you do 20 minutes of aerobics at intensities that change every minute, escalating from a perceived exertion of "5 out of 10" to "10 out of 10."¹⁴ For example, if you do the same amount of exercise "work" (distance traveled, for example) in the same amount of time using either a steady pace or via HIIT, you will burn close to the same number of Calories, including the modest EPOC.¹⁵

Phillips stated that "the majority of calories will be used up the hour after our workouts, provided we don't eat for one hour after our exercise sessions."¹⁶ You get two myths for the price of one with that statement (also see Myth #7). Phillips told me via his assistant that he based his claims on a 1994 study by Angelo Tremblay et al., but this study has been poorly represented using sketchy statistical analysis time and again. In reality the amount of fat lost by the participants using HIIT was very little, neither group lost much weight at all, and the HIIT group had 20% more body fat than the steady state group to start with (which would definitely affect results). Also, the overall fat loss conclusions were wildly skewed by some bizarre calf measurements. The rest of the body fat data showed little difference between groups.¹⁷

Back to Phillip's book: A couple of pages later Bill said, "You'll become more metabolically efficient. Your body will burn fat at a significantly elevated rate, even while you're sitting at your desk..."¹⁸ Well, those two sentences completely contradict each other. Efficiency means you go through fuel (fat stores) at a much slower rate. When it comes to getting in shape, the first sentence is true because you *will* become more efficient. As a result, the second statement is wrong.

HIIT works fine as a calorie-burner and is comparable to steady state high-intensity exercise that can complete the same amount of distance traveled over the same period of time. What HIIT *really* is for is enhancing physical performance. In short, it makes you faster, and athletes have used it for decades as a training tool. If you're into running races, then definitely go for it, but most advise not doing it more than twice a week because of the punishing intensity and risk of injury.

Conversely, if you don't like the idea of doing HIIT and just want to run / cycle / swim / whatever at a steady state then there is nothing wrong with it. Although I

do advocate interval training for improved speed, there are a couple of extra reasons not to like it as much as steady state:

- With running, it often lends itself to running on a treadmill because of the constant measured intensity changes, and I hate treadmills. Runners who do all of their running outside having higher adherence rates; they are more passionate about running because there is a higher enjoyment factor.
- It promotes an improper mindset. Running (or cycling) is something that is enjoyable. It is something that you can just pick your pace and go. It is therapeutic, allowing you to work through issues, plan things, or just plain daydream. Focusing on HIIT screws this up by making you change pace frequently. The (false) HIIT as a mega calorie-burner mentality is that activities like running are all about losing weight. In my opinion, if you're not actively training to get faster then HIIT can ruin the whole Zen of exercise experience; at least for me it can make running and cycling less enjoyable.
- For beginners, HIIT can lead to injury.
- HIIT can be exhausting even for trained athletes. Several times I've managed to run eight miles in an hour using HIIT and I was wiped out afterwards; I couldn't go any further and was in a bit of pain to boot. However, I can go eight miles an hour at a steady pace and last for twice as long, covering 16 miles in total, and get a better endurance training response and burn twice as many calories (and not hurt that much either).

There is value to adding more intense portions to aerobic exercise where you get close to your maximum heart rate, because it can give a boost to your exercise tolerance when it comes to weight training, and being able to engage in short bursts of speed can come in handy. I once saved my son from turning his face into pizza when his feet slipped off the pedals of his bike and I raced after him and grabbed the back of his shirt right before he smashed into the back of a parked Ford F-150. My wife saw the whole thing and was impressed; I earned major hero points that day. I probably saved myself a huge pediatric dental bill as well.

I do regularly integrate interval training into my running in order to get some physical benefits and get faster, but if you don't want to engage in this type of training then don't feel compelled.

And don't believe those who say steady-state aerobic training is a waste of time. It is anything but.

EPOC of Weight Training

Some say that you don't need to do aerobic activity because weight training has a high EPOC. I love weight training. It's not hard to motivate myself to do it. There are a lot of people who, once they get the weightlifting bug, are hooked.

Many men like the idea of working with weights even if they don't currently engage in it, whereas women generally need more encouragement. Conversely, a lot of men are less receptive to the idea of taking up aerobic activity. I think this is why some fitness "experts," engaging in that despicable behavior of telling people what they want to hear, report that you don't need to engage in aerobic activity. They say that you can be perfectly fit by just lifting weights because it has a high EPOC. This is the "new" weight training myth after the "50 Calories per pound of muscle per day are burned at rest" myth got busted.

Yes, there is some evidence of EPOC from intense weight training; about the same you get from intense aerobic exercise. In other words, the level of EPOC isn't all that significant and factors hardly at all into the overall quest to burn fat, especially for trained people.

- L. Van Etten et al. measured sleeping metabolic rate after weight training and found that it was no different that when participants didn't lift weights.¹⁹
- Irene Bosselaers et al. conducted a study that compared the metabolic rates of bodybuilders against lean control subjects. The bodybuilders did have a higher average metabolic rate, but further investigation revealed that this was due to their significant differences in fat free mass (the bodybuilders were huge). There was no measurable EPOC taking place from the bodybuilders intense weight-training activities.²⁰
- Craig Broeder et al. compared an aerobic training group with a weight-training group and discovered that "after both forms of exercise training, RMR did not significantly change..."²¹
- Eric Poehlman and Christopher Melby found that when trained subjects engaged in **90 minutes** of intense weight training that EPOC was 11-12% higher than normal for two hours after the exercise.²² First off, the subjects did a 90 minute session, which is totally hardcore, and second, 11-12% metabolic elevation for only a two-hour period still isn't that much.

This information is not intended to turn you off of weightlifting; I provide it so that you understand that training with weights is not the new miracle fat-burning exercise. Yes, it is important, but sustained and intense aerobic activity is equally so.

Something else worth noting is that the manner in which you train with weights makes a difference in how many calories you burn during the exercise even when the same amount of work is completed. Fortunately, the manner in which you need to lift to build strength, size and functionality lends itself well to maximizing caloric burn.

Gary Hunter et al. ran the following test:

- 17 subjects bench pressed 20% of their one repetition maximum (1RM) one time and oxygen uptake (VO₂) was measured.

- The 17 subjects then lift 80% of their 1RM one time and VO₂ was measured.
- They found that the subjects used 12 times as much energy (calories) to lift at 80% of 1RM than at 20%, even though the amount of work done was only 4 times as much.²³ Therefore, using the heavier weight resulted in three times the calories burned for the same amount of work accomplished.

This is good news; the intensities I recommend you lift weights at are largely in the 65-90% of 1RM range.

Whew. That EPOC myth took a lot of work to bust.

My final word on EPOC is this: **ignore it**. Don't even factor it into your energy balance equations. If you're lucky, the small amount of extra calories you burn via EPOC will make up for the ones that you "forgot" that you ate.

Myth #6

Exercising first thing in the morning on an empty stomach burns more fat than exercising later in the day.

Like Myth #4, this is also true, and also irrelevant. Many people have professed this one; it is popular in the bodybuilding community, which makes sense why it was yet another myth perpetuated by Bill Phillips (who is a former bodybuilder).

Phillips wrote (via Michael D'Orso) that:

"To further enhance the fat-burning effects of these workouts [his HIIT workouts], do them in the morning, in a fasted state (before eating). Scientific studies indicate that fat is burned much faster—up to 300 percent faster—when you exercise in the morning as opposed to doing the same exercise in the afternoon."²⁴

Bill mentions "Scientific studies," but his book doesn't have a single footnote or a bibliography, so I'm not sure which studies he refers to.

While it is true that you burn more fat by exercising in the morning in a fasted state, when put in perspective of a 24-hour energy balance it makes no difference.²⁵ If you take in fewer calories during the day than you consume, those same fat stores are going to be burned regardless if it was during your morning fasted run or even while you were sleeping. When you run out of easily accessible energy stores, your body metabolizes fat; no matter what you happen to be doing at the time. You don't only burn off fat during exercise; you can be burning it at any time of day if you are in a negative energy balance.

Therefore, the best time of day to exercise is the time when you *want* to exercise. The time you *will* exercise, and you don't need to fast beforehand. In fact, having food energy in your belly will fuel enhanced performance. So eat something.

Myth #7

The size, frequency and timing of meals have a large effect on metabolic rate.

Bill Phillips. Again.

And he's wrong. Again.

According to Bill: "...studies show eating often helps accelerate the metabolism, so you burn more calories."²⁶ Again the word "studies" is used, but no reference is provided. Bill is not the only one who has spread this myth, by the way. If you Google "six meals a day" you'll find that many others jumped on this bandwagon after Phillips popularized it. Many personal trainers and "nutrition experts" still recommend six meals a day, but it doesn't make them right.

Eating one gigantic meal a day is a bad idea, but this myth extols eating six meals a day and I do *not* have time for that. It is impractical, as well as unnecessary. Bill says in his book that the three meals a day approach is all wrong, but the research disagrees. You should be eating a *minimum* of three a day, meaning three is just fine. Six is fine too if you want to do that and can make sure you keep them all small enough not to go over your caloric budget for the day. I eat three meals a day with some small snacks (like an apple or a banana) in-between. Usually the snacks are timed right before exercise to give me an energy boost. I like the three meals approach for two reasons: it is far more practical than six, and they are large enough to provide me with some real satisfaction, because I like to eat.

Now I think I'll quote some actual studies to back up my claims:

- According to France Bellisle, "The notion [of high meal frequency] has been put into question by the recognition of a high level of dietary underreporting in overweight individuals. In addition, no difference in total daily energy expenditure has been documented as a function of daily meal number. Weight loss is not facilitated by high meal frequency. Snacking in obese subjects is associated with higher energy and fat intake."²⁷
- M. A. Taylor and J. S. Garrow reported that, "When [equal amounts of calories] was given as two meals per day or six meals per day there was found to be no significant difference in total energy expenditure."²⁸ Actually, the title of their article pretty much summed it up: "Compared with Nibbling, Neither Gorging nor a Morning Fast Affect Short-term Energy Balance in Obese Patients in a Chamber Calorimeter."

- Wilhelmine Verboeket-Van De Venne et al. compared two meals a day vs. seven and found that there was no difference in total energy expenditure or average daily metabolic rate.²⁹

You don't need to eat six small meals a day, but if you do and you're overweight there is a chance that you will use it as an excuse to eat more, not even realizing that you're doing so. It is easier to keep track of overall caloric intake if you eat three meals a day with a couple of small, healthy snacks.

On a 2,400 Calorie / day diet (which is just above maintenance level for me with no exercise) at six small meals a day each meal is only 400 Calories. I'm sorry, but I'm still hungry after 400 Calories. I don't care if I get to eat again soon. I want more now! On a typical day calorie-restricted day I will eat 300 Calories worth of snacks, and three meals averaging 700 Calories each. Now, that's more like it. This pattern is at regular intervals and it keeps my appetite under control, allows for high nutrient absorption, and keeps my energy levels stable so I always have fuel for exercise. It's also a lot more convenient than trying to measure and prepare six meals a day.

Although I discourage the six-meal a day plan, I also need to warn you about eating too infrequently. I recommend three or four meals a day. There are dangers associated with eating too infrequently:

- France Bellisle reported that, "Obese people tend to eat little in the morning and much in the afternoon and evening. In extreme cases, a 'night-eating syndrome' is observed."³⁰ This is a common theme that obese people skip breakfast. I'm not sure why they do. Perhaps they believe that if they skip breakfast they think they will take in fewer calories during the day, but the opposite is true. Contrary to what you might have heard or read, eating breakfast *does not* get your metabolism going in the morning. Hopefully you've learned by now that tricks to boost metabolism are mythical. What eating breakfast does do is help establish a regular meal pattern and keep appetite under control so that you don't overdo it later in the day. So, yes, eating breakfast is damn important, but for reasons of appetite-control, not mythical-metabolic boosting.
- David Speechly et al. agree with the telling title of their article: "Acute Appetite Reduction Associated with an Increased Frequency of Eating in Obese Males." The authors asserted that "Increased meal frequency thus induced a reduced appetite at the subsequent meal..."³¹
- Astrid Smeets and Margriet Westerterp-Plantenga compared three meals vs. two meals a day and found that those who ate three a day had higher feelings of satiety over a 24-hour period. Conversely, they found that it had no difference on total energy expenditure, again showing that higher meal frequency does not boost metabolism.³²
- Taylor and Garrow reported that, "A morning fast resulted in a diet which tended to have a lower percentage of energy from carbohydrate than with

no fast.”³³ Healthy carbohydrates are your friend. When people reduce carbs, they often replace it with fat. This is bad because increased fat intake is associated with increased caloric intake and higher bodyweight.

If you want to eat six small meals a day then it isn't bad for you. It also maximizes nutrient absorption, although I'm not sure that it is much higher than eating three or four meals a day. The point I make here is that you don't *have* to eat that frequently if you don't want to. Just don't eat too infrequently.

A note about Bill Phillips: Although he perpetuated a number of metabolism myths, he is not guilty of reporting blatantly false information the way many other diet and exercise writers do. Bill's program recommends intense weight training, aerobic exercise, healthy eating and portion control, which makes it better than many other fitness books. I do advise you ignore the book's prevalent supplement recommendations though.

Eating Before Bed

You may have heard that eating right before bedtime is a bad idea because the food gets stored as fat while you sleep because you aren't being active. Again, this myth contradicts the fundamental rule of the 24-hour energy balance equation. At what time of day you eat is irrelevant. *How much* you eat is what matters.

That being said, not eating that snack before bed is a good idea because it is a few hundred Calories fewer that you are eating and contributing to a larger caloric deficit. The only time of day it's okay to be hungry is when you go to bed. If you allow yourself to get too hungry early in the day it can cause a binge later on. However, if you go to bed hungry (but not so hungry that you get up in the middle of the night to raid your kids' Halloween stash), then your need for food essentially resets overnight and you can face the next day with a clean appetite slate.

Myth #8

Eating a high-fat diet makes you fat

Technically this is not true; eating more calories than you burn makes you fat, regardless of how much fat content is in the diet. Rudolph Leibel et al. proved this with a carefully controlled study in 1992 which was published in the American Journal of Clinical Nutrition. The authors found that: "Variations in fat intake from 0% to 70% of total energy under conditions of equal energy intake produced no significant changes in body weight over periods of observation averaging 33 d [days]."³⁴ Leibel's study put participants on balanced energy diets: they controlled to ensure that they took the same number of calories that they burned over a 33 day period. The participants got a varied range of overall fat content, from 0% to

70%, but everyone's weight stayed the same, again proving the first law of thermodynamics.

Weight stayed the same because they were on maintenance level calories. It does not matter what percentage of protein, carbohydrates or fat you consume in the grander scheme of weight loss and gain. It is all the simple formula of calories in minus calories out. Golay and Bobbioni, in their article "The Role of Dietary Fat in Obesity," agree: "...fat is almost exclusively used or stored in response to day-to-day fluctuations in energy balance."³⁵

If you eat 2,000 Calories of butter-fried pork rinds a day, yet burn 2,500 Calories a day, you will lose weight. You will also be one unhealthy bugger.

If you eat 3,000 Calories of spinach, carrots, and egg whites a day, yet burn 2,500 Calories a day, you will gain weight.

Is this sinking in yet?

All this being true, a high-fat diet is still a bad idea. Although it is not directly responsible in a simple cause and effect manner for weight gain, it is indirectly responsible for people being fat for two simple reasons. According to Golay and Bobbioni: "Dietary fat induces overconsumption and weight gain through its low satiety properties and high caloric density."³⁶ Fat has nine Calories per gram compared with carbohydrates and protein, which have only four. Its high caloric density simple means that when you eat a lot of fat, you get more than double the calories than if you choose carbs or protein. Further, carbs and protein are proven to control appetite much better, whereas fat is hardly satiating at all.

There is also the fact that fat makes things taste good – it stimulates the reward pathways in the brain and can lead to out of control eating because high-fat stuff is just so damn yummy.

There's even more reason to limit fat: There has been a lot of news surrounding a so-called hunger hormone called ghrelin. Perhaps you've heard of it. Essentially, ghrelin secretions tell us to eat. Numerous studies have shown that protein and carbohydrates have strong suppressing effects on ghrelin, whereas fat only weakly affects this hunger hormone.³⁷ There is also the fact that fat has a negligible TEF³⁸, so no love there either. Pretty close to every calorie of fat you eat counts as "calories in."

Losing weight is about one thing and one thing only: creating a negative energy balance. In other words: cutting calories. It is critical to understand that calories are king, and **cutting fat intake is a very powerful tool in cutting caloric intake** because of the above mentioned reasons. Cutting fat intake does NOT give you carte blanche to eat as many non-fat calories as you want.

A comprehensive review of popular diets was published in 2001 in the *Journal of the American Dietetic Association* which stated:

“Diets that are high in carbohydrates and low to moderate in fat tend to be lower in energy [which is good because energy is the same as Calories]. The lowest energy intakes were observed for those on a vegetarian diet [good for them – I’m still not doing it]. The diet quality as measured by HEI [Healthy Eating Index] was highest for the high carbohydrate groups and lowest for the low carbohydrate groups. The BMIs were significantly lower for men and women on the high carbohydrate diets; the highest BMIs were noted for those on a low carbohydrate diet.”³⁹

I’m not advising the elimination of fat from your diet, just a reduction – specifically of the saturated and trans fats. Not all fats are bad, but North Americans chronically ingest too much unhealthy fat in their diets.

Myth #9

Increasing activity level increases appetite, so you end up eating more calories and wiping out the weight loss effect of the exercise.

This one is so stupid the word “special” comes to mind.

Just taking a big-picture view, exercise is proven to extend life and improve its quality. You gain strength, speed, functionality, flexibility, enhanced mood, lowered stress, increased sex drive, improved appetite control – the list of benefits is long. When snake oil salesmen discourage exercise I want to stuff a premenstrual crocodile down their pants.

Enough; let’s debunk this stupid myth and move on.

- Sonya Elder and Susan Roberts conducted a review of the published research in 2007 and found that there was a “failure of energy intake to increase to match increased energy requirements [caused by exercising]”⁴⁰
- Christina Wood Baker and Kelly Brownwell consulted numerous studies looking at the effect of exercise on both short and long-term energy intake and found that the difference was negligible.⁴¹
- Kathleen Melanson et al., found minimal differences in hunger and satiety after exercise.⁴²
- Stephen Burns et al. found that aerobic exercise had no effect on total ghrelin levels, and that hunger levels were actually lower in the post-exercise group than the non-exercise group.⁴³

Once you integrate exercise into your life you will crave cleaner, more nutrient-rich foods to fuel more exercise, rather than the crap you might be eating now.

Further, your stronger will enables you to resist junk food more frequently (not always) and avoid overeating.

Finally, the importance of exercise as a stress-reliever cannot be overlooked.

We've been programmed via evolution with a "fight or flight" response. In the bad old days a saber tooth tiger might wander into the cage and we either grabbed a spear and got busy stabbing, or high-tailed it out of there trying not to become tiger kibble. In both scenarios – valiant spearing or cowardly running – you have a massive exertion of energy to use all that adrenaline coursing through your veins, and that's good.

Also, the "stress" of the tiger situation is over in a few minutes and a short time later you were either roasting tiger steaks for dinner or mumbling that you didn't really like that cave anyway and looking for a new one to live in.

Nowadays, things are different. Now you might get a pissy email from you boss admonishing you for your repeated failures and reminding you about next week's performance review. The stress lingers and you can't just run down the hall to his office, punch him in the face and throw him out a high window to assume your rightful place as alpha leader o'er the cube farm.

Instead, you sit and stew, maybe send a snotty email to someone, and possibly hit the doughnut shop and/or liquor store on the way home. All that stressful adrenaline that arose out of the threat to you goes unused.

This kind of stuff kills people. Really.

In 2006 Tsatsoulis and Fountoulakis reported that your adrenal glands going berzerk from chronic stress leads to bad things like insulin resistance, storing of visceral (belly) fat, and suppression of gonadal, growth and thyroid hormones. All this serves to put you at much higher risk of heart attack.

They also stated that exercise can make this go away,⁴⁴ so what are you waiting for? Don't listen to the exercise haters and go lift some weights or something!

Myth #10

Glycemic Index of foods is important for regulating metabolism.

Glycemic index is the level at which carbohydrates affect blood glucose, which in turn affects insulin levels. Low GI foods have a small effect on these levels, and high GI foods have a high effect.

My opinion about carbohydrates is simple: if nature made it that way, go big. If it has been processed to hell, then limit it.

For example:

- Apples = good / Apple sauce = not so good
- Tomatoes = good / Ketchup = much less good
- Whole wheat, whole grain bread = good / White bread = bad
- Whole grain rice = good / White rice = poop
- Potatoes = good / Potato chips = toxic
- Cherries = good / Cherry Coke® = [insert retching noise here]

You get the idea.

Even in their natural forms carbohydrates have fluctuating glycemic indexes, but in the grand scheme of things I don't think it matters. If you focus on eating natural carbs then you are way ahead of the game, because as a general rule healthy carbohydrates are lower in glycemic index anyway.

I'm not the only one who thinks you should ignore glycemic index:

- A 2008 *Nutrition Reviews* article found that it was "premature to include GI/GL [glycemic index and glycemic load] in dietary recommendations."⁴⁵
- Also in 2008, Arne Astrup found that "It remains to be shown whether a low-glycemic index diet provides any benefit to weight control..."⁴⁶

The funny thing is, I don't actually completely agree with the above statements. In an indirect manner, I believe GI *is* important because highly processed crap carbs are high GI, and natural carbs are almost exclusively low or medium GI. Still, thinking about GI just overcomplicates things. You do not need a comprehensive list of what the various GI level of carbs is. Instead, keep it simple; make most of your carbs unprocessed and you'll be fine.

Myth #11

Your bodyweight has a "set point."

Your bodyweight does *not* have a set point, it has several. Your body will try to find a fat-balance equilibrium based on your current levels of energy intake and expenditure. It is possible to fight this equilibrium effect by beating it into submission through sloth and gluttony, continually gaining weight until you die, but even most extremely obese people eventually level off and achieve a degree of energy balance.

Your bodyweight set point fluctuates based on your current behaviors.⁴⁷ Say you start exercising and limiting calories, then you will achieve a new, lower bodyweight set point. If you go back to your old behaviors, then you are going to go back to your old set point. You can't just do all the work to lose weight and then expect to maintain your new weight if you go back to your old habits. I worked my ass off to achieve the body I have, and I must continue to work my ass off in order to maintain it. I am at my bodyweight set point for my current

(healthy) lifestyle. One day age is going to wreak some havoc, but that day has yet to arrive.

This is why learning to love exercise and healthy eating is so important. Some people can power through hating exercise and feeling deprived in their diet for a while and achieve amazing changes in their physiques (Oprah), but because they never learned to love the journey they backslide into old habits and weight is regained.

So don't focus so much on weight loss, but on the enjoyment factor of permanent lifestyle change instead and weight loss practically takes care of itself.

Myth #12

You can lose [insert tremendously high number of pounds here] in only [insert ridiculously short period of time here]

Some people just really suck at math.

I once saw a video on CNN that showed how a guy lost 237 pounds in 7 months. That's over a pound a day. This actually happened, but the guy started out at 640 pounds. He still weighed around 400 and needed to lose another 200 to get to a healthy weight level. I can guarantee that those next 200 pounds would come off a lot slower than the first 200 did.

Extremely obese people can handle rapid weight loss because they were taking in such massive amounts of extra calories in the first place that putting them on a regular caloric intake with a bit of exercise makes it possible to lose a pound a day. This is coupled with the fact that a 640 pound guy has an incredibly high RMR (remember the calculations from the previous chapter).

For people who need to lose 40 pounds instead of 400, there is no way we can lose weight that fast. Besides, I've already beat the tortoise vs. hare argument into your head.

There are innumerable weight loss books, magazine articles, exercise DVDs, machines and other products available that claim you can lose large amounts of fat in a short period of time, and they're all full of crap.

I'll withhold author names and titles to protect the guilty and just report that one popular diet book that promises it can help you see your abs claimed one of their subjects went from 220 pounds to 190 pounds in six weeks. Let's run the numbers on that, just for fun:

- 30 pounds of fat = 105,000 Calories
- 105,000 Calories in 42 days = a 2,500 Calorie deficit per day

If we assume an average sedentary 220 pound guy has an RMR plus TEF plus NEAT of about 2,800 Calories a day, we could restrict him back to 2,000 Calories a day by instantly giving him a very healthy and fat reduced diet. He'd still be hungry, but let's take that out of the equation, and we can't go any lower than that or he'd be too damn hungry and wouldn't last long. He'd be bingeing in no time.

This still leaves another 1,700 Calories a day that would need to be burned via added activity. This would be the equivalent of him running about eight miles each day, plus an hour of intense weight training each day. All told he would run 56 miles a week, plus do seven hours of weight training a week.

Riiiiiggghhhh...

This doesn't even take into account that his metabolism is going to start slowing down both due to the weight loss and due to an increase in efficiency (see Myth #3). By the way, the book doesn't recommend an exercise regimen nearly so rigorous as what is outlined above. Therefore, the only conclusion I can make is that the author flunked remedial math.

The same book said you can burn off twelve pounds of fat (from your belly first – they claim) in two weeks or less. Even if we give them the full two weeks it means a 3,000 Calorie per day deficit. You already know that's impossible, but what is also impossible is to control *where* you lose the weight from. Your body decides where the weight will come off, and you have no say in the matter. For the vast majority of men, the gut is going to be the last place you lose weight, and that's why we have to get to a very low level of body fat in order to see abdominal muscles. Have you ever seen a guy with a fat ass and washboard abs?

Women, conversely, can slim their waists easier but keep it in their ass and hips. If you're female and have a plump rump, it is going to be the last thing to go. Sorry.

There is a plethora of programs and products that promise rapid weight loss. Most are bogus, but some can actually work. You could start exercising hard for at least six or more hours a week and creating large caloric deficits every week. If you did that you could lose at least two or more pounds a week for several weeks. BUT, do you honestly think you are ready to do that? Is your head and motivation there yet? Do you really think you could keep it up for very long or sustain it long-term? Almost nobody can. Accept that you are like the vast majority of people in this regard, follow my advice, and take it slow. If you do that, you *will* succeed and you will maintain your new physique.

Weight loss is a crappy motivator because the “response” of losing weight happens so long after the “stimulus” of lifestyle change, meaning there is no positive reinforcement from that perspective, so just stop thinking about it for now. You’ve got more important things to concern yourself with, such as permanent lifestyle change. Weight loss will happen in time when you’re at a place when you can realistically commit to it. Work on getting yourself to that place first and tackle shedding pounds when you’ve got the full commitment and focus to do so.

The Good News

I think the most important take away from this chapter is that it makes things less complicated for you.

You don’t need to worry about doing HIIT aerobics and changing your pace every minute or two, or how to maximize fat oxidation, or eating six times a day, or calculating EPOC, or any of the rest of that crap. It still just all boils down to: Eat healthy, don’t overeat, and work your ass off at weights and aerobic training. This is your formula for success, metabolism be damned.

To conclude, getting in shape and losing weight makes your body more efficient and lowers your overall metabolic rate. The act of exercising temporarily increases metabolic rate which increases the number of calories you burn in a day so that you can create a caloric deficit and lose weight, but the longer term effect of regular exercise serves to lower the rate at which you burn calories, both actively and at rest. It *lowers* your metabolic rate – averaging anywhere from about 10-30% depending on how good shape you get in and how much weight you lose – It *doesn’t* make it come to a complete stop.

Take comfort in the fact that a more efficient body is a healthy one. Instead of owning a gas-guzzling old clunker towing a U-Haul full of lard, you now live in a finely-tuned and high-performance machine that will be able to do more and more as you get in better shape. Once you are in shape it may take 1.3 miles to burn the same number of calories that you burned running only a mile when you were much less fit, but remember that getting in shape gives you the ability to run many, many miles further.

The lesson to be learned here is to go until you’re tired, and then go some more. Challenge your body and your endurance will improve, giving you the energy to burn even more calories and lose more fat.

If you have feedback on this metabolism report (or if you found typos) please email james@bodyforwife.com.

Notes to Part II

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