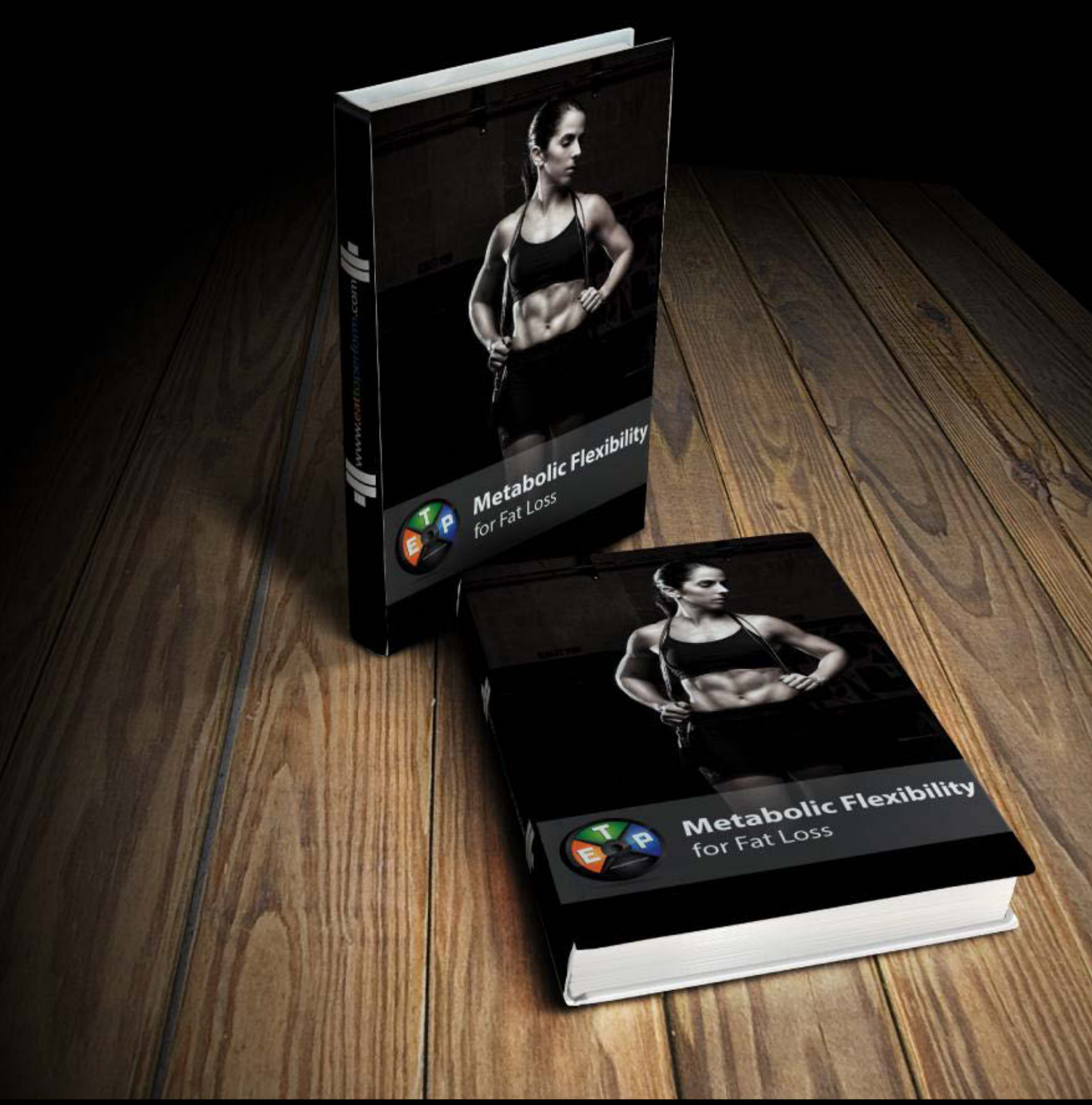

Metabolic Flexibility

Mike T Nelson, BA, MSME, PhD, CSCS

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About the Author

For over 18 years, Mike T. Nelson has dedicated his life to researching human performance. In addition to his bachelor's degree in Natural Science, and his master's degree in Mechanical Engineering (Biomechanics), he recently completed his doctorate in Exercise Physiology through the University of Minnesota.

This is why the world's top organizations call on him to help their members perform their best, organizations like:

- The military's elite research group
- The International Society of Sports Nutrition
- American College of Sports Nutrition
- National Strength and Conditioning Association

The tactics Mike teaches in his seminars, boot camps, and videos are designed to drastically improve the results you're getting from your current workout – or they could be used to build a new workout from scratch without injuring your lower back, destroying your knees, or overstressing your joints; all while burning more body fat for a leaner you.

In addition to being a member of the American College of Sports Medicine (ACSM), the National Strength and Condition Association (NSCA), the International Society of Sports Nutrition (ISSN), and American Society of Nutrition (ASN), Mike has been published in peer reviewed journals, is regular peer reviewer for a top sports nutrition journal, and has earned a number of certifications:

- Certified Strength and Conditioning Specialist (CSCS) by the National Strength and Conditioning Association
- Z-Health R, I, S, T Phase, Advanced Nutrition Course (9S Sustenance)
- Z-Health Master Trainer
- RKC (Russian Kettlebell Certification)

As a result of his education and experience, Mike looks at systems of the body differently. Realizing that the majority of people were disappointed with using a lower carbohydrate approach for fitness and weight loss, he began searching for a way for people to increase their metabolism, decrease their body fat, and improve their overall energy. Through his research, he developed the concept of Metabolic Flexibility, which became the focus of his doctoral dissertation.

The result of this research is the program you now hold in your hands. Very few people have the time to read a 400 pg. research document that requires them to reference a thesaurus just to learn how to burn fat and perform at a higher level; the purpose of this book is to summarize Metabolic Flexibility in easy-to-understand terms, and make its application highly practical. The goal is to provide you with enough information to understand the concepts of Metabolic Flexibility so you can utilize them TODAY, for immediate results.

Here's to your success,

- Mike T Nelson, MSME, CSCS, PhD

Section 1: Overview

Congratulations for taking massive action and picking up this e-book! You've taken the first step to make it happen and start moving towards your fat loss goals, so pat yourself on the back!

This section is designed to get you on the fast track as soon as possible. Since the ideas presented in Metabolic Flexibility are **not** the norm, it can be difficult to comprehend at first but they **do** work if you apply them correctly.

I'm going to introduce you to some new concepts regarding nutrition for fat loss, so I recommend that you read this e-book from **start to finish.** Understanding the principles or the "method to the madness" will be important to keep you on track.

A Gradual Approach

It's important, before you begin to put the principles of Metabolic Flexibility into action, that you understand one simple truth:

Success does NOT occur overnight.

The first couple weeks of your experience will be wrought with changes that may make you uncomfortable. There's a process to this approach that may not line up with what you've become accustomed to expect from a diet protocol. Depending upon where you're coming from, you may be frightened to take the first steps, or remain on the path. It's OK! **This takes time.** It's a gradual process that you can adopt for the rest of your life.

I know exactly what you're thinking:

"So how MUCH time are we talking about?"

I'm asking you to set aside **90 days – 3 months** – of your life to dedicate to yourself in the pursuit of lasting change and permanent alteration of how you see yourself, inside and out. I'm asking you to cast aside your doubts and rebuild your concept of nutrition from the ground up so that you **never** have to worry about dieting again. While this sounds like a massive chunk of time, keep in mind that we are talking about permanent change here - the kind that will last you a lifetime. This is your ticket to finally get off the yo-yo dieting rollercoaster.

Unlearning 101: A Brief Tangent

I used to golf. **Correction:** I used to go out on a sunny day and throw some small round balls into the water, and attempt to knock out squirrels as they were rummaging for nuts in the woods. Actually, I'm not sure I would even call what I did "golf." To say I sucked would be an understatement. In the end, after only a short period of time, I quit; but probably not for the reasons you would assume.

I quit because I took too many darn motor learning classes (massive geek) and could not get the fact out of my thick skull that I was only embedding poor skills. I was getting really, really good at slicing golf balls into the next green, almost pegging unsuspecting golfers from a great distance. I even started lining up facing my left more in an attempt to compensate for my awesome slice. It was either time to man up and take some lessons to get better, or stop all together. I opted to stop since I figured I could learn it later in life.

If I continued on, I would've just gotten worse and developed bad habits. A bad habit is nothing more than something you are quite good at doing without much thought - just **poorly.** The fancy jargon used to describe this scenario is "unconscious incompetence."

The huge bugger is that bad habits are hard to break. The unlearning process is slow for everyone; this applies to fat loss too. The media is constantly bombarding us all on

a daily basis with “less than stellar” (cough, garbage, cough) information about what we need to do to get where we want to be.

“Don’t eat carbs, they will make you fat!”

“Fat has more calories than protein or carbs, so dietary fat will make you fat.”

“Don’t eat too much protein since it is hard on your kidneys and you will damage them.”

Well, that gets rid of all 3 food groups (macronutrients) now. What am I supposed to eat? Should I just forage around the woods for some twigs to gnaw on?

Sadly, exercise is (apparently) not much easier to figure out.

“Don’t do long slow cardio, it makes you fat.”

“All that strength training is going to make you bigger!”

“Intervals are too hard on your body and they will make you fat.”

“If you exercise, you will just eat more.”

I’ve even heard Gary Taubes, the famous science fiction/nutrition author, say that exercise is worthless for fat loss ("The Scientist and the Stairmaster")

Since exercise is bad news, it looks like I’ll just keep my butt planted firmly within the indent I’ve left in my couch. I won’t eat anything either – I wouldn’t want to put on any excess body fat or damage my kidneys!

We all hear this crazy stuff, even when we try to avoid it. It’s no wonder people are confused. I’ve seen researchers at conferences almost get into fist fights arguing about the *same* data. It’s not easy to interpret!

My whole point is that **each of us** has something to unlearn about nutrition and fitness if we want to realize our fat loss and performance goals…and that's just fine. The catch is that it will take time, and education is the first step. Keep this in mind, dear reader, as you continue.

Allow Performance to Drive Your Results

Allow me to drop this knowledge bomb on you – **exercise does more than just burn calories.** You are smart, and you know that already, but this fact gets swept under the rug almost all of the time. Exercise **does** burn calories, but it also exerts powerful signaling effect throughout your entire body. When it's done correctly (which we will get to), it has the power to **literally** change you from the inside out.

Take home points about exercise: 1) burns calories 2) turns on powerful signals for change. Got it? Good!

Knowing this, we've designed our method around achieving results through performance increases. You're not exercising to burn calories – you're exercising to improve your work capacity, which will increase the amount of fat you can burn by helping you build and maintain lean body mass. Since your results will be driven by performance, it is important to fuel your training. Analogy time!

If you only put 2 gallons of gas in your car, how far can you get? Unless you can put your feet through the floor and pedal like a Flintstone, you probably won't get super far. What if you completely fill the tank? You can travel much farther, of course! Similarly, your body needs fuel to "go the distance" and perform. Better performance not only burns more calories, but it also sets in motion (via signaling) many other important processes that will speed up your results.

A Word About Weight Loss

Now, since fueling your workouts requires food, you may be looking at eating more than you're typically used to. Like I said earlier, we're going to change the way you look at nutrition – particularly the notion that it's necessary to underfeed **every day** if you're trying to lose body fat. Scale weight is fickle, and it's never a linear progression from "a" to "b" – it changes based upon how much water you drink, how much activity you get, and how much food you eat. Regardless of your current body composition, it's likely that you will either gain a few pounds or feel bloated at first. **Practically everyone experiences this,** and it's perfectly normal.

Scale weight has little to do with your body composition, and that it can be easily manipulated by cycling calories and macronutrients based upon your activity levels, as you'll learn to do with this book.

You will NOT exponentially gain weight, but it can be kind of disconcerting for some folks – especially if they're trying to drop some extra fat – to step onto a scale and see a small increase. **Don't let this bother you.** It's necessary to fuel yourself properly if you want to make a lasting change. **What will happen** as you put performance first and dedicate yourself to this new way of eating is that your workouts will improve, you'll get less sore, and you'll probably find that you're sleeping better. **You'll feel great and you'll stabilize.**

Once you find your "center" and everything has calmed down, you will begin to positive changes in your body composition, but as I mentioned earlier, it takes time. **That's why I ask for 3 months of consistent dedication to the program.** There's a process at work, and you will have to trust in it for a bit. I guarantee you won't be disappointed.

On or Off

Training and recovery are equally important. More is not always better - better is better, and it's OK to take a day or two off from the gym. Trust me on this one; you

won't lose all your gains. In fact, taking more days off from training is actually recommended if you want to prioritize fat loss. It's also not a bad idea if you're focused more on performance. In my experience, most people see strength increases after taking some time off because they're giving their body time to repair. While training provides the stimulus for change, that change is realized outside of the gym.

On your off days, it's important to give yourself a mental break as well. Just like your muscles work hard in the gym, your brain is working hard all the time making multiple decisions every day; and this takes energy too. There is no need to be 100% "on" 100% of the time. Relax a bit, both physically and mentally On your off days, eat until you are comfortable and call it good. No need to further fuss and expend more energy. Use this time to recharge.

<u>3 Key Principles:</u>

1. Performance drives fat loss!
2. Fuel your training appropriately!
3. Refine your body over time!

You **CAN,** and you **WILL** accomplish your goals and maintain the results **IF** you utilize the tools at your disposal – this book, along with the support provided by Eat To Perform – and throw away what you **thought** you knew about fat loss.

Met Flex Testimonials

To help reinforce your faith in the program, I'd like you to take a look at some testimonials from people just like you that have found success with these methods. Note that these results are **TYPICAL** - that's right - it can be done and many have already done it. You can (**and will** be) next. It's a process and it won't happen overnight. Give yourself 90 days to dial in the best approach for your body. Fuel yourself correctly, watch your performance in the gym increase, and tweak the formula over time.

Here are some people just like you who've found success with Metabolic Flexibility, along with some lessons they've learned:

Maggie – 3 and 6 Month Results

"It was a long day, my 27 pound wiggly two year old did not want to be put down. Up and down the stairs, down the hall, outside, at the park…wherever we went, she wanted to be held. I was tired and my back hurt. While looking down at her, honestly a little exasperated at her asking me to pick her up again, it dawned on me. The extra weight I was carrying around on my body was more than what she weighed. Weight I had gained in the last five years. I mean, I knew I wasn't in shape, but somehow seeing it the way that I did at that moment, I knew I needed to change something.

I had heard of cross training before, had two friends doing it and loving it, but between my husband's work schedule (5:30 a.m. is the only time I could do and I am not a morning person…at all. I'd rather stay up until 5 am than get up at 5 am), I was hesitant. But, at this point, I needed something that was going to kick me in the rear and get going, so I started.

October 2012 **July 2013**

After my first WOD, I promptly walked into the bathroom and got sick. I remember thinking "I can't do this. Why am I here?" But I also knew that if I didn't go back, I wasn't likely to get out of my very deep rut. Thanks to some well timed encouragement and kind words from a few regulars of the 5:30 a.m. class (Val, Amy, and Andrea!), within a short time, I was hooked. A month after I started, the owners announced a Paleo Challenge where we could sign up for a three month or six month challenge, which started with the Whole30 plan. I wasn't going to do it because the idea of that much planning and prep (not to mention going without my 2xday Diet Coke and daily flavored coffee creamer) scared me, but after talking with one of the owners, I reluctantly joined the Challenge.

Getting Tested

One of the things I am most thankful I did, even though it was hard to see the numbers in black and white, was to get a BodPod test. When I got the results, I folded the paper in half and walked back to my car. I opened it up and looked at the number again. Not the weight, I knew that already. The body fat percentage. 41.7%. That put me in the "risky" category. I wanted to cry. Okay, so I did cry. I knew it was bad. I didn't know it was that bad. The co-owner of our box called me and helped me work through some of what I was thinking. I then took a deep breath and said to myself…"well, I have to start somewhere."

As part of the Challenge, we also measured our total (one rep max on three different lifts) and completed a baseline WOD. The improvements in these scores, plus the changes in our BodPod would determine the winner.

Side note: If you are at the beginning of your journey please get a Bodpod or similar test done. It might be difficult, but it WILL be worth it to see your progress! I still don't yet "see" myself as different in the mirror, though pictures show it, but as Paul Nobles – Eat to Perform always says #datadontlie. Those numbers help take away the power of the number on the scale.

Paleo/Whole30

Although at the time of the Challenge I hated the thought of doing the Whole30 plan, I am so thankful that I did. I had no idea how my body reacted to food! I really needed the rules and structure to follow as well. At first, I felt like I was starving all the time, but then talked with Paul Nobles/Eat to Perform who suggested more fat and more protein, so I started eating fattier cuts of meat, using coconut oil to bake chicken, and soon I wasn't so hungry. It didn't come easy, as I was used to a "low fat" diet. I also tried to stay off the scale during these 30 days because I was afraid that if I didn't see movement, I would give up. So I pressed on. Three meals a day plus a snack or so, all Paleo…but more importantly, all whole/real food, no processed stuff! I did NOT count calories or macros at this time, as I needed to focus more on the quality of my food intake.

After the 30 days, we were allowed to add back food if we wanted to. At this point the weight was coming off fairly easily and I was noticing progress. Oh, and no tracking food either. I just ate when I was hungry (really hungry, not just snack-mood hungry), as much as I needed to eat to feel full, with as much variety as I could put together while avoiding processed foods.

Is strict Paleo or Whole30 for everyone? Not necessarily; however to jumpstart a new lifestyle it was a key change for me. Foods tasted so much different afterwards, I couldn't stand canned/bottled Diet Coke anymore (shocker for me), and the thought of putting in the non-dairy flavored creamer made me want to spit out my coffee. Gross.
It was like pushing a reset button on food. Quality of food makes a huge difference!

Results
After three months we went for another BodPod test.

- *Body fat reduced by 7.3%/17.8 lbs*
- *Muscle mass increased 3.3 lbs*
- *Net 14.5 lbs lost*

Not only that, but we re-did our total and baseline as well and my performance improved significantly! Up 40# on my back squat, 30# on my deadlift, and 10# on my shoulder press. I reduced modifications on my baseline WOD and was faster by 1 minute 42 seconds! It was pretty cool, I was the female winner for the challenge, but I still had a lot of room for improvement.

Six Month Update
Once the three month challenge was over, I did add "eating for joy" moments more often, but definitely not as often as I used to. While I typically still avoid gluten and dairy in meals, we occasionally have pizza and frozen yogurt, and I frequently have a glass of red wine. Per Paul's suggestions, I have added white rice and more starchy carbs into our meals and added Progenex after my morning workouts. I don't count my macros. Let me repeat that, I don't count macros and I don't fill out spreadsheets. Don't get me wrong, every so often I do write down what I eat as a double-check to make sure old habits weren't creeping back in, but that's about it.

At the six month mark, we again went back and re-tested in the Bodpod and I had even better results.

- *Body fat reduced by another 4.2% (-11.5% over six months, **25.5 lbs of fat!**)*
- *Muscle mass increased by another 3.8 lbs (7.2 lbs over six months)*
- *Net 18.3# loss.*
- *PR'd all three lifts again*

25.5 lbs of fat lost *plus 7.2 lbs of muscle gained over six months! No dieting or calorie restrictions, in fact, I eat more now than I ever have in my adult life! Oh, and no crazy workout schedule, I only train 3x week, then do some at home lately (slow lifting, trying to get pull ups, situps, and pushups). I still have to scale some skills, I'm still not great with cardio (one of the slowest at the box with runs!), but I'm always making improvements and scaling less! For instance, in just the last two months, I have reduced the band on my pull-ups from the green band to the red. I'll get pull-ups soon (Note: Since this was written I HAVE GOTTEN PULL-Ups)! I've PRd all my lifts again. I look forward to repeating the Bodpod test in the future as I am confident of additional progress. Since learning to Eat to Perform following Metabolic Flexibility, I have set my main focus as gaining muscle, confident that more fat loss will follow."*

Lessons Learned:

- Quality of food matters a lot!
- You can eat more than you ever have AND lose substantial fat!
- Body composition tests, along with performance measurements are much more telling than the numbers on the scale.

Christine

"I'm leaner now than before while eating more carbs!"

"Before ETP and Metabolic Flexibility I was eating between 900-1500 calories total. Burning who knows how much of that with cross training and Oly training. Eating low carb and hungry all the time. My lifts had stalled and I was tired.

I joined ETP and April Blackford, Moderator for ETP picked me up immediately. I was scared to death because I had already used the calculator and the calorie total had me wanting to run screaming from the room. She bumped up my activity level because, of course, I was at moderately active and that was crap. I was very active on my lowest activity weeks, then she increased the already high (in my opinion) carb amount. But I had a decision to make. I was either going to stay scared or do it "as prescribed". I decided to trust her and the science

of ETP because it made sense. So below is what I've been eating for the last six weeks and below that are my photos. They were taken exactly six weeks apart.

- *Calories: 2000/2300 control (aka rest day)/active*
- *Carbs: 215/282 (that's right 282)*
- *Protein: 125 or more every day*
- *Fat: 70-75 I go over some days but stay under 90ish*

I have stuck to this with the exception of a couple of lowish days. But no more than that. I've been eating mostly jasmine rice, sweet potato, cinnamon Chex cereal, oatmeal and ripe bananas for my starchy carbs. I have thrown in some cupcakes here and there and wasn't even sorry because they fit into my macros.

I PR'd most of my lifts and increased my dead lift by a 40lb jump!!! I feel amazing and haven't been hungry in weeks. (Except when I wake up in the morning)

EAT THOSE CARBS and calories!!!"

Lessons Learned

- Eat carbs (in the correct amounts and times, more coming up)
- You do not have to be hungry all the time to make progress

Yep! Carbs are not the enemy. Christine ate more carbs AND felt great. Contrary to what is in the popular media, she did not gain tons of fat! Remember what I said about unlearning? It's hard – your habits are firmly rooted in your beliefs. That's why it's important to read testimonials; you need to believe that you can succeed to change your habits.

April

"Here I am in all my glory, nine months into my build. I still can't believe that I took these progress pictures – no one really shows progress pictures during a bulk right?? I guess there is a first time for everything, huh?!

I wanted to show a few things. First, what I look like 11 lbs. heavier, and also that you don't need to be afraid of carbs. Remember, that was me that said that carbs were magical and not to be afraid of them.

The first pictures (with longer hair) were taken November, 2012. Here I was 124 lbs. In the second pics (with the shorter hair) I am 135lbs.

Allow me to note that all the current pictures were taken today after having consumed 300g of carbs yesterday, and 150g up till the time of the pictures. So (obviously) no water manipulation and just all normal bloat for me.

Let me tell you what changed from the two comparisons.

First of all, I stopped giving a crap about the scale and started focusing solely on my performance in the gym. I increased my carbs substantially; prior to trying to build, I was eating 150g of carbs on my high days. I currently eat 300g of carbs on the days that I train, and 200g of carbs the days that I rest. Yes, that's right – 300g of carbs.

My current plan is to continue with my build at least through the end of this year. At that point, I will decide if I want to attempt a cut or not. The good news is that if I do, I will likely be able to cut on a higher amount of carbs. Now who wouldn't want that?

If you are one of those people that stress when you step on the scale and see the number go up, then hide that scale in the closet!! Put more focus on your performance in the gym and I promise you, with time and patience, you will achieve the body that you desire. This is a marathon, not a sprint. I suggest sitting back and enjoying the ride as well as the beautiful scenery along the way."

Lessons learned

- Carbs are not evil
- If the scale freaks you out, get off it

Lisa

Lisa Cartwright made some amazing progress too from doing the HCG diet to now looking much leaner and not freaking out about eating Mexican food with her family on occasion.

"I think the main thing that I want people to know is that this isn't a start/finish photo. It's a progress pic. I've done several "lose weight fast" diets in the past (as recently as January) that appeared to be successful, but the finish photo usually represented the end. I could never maintain, and unfortunately, I always seemed to be back to the start photo in no time. You always hear about not dieting but developing a lifestyle. I feel like I'm finally able to do

that with ETP and am excited to see further progress.

For the past 2.5 years or so I have been trying/struggling to keep my weight off. I tried the HCG 500 calorie diet. With that, I got to where I thought I wanted to be on the scale and fit into smaller size clothes, but I still wondered why I wasn't happy with the way my body looked.

I was smaller, but in many ways I still looked the same. I think they call that "skinny fat!" After that, I transitioned to a low carb style of eating and maintained that on and off for a while. I swore by it when I wanted to drop some weight quick and spent the next year or so yo-yo-ing back and forth.

Enter High Intensity workouts

I started at my box (gym) in October and shortly after gave the Advocare 24 day challenge and Paleo a try. It was a fantastic program and I saw incredible results in just 3 short weeks, but i still struggled to keep it off and was back to my start weight yet again. I recognized that my eating was at the core of my weight loss/weight gain problem, but I was at a loss for a solution.

Recently I saw that our box owners and several members had liked the Eat To Perform page, and I liked it as well. I loved how much it made sense to me and was based on science.

I was also intrigued at the idea of not only losing fat, but getting stronger and better at working out. Plus I have to admit, the thought of eating carbs again made me a tad giddy!! So I was all in!

Results with Eat To Perform

I almost immediately started noticing that I seemed to have more gas in the tank for pushing myself during WODs (training). Even better than that was the fact that the lbs. on my strength exercises and lifts kept getting bigger every single week. Before, I had kinda just gone up and down and never made any big progress.

I think the fact that I have gained 6 lbs. while becoming visibly smaller says it all! It's been a significant component. In fact, the way I was feeling at the gym and the strength gains I made were the only thing that kept me from ditching ETP and going back to the low carb eating.

I knew if I did that, it would help me to quickly lose some weight before summer got here, but I also knew my performance in the gym would suffer as well and I just wasn't ready to go back to that. I really wanted this to work. Finally, I started seeing fat loss, and I knew it was a result of better performance in the gym.

It never crossed my mind before to eat to fuel my workouts! I ate to lose weight….period! Now I eat according the Metabolic Flexibility guidelines. I have increased my calories by 600 to fit with the level of my activity and started eating more carbs. Throughout the day I eat my proteins and healthy fats, leaving the bulk of my carbs to be eaten around my workout when they are the most useful, which is typically at 5 p.m.

Eating this way has completely changed my thoughts on food. Now when my family wants to go out to eat pizza or Mexican food, I don't feel guilty the next day.

I think "Man, I'm gonna kill my workout tomorrow"!"

Lessons Learned

- Ate more food – 600 kcalories more, and was less obsessive about it
- Got leaner

What about the guys? Can you dramatically alter your body composition? Yep! Try 2% leaner (sub single digits) while adding over 13 pounds of lean mass. Check this out!

Jeremiah

In the end, a consistent approach to diet and getting better led to the following during the 6 month challenge by Jeremiah.

"I gained over 13 pounds of lean muscle AND dropped to single digit body fat levels!"

"The Paleo Challenge at my gym began on 10/13/12 and the choices were simple, 3 months or 6 months? You would BodPod at the beginning and the end and you would complete a benchmark total and a benchmark WOD that would each be re-tested at the end of the time period. No food journals, just eating Paleo and working out. The only other stipulation was the first 30 days were to be Whole30 approved (so really strict!).

It was really a no-brainer for me to get involved in the challenge, as I had been eating Paleo since January 2012, when I first started going hard again I decided to give it the full 6 months. I was not necessarily in the challenge to win, but to give myself a reason to stay on track and see what I could achieve during that time.

I decided to set a few goals after the first BodPod on 10/13 when I weighed in at 201 lbs, 9.1% body fat, and fat free weight of 182.6 lbs (I am 6 ft 3 inches tall). It was my first experience in a BodPod for body fat testing, with my only previous experience being caliper testing (not overly accurate in my opinion). I was surprised by the body fat reading of 9.1%, as I thought it would be higher than that. With that said, I now had some targets for the end of the challenge: Gain 10 pounds and lose 1% body fat. I knew it would be tough and I would have to change some things, but I was up for the challenge and I will tell you the results and how I got to them shortly. First though, I need to give a bit of background on myself.

I was always active and involved in sports growing up. As a kid, I played football, baseball and ran track. Once I got to high school, my sports became just football and track, as I was never all that good at baseball. I was fortunate to receive a full-ride scholarship to play football at the University of Kentucky where I was a 4 year letterman and 2 year starter at tight end. During this time, my weight fluctuated

between 240-245 (in-season) and 250-260 (during the off-season). The concept at the time was pretty simple, eat anything and everything, workout, and play football year-round.

After five years of college football, and 12 years of football prior to that, I was pretty burned out on weight lifting and football in general. I ended up taking about a year off of physical activity, but continued to eat like I was playing football. My weight fluctuated between 230 and 240 pounds, which included less muscle and more fat than my playing days. Over the course of the next 3-4 years, it was an on-again, off-again cycle of exercise and eating "healthy" (or at least what I thought was healthy). I would start a routine, continue for a few months, and then "get busy" and stop. Part of the problem was finding something that I enjoyed doing, while also not having any competitive reason for going through the routines. During this time, my weight would go down as low as 220 lbs, while creeping back to 230-235lbs during the "off" times.

Finally, in 2009, I found something that kept my interest, Boxing. I had the pleasure of meeting a former professional boxer by the name of Gerald Reed, who trains MMA fighters and boxers. My wife and I began working out with him one day a week personally, and then took two "Boot Camp" type classes per week with him at the local globo gym. I loved the high-intensity, tough workouts that he created and it seemed to constantly change each time. I never actually boxed another person, but hitting the pads and flipping tires was a blast. I continued this type of training for about a year and half before making a move north to Minnesota for work. At that time, my weight was steady around 220 lbs.

When I arrived in Minnesota in the winter of 2010, I no longer had a trainer or program to follow, so I joined the local globo gym and started participating in some boxing classes they offered a few days a week. I never touched a weight while I was a member of the gym, and I was not consistent with even going to the gym. As my wife and I sat in our house on a cold snowy day in December 2011, we watched the Games replay on ESPN 2. It looked like the exact thing we needed to get back on track. January of 2012 began a journey that is still going strong today.

When I first entered the gym, I was humbled. My weight was actually the lowest it had been since high school at 215 lbs, but I hadn't lifted a weight in about 2 years, so there was not a lot of muscle in the 215lbs. I couldn't lift more than a PVC for overhead squats, I needed a band for pull-ups and ring dips, and I was out of breath after the warm-up. I also nearly broke my neck trying to do a handstand against the wall, but I was hooked! The other thing that happened right from the start was a decision to commit to Paleo and change our lifestyle. Both my wife and I made a full commitment and we cleaned out the pantry and refrigerator to eliminate non-Paleo foods.

It took me a few months to start RX'ing some workouts, but I was losing weight and feeling good. Over the next 9 months, I was able to drop about 15 pounds down to the BodPod weight of around 201 pounds. I was eating Paleo consistently, but I knew there were some changes that needed to be made moving forward.

This brings us to the 6 month Paleo Challenge…

I will focus mainly on what I changed during the challenge, along with some aspects that I feel were important. I will also provide what an average day looks like in terms of eating.

The first thing I knew that needed to change was to increase my protein intake. Prior to the challenge, my afternoon snack would consist of a Lara Bar or an apple or some nuts. In addition, my post-workout food consisted of eating 5 or 6 prunes and that was it. To change it up, I began using Progenex Recovery, post-workout, mixing it with 12 oz of Coconut Water. For the afternoon snack, I began eating half of an

Avocado along with a can of Wild Planet Pink Salmon. On my off-days, I would occasionally substitute a Progenex More Muscle Protein shake mixed with water and a handful of cashews or Macadamia Nuts.

I was doing a decent job the rest of the day in that I was eating protein at breakfast, lunch and dinner, however, I did decide to increase my egg intake for breakfast from 2 eggs to around 4 or 5. I also began drinking homemade Bone Broth; first in the morning, then I changed it to right before bed. Not sure if the time of day makes a difference, but it worked out better for me before bed.

In order to make sure I was getting enough protein and fats, I spent a little time toying with the Zone prescription, but never really followed it exclusively. I really just took the 5 block approach for my snack and each meal to ensure I was getting enough protein and fat at those meals. On most occasions, Dinner was well above the 5 blocks for both protein and fat.

In addition to the increased protein consumption, I also knew that my carb intake was too low. For the first 9 months of working out and eating Paleo, I was not really getting enough non-vegetable carbs. I dropped body weight during that time and I increased my work capacity, but I felt tired in longer workouts and knew that I was not optimizing my performance. I added starchy carbohydrates for dinner, which basically consisted of Sweet Potatoes, and more recently Sticky White Rice. I will say that my carb intake is probably not as high as it needs to be, but I was still able to get good results.

I almost exclusively eat grass-fed meats, free-range chicken and eggs, and organic vegetables. I also try to buy locally for these items. My reliance on supplements is pretty minimal. I take some fish oil in the morning, along with a Vitamin D supplement and a multi-vitamin. Aside from those, the protein shakes are the only other supplements that I use.

Aside from the details of what I ate, I think the biggest part for me was the consistency. By no means was I eating strictly Paleo all the time, as I would occasionally indulge in some Pizza, some Ice Cream, some alcohol, etc. However, I made sure to keep it a once in a while thing, and tried not to over-indulge. In addition, I did not let it affect me the next day, as I would just go right back to my normal eating routine.

Consistency played a major role from a diet standpoint, but it was even more important now that I was working out with intensity. I was consistent with my workouts of 4 or 5 days per week, depending on how my body felt, but more importantly I was consistent in holding myself to the movement standards of the WOD. I had no problem no repping myself if I didn't meet the range of motion standards even if that meant it took me much longer to finish a WOD. I also worked to improve my technique. Overall, I think this helped lead to better gains and better performance over the course of the challenge.

I am looking forward to what the next 6 months will bring…"

- Body Weight increase from 201 lbs to 214 lbs
- Body fat decrease from 9.1% to 7.1%
- Muscle gain of 15.7 lbs
- Increased my Deadlift, Shoulder Press, and Back Squat Total by 75 lbs
- Decreased benchmark WOD time by 23%

Lessons Learned

- It is a process
- You can add lean mass and lose fat

Now it's your turn! You can do it and you are on your way.

References

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Section 2: Fixing Broken Diet Methodologies

NOTE: *This section is a collaborative effort between Paul Nobles and I. He did most of the writing, and I added references to support it. –Mike T Nelson PhD(c)*

I'm about to let the cat out of the bag. Meow…

The secret to dieting isn't a secret at all – it just doesn't sell a lot of books or fat loss systems. Nobody within the industry wants this, but I'm goin' for it. Are you ready for this? The secret to long-term, effective dieting is to **stop dieting**.

Before I explain what I mean, let's review some common approaches that are taken in pursuit of fat loss and why these methods fail to establish a congruent, sustainable solution to the fat loss puzzle. Now, I am certainly not saying you **CAN'T** achieve success using the 3 methods I'm about to outline, but I am going to throw out the pros and cons of each scenario.

Method 1: Eat Less/Do More

By far the **least** effective and most harmful way to approach fat loss is the "eat less/do more" model. Unfortunately, a lot of fat loss advocates champion this approach. They have a great fall back plan when their systems don't work too – **they blame it on their clients.** This is nothing but a cop-out. Let me explain why.

You aren't eating, and you're engaged in some manner of extreme exercise, but the scale ain't moving. You asked your "diet guru" to just "tell you what to eat", so they did and now you're starving - you're crabby all the time and you can't get to sleep, let alone **STAY** asleep. You wake up in the middle of the night and you follow your instincts; you **EAT**. This behavior is of course followed by feelings of guilt, because

you're not midnight snacking on chicken and broccoli – you go for the stuff you know will work, the energy dense stuff like ice cream, PB n' J, and cold pizza.

That's when your "diet guru" openly questions your resolve. They point to the four people on the wall that "made it." "Made it" is of course relative because many people that lose weight this way end up looking like a smaller version of their heavier selves – they end up **skinny fat.** More importantly, it doesn't stick for a lot of folks because they weren't taught how to *sustain* their results. This is why I find it ironic when someone that is heavy says to me "the only thing that has ever worked for me was Weight Watchers and being active". In my opinion, they are wrong; the magic happened after they got **off** Weight Watchers and started to eat again. What truly worked was the process of dieting and then rebounding. It's sort of like saying "the hammer did all of the work" when nail and wood are integral parts of the equation.

Pros

- It KIND of works

…That was about all I could come up with.

Cons

- While it works, at what cost does it produce results?

The client feels horrible when they cannot keep it up, and they blame themselves.

Method 2: Extreme Deficit Dieting

The most effective way to lose fat is, unfortunately, often the least sustainable. Note that I say "most effective," not "best way to lose fat."

I think most of us have tried this method before – it's the basis for many of the "30 day Paleo/low carb/whole foods/etc. challenges." This person is usually someone coming from a background of eating mostly processed carbohydrates, inadequate amounts of

protein, and relatively little fat. Flip that around – teach people to eat low carb, high fat/high protein in the form of whole foods – and it seems like something magic is happening.

If they move towards a more "whole food" way of eating and keep their activity low (activity requires energy after all), they can typically lose a good amount of weight in a short period of time since their energy intake decreases. A steak and a salad will provide fewer calories than a double cheeseburger and a milkshake. It won't take much of a toll on their lean mass in the beginning because they really aren't doing all that much. Plus, the more weight you have to lose, the more aggressive you can be with fat loss without a loss of lean mass. The story here takes a drastic turn for the worse when high-intensity exercise is added into the equation. This happens all too often and that's why Eat To Perform exists.

For these people, moving to a low carbohydrate way of eating seems like a godsend as they are now allowing their body to have a lower overall level of insulin; this teaches their body to use fat as a fuel source. Make no mistake about it though, it isn't the fat doing the heavy lifting – it's the calories and the carbs.

For a lot of people, losing 30-40 pounds is great but they probably won't look or feel all that great. Since there was no emphasis on building lean mass or developing skills, this approach will leave the person less capable and "skinny fat". In an effort to further strip away body fat, calories will inevitably continue to drop, and they'll eventually start to get **really hungry.**

As this group of people leans out, their hormones do tend to work better, and that's a plus. In a comparison of hormonal responses to exercise between lean and obese subjects, Wong et al. showed that the obese folks displayed hormonal adaptations that resulted in the diminished use of fat as a fuel (Wong & Harber, 2006).

A downside to this approach, however, is that thyroid function can take a nosedive – it's not pretty. In a study of obese females who were put on either severe caloric restriction (high protein/ low calorie diet or gastric banding procedure), after three weeks there was a decline in thyroid function as measured by TSH levels and a rise in rT_3 and fT_4 levels (you want those to be lower as they are for reverse binding T3 and T4). After 3 months, fT_4 and rT_3 levels returned to baseline levels, whereas TSH and T_3 levels were persistently decreased (Lips et al., 2013).

This group is now confused as to why their plan is no longer working and they default to the most logical conclusion (it's actually wrong, but I will talk about this more later): **they eat.**

To top it off, they didn't really understand why they lost the weight or now how to keep it off. They do know that it **sucked,** and they certainly know that **eating doesn't suck** as much as dieting did…So they return to their old routine. A lot of people regain the weight with interest.

Pros

- Can work well for sedentary people who need to quickly lose weight for health reasons
- Hormone function is restored.
- An emphasis on whole foods can improve overall health, especially if fish/grass fed meat and a multitude of vegetables are included.

Cons

- While overfeeding was **possibly** part of the problem, the real issue (lifestyle) isn't addressed and these people will often create an incredibly stressful atmosphere within their bodies to continue to see results.
- The scale will often go down, and in the beginning a lot of that weight will be fat, but the individual is **not** a more capable human being – they're just smaller.
- Certain hormones like thyroid can get messed up and potentially stay messed up.
- While the first 30-40 pounds come off easily using this method, after awhile the loss of lean mass due to lower calories can become a threat to long-term health.
- This approach is **not** sustainable for athletic populations.
- Rebound weight gain is very common.

This isn't to say that no one has made it using this approach, and it may well be the best approach for sedentary people with issues related to obesity, but most people fall somewhere in the middle of the continuum and being less capable as a human being without the ability to live life and use the body they were blessed with isn't a great long-term plan. It's also not great for body composition, so many of these people DO lose weight but DON'T really look much better - they'll often deal with a lot of loose skin because their body didn't have enough time to adjust to the change. As their fat layer shrank, their muscles were weakened by the lack of activity and there was nothing to fill in the space.

Hopefully this has given you something to think about as far as weight/fat loss goes. The "30 day" approach is not the most pretty, exciting, or sustainable way to go. It's not the **best** way to lose fat either. Sure, it seems **logical,** but keep in mind this quote from one of the foremost experts in the field of exercise nutrition:
"Just because something is logical does not mean it is physiological." –Dr. Peter Lemon, Director of Kent State University's Applied Physiology Research Lab

Method 3: Eat A LOT Less/Do A LOT More

This is when the poo hits the fan…

This person has basically sucked the calories dry, so in an attempt to "buy calories", they start to exercise. In the beginning they might just start with some low intensity cardio, and as the results dwindle over time, it doesn't seem logical that adding **more** food will work, so **they add more intense activity.**

Now, the introduction of intense activity like weightlifting, sprinting, cross training, etc. has made them a more capable human being than they were when they weren't doing anything at all, but their degree of functioning has only marginally increased. From a cardiovascular standpoint you can see some good gains, but as this group starts to lift weights, they won't see similarly impressive results.

Keep in mind that **results are relative.** If you have never lifted weights in your life and you move from 45 lbs. to 75 lbs., that seems like a lot, but trying to explore the limits of what you are capable of, without enough food, is not a formula that will get you the best results. There are a lot of people walking around our gyms in a state with chronic stress; the **EXTREMES** they are pursuing aren't actually netting very much in terms of fat loss or performance improvement – it just seems so hard that it **has** to be working, right? **Wrong.**

I already hear the Pubmed Ninjas getting ready to skewer me with the 800 kcal study that's been thrown around the internet more times than a javelin at an Olympic track and field event. It is true that you **can** make progress for a while, as strength training is very protective of your metabolic rate. The often quoted 1999 study by Bryner et al. put people on an 800 kcal diet for 12 weeks. The sedentary group saw a drop in resting metabolic rate (RMR), but the exercise group did not (Bryner et al., 1999). Keep in mind that this study only lasted 12 weeks. What are you going to do next? 600 kcals a day? For the rest of your life? While the conditions of this study aren't practical, it does show us that strength training is protective in the short-term.

Research by Ventre et al. in 2013 showed that less rigorous exercise did not elicit a stress response and thus no increase in salivary cortisol levels. However, a much longer intense exercise elicited a stress response with significant increases in cortisol (Ventre, Colonna, Smith, Alfano, & Moldow, 2013). Doing intense exercise for longer periods of time results in a greater stress response. To make matters worse, those with more fat to lose also have a much higher cortisol response to exercise which could drive them from bad to worse (Wong & Harber, 2006). All of this conspires to the death of long-term, sustainable fat loss results.

Simply put, if your body wants 'x' amount of calories and you consistently feed it less and less, it adjusts. If you add in extreme activity, it adjusts to that as well. Adaptation

cannot be stopped. For most people this adjustment increases their cortisol response and their body holds onto fat.

Pros

- I have to admit it was hard to come up with a pro for this scenario but I **guess** the person is slightly more capable as a human being.
- With minor adjustments they can improve the health they have been destroying in search of fat loss nirvana and become the athletes they're desperately trying to become.

Cons

- This example is harmful, and if they continue past the red line, not only will they struggle to reach their fat loss goals, but as they look to even more extreme measures to get a result, they further the toll they are taking on their bodies.
- Sickness, injury, and a lack of recovery are outward signs for these folks. Basically, they are digging a hole they will struggle to climb out of, and the solution will often lead to eating disorder-type behavior.

Solving The Puzzle

When someone purchases Met Flex for Fat Loss and starts Eating To Perform, we walk them through how they can tip-toe into eating more without gaining a lot of fat. When a person coming from a depleted background adds more energy (food) into their plan, massive fat gain is not an issue. They may gain a bit, but it does not scale directly to the increased caloric intake. This is especially true if they are exercising and eating more dietary protein (Thivel et al., 2013; Wycherley, Moran, Clifton, Noakes, & Brinkworth, 2012)

In our experience, the net result is a measurable improvement in the gym (performance) and in the mirror (body composition). Even when someone puts on a few pounds, it's rare for that extra weight to be fat. What we have observed is that the great majority of people put on several pounds of lean mass in just a few weeks with little-to-no increase in body fat percentage.

It turns out that your body **wants** to be mostly fed! Your body works like a puzzle – you were just missing a piece.

The Secret to Dieting is to STOP Dieting!

You may remember this line from the beginning of this section. Let me give you an example of what I mean by this.

Let's say that for a while now you've been eating mostly whole foods with the occasional treat. You've been intuitively consuming about 1,400 calories on average. Let's propose that you want to lose weight. You buckle down, cut out the treats, but make up for it by eating more whole foods and end up at the same 1,400 calorie average each day. Would there be any real benefit? It might surprise you to find that there would be no substantial change related to your weight.

To lose weight, the logical answer is to cut calories. After all, when you took the treats out, it didn't make a significant difference. Changing the quality of the food didn't work, so it must be that you're eating too much. Asking your body to do the same training with fewer resources (in this case food), is more stressful on your body. Here's a quick analogy: Imagine if your boss showed up at your desk and told you that you needed to do 25% more at your job with the same amount of pay. What would happen to your stress level? It would go up of course! What if you had to do 50% more? Would you even stay at your job? There is a breaking point where you can't take it anymore and say "Screw you, I'm done!"

You can't continually expect more output with less input. Your body isn't all that different. If you continually reduce your energy input (food) with the expectation that your body will maintain the same or greater output (exercise), at some point it is going to revolt.

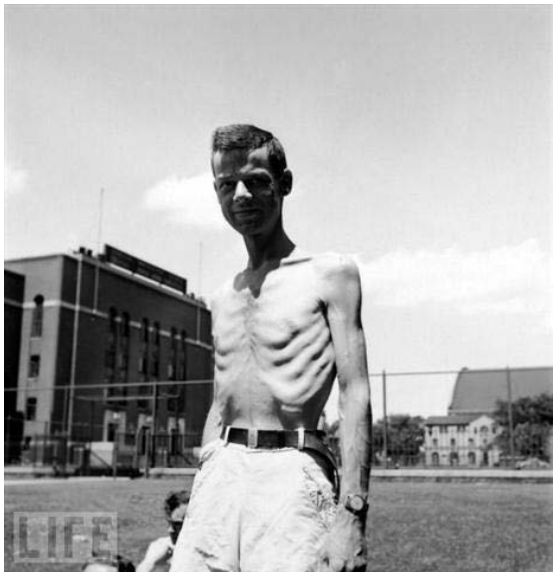
What we see is that metabolic rate tends to trend downwards, and then the breaking point, dramatically downshift. This is a perfectly valid survival response – reducing output will help protect you from running yourself right into the ground. If you keep forcing the same work with fewer calories, not only will you **feel** horrible, but thoughts of food (cravings) skyrocket in attempt to turn the ship around.

A great research example is the Minnesota Starvation Study. They took subjects and gradually reduced their food intake while ensuring their exercise (work) was held constant. The study was done to determine the effects of severe and prolonged dietary restriction and the effectiveness of dietary rehabilitation strategies. It was conducted between 1944 and 1945 with the goal of helping those who returned from the prison camps at the end of World War II (Brozek, 1995).

To summarize the 1,000+ page book that was produced, here is an excerpt from (Kalm & Semba, 2005):

"Food became an obsession for the participants. Robert Willoughby remembered the often complex processes the men developed for eating the little food that was provided: ". . . eating became a ritual...Some people diluted their food with water to make it seem like more. Others would put each little bite and hold it in their mouth a long time to savor it. So eating took a long time." Carlyle Frederick was one of several men who collected cookbooks and recipes; he reported owning nearly 100 by the time the experiment was over. "

Many of them, as stated above, went bonkers, and several of them were found hording *pictures* of food from cookbooks. **They thought of food all the time.**



While this is an extreme case for sure, the point is that when stress gets out of hand, your body will decrease your metabolic rate as a form of self-

preservation. While it's not a linear process, rest assured that at some point, your metabolic rate will slow down in order to keep you alive longer (Kozusko, 2001; Redman et al., 2009; Wycherley et al., 2012).

When you're in an extreme energy deficit for too long, your body doesn't **want** to lose fat; you have already played your "eat less" trump card.

This is where a lot of people play their "do more" card and obtain similar results. In the beginning the scale seems to move, but that soon ends. The net result is that you are eating **almost nothing** and working out **all of the time**. Life sucks, but you're scared as hell to add more food into the mix, even though you know that's **probably** what needs to happen. It's either that or you resign to having no control over your body, and for a lot of people, that's when the wheels come off.

Some are quick to point out that the subjects in the Minnesota Starvation Study ended up pretty lean, and that is true. They were **very lean** and also had little muscle mass. Did I mention that most of them went **nuts** and **never recovered?** I rest my case.

Solution 1: Eat Well and Do Nothing

Let's begin this discussion by bringing up an important consideration that is often lost in translation: the way you are **currently** eating i.e. your nutrition history. By far, the most effective way to lose fat is to be **well-fed** in the beginning. Because many people that read Eat To Perform are **underfed** for their level of activity, I will address this scenario (and how people tend to get there) first.

It may shock you that the most **effective** way to lose fat (not the **best** way) in the short term is to first overeat, and then dramatically reduce your food intake while you do virtually **nothing.** Let's break it down.

Why is the "do virtually nothing" part important? Because doing things makes you **hungry**. While exercise paradoxically decreases short term appetite, this won't last

very long (Blundell, Stubbs, Hughes, Whybrow, & King, 2003; Hopkins, King, & Blundell, 2010; Westerterp-Plantenga, Verwegen, Ijedema, Wijckmans, & Saris, 1997). When you're hungry and you ignore the signal to eat, it's a huge stressor. When you overeat (specifically on carbohydrates) it inhibits many of the hormonal functions that tell your brain to mobilize fat. Remember that as insulin levels are increased, it pushes you towards carbohydrate metabolism. The downside is that you are now not burning as much fat for fuel. This might surprise some people, but your fat actually talks to your brain through multiple hormones such as leptin and grhelin (Wilmore & Costill, 2007). It is a complicated system and attempting to outsmart the human body is never a good idea. Nobody is **that** smart.

Solution 2: "Just Eat More"

While I am a fan of eating more to fuel athletic performance, I am **not** a fan of excluding macronutrients – neither fat nor carbs. For most people trying to eat and do something relatively athletic, cutting out macronutrients can be detrimental to your hormone profile and is **unnecessary**. Dietary fat is known to affect testosterone levels (Derouiche et al., 2013; Macaluso et al., 2013)**.** Once a person realizes that their low calorie diet isn't helping them achieve their objectives, they look at a macronutrient solution like low fat or low carb. Let's say you were eating low calories already, and you started eating more – you would probably feel better because you are no longer starving yourself. There is no magic there; starving yourself sucks and not starving yourself sucks less.

Low Fat

I am not going to spend a lot of time on the low fat portion of this but the long and short goes like this: if you were eating less than you should have been and you eat more carbohydrates but keep fat low, you will gain weight. Why? Well, for every gram of carbohydrate you take in, there is a tax – water retention – that accompanies it (roughly 3 grams of water). Without a significant uptick in your activity level, your body will struggle to process these carbs more than it did when you were eating dramatically less, which is why the only way to stay on the "low fat" train is to continuously eat fewer

calories to a point where it becomes dangerous to your health. Your hormone function (especially the sex hormones) will tank if you drop fat too low, and this is a big deal if you're trying to achieve a lean physique (Alemany et al., 2008)

Low Carb

This is where the low carb folks think they have a better approach, but this method comes with additional flaws as well. Today I was checking out a "fat loss template" from a popular Paleo blog, and I literally couldn't believe what I was reading. Now first let me say that their audience isn't made up of athletes, but even in the instance of "regular folks" their recommendation would not actually net the people long-term fat loss, which is what they were suggesting it would do. Their recommendation was more food with no sugar (little fruit) and little-to-no starches, opting more for vegetables as a primary carb source.

If you are an athlete (or you exercise with intensity), that's where you just click the little "x" on your browser, close the window, and move on because that blog **isn't** for you and could end up damaging you. When you drop carbs and go high fat, you end up relying on ketones via fat metabolism and gluconeogenesis to meet your glucose needs (G. H. Brooks, Fahey, & Baldwin, 2005). While being "fat adapted" is a part of Metabolic Flexibility, these are very slow processes and do not provide your brain and other essential organs with energy quickly enough. Put succinctly, high intensity exercise requires a ready supply of dietary glucose and the best way to get that is by eating starchy carbs (G. A. Brooks, 1998).

Don't believe me? Ask Robb Wolf (ironically the author of a thirty day system the aforementioned blog was selling).

"I have tinkered with many, many clients and found the same results: as we push into the glycolytic pathway (think 800m sprints or a wrestling match) the wheels fall off the wagon if we have inadequate glycogen storage, as we simply cannot, under any adaptation scheme, produce that low-end torque from the beta-oxidation of fats, nor by

utilizing ketones. I wish we could, but we can't." – from "Low Carb Paleo Pt. Deux" by Robb Wolf

The author from the previously mentioned Paleo blog then goes on to recommend HIIT training once fat loss stalls (once again, a big no-no even for regular folks). HIIT or high intensity interval training MAY work initially as a stress response, but long term, it puts people in the danger zone because of the calorie deficit it creates that had them eating more fat in the first place.

The author did eventually concede that some people may need "carb re-feeds" to fix the damage being caused by the overly-restrictive approach. If all of this sounds pretty damn extreme for a little fat loss, that's because it is – most people end up more confused; I have actually seen many body fat tests where people took this approach and gained fat. Once again, I don't know many exercise physiologists that recommend this for athletes, which is why you don't see a lot of "low carb" endorsements from big names. **(It doesn't work!)** It makes zero sense to be pushing hard glycolytic work in the gym attempting to run off only fats. I have not seen this approach be successful.

Pros

- You are eating more; that is a good thing. It's much better than starving yourself.
- In both cases (low fat or low carb) it can be done with whole foods, so that is a good thing.
- Lastly, when you are eating less than your body ultimately requires, fat storage is not typically an issue.

Cons

- As I mentioned above, when you take a low fat approach and you add more carbs, you are essentially adding more fluid to your body and ultimately hindering your body's ability to process that fluid.
- When you start adding in strenuous training on a low carb diet, your body will adjust as a stress response and the net result will be less muscle and/or more fat.

The Final Solution: What Works & What To Do!

Eating enough food works every single time. It's not that you **can't** diet occasionally, but every time you cut calories, you are making a concession to your capabilities as a human being. Now, that isn't to say that you can't perform well and maintain a good looking body – far from it! I'll talk about what works, and break down some fat loss strategies that are ready for the long haul.

How we see lean people isn't always accurate. They don't always have the fat loss puzzle solved; many people keep themselves lean by excessively undereating or overworking themselves. This doesn't set you up to be more capable when it's time to move some furniture, lift a weight, or really do anything requiring absolute strength. Keep in mind that chronic undereating can set you up to overeat in the future as well (Dulloo, Jacquet, & Girardier, 1997). For these folks, the answer is to bring their daily caloric intake up to match their level of activity. If they incorporate resistance training, they'll typically build muscle while maintaining the amount of fat they have on their body, resulting in a net decrease in their body fat percentage.

This is typically known as a **recomposition.** Remember it is body recomposition, not decomposition! It's a slower process, but since the person is already lean, patience is not typically an issue. Developing muscle and strength overnight is **not** a reality. Most lean people have some element of the activity component dialed in. Unfortunately, many people I would define as "lean" don't define themselves as lean because everyone believes they have more fat to lose than they actually do.

Option 1: Recomposition

So the first answer is a recomposition option where the person would increase their energy intake to match their activity levels and add in some resistance training. Cardio bunnies beware, as running dozens of miles every day in an attempt to burn more calories is the enemy for people trying to build lean mass and look good naked. If the

endless cardio approach worked so well, everyone on the elliptical machine would look different from one year to the next, but as you probably already know, **they don't.**

There is a sweet spot and we see it every day in our gyms – the people with the most favorable body composition and the greatest work capacity are often the people who eat the most and move the most weight.

Option 2: 3 Months On/3 Weeks Off

The next option is to Eat and Perform with an eye on the scale for three months, being up a couple of pounds while you are pushing your capacity is fine but anything more than say 5 pounds is enjoying the "Eat" part much more than the "Perform" part. Once those three months is up you have earned three weeks of "eating less". The goal is to use that high functioning metabolism while it's revving, hopefully you have kept in the ballpark of your old weight in this process or even made some slight fat loss gains either through a mild recomp or through your metabolism purring on a bit better.

Your work capacity should be super high at this point. Remember that weight gain does not scale directly with increased food intake. Most would have you believe that if you overeat the standard 3,500 kcal that you will automatically gain one pound. In reality that number varies a ton since in some people, eating more further increases their metabolism; thus the net gained is many times less than the predicted one pound (Wells, 2012).

For training, most will do great lifting 3 days a week with any intensity at all. The goal is to simply be able to walk back into the gym without having to gain back too much ground. In my view if you want to come back to relatively decent WOD's, you would do a full body lifting session once a week and then two HIIT sessions. You could also WOD but scale down to account for your lack of energy. You won't be 100% yourself and so you need to keep that in mind. Your lifts might suck more than your cardio.

For maintaining your performance levels, the first option is the best **by far.** The second option will have you playing catch up a lot because you will lose some capacity with the time off or trying to perform in workouts at less than 100%.

You never **completely** solve health, but when you make it a bigger priority and you are patient with your results, you will end up with better answers than any "diet guru" can provide you. This is because you essentially find the things that work best for you and you continuously look for improvements to that approach. All of that, of course starts with becoming comfortable with yourself **NOW** and being willing to accept all of the realities of a lifelong journey.

Those realities include success, failure, and confusion. I don't have a problem with someone saying they are confused, but I do have a big problem with them using the word to victimize themselves. Life is a puzzle and it's up to you to figure out the answers. In the end it's **your journey.** We'll support you and answer your questions along the way, and hopefully that will make the journey a smoother ride, but trying something and failing isn't wrong – it's only wrong if you give up. If you continuously search for a better solution, you'll eventually arrive at a successful conclusion.

Summary

- The secret to long-term, effective dieting is to **stop dieting**.
- It might surprise you to find that by eating "clean" without cutting calories, there would be no substantial change related to your weight. What is a clean food anyway? As Layne Norton has said "does spraying your food with Windex make it clean?" Everything you eat is either bringing your closer or further to your goals.
- When you're in an extreme energy deficit for too long, your body doesn't **want** to lose fat; you have already played your "eat less" trump card. This is where a lot of people play their "do more" card and still don't lose fat. Life sucks, but you're scared as hell to add more food into the mix, even though you know that's **probably** what needs to happen.

- If you come from a depleted background and add more energy (food) into your plan, you are able to do more in the gym, feel better, and start to make progress again.

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Section 3: Metabolic Flexibility

The Importance of Metabolic Flexibility

The human body is an amazing, adaptable machine. The keys to optimal health, performance, and body composition lie in taking advantage of this capacity for adaptation.

If you're like most people, you want a lean and fit body, but you just can't seem to speed up your metabolism enough to lose weight effectively. Do you often follow diet programs that just don't give you the results you need? Everyone's been there, but you don't have to continue chasing your tail. There is a better way.

Metabolic Flexibility

Metabolic Flexibility is a new and unique concept, unlike the low fat, low carb, calorie counting programs you may have tried in the past. This concept—metabolic flexibility—is based around the new science of how your metabolism works to burn more fat and perform at a higher level. I was so intrigued by it that I made it the focus of my PhD dissertation. I've been actively running experiments in the lab and researching it for over 6 years.

This system is specifically related to developing a healthy metabolism. Not only can you lose weight (which is probably your main goal) but you can also increase the health of every cell in your body. With a high-functioning metabolism, you can experience increased mental energy, increased physical energy, and an increased immune system. You can improve your all-around health and at the same time decrease your body fat. Awesome!

The Metabolic Flexibility system is unlike most programs on the market today, which focus only on dropping fat, often at the expense of your health or performance in the gym. Yes, I agree that your weight loss goals are indeed related to your health, but

many people are overweight specifically because there's some kind of *dis-ease.* Not the normal use of the word *disease*, but a dis-ease; a disconnect somewhere inside their body. In many cases, the dis-ease is that their metabolism has been thrown out of whack because of their yo-yo dieting or because of the doughnuts and 25 cups of coffee every morning for five years. Their chemical balance has been thrown off, which has adversely affected their metabolism. Nobody wants to get demolished in the gym when they could have made a few simple changes to perform much better.

Metabolic Flexibility works to change all of that. How so? I'm glad you asked! On a simple level, you want to be able to use both fats and carbohydrates for fuel. So during a lower intensity exercise, such as just walking and moving around doing your daily job, you want your body to be using fats as its primary fuel. But when you exercise, especially higher intensity exercise, you want the ability to shift into using carbohydrates at that point. Using carbohydrates during exercise will actually result in improved exercise (or athletic) performance.

Using the Right Fuel at the Right Time

Metabolic Flexibility enables you to (1) transition between fats and carbohydrates so you can burn more fat when you're **not** exercising; and (2) use carbohydrates when you **are** exercising to fuel that activity and perform at a higher level.

This flexibility is the transitioning back and forth between fats and carbohydrates. Eventually, you can actually burn **more** fat when needed and use carbohydrates more effectively when needed. You get the best of both worlds (fat loss and performance) by training your body to use the right tool for the right job, at the right time.

Developing the Concept

In my research, I've studied different theories related to metabolism, but many seem to explain only one particular aspect of it. Human metabolism is a very complex system. Everyone wants a nice and simple answer. Some take a very low carbohydrate

approach. Others go the opposite direction with a higher carbohydrate approach, and then there's everything in-between, from the grapefruit diet, Atkins, Zone, South Beach….You get the idea.

Most things worth knowing aren't that simple in theory. Eventually, I came to find the work on metabolic flexibility was the simplest explanation without being inaccurate.

I got there by researching the two main fuel sources (fats and carbs) and how they are associated to metabolism. To really understand them, I investigated what happens when they go awry. For example, a problem with carbohydrate metabolism is seen in type 2 diabetics; they have a very hard time using carbohydrates for energy. At the other end of the spectrum are a group of people who cannot effectively use fat as a fuel (impaired fat oxidation).

Metabolic Flexibility was one idea that actually explained ***both*** ends of the metabolism spectrum. Some people have a harder time burning fat and some people—especially those who have been on low carbohydrate diets for long periods or type 2 diabetics—have a harder time using carbohydrates when needed to fuel higher intensity exercise.

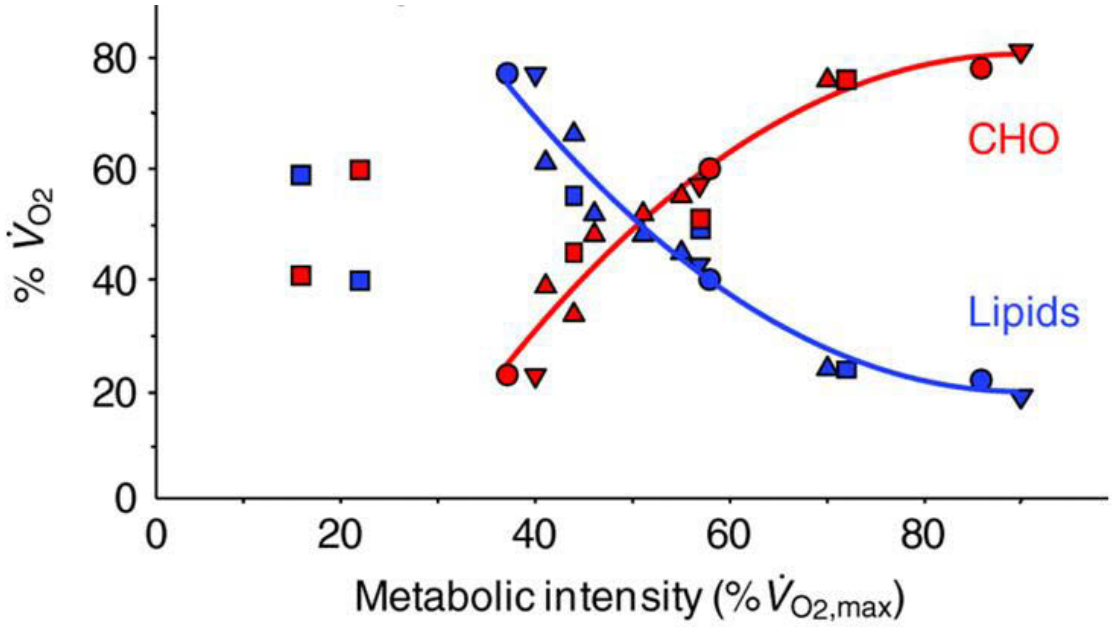
The Role of Metabolic Flexibility in Fat Loss

Metabolic Flexibility is one theory to explain metabolism more completely (Storlien, Oakes, & Kelley, 2004). Research into this particular concept began in the early 2000s by Dr. David Kelley from the University of Pittsburgh (Kelley & Mandarino, 2000) The concept was then picked up by other researchers. While it's become well-known in scientific circles, the idea has not yet been popularized in mainstream media or by many people at all.

The main reason to use Metabolic Flexibility for fat loss is to increase the body's ability to use fat at rest. That way you could be watching your favorite TV show (such as my favorite "The Big Bang Theory") and burn more fat!

This is related to a concept called the “crossover effect.” For example, lower intensity exercise should primarily be fueled by the use of fats, but when we do higher intensity exercise (weight training, or sprints) we want to use carbohydrates. What's fascinating is that the metabolism of some people doesn't like to shift from one to the next (they are metabolically **IN**-flexible) so they actually lose out on the transition (Kelley, He, Menshikova, & Ritov, 2002b). During rest they cannot burn as much fat as their metabolically flexible twin and during intense exercise, they cannot use carbs as effectively either. In fact, their range of fuel uses actually becomes less when they are metabolically **IN**flexible. Not good.

Bear with me as I present the graph below:



Weber J J Exp Biol 2011;214:286-294

The Journal of Experimental Biology

The Crossover Effect

The big take away of the uber-geeky graph above is that when you look at the red line, it represents carbohydrate use, and the blue line represents fat use. As you move to the right end of the graph, it represents a more intense exercise modality (weight

training, sprinting, HIIT), while the left end of the graph represents a very low level of exercise intensity (rest or walking). This is classically known as the “crossover effect” as shown by Brooks and Mercer.

At the far end you will notice the maximal use of carbs, but very little use of fats. At the left end it is the direct opposite: almost all fats, but little carb usage.

The key, ala Metabolic Flexibility, is to use the right fuel (carbs or fats for our discussion here) at the right time. Timing is everything!

Unfortunately, it does not always work this perfectly for everyone.

The graph above can be generated using a metabolic cart. (Indirect calorimetry for the geeks out there.) In one of my studies, we actually measured this during exercise as pictured below. By having the machine measure the amount of oxygen and carbon dioxide, we can measure the ability of the body to use a particular fuel; either fat or carbohydrates.

Metabolic cart from COSMED (http://www.cosmed.com/quarkcpet)

As I mentioned before, research has shown that people who are metabolically **IN**flexible have a harder time switching (Kelley Storlin 2004) They can't go all the way down to the left end of the spectrum to use fat effectively, or go all the way up to the right end of the spectrum to use carbohydrates effectively. By using Metabolic Flexibility, we're actually able to expand that range so they can use fats more effectively most of the time when they're performing their day-to-day activities, and switch over to carbohydrates at the higher end when they're engaged in intense exercise.

Effects of Insulin

Since I've been talking about this spectrum, there is another way to affect carb and fat usage. I'm sure you've heard about insulin before; probably all sorts of evil things. The truth is that without insulin production by your body, you would die! It is required for life.

Glucose (sugar) is actually toxic in the bloodstream in high amounts. The body secretes insulin to get it the heck out of the blood and into tissues where it is safely stored for later use (glycogen or converted to fat and stored there) or burned for fuel.

Analogy Time

Think of someone trying to enter a room. Glucose comes to the door/tissue, but has no arms (I know this is crude, but stay with me here.), so it gets its buddy insulin to knock on the door to allow entry. At doors/tissues that are working correctly (no pathologies), insulin knocks a few times and glucose moves on in–everyone is happy and there's one big P-A-R-T-Y.

Over time, for various reasons, tissue may become less sensitive to insulin. Our buddy glucose needs more and more insulin (remember, glucose is just a torso) to create more and more knocks at the door since the tissue is going "deaf" to the knocks and doesn't respond quite as well.

If this goes on for a long period of time, the poor pancreas (the organ that has to crank out insulin) may burn out; this leads to type 2 diabetes. Keep this in mind as it will become important.

Back to Insulin

Another way to think of insulin is as a fuel selector switch. As the body's levels of insulin decrease, the body is going to trigger the use of fats as a fuel source. When insulin levels increase, the body is going to shift more towards a carbohydrate-based metabolism. High levels of insulin can actually prevent the body from using fats very effectively as a fuel. For type 2 diabetics, their baseline levels of insulin tend to be relatively high, especially in the later stages of the disease. Their body is attempting to secrete more and more insulin to get glucose the heck out of the blood stream. (Remember, in large amounts, glucose is toxic.) Now their insulin levels are higher, which prevents their body from using fat very efficiently, and they are doubly-hosed (techy term). By definition, they are extremely metabolically **IN**flexible.

If that was not bad enough, they have a harder time losing fat because the chronically elevated level of insulin in their blood stream is preventing them from shifting all the way down to using fats as a fuel source. Completely corn-fused now? Hang in there, dear reader as it will make much more sense very soon.

Basic Idea of Metabolic Flexibility

To help you understand the basic idea of metabolic flexibility, remember these two simple facts:

- Under high intensity exercise ---> **use carbs**
- Under lower intensity exercise ---> **use fats**

We can push this a bit by altering insulin levels. Insulin is probably the one hormone under the most control through nutrition.

- Increased insulin ---> use carb metabolism for high intensity exercise
- Low insulin ---> burn more fat during low and moderate intensity exercise

Fasting and Fat Loss

To understand the concept of Metabolic Flexibility more easily, let's look at two opposing conditions: fed and fasting.

During fed conditions (such as after a meal), insulin levels will be much higher due to incoming energy (food). While a whole primer on insulin is beyond the scope of this book, the following (highly simplified) points are critical:

- All foods result in the release of insulin, unless you are doing shots of pure olive oil.
- Insulin is the fuel selector switch:
    - When insulin is low, the body is shifted towards a fat-burning mode.
    - When insulin is high, the body shifts towards carbohydrate metabolism (and fat storing mode).

During fasting conditions, someone who's metabolically flexible will be able to tap into stored body fat more easily, since their insulin levels are very low. This shift to using body fat as fuel is a good thing, but you can't just stop eating and expect to have the body of your dreams overnight.

Fasting is not as evil as most people would have you believe, and has shown some great benefits in research (Van Proeyen K, De Bock K, Hespel P 2011; Van Proeyen K, Szlufcik K, Nielens H, Ramaekers M, Hespel P 2011; Van Proeyen K, Szlufcik K, Nielens H, Pelgrim K, … Hespel P 2010) Fasting for a period of time (aka Intermittent Fasting) is one way to train your body to use fats more effectively; however, keep in mind that unless you are taking too much Ambien and raiding the fridge at 2 a.m., you are **already** fasting overnight.

In the morning, your insulin levels are already very low due to the fasting period called "sleep." I use the same method as Paul for those who perform a lot of high intensity training by putting off breakfast until a few hours later.

On EatToPerform.com, Paul suggests to delay breakfast and potentially work out fasted to increase the fat adaptation of your body. For instance, workouts from say 5 a.m. to 9 a.m. are probably fine to do fasted because you are mostly fed from the day before because you have enough stored carbs as glycogen to fuel your training sessions. Anything later than that and you should probably have a meal of mostly fats and proteins. This should be more along the lines of a snack rather than a big meal.

The problem with fasting is that most people get a set time to go without eating stuck in their head; they do whatever's possible to adhere to that window. Just like taking a hairpin turn in a Yugo, forcing physiology is a bad idea. Instead, you should coax it in the right direction. Think of it as upgrading your body to a Ferrari in the process to handle all the tight turns. If your fat loss has stalled, push out your breakfast just a bit and monitor your performance. If your performance tanks, that was too big of a jump so back it down. If your performance was good, hold it there and see how your body composition changes. The goal is **not** to attempt multiple workouts while fasted to be more "hardcore" than the next person, but to make the minimal positive change to get you moving in the right direction again.

Route du Col de Braus source Ericd

Fasting Will Destroy All my Muscle Tissue, Right?

If you've read any mainstream bodybuilding-type literature over the past several decades, you'll know that fasting is frowned upon. Going without food has always frightened bodybuilders and athletes; most people believe that your body is going to chew up all its muscle tissue during that brief period without sustenance. I'm sure you have read statements like:

"Yo dude brah, you need to eat every 2.2345 hours to stay anabolic, otherwise your body will eat its own muscle!" –Big Gunz 456

In reality, this fear of wasting muscle tissue during a fast is not warranted **at all**. For periods of time without any food (even up to 24 hours), the amount of muscle you would lose during a fast is negligible. Fasting may actually **protect** your muscles against catabolism. Translation – **don't worry about it.**

The main purpose of a fasting period is to train your body to use fat as fuel, since your insulin levels will be very low during the fast. During that time, while you won't necessarily gain muscle per se, you're not really going to lose any muscle tissue either. Your goal is to extend your body's ability to burn fat. That new capacity will carry over at other times as well, enhancing the amount of energy you derive from fat overall.

Metabolic Flexibility Diet

A healthy diet is one of the key components of Metabolic Flexibility. There is so much more to a healthy diet than counting calories which, by the way, do matter. Take in more calories than you burn, and you will add weight; take in fewer calories than you burn, and you will lose weight. If you force your body to lose weight by slashing your calories in half overnight, your body isn't going to be happy and your long term results will suffer. Yes, you will lose some more weight in the short term, but drastic measures are unnecessary, and in the long term behavior like this will hurt your progress. Weight loss is not our main focus; reduction of body fat is the goal, so let's examine some

important ideas that will help you shed fat without dramatically reducing your calories and killing your performance.

Protein

One of the first steps of the Metabolic Flexibility diet is to increase the amount the protein you consume. Why? Protein is handled very well, metabolically speaking, by most people. Just eating protein itself will increase muscle protein synthesis, which is the actual physical process of taking amino acids from the protein and putting them towards bigger and stronger muscle (Hawley, Burke, Phillips, & Spriet, 2010).

Increased protein intake has been associated with increased fat loss (Wycherley, Moran, Clifton, Noakes, & Brinkworth, 2012). Protein is also very helpful in reducing your hunger levels. If you've just eaten two chicken breasts, you're probably not going to be as hungry as you would be if you'd had a glass of juice instead. Studies conducted by Dr. Layman's group (Devkota & Layman, 2011) showed that as people ate more protein, theyalmost automatically reduced the amount of carbohydrates they ate. (We'll get into more carbohydrates in just a minute.)

Another benefit is that when people increase their protein intake, they have a better chance of being consistent. In general people want to be told what they **can** do, and don't like to be told what they **can't** do. We focus on behavior that generates a positive outcome —instead of getting people to focus on what they can't/shouldn't do.

Based on this, I usually have people at the beginning of the program set their protein at around .75 grams per pound of body weight. This means, if you weigh 200 pounds, you would be allowed 150 grams of protein per day. While you can go over that amount, you gradually work up to that amount total per day.

Once you have reached that point for a minimum of 2 weeks (ideally 4-6 weeks since your body does need some time to adapt), you can then push out breakfast one day a week if your results have stalled.

If you still enjoy carbohydrates, move them to around your training session. Most do better by adding more carbs post-training, and then before if their performance is still up to par. If you eat some protein and carbohydrates before training, your insulin levels go up and that pushes the body to carbs which is the fuel source you want to use for high intensity activity.

Caution!

*There are some exceptions to this: in the early morning, training fasted is **probably** preferable. Also, people who're coming from a mostly low carbohydrate approach will find that adding some fat to this mix will probably help as it relates to generating a more stable insulin response and won't necessarily interfere with your training. This is very individual, so for the most part, I suggest testing it and seeing what feels the most right. If you are at the point of adding some carbs and protein before training, test it out on a non-training day or at a different time so you will have an idea of how you'll respond. I don't want to hear about anyone getting light headed with a bar over their head!*

Why Carbs?

You need to use carbohydrates to perform higher-intensity exercise. When insulin levels are higher, your metabolism becomes more carbohydrate-based, which will help for weight training.

Also, by ingesting carbohydrates after training, the body is more able to use carbohydrates. In one study with human subjects (Rabol, Petersen, Dufour, Flannery, & Shulman, 2011).) scientists measured just the effect of exercise alone in determining the use of carbohydrates or glucose. When the group that didn't exercise was given carbohydrates, researchers determined that the carbohydrates were actually converted and stored as fat.

In the next step, the group exercised first before using the carbohydrates. Results showed they were **not** stored as fat. They were actually mobilized and stored as glycogen (stored carbs) in the muscle tissue. How cool is that?

This human subject study (no furry rats used in this one) was very interesting because it was conducted with sophisticated MRI-type equipment and radioactively labeled tracers. Scientists could literally follow the tracers around in the body to see where they went. The only downside is that it was an acute study, so we can't say for sure that this "glucose hijack effect" stays around for days to month to years (although I suspect that it does).

What Do I Eat?

When you consume carbohydrates before or after training, fats are usually fixed at a moderate level. Here is a template for a more advanced person to give you an idea. Again, this will have to be adjusted to your body and food preferences:

- Breakfast –3-5 whole eggs, vegetables, and maybe a piece of fruit.
- Pre-training - you can enjoy a protein or carbohydrate beverage.
- After training - you can eat your favorite carbohydrate with some protein and veggies.
- Rest of the time –protein, veggies, a bit of fat.

Many people follow this routine most of the time, but life does get in the way. Their compliance is judged by their actual results; there are situations where being extremely strict are actually a detriment to achieving your long-term goals. If they follow the routine 70-80% of the time and still get the results at the rate they want, then that would be fine. If they feel as though they want to accelerate their progress, then they would follow their routine more strictly. Everyone is a bit different, so it will take a bit of time to get it dialed in accordingly.

Eating before Bed?

Do you typically like to grab a bite to eat before bed? Are you concerned about the negative implications (like putting on body fat)? Well, you can stop worrying. The effects of highly specific meal timing come in a distant third compared to **what** you eat and **how much** you eat. Research from van Loon's lab showed that consumption of protein before bed actually helped recovery (Res et al., 2012)

Summary

The key is to pull in the bulk of your carbohydrates around your exercise time. Doing so will have a greater effect on your metabolic health and stimulate fat loss.

FAQ – Other Diets

You can't turn on the news, surf the web, or attend a social function without hearing about some new "miracle diet." Like all things, some diets are good, some are horrible, but the truth is usually somewhere in the middle (between theory and practice.)

The Paleo Diet

Are you as hungry as a caveman? The Paleo Diet, which is very popular nowadays, maintains that you should eat an "Ancestral Diet". That is, you should subsist upon what cave people ate eons ago, with some variations, such as whether or not to include dairy.

I view Metabolic Flexibility as the ultimate Paleo diet because of the emphasis on adapting to as many different foods as possible, without suffering a detrimental effect. Many practitioners of this diet end up restricting their carbohydrate intake (the rationale being that ancient humans ate more meat and fat than anything) and this kills their performance. Ancestral humans would not pass up any type of food, because food was

scarce. It was also a massive benefit to operate under conditions of both low and high insulin levels. You don't want to be the Paleo person who passed out in an insulin-induced haze when that woolly mammoth strolled by do you?

Consider this: If a caveman had been hunting for a prolonged period of time, his insulin level would be low, but he would still need to be able to effectively find food at that point. This would necessitate fasting. On the other hand, if he had just killed a woolly mammoth and knew he was going to eat a lot of woolly mammoth for the next couple of days, he would still want the ability to function on the greater amounts of food (along with higher levels of insulin too.) Flexibility was key.

This means that a diet associated with Metabolic Flexibility is very similar to the Paleo diet. With few restrictions, the diet is based on the person's reaction to what he or she is eating. Certain foods are not necessarily automatically off limits. They'd only be off limits if the effect they have upon you is undesirable.

Gluten-Free Diets

We've all been made aware of the existence of gluten (a protein found in wheat, corn, and many other cereal grains), as well as the prevalence of gluten intolerance, especially over the last several years. My wife is actually very intolerant to gluten, but it doesn't bother me at all. For those of us who are less tolerant of gluten, they will definitely have to remove it for a set period of time, simply because their reaction to it isn't very good.

For example, if my wife has had gluten and doesn't feel very good, her energy level goes down and, as a result, she's a bit more irritable. (Sorry honey.) If you think you're experiencing gluten-related issues, then exclude it from your diet for at least 30 days and see how you feel and perform. After that period, try to re-introduce gluten in very, very small amounts. Most people tend to overindulge at this point and eat a huge meal stuffed with gluten. What I've seen is that people can tolerate smaller amounts over time, but it has to be gradually brought back into the diet after they've gone through the

exclusionary period and determined how it makes them feel. Usually, there's a marked difference in inflammation and well-being. The first time my wife went entirely gluten-free, she dropped a couple of inches off her waist very easily in just a few weeks. Again, this does not happen for everyone, but it may be worth testing out.

Like the Paleo diet, I'd base the success of the gluten-free diet on your response. If you think you have an issue and want to remove gluten for a period of time to determine whether or not it's negatively affecting your health, you have my support.

Artificial Foods

In general, try to minimize modified foods as much as possible. These foods include genetically modified organisms (GMOs), like Twinkies, and non-nutritive sweeteners (such as aspartame.) While artificial foods shouldn't send you into a tailspin if you have them occasionally, you should still consider replacing them with a food item that does not come in a package, that will go bad within a few days (not within the next century).

Certainly, the media has generated concern about the effects of these non-natural foods, but there's not much scientific literature to prove or disprove the negative effects of GMOs. What this means for you is that you don't need to be alarmed if you eat something that has been artificially produced. Again, evaluate your response to these foods. How does your body feel?

Saturated Fats

Saturated fats have been deemed evil for quite a while. In the 1940s, researcher Ancel Keys led the Seven Countries Study to determine the relationship between lifestyle, diet, coronary heart disease, and stroke. In the seven countries (United States, Finland, Netherlands, Italy, the former Yugoslavia, Greece, and Japan), results showed that as people ate more foods high in saturated fat, their risk of cardiovascular disease also increased. Drugs, such as statins were created as an antidote to the problem.

Ironically, if he had studied different countries, as was done later, he would have gotten different results. In most populations, people eating higher amounts of saturated fat do not automatically increase their blood cholesterol levels.

Nevertheless, if you are still worried about saturated fats, consult your physician for a cholesterol screen and make the appropriate changes in your diet. See if your Doc will allow you to run an experiment where you eat more saturated fats for a period of time, and then have your cholesterol re-measured. Many people will not see significant changes in their cholesterol. Ironically, HDL cholesterol (aka “good cholesterol”) actually goes up, which is a benefit.

Saturated fats are not necessarily related to high cholesterol. Your lifestyle, your environment, and maybe your genetics, have more to do with how your cholesterol level works and whether it's high or low. People oftentimes cannot control those parts of their lives, but saturated fat intake doesn't seem to have much effect as we commonly believe. The same principle I discussed in regards to eating gluten is true for eating foods with higher cholesterol content. Are egg yolks bad for you? Are egg yolks good for you? Unless you have an established cardiovascular condition, my bias is to stop worrying and eat the whole darn egg!

Exercise

If you were to ask me what the single-most important component you should change about your lifestyle is, I would pick exercise, for its long-term effects upon health and Metabolic Flexibility. Kudos to you for having this piece of the puzzle in place already—awesome! You’re already ahead of the pack in terms of optimizing your health and how your body utilizes carbohydrates. For example, type 2 diabetics are much more sensitive to insulin after training, and as a result can handle carbohydrates better. Strength training also elicits muscle hypertrophy (muscle growth), thus increasing the most metabolically active tissue in the body – skeletal muscle!

Without a stimulus (lifting heavy objects), there will not be an increase in muscle mass, and you'll actually begin to lose muscle mass. Send someone up to the International Space Station in zero gravity, and that person will lose muscle (and bone) at an accelerated rate.

To look good naked, perform better, be healthy, and enhance Metabolic Flexibility, you must exercise. Remember, too, that high intensity exercise can help you shift between burning carbs and burning fat. If I were a betting man like Paul, I would bet that you have this whole exercise part covered. In the event that you aren't already engaged in a high intensity exercise regimen, this section will be important for you to follow. Either way, here are a few tidbits of new information for you to digest.

Weight Training

An informal exercise is some form of weight training. This doesn't necessarily mean you have to use weights; you can practice bodyweight exercises, which will result in the shifting between fats and carbohydrate metabolisms in the same fashion as lifting a free weight. For example, when you perform a squat, bench press, or even a pushup, your body is primarily using carbohydrates as a fuel. The same result will occur when you run some sprints or bust out some high-speed running.

What's interesting is that as soon as your exercise is done, the body will actually switch over to primarily using fat during your rest period. Weight training is a very powerful stimulant for this effect. This exercise payback is called EPOC (Excess Post-exercise Oxygen Consumption), commonly referred to as "the after burn effect." By strength training, you're actually helping the body switch back and forth between these two fuel preferences. Even people with **IN**flexible metabolisms are able to shift back and forth from fat to carbohydrates, and then back again when they're weight training.

Think about how most workouts are set up – they are done over multiple sets. So if you do a set of pushups, carbohydrates are fueling the exercise. Then while you're resting before your next set, fat metabolism is at work. Then you begin your next set and your

body flips back the carbohydrate metabolism again. Now it gets a bit more complicated, because you're still using fats from the first set. The effect is somewhat like multiple waves hitting the beach. You're shifting back and forth between carbohydrates and fats constantly.

Often people think of weight training as a high intensity exercise that doesn't use much fat. While that's true **during** the exercise, we find that the effect **after** exercise can increase your metabolism (which is primarily fueled by burning fats) for sometimes up to 24-48 hours afterward.

Compound Exercises

Certain exercises have a greater impact on Metabolic Flexibility. As far as weight training is concerned, compound movements (exercises that use multiple muscle groups and joints) are the best bang for your buck. This includes anything where you're moving your whole body through space or moving a weight which will give you a greater range of motion. Examples would be squats, deadlifts, pushups, pressing weight overhead, Olympic lifts, pull-ups etc.

What you want to look for are two things: (1) how far the weight is going to be moved or, in the case of a bodyweight exercise, how far you're moving your body through the space; and (2) how much weight you can actually use on the exercise. Most people are obviously going to be able to use more weight for a deadlift than they would be for a preacher curl.

Prioritizing compound movement stimulates more muscle at the same time. This will allow you to do more work in a shorter period of time and save you hours in the gym vs. targeting specific muscle groups. You'll use up more glycogen, which in turn increases how long you're going to be burning fat post-workout. If you are following a well-designed exercise program you've already got this covered.

Three-Step Approach for High Intensity Athletes

Here is a three-step approach to increase your performance and lose fat.

Step 1: Moderate Insulin Levels during the Day

Your food in these meals will be protein (about 20-40 grams), fats, and veggies. While all foods elicit an insulin response, a mixed meal with protein and fats as a base results in a more moderate insulin response (especially if you add in some fiber from the veggies.)

Step 2: Carbs around your Training

Carbs are the main fuel source for weight training. These carbs can come from glycogen (which is stored in the muscle and liver) or through dietary sources, so increasing your carb intake by about 25-50 grams on your training day is the first step in ensuring that you have ample amounts of energy for workouts.

Keep increasing this amount until your performance comes back up. Start by adding these carbs post training, and then pre-training. (Again, make sure to test it out at another time, away from training first.) By consuming some carbs pre-training (if necessary), you increase insulin and push the body to use carbs for that training session.

Caution!

Note: If you have not done this before, and have been on a low carb diet for a long time, I would recommend that you test this slightly higher carb intake in place of your breakfast to determine your response. A few people will experience a drop in blood sugar after consuming more carbs and become a bit dizzy, which is not conducive to lifting heavy objects. This is rare, but test it out at breakfast on a non-training day and note your response to it first.

Step 3: Monitor and Continue

Monitor your performance and body fat levels. If both are good, continue onwards. If your performance is on the decline, try adding more carbs as in step two.

If you are looking to lose more fat, make sure your protein levels are up to par (per step 1) first, and then dial back your carbs a bit (first from the pre-training portion, then post training.) If your performance tanks, you removed too much carbohydrate.

This will allow you to fine tune your performance and fat loss to your body over time.

Summary

Let's review the important points of the Metabolic Flexibility program.

- **You don't have to make major changes in your life**

  Some people may choose an extreme low carbohydrate approach, a Paleo diet, or any number of different nutrition protocols that are impossible to stick with over the long-term. People are constantly fighting to adhere to the program, but don't just take my word for it:

  "If you have a high demand training schedule, you are getting all the hormetic stress you need via exercise. You are likely training at a level that is already beyond the genetic norms for health and longevity. LC (low carb), fasting, etc is NOT a smart addition to your game plan unless tanked adrenals are a personal goal."---Robb Wolf from "My thoughts on Low Carb and Paleo Episode 3: A New Hope"

- **You are increasing your metabolism**

  With the Metabolic Flexibility program, you're actually increasing your metabolism. You're expanding your body's ability to use fats while retaining the

ability to use carbohydrates. That actually makes maintaining your weight much easier.

Conversely, if you're using carbohydrates very well and eat a big feast, you're not going to completely destroy your results on that end either. The program enables you to be more flexible with your approach—which makes you more socially at ease as well. You don't have to avoid cake at birthday parties ever again!

By working to increase the ability of your metabolism to respond to both ends of the spectrum, you are making everything in between much easier.

- **You are increasing your energy**

  Once your body gets used to the Metabolic Flexibility approach, you will have more freedom with nutrition and exercise. Increase the amount of protein you eat; work up to about .75 grams per pound of body weight. Focus on more compound lifts in the gym, such as the deadlift, squat, and military press (as well as body weight movements.) Whether or not you have access to a gym, prioritize the exercises that allow you to lift a significant amount of weight through a full range of motion. Then, move most of your carbohydrates to before and after exercise.

With the Metabolic Flexibility program, you have expanded your abilities to control aspects of your health that seem very difficult to others around you.

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Section 4: Customization Guide

Where Do I Start? How to Customize It For Your Body

A question burns in the minds of the people, they want improved body composition, but they're not sure where to start or where they fit in.

"How do I customize this Metabolic Flexibility approach to my body?"

Great question! While we are all human, each of us is different. For example, I like dark beer and consider light beer to be piss water, but many others drink light beer exclusively. (OK, that is not the best example. Let me try again.)

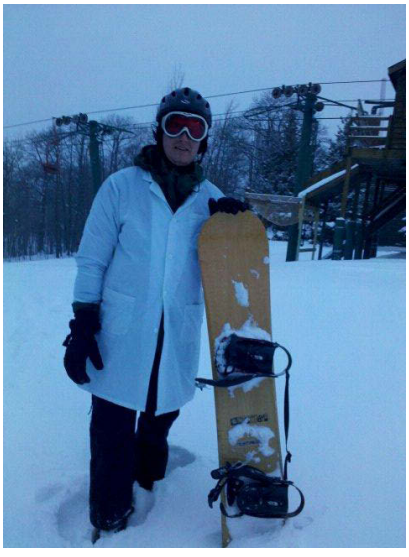
We are all human. Each of us has a similar facial structure, yet we are unique and identifiable; even identical twins have facial features that are just a bit different, so you can tell them apart. (Well, most of the time!)

Nutrition and exercise are similar. While we are several years away from a complete, customized plan based on our genes (nutrigenomics), there are some basics categories with specific recommendations that can get you off to the right start.

WARNING!

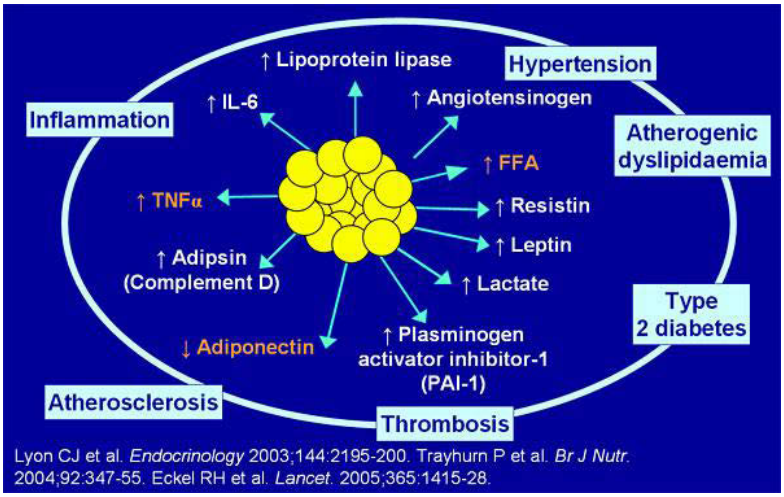
I know, I know, I can hear a few people rightfully ask "Where is the science behind this, Mr. Lab Coat?"

While I confess to being a dyed-in-the-poly-lab coat, uber-science guy (hell, I snowboard in a lab coat for fun), there is just not that much good science surrounding this topic that will tell you specifically, down to a gnat's butt, what is best for you. Yes, that makes me sad too, but there is hope!



Lab coats are cool

Physiology does provide us with some clues, and one of the main ones is related to the fat cells themselves. A few years ago, scientists believed that these lazy fat cells sat on their butts all day and did nothing other than store fat and look bad. It turns out they were wrong (very wrong actually). Fat is now viewed as one of the most hormonally active systems in the body. This gives us some clues as to what will be best for people with different levels of body fat.



I had to include a graph!

I won't get into the science on this part, since it's far from clear, so instead I've gone with pure experience on this one. These guidelines will get you going in the right direction pretty fast, but it is impossible to be 100% correct unless you work with someone 1-on-1 for quite a while. The downside is that is much more expensive and even if they really know what they're doing, it takes a bit of educated guesswork and plenty of feedback to get it all dialed in.

How to Apply Met Flex Principles

First thing's first: You should really get an accurate body fat estimate. Once you have a BOD POD or DXA Scan result, you can look down below to see which category you fit into.

10% vs 10%

Credit to Leigh Peele

Body Fat Percentage Notes

Keep in mind that even two people who are at the same body fat percentage may not **look** the same. Each person will hold fat in different places; some people hold more internally (visceral fat) and some people hold more under their skin (subcutaneous fat). Thus, two individuals will appear drastically different.

Without further yammering, here are three scenarios based on body fat percentage in which you can apply the Metabolic Flexibility principles.

I) Extreme Fat Loss

Women: >30 % body fat

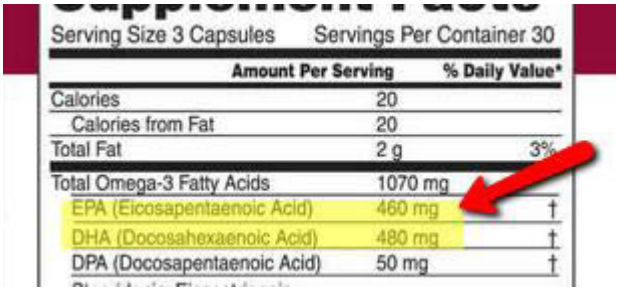
Men: >20% body fat

Goal: Lose fat. Low risk of muscle loss, scale weight will go down.

Approach: More protein, carbs around 120-200 grams per day, moderate fat.

If you are here, your overall goal is going to be primarily fat loss. You have a pretty low risk of losing muscle, so you can be a bit more aggressive with fat loss. Remember: you want to keep as much muscle as possible since it adds to your overall metabolic rate. It looks much better too. An average rate of fat loss of 1-3 lbs. a week is possible, depending upon how much fat you're carrying. Those at the higher end of this range of body fat percentage can lose more fat, more quickly.

Protein will be set at around 0.75 grams per pound of *body weight.* This comes out to being a bit lower than my recommendations for the other groups. Carbs will be set at between 120-200 grams per day, with the higher amount on training days and the lower amount on off days. Ideally these carbs will be split into pre and post training (60-100 grams). This is not set in stone, so play around with a bit. There is not much need to track fat and if you are eating enough protein from whole food sources, you will have enough dietary fat. I would recommend you supplement about 3 grams total of EPA + DHA from fish oil. Make sure you read the label and add up the amount of EPA and DHA (those are the actual fish oils).



Fish oil label showing EPA and DHA

NOTE: Fish oil is an invaluable supplement. It provides fat essential for your body to function and may help reduce systemic inflammation.

II) Body Recomposition or "Getting Jacked"

Women: 20-29% body fat

Men: 12-19%

Goal: More muscle, less fat. Weight may stay the same (don't freak out).

Approach: Moderate protein, generally more carbs around training, moderate to lower fat.

Most people who fall into this category do want to be *lighter*, but they also want to look *better*. How you look does not have a ton to do with your weight on the scale. As a note to the women out there that believe you must weigh 120-130 lbs. but no more, take a look at the gals after this paragraph. Most women who look like they're in great shape carry more muscle and (surprise) they don't weigh 130 lbs. The reason many think that being lighter is the key to the perfect body is due to inaccurate stats published online and in many fitness magazines. In many cases, these stats are flat-out wrong. One way to get a true estimate of weight is to look at sports that have a certified weigh in, such as MMA.

Gina Corano looks great at 143 lbs.

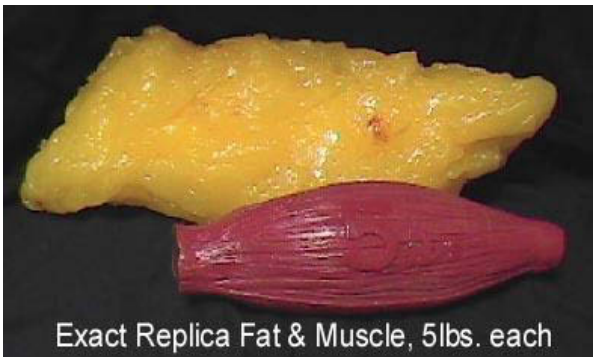
Another MMA fighter, Katlin Young, must aggressively cut weight and dehydrate herself to weigh in at 135 lbs. before a fight.

Katlin is normally about 10-15 lbs. heavier than that, but you would never guess as she is very, very lean. My rant goes to serve you a visual reference. There's no reason to berate

yourself if you weigh more than you think you should. The scale will **never** tell the whole story.

Another way is to look at the concept is to pit fat vs. muscle. Check out the picture below and notice that both models represent 5 lbs. of tissue, but the fat takes up much more space. I've seen many clients not have any change in their scale weight, but yet look much better in addition to their overall circumference measures go down. This is actually very common.

Protein will be set about around 1 gram per pound of bodyweight, which is higher than most are used to getting. Carbs are a bit tricky, as most will need to increase them a bit more than where they're at currently, as long as their performance is going up. Carbs are important to fuel your performance. Better performance is associated with more muscle and looking better in the long-term.



Notice how fat takes up more space.

Keep in mind that the scale may not change as you are basically exchanging fat for muscle. If you can get simple circumference measures, they are very helpful. Simple waist and/or hip measurements are a great start. I've seen many clients remain constant or even increase in scale weight, but their circumference measurements got smaller (and they looked much better).

Don't be afraid to fuel your training; if your performance is not going up, try to add 25-50 grams more carbs pre and post training for 2-4 weeks and re-evaluate. Fat is left pretty moderate to low, with about 3 grams of EPA+DHA from fish oil and the rest from whole foods.

III) Maintain Muscle and Get "Shredded"

Women: <20%

Men: <11%

Goal: Keep as much muscle as possible, lose fat. Weight will decrease.

Approach: Moderate to higher protein, cycle carbs up and down over weeks, preserve performance, moderate but flexible dietary fat intake (since their calories will be going down).

Let me start off by saying one thing here: In a perfect world (which nobody lives in), my recommendation would be for those in this group to focus on building muscle first, but most of these folks are putting fat loss first. They simply want to get leaner. My job is to help you arrive at YOUR goal, not mine, so the approach we've laid out will allow you to shed fat while you preserve as much muscle as possible. Be warned that your fat loss will not come as quickly as it would if you fell into the aforementioned categories, and you **WILL** hit plateaus. Remember, a plateau is not a big deal. Since it's easy to hit plateaus, you just want to focus on hitting a *lower* body fat plateau. If I had one of those cool flashy/mind-erasing thingies from Men in Black, I would wipe your mind of the idea that plateaus are evil. I've seen people lose their cookies and do the craziest, most silly things…All because they were at a plateau for 2 weeks. **Step 1 is to not freak out!**

Protein will be set pretty high at 1 to 1.25 grams per pound of body weight. Protein serves to ensure that you maintain as much muscle as possible. It also helps keep you full, which is great because your calories will be lower over time. Fiber is a good thing here too, so fill up on as many fibrous veggies as you can. Fat will be used to "make up" the difference from carbs. When your carbs are high, fat will be low; when your carbs are low, your fat will be higher. There is no need to do a full-blown ketogenic diet if you're weight training 3-5 days a week.

I like cycling rotating carbs, with periods of higher carbs matched with **improving** performance, and periods of lower carbs matched with **steady (but not decreasing)** performance.

For example:

- 2 weeks of higher carbs– around 200 grams of carbs (100 gm pre and 100 gm post).
- 2 weeks of lower carbs – around 100 grams of carbs (50 grams pre and 50 grams post).

Most will do well on 2 weeks of higher carbs and 2 weeks of lower carb repeated back-to-back. Carb tolerance will vary widely in this group. Some people can get really lean on a boat load of carbs and others can't at all. A general rule is to get in as many carbs as you can while still losing fat. If you are losing fat on the higher carb weeks, stay there as long as you can; if you are not losing fat at the end of 4 higher carb weeks, go to 2 weeks of lower carbs and then re-evaluate. Play around with it a bit while focusing on the goal of maintaining your performance on the highest amount of carbs you can get away with while still (albeit slowly) losing fat.

Wild Card - What to Do If You Aren't Changing

If you have less fat as measured in the total lbs. (not a percentage) comparing week 1 to 4, but your waist has not decreased by more than 1", consider monitoring stress in addition to macronutrient changes. Central adiposity (more fat around the waist area) seems to be associated with elevated stress levels. Many people even consider themselves "skinny fat" when they're thin in other places, but have a larger waist than they'd like. It's important to consider other aspects of your daily life as well as your macros.

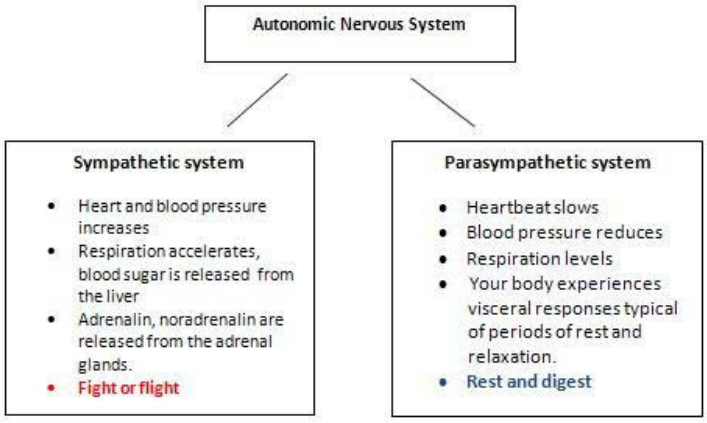
Why Not Start Here?

The great part about Met Flex is that it allows you to make changes based on your body's responses. If your waist circumference is not changing, it is time to make sure you are accounting for stress.

A few tips to help lower your stress levels:

Breathing

Your autonomic nervous system can be divided into 2 main branches 1) the parasympathetic nervous system (PNS) which is responsible for "rest and digest" and 2) the sympathetic nervous system (SNS) known for controlling the "fight or flight" response (Brooks, Fahey and Baldwin 2005). Think of the PNS as kind of like the brake on your car, and the SNS as the gas pedal. If you have lots of stress, you are constantly pounding on the gas pedal, so it is time to either reduce it or increase the parasympathetic branch to help counteract it. One of the best ways to do this is with breathing.



The Autonomic Nervous System (photo credit Keats Snideman)

A healthy, normal breath should be driven by your diaphragm. Your stomach should expand a bit when you breathe in. During the day when you feel stressed, check to see if you are breathing with your diaphragm. If not, just focus on breathing in nice and slow as your stomach expands a bit. This will help relax you and increase parasympathetic tone.

Sleep

I know I talked about this last time and it can't be emphasized enough. Getting good sleep is not easy, and I still struggle with it myself. Set the simple goal of going to bed earlier or sleeping in later. Even a half hour earlier at night can help. Ideally, you should wake up and feel refreshed without an alarm clock. While it is normal for most to get dragged out of bed by multiple buzzes from their alarm clock, that doesn't mean it's optimal.

Heart Rate Variability (HRV)

HRV is a way to measure the nervous system and there are many devices on the market now that run through your smart phone or iPad. My favorite currently is the ithlete device, for both precision and price. Make sure to run the measurement first thing in the morning before you do anything else. If you have a heart rate below approximately 50 BPM, you will want to run the measurement in a sitting position. It allows you to see your body's response to stress. If you see it trending up and your fat loss has stalled, work on the breathing drills above and improve your sleep, along with anything else you can do to reduce overall stress.

Summary

Now that you have a category to start with, jump in and make changes from there. While it is currently impossible to give you an exact plan based on a few parameters, this will get you going in the right direction quickly so you can arrive at a leaner, more athletic version of yourself in less time.

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Section 5: Performance Based Fat Loss

One of the keys to this approach to fat loss is through performance. Better performance = better fat loss. Don't worry, as you don't have to work harder, just smarter. Heck, you will probably be doing it in a much easier way.

Are you Trying Too Hard?

Everywhere you go, every person you talk to, will tell you the same thing. The gospel of fat loss is to "try harder and sweat more". Hard work equals results!

With your sourpuss face, limbs shaking like a tree in a tornado (as cows fly by), and sweat pouring from your body, you **must** be burning fat as if you were taking a massive flame thrower to your ass-adiposity, right? (Please don't use a real flame thrower to burn fat.)

I mean, you've got all your fittest friends telling you how hard they work in the gym, so they must be doing it correctly. Sure, they could barely get out of bed the next day and they wrung enough sweat out of their workout clothes to water their house plants...But look at how toned they are!

So you say to yourself, "Self, it's time to kick it into high gear. Starting tomorrow, we're going on a 1200 calorie-a-day diet, and we're gonna be in the gym for four hours every single day after work, for as long as it takes to melt off every ounce of fat from our body, whether it kills us or..."

…Hold that thought. What if there was an easier way to do this, a way that didn't require you to treat exercise like a part time job or push yourself to the point of breaking?

Measuring Body Composition 101

Everyone reading this knows that getting accurate measurements of **body composition** (the amount of lean tissue and fat tissue) is a great way to track your progress, and I totally agree.

However, one of the sneaky things that you rarely hear about is the **accuracy and resolution of body fat measurements.** Without going off on a massive tangent, the cold reality is that unless you are going to get an MRI, the accuracy can be off by at least 2-4%. This applies to DEXA, hydrostatic weighing, and BOD POD as well. Don't blame me, blame these researchers: Charney, 1998; Jackson, Pollock, & Ward, 1980; Lohman, ZiMian, Scott B., & Heymsfield, 2005; Moon et al., 2008; Shaw et al., 2007; Siri, 1993; Tseh, Caputo, & Keefer, 2010; Urlando, Dempster, & Aitkens, 2003; Van Der Ploeg, Withers, & Laforgia, 2003; Vescovi et al., 2001.

One study (Bergsma-Kadijk, Baumeister, & Deurenberg, 1996) even showed an individual error rate as high as 6% for DEXA. Oh crap.

For example, you get a DEXA (often regarded as the gold standard for measuring body composition), and it reads 16% body fat with a 4% margin of error. This means you could **really** be anywhere from 12-20% body fat. The same goes for the other hydrostatic weighing and BOD POD. Don't even get me started on the at-home electronic body fat scales/bio impedance analysis (BIA) – You can oftentimes get a more accurate reading by guessing!

A few years ago I got my body fat tested as many ways as possible within a 5 day period. I had everything done from DEXA, hydrostatic weighing, BOD POD, 7-site skin calipers, 3-site skin calipers (with a different person performing the measurement) to BIA (bio impedance analysis). All of it was done with research-grade equipment since I was working in the lab every day. The BIA I used was **not** the one you can order for $23 on eBay – it was the full research-grade version that costs several thousand dollars, complete with pads that you place on the skin.

After I looked at the DEXA scan, I was saddened to see that I was a fat bastard. **Ugh.** BOD POD was a bit better; hydrostatic weighing was worse, so I did the next best thing I could do - I promptly got a 7-site skinfold caliper reading that said I was 8% lower in body fat than the other tests did. That made me feel better!

While this is just an n=1 experiment, the truth is that getting super-accurate body fat measurements is **not** as easy as it sounds. Unless you have access to an MRI, getting a dead-on body fat measurement is nigh impossible.

When, Where, and How

Getting your body fat measured every couple months is more than adequate. What you really want to know is the **change** vs. your last test, which is different than the overall accuracy. To get the most consistent and useful results, it's best to go to the exact same place, at the same time, under the same conditions (if at all possible). BOD POD is generally the most useful, since it's pretty stable from one measurement to the next if done correctly in a lab. I've run 100s of BOD PODs in the past. Anecdotally, a few times the measurement does not match my visual assessment of the person (accuracy), but it does appear to be repeatable.

Pictures are great too. Heck, just trying on old pairs of skinny jeans is a low-tech way to assess changes in body composition. The downside is that visual inspection can be influenced quite a bit by water retention.

The key is to get a consistent measurement that is done the same way each time. You really want to look at the *change* from one measurement to the next to determine if you are going in the right direction or not. This is similar to how you'd use a compass to keep you on track while hiking.

What if There Was a Better Way?

The usefulness of an accurate, repeatable body fat assessment cannot be understated, but as you've learned, it's just another data point (albeit a very important one).

What if there was a more affordable (and faster) way to know whether or not you were getting closer to your fat loss goals? What if you could perform a measurement every 30 days **without visiting a lab?** The increase in frequency of testing would let you know if you happened to veer a bit off course – it would allow you to make intelligent modifications to your nutrition so that you could get back on track more quickly.

What if you could test every 2 weeks? **Now we're talking!** The worst-case scenario is that you head the wrong way for only 14 days. What if you could obtain useful data on your progress **every week?** What about **every day?**
"Psht…That sounds like a fantasy! Stop pulling my leg Mike!"

What if I'm **not** pulling your leg? What if there's a way you can receive constant feedback regarding your progress towards your goals that doesn't involve installing reinforced floors in your living room and dropping a few million bucks on your own MRI? You'd be interested in hearing about it, right? **Well listen up!**

Performance

The unicorn I've been describing is something you're already familiar with. **Progress can be measured by testing your *performance*, and it's pretty simple.** *"Performance? I want to lose fat! How does analyzing my performance help me know whether my body composition is going the direction I want it to?"* Yep, I hear ya…But to answer your question, we need to dig into a bit of physiology. (Where is my lab coat? Ah, here it is!)

Focus on Muscle

Andy Bolton

As we discussed in the first section of this book, your muscles are akin to a big, gas-hungry engine that needs lots of fuel (fats and carbs). The bigger the engine, the more fuel you can put into it (translation: eat more and get leaner). Sign me up!

One of the main drivers (get it, car analogy, driver, hahaha) is muscle hypertrophy (aka muscle size).

Remember the picture from the previous chapter that compared a lb. of muscle to a lb. of fat? **Muscle is much denser**, so gaining a bit of muscular bodyweight (and keeping as much as you can) is a good thing as far as your appearance is concerned.

Whenever I mention this fact, the first image that pops into people's heads is a powerlifter (like Andy Bolton) struggling against bone-crushing weight. While lifting extremely heavy weights is an effective method to add muscle (and primarily strength), is it the only way? No!

The 3 Main Methods

"Ok, Mr. Science Pants - what the heck do I do in the gym now?"

The main goal is to continually apply **overload.** Without overload, your muscles have zero reason to change. **No overload = stalled progress.** This is the first thing I look at with any new client. Many times, they're going all-out in the gym, but they are actually applying insufficient overload to their muscles. **Less overall = less results.** Yep, it's that important.

The 3 main forms of overload are:

1. **Intensity:** the amount of **weight used**, commonly expressed as a percentage of 1RM (one rep maximum)
2. **Volume:** the amount of **work done** (weight x reps x sets)

3. **Density:** (volume/time)

Tons of research shows us that overloading your muscles by altering these variables is very beneficial (and in fact required)(Abe et al., 2012; Folland & Williams, 2007; Phillips, 2007; Schoenfeld, 2010; Spangenburg, Le Roith, Ward, & Bodine, 2008; Yasuda, Fujita, Ogasawara, Sato, & Abe, 2010).

Stimulating Overload

Let's look at how you can modify intensity, volume, and density to elicit an overload effect and stimulate muscle growth.

- **Increased intensity (aka lifting more weight)**

Intensity is defined as a percentage of your 1 rep max, **not how hard you are trying.** The effort you're applying is referred to as the **rating of perceived exertion** or RPE and does not always correlate with the amount of weight you're lifting**.** Thus, the greater the load you can move, the more overload you are providing to your muscles. For example, bench pressing 315 lbs. for 1 repetition (315x1) will provide more overload than benching 275x1. To progressively overload intensity, a person bench pressing 275x1 would seek to eventually bench press 280x1.

- **Volume (aka the amount of work done)**

Volume is how much work you are doing, classically defined as **weight x sets x reps.** For example, doing 3 sets of 10 repetitions of bench press with 275 lbs. yields a 8,250 lbs. **volume of work.** 3 x 10 x 275 = 8,250 lbs. By adding one more set (4 x 10), your volume will increase to 11,000 lbs. That's a 2,750 lb. increase in work.

Volume is a powerful driver for hypertrophy (and fat loss) as you are physically doing more work.

- **Density (aka work / time)**

Density is simply the volume of work you perform divided by the amount of time it takes to get it done. If it takes you 12 minutes and 37 seconds to perform 3 sets of 10 with 275lbs. on week 1, but you perform the same volume of work over 10 minutes and 57 seconds in week 2, your density has increased.

Increased density = more overload = more muscle and strength = faster fat loss (and retention of metabolically expensive muscle tissue).

True or False Time

Geek confession: I've always loved "true/false" questions since I automatically had a 50% chance of beating the chimps. Sadly, I felt horrible when I was wrong and now I must subject you to the same potentials.

True or false: "You have to *try hard* in the gym for results."

What do you think?
You are smart, so I know you caught me on this and said **"false."** **Trying** has little to do with it.

Of course, **you do have to show up and work hard**…There's no question, but trying harder and harder each day is **not** the key to progression. I would even argue that trying too hard is a bad idea because it decreases your enjoyment of the activity and makes it into a stressful situation.

Calculus anyone? *That crap sucked* (even though I took more of it than I ever want to admit to get a math minor). Isaac Newton can kiss my ass.

Easy Math

Bear with me for a bit of math (NO calculus!) to prove my point:
Billy-Bob Badass goes to Globo Gym to do some chin-ups. Billy has been reading my stuff (smart dude, that Billy-Bob), so he knows to keep track of overload via weight, volume, and density in his trusty workout notebook. He works up **8 bodyweight chin-ups**, but the last two were really hard to complete. For those two reps, he was making the sourpuss face and squirming all over the place as he chicken-necked his chin over the bar. Sweat dripping from his brow, Billy-Bob jots down a note in his workout log about how **"hard"** the sets were.

Billy-Bob worked up to **3 sets** in total over the course of **12 minutes.** His body weight is **200 lbs.**

NOTE: *Unless you are Greg Vallentino (Google him!), you can just use your body weight for exercises like chin-ups and push-ups to determine the load you're lifting. You don't need some fancy calculation to subtract the weight of your massive Popeye arms.*

- Billy-Bob's **volume** (weight x reps x sets) was **200** x **8** x **3** = **4,800 lbs.**
- We know that density is just volume/ time.
- It took him **12 minutes** (**12** x **60** seconds per minute) = **720 seconds**
- **Density** (volume /time) = **4,800** / **720 seconds** = **6.66 lbs/sec**

Let's compare Billy-Bob to Marvelous Matt.

Matt goes into his garage gym and also does chin-ups. As luck would have it, Matt weighs the same as Billy-Bob (wow, what are the odds of that!), which is **200 lbs.**

Matt does **4** sets of chin-ups at **6** reps each. It takes him the same amount of time; **12 minutes.** Matt notes in his workout notebook that the sets were **"easy."**

Matt's volume is 200 x 4 x 6 = 4,800 lbs., **the same as Billy.** His workout was done in the same amount of time too, so it's the **same density.**

The difference is that Matt did not struggle to get the 2 extra reps at the end of each set. As soon as it got "hard", he terminated the set.

Who Wins?

Let's review: both subjects worked at the same **intensity**, performed the same **volume** of work, and did so in the same **density** of time. Their adaptation (more muscle and strength) will be the same. Notice that "trying hard" is **not** part of the calculation here. In this case, their overload is the same, but…

Which one had a better workout? **Matt did!**

Why? He was calm the whole time, smiling and joking with friends between sets, not worried about his next life and death battle with the chin up bar. He didn't try to squeeze out those last few reps like "HyooogeGunz43" told him to.

"Bro, the last 1-2 reps are the ones that really trigger muscle growth. If you don't go to failure, you're wasting your time bro!" **–HyooogeGunz43**

Like the other reps somehow don't matter at all…

This is a load of BS. If the last two reps of a set are the only two that count, then why do more than two reps? While failure can be a useful tool (as you'll read later), it isn't always necessary to trigger growth as it limits how much work (volume) you can do.

Add Easy Overload

So if both Billy-Bob and Matt triggered the same strength and hypertrophy adaptations, why did Billy-Bob put himself through such a fuss? Why would you? Why wouldn't you make it easier on yourself if you're going to get the same benefits without any negatives?

Nothing magically happens with the last 2 reps that have you flopping around like a dead fish at the end of a Faith No More video (old school 80s reference for you all). The key is that you simply do one more set, and BOOM, more overload. The easy way.

Summary So Far

1. Do work in the gym? **TRUE**
2. Provide overload to your muscles? **TRUE**
3. Pick stuff up and put it down? **TRUE**
4. Press and pull? **TRUE**
5. Make it hard? **FALSE**
6. Is making a workout harder than it needs to be counter-intuitive? **TRUE**

Will you make faster progress teaching your body it is easy and applying overload principles? **YES. TRUE. I guarantee it!** Overload is the key to providing a positive stimulus for your body to change. Your resources are limited though, so get the work done in the most efficient fashion possible.

What Do I Do Now?

At the end of each session, calculate your overload for each exercise as outlined above. Track these over time to ensure you are applying the correct stimulus to your body. It almost seems too simple, but I guarantee it will make a massive difference in your progress. If you aren't getting a continuous overload, your body will have ZERO reason to change for the better (thus no results). Don't get trapped by feeling like it was harder. Monitor your overload.

Convinced?

Hopefully I made my case, and if you are ready for action, please **STOP** reading here. Apply what you've learned and carry on. If you need more information, then read on, but you have been warned: We're going down the rabbit hole.

Down The Rabbit Hole (You Were Warned)

It's a well-known fact that I'm as giddy as a school girl when I'm around new research. A great paper recently investigated what the best scheme for making your muscles bigger is, and provided us some very interesting insights. First of all, the researchers didn't use anyone with tails; all subjects were as human as you and I. Score one for the researchers on that point.

The question they were looking to answer was:

"Do you need to lift heavy to get bigger?"

Common knowledge and bro-science tell us "Yes.", but is this supported via research? In 2010, Burd, et al. from Stu Phillip's lab showed *acutely* that a **low load**, but **high volume** (remember, volume = weight x reps x sets) of weight training did stimulate muscle protein synthesis (stuffing amino acids into muscles to make them bigger and stronger) as compared to a **high load, low volume** approach (Burd et al., 2010).

They compared 3 groups:

1. 90% 1RM taken to failure (90FAIL)
2. 30% 1RM in which the external was work-matched to 90FAIL (30WM)
3. 30% 1RM in which the subjects performed the sets until volitional failure (30FAIL)

As stated, the volume for the 90FAIL and 30 WM groups was the same. Interestingly enough, for the myofibrillar response (the response of the muscle fibers themselves), only the 30 FAIL group demonstrated a response in protein synthesis at 24 hours.

"In English Please?"

Based on this data, it tells us that muscle protein synthesis (making bigger muscles) is still occurring a whole **day** after lifting, but only in the 30FAIL group, who moved the most weight in the study (highest volume lifted) and went to failure. At first glance, it looks like volume and training to failure is an important aspect of building bigger muscles!

The downside to this paper was that it was an acute response to an acute stimulus, which many times does not hold up over several weeks. **Hold that thought.**

Acute Response Story Time

Here is a story to help illustrate my point.
Muscle soreness is common where the acute (short-term) stimulus is different from the chronic (long-term) stimulus.

For example, I went on a hike years ago up a local mountain. It took me most of the day to get up to the top, but only a couple hours to get down. The fast downhill running made my quads crazy sore via DOMS (delayed onset muscle soreness). I was hobbling like a 90 year escapee from Shady Pines looking for his walker.

However, a few days later, it was suggested that we should do it again, and since I am a glutton for punishment, I said "Yes!" This time, despite doing the **same thing**, I had a **different response** – I experienced very little soreness since the acute stimulus (running downhill) did not have the same effect on my muscles. The point is that an acute effect may not hold up over time.

In another study (Mitchell et al., 2012) they took eighteen men about 21-22 years old and randomized them to 2 of the following training conditions:

1. 30% of 1 RM (rep max) for 3 sets
2. 80% of 1 RM for 1 set or
3. 80% of 1 RM for 3 sets

This looks a bit similar to the study by Burd that we discussed earlier. The cool part was that each only trained ONE of their legs using the parameters above, so the opposite leg served as a comparison control. According to Stu, yes - they did walk funny for several weeks after the study.

Unlike the Burd study where they only looked at the acute response, this time they did a long-term study for 10 weeks.

To determine muscle hypertrophy (muscle growth), they used magnetic resonance imaging (MRI) in addition to stabbing out chunks of tissue via pre-and post-training biopsies of the vastus lateralis (quad muscle) plus 1 post-exercise (1 hour) biopsy following the first bout of exercise.

The subjects exercised only **1 leg,** had chunks of muscle tissue removed, were jammed into an MRI, and infused with radioactive protein, all in the name of science! Sign me up.

So What Happened?

Measurements after training were significant ($p<0.01$), so they did get bigger, *but* there was no difference between the 3 groups.

Interestingly, (for the uber geeks out there), no correlation was seen between phosphorylation of any signaling protein and hypertrophy. For all of those bro-scientists suffering from mTOR-itis, this is a big blow!

It did match their previous work (that we talked about above) that the acute measurements of muscle protein synthetic rates from lifting a low load many times to failure did result in similar hypertrophy when compared to a heavy load lifted to failure. The downside is that this study used untrained subjects, who will respond to just about anything (the ole' newbie effect) and we can't directly transfer these results to more experienced lifters.

Key Points

The key take away is that even a light load done for enough reps (and possibly to failure) is a major stimulus of muscle hypertrophy. Remember, having more muscle will positively influence your fat loss results. In addition, you don't need to lift heavy every single time you set foot in the gym. Apply overload and leave.

If you're strapped for time, taking a set to failure with a lighter load is still enough to stimulate muscle.

"… lighter weights allow greater volume and that has to happen" **-Dr. tu hilli s**

Take an exercise that you normally use only a heavy weight, lighten it up and do some good ol' fashioned rep work.

- If you normally bench 200 lbs. for 3 reps and 3 sets, try 100x6x5 to get more volume overload.
- If you've been benching 100x10x5, try doing 175x5x5 and go for a slight decrease in volume and get in some intensity overload.

Measure your response over time, and not only will you see results more quickly, but I bet you'll feel better!

Summary - Wrapping It All Up

Overload - volume, density and intensity - is the key to your results. Notice I said overload, **not** working hard at **trying to overload.** I've seen plenty of people who always need to be psyched up to hit the gym. They go in with no real plan of action – they tend to fade away, while the people who go in calmly and get the right amount (as well as the right kind) of work in see continual results.

Get in, get it down, do more volume, increase density, bump up the intensity. Do more than you were doing before and get out!

Dan John calls these "punch the clock workouts."

Don't get me wrong - I love loud music and coffee pre-training, but doing it to the max every day is not ideal. It is fine for an occasional test day (distress training), but red-lining it day in and day out will eventually catch up to you and you'll stall out.

Maximum effort 100% of the time is unnecessary.
Gradual, progressive overload is **vital.**

So is record keeping; record the overload of each session in your training journal. Monitor it over time to ensure you are giving your body a positive stimulus to change. Without that stimulus, your results will come to a grinding halt.

In time, you will be stronger and leaner much faster than you would be through effort alone.

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Section 6: Metabolic Conditioning

Have you ever wonder about certain aspects of physiology and how they affect your strength, body composition, and health? Probably not, but I do since I'm a huge geek. Here's one of the big questions I've asked (and subsequently researched).

"If adding muscle takes energy, and fat is stored energy, why can't your body just burn fat to help fuel muscle growth?"

This would be the ultimate in body recomposition.

My next thought was "What if we just blocked the fat from getting into the fat cells?" With no fat entering the fat cells, they can't get any bigger and hang over your belt, or flap in the breeze when you wave hello.

Any Volunteers?

No? I can't say I blame you. Humans rarely like to be experimented upon, so to study this, scientists genetically engineered a litter of furry subjects with tails that lacked a GLUT-4 receptor on their fat cells (Yang et al., 2005).Remember from earlier that GLUT-4 is like the door man at an elite night club – it controls who gets in and who stands outside all night just peering through windows.

A special subject, the AG4KO mouse, was used it to investigate this mechanism. The KO stands for "Knock Out" - not because it's the Mike Tyson of rodents, but because it has the GLUT-4 receptor knocked out. This is like taking the door man away and locking down the club; nobody is getting in! Glucose is barred from entry into that pesky fat cell.

Sounds awesome, right? In theory, you don't want those fat cells getting bigger. The downside here is that scientists found that there was increased insulin resistance in

secondary tissues like the liver and muscle. Ah crap! You want those to be as insulin-sensitive as possible to allow all the muscle building nutrients to enter.

While we can't completely shut down the GLUT-4 receptor in human fat cells, it turns out that exercise is able to regulate the entry of glucose into the fat cell (a really good door man) in an efficient manner (Bruce et al., 2006; Hawley, 2004; Yeo, Carey, Burke, Spriet, & Hawley, 2011). Keep this in mind and we'll come back to it later.

Collateral Damage

So it appears that taking out the GLUT-4 receptor in fat cells causes insulin resistance in other tissues. Insulin is one of the main hormones controlling where nutrients go, so messed up insulin signaling is not good for your body composition goals. If left unchecked, insulin resistance can lead to Type 2 diabetes, which can lead to a loss of vision, cardiac issues, and even the loss of a limb (Bogaert & Schrier, 2011). Keeping tight management over insulin is paramount from both a health and performance standpoint.

If blocking fat from entering the fat cell by knocking out GLUT-4 is a bad idea, where does the science go next?

Let's look at a human study to help figure this out.

In a study by Hussey, (2011) they took a small group (n=7) of humans with Type 2 Diabetes (T2D) and had them do some low-intensity bike riding (60 min at about 55% W_{max}, 3 days/ week) with some moderate sprints (6 x 5 min bouts at about 70% W_{max} with 2-5 min rest intervals, 2 days/ week) (Hussey et al., 2011). They saw an increase in GLUT-4 at the level of the fat cell following 4 weeks of exercise. Sweet! Now more glucose can get into the cell and there'll be less collateral damage via insulin resistance! The highly counterintuitive conclusion so far? Allowing the body to put glucose into the fat cell is actually a ***good*** thing. Exercise helps to restore this ability quite nicely as it

upregulates the GLUT-4 content in muscle in humans (Kraniou, Cameron-Smith, & Hargreaves, 2004).

Like parking in a handicap spot, blocking glucose into fat cells is a not a wise idea. What is the solution then? You need to allow glucose and fat to get stored into the fat cell, but increase the USE of fats as a fuel source to keep the fat cells in check.

Be Like Water

Imagine an un-plugged bathtub. The water entering the tub from the faucet is like fat or glucose looking to get stored in the fat cell and taken out of the blood (go down the drain). The water level of the tub is representative of your blood fat/glucose. If the water gets too high, it will overflow and create a big mess. The same is true in your body; if your blood levels of fats or glucose get too high, it creates all sorts of metabolic havoc. To keep the level of the tub constant, you need to match the incoming water with the water going down the drain. If you're looking to lower the level, you need to either turn down the faucet or increase the size of the drain.

The body is similar, but with a twist. It appears that letting the faucet run wide open and then opening the drain wider is the best solution. Fats and carbs can leave the blood stream to flow into the fat cells, but they are used right away and thus less is left to be deposited in the fat cell.

Big Fancy Word of The Day: Mitochondrial Biogenesis

Say what?

Since our goal is to ramp up the use of fats as fuel most of the time by cranking open the drain, we have to take a short detour into some molecular science.

At some point when you were half-conscious in biology class, you heard the teacher ramble on about mitochondria, the little power houses of the cell that literally help create the all energy currency of the body –ATP.

In short, they take in fats and turn them into ATP (via phosphorylation of ADP through respiration). This is similar to the way Ben and Jerry's take a bunch of stuff and make it into wonderful, tasty goodness. Most of the ATP is made by aerobic respiration, which requires oxygen. When oxygen is not present, ATP will be created by an anaerobic process (where oxygen is not needed). Lifting heavy weights for low reps or sprinting very fast are both anaerobic processes.

Don't believe me? You can try this out at home, but be careful.

How far can you sprint without breathing? You can probably do it and run very fast, but only for a few seconds.

How far can you run now at a slower pace without breathing? Not far, I'd imagine. Sprinting fast does NOT use oxygen in the immediate process. You could sprint while holding your breath right? That is an anaerobic process.

How long can you hold your breath at rest? A few minutes? You certainly could not hold your breath for hours. Most of your day is spent using oxygen to create ATP via aerobic respiration (metabolism).

"Why?"

Glad you asked! Essentially, your body is much more efficient creating ATP with the use of oxygen - about 13 times more efficient actually (Rich, 2003). So the primary job of our friendly mitochondria is to perform aerobic respiration by taking fats (free fatty acids) and turning them into ATP by using oxygen. The more fat we have available, the more fat we can potentially use.

Back on Track

OK. So, our goal is to burn more fat, not necessarily to prevent fat from being stored. Mitochondria burn fat to create ATP (cellular energy) primarily through aerobic metabolism (with oxygen).

This leads us to a 2-pronged approach to burning more fat:

1. increase the number of mitochondria within the cell
2. increase their function –have the little buggers burn MORE fat

Mitochondrial biogenesis is the process of creating more mitochondria.

The question is, then, "How do you accomplish this?"

Go Hard Or Go Home

One of the most difficult tests to perform in an exercise physiology lab is the dreaded "Wingate bike sprint."

I've supervised hundreds of Wingates from my time in the lab, and performed a bunch myself. Wingates are so intense that we always had an over/under on how many pukers we would have after only ONE test. Yep. **One test.**

To do a proper Wingate test, the subject hops on a specialized bike and starts pedaling like a mad man—all out as fast as possible against a pretty light resistance. After about 10 seconds, a large weight is dropped on a fly wheel to dramatically increase the resistance from a very low level to several hundred Watts in seconds. The subjects keep pedaling as fast as they can for another 20-30 seconds.

About 10 seconds in, it feels like someone came by and filled your legs with concrete. Near the end, it is about all you can do to just keep pedaling. At first you feel very tired, but oddly enough you're OK as you attempt to catch your breath. About 1-2 minutes later a super nauseating feeling sweeps over you like a bad hangover. You start to fumble for the bathroom like a baby giraffe trying to run. Hopefully you make it, or visit

a nearby waste basket. Good times! Wingate testing days always bring spectators out to ogle at the craziness.

This test is used in research as a form of intense exercise. Research from Little et al. (2010) and Burgomaster et al. *(*2005, 2006, 2007,2008) has shown that low-volume HIIT consisting of 4–6 repeated 30 second 'all-out' Wingate cycling tests with 4 minutes of recovery was an effective stimulus for improving mitochondrial function (Burgomaster, Hughes, Heigenhauser, Bradwell, & Gibala, 2005; Burgomaster, Heigenhauser, & Gibala, 2006; Burgomaster et al., 2007; Burgomaster et al., 2008; Little, Safdar, Wilkin, Tarnopolsky, & Gibala, 2010)

The 2 big downsides are:

1. You need a specialized bike (although you can get kind of close on a stationary bike)
2. Did I mention that they're BRUTAL?

Less Nausea, All the Results?

What if you could make the same impact on mitochondrial biogenesis, but with a lower intensity form of exercise? I am all for working hard in the gym, but if I could get the same effect with LESS effort, I would take the easy option any day.

A follow-up study (Hood, Little, Tarnopolsky, Myslik, & Gibala, 2011) showed a similar result by using an even lower exercise intensity of only about 150 W (about half of the earlier studies) and used a sprint duration of 60 seconds. Great! A downside to this study was that the subjects were untrained. Untrained subjects can get better at doing just about anything. (Daussin et al., 2008; Starritt, Angus, & Hargreaves, 1999; Tonkonogi, Walsh, Svensson, & Sahlin, 2000). Thus the results from that study need to be taken with a massive grain of salt.

Trained Subject Data

In a great study conducted by Little et al. (2010) from Dr. Martin Gibala's lab researchers took seven young men who were trained (VO_{2peak} = 46 ± 2 ml kg^{-1} min^{-1}) and had them perform six training sessions over two weeks (Little et al., 2010). Each session consisted of 8–12 intervals at 60 seconds each, at around 355 W, with only 75 seconds of recovery (30 W) between. In short, it was pretty darn brutal.

They found that after **only 6 sessions** in trained subjects (remember, this is important) that mitochondrial biogenesis was increased by about 56%. Wow!

We now have data in trained subjects that HIIT will increase mitochondrial biogenesis. Boom!

Drop the Hammer – Back to Insulin

I'm not happy with leaving well enough alone. I'm always thinking to myself "Is there another way to get an even *better* result?"

It turns out that one of the stressors for activating the pathways associated with regulation of mitochondrial biogenesis is a reduction in carbohydrate availability (Bishop, Granata, & Eynon, 2013; Philp, Hargreaves, & Baar, 2012). Endurance training performed with reduced carbohydrate availability results in enhanced skeletal muscle oxidative capacity (Bartlett et al., 2013; Burke, Hawley, Wong, & Jeukendrup, 2011; Hawley, 2011)

Barlett et al. (2013) demonstrated that when subjects exercised in a glycogen-depleted, overnight fasted state (no carbs before training either, so insulin levels were very low) they saw a great increase in p53 phosphorylation which is an important regulator of mitochondrial biogenesis (Bartlett et al., 2013). It appears that a low insulin condition and/or lower glycogen levels may further enhance this effect.

Fed vs. Fasted in The Real World

Gillen et al. (2103) however showed that short-term low-volume HIIT was a time-efficient strategy to improve body composition and muscle oxidative capacity in overweight/obese women, but fed- versus fasted-state training did not alter this response (Gillen, Percival, Ludzki, Tarnopolsky, & Gibala, 2013).

Keep in mind that this was a study in moderately active (but not highly trained) subjects and was only six weeks. We don't have a longer term study in trained subjects yet, although I would predict that the fasted group would have an edge as far as body composition is concerned.

Mitochondrial Biogenesis Protocol

So with all of that information, you must be asking yourself: "What do I do to improve mitochondrial function?"

- If body composition is your goal, add in 1-2 sessions initially per week of fasted interval (HIIT) work. If you can't do these sessions fasted (no food for about 5-6 hours before), just do them in a non-fasted state as there is still quite a bit of benefit.
- Get on a bike with a power meter and warm up for about 5 minutes at a comfortable pace.
- If you don't have a power meter, go by RPE (rate of perceived exertion).
- Add in a high intensity interval at a power output of around 350 W for 60 seconds. This will equate to an RPE of 8-9.
- Switch to a "rest" between each interval at about 30 W for 75 seconds. The rest should be easy – an RPE of 1-2 is appropriate.
- Start at only ONE interval at each session add one more following the protocol above until you reach a max of 10 – 12 total intervals. At that point drop back down to one again, but bump up the power output to 375 W.

This looks easy on paper, but it is FAR from easy.

"What if I can't do 350 W for 60 seconds?" No worries - just start where you are at and follow the same progression. Let's say you only get 275 W for 60 seconds. Cool. Just sub in 275 W for the 350 W above.

Summary

- Insulin is still important!
- While it doesn't sound productive, allowing glucose and fat to enter the fat cell is a *good* thing for your health.
- The key is to ramp up the use of fat as fuel, so less ends up stored in the fat cell.
- While mitochondrial biogenesis sounds like a big scary science word, it is not all that scary and improving the function of this mechanism will help you torch some body fat in no time.
- Increasing the number of fat burning furnaces (mitochondria) and the fuel that they use (more fat) can be done by adding in some high intensity intervals.

It's go time now!

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Section 7: Broken Metabolism?

Metabolic Damage 101 (And How to Fix It)

If you spend any amount of time around a group of people who engage in intense exercise with the goal of performing and/or looking better, you'll eventually hear about "metabolic damage." The phrase references the idea that human metabolism is aplastic and prone to dysfunction (or even complete failure) if you don't eat or exercise properly. Some people live in fear of such a fate while others regard the notion as a complete myth.

If you have reached a plateau in your fat loss goals, you will probably hear people say "you damaged your metabolism and that is why you are not progressing"

This brings us to a series of questions that this section works to answer: Can your metabolism be **damaged?** Is it as delicate as a fine vase (pronounced "vās" since it's fragile and expensive) or is it more resilient than we're commonly led to believe?

If your metabolism **can** be damaged…How do you know when it is? What are the signs? If it **is** damaged, can it be repaired?

Metabolic Damage

Most people talk about metabolic damage as though your metabolism is a piece of machinery that can malfunction and stop working altogether. If your metabolism comes to a complete stop, you have big problems because **you are dead.** A more realistic way to look at metabolic damage is a **slowed** metabolism in response to increasing exercise demands combined with decreasing calories.

You have probably heard this one before:
"Man, I am doing hardcore exercise 5 days a week and I am down to 900 calories a day, but I am not losing any weight. What the heck is going on? This metabolic damage sucks." - Dude Brah 23

Moving Metabolism

Your metabolism is **not** set in stone. It's **flexible** and it can adapt to practically any situation. This is actually a *good* thing, but many fear the dreaded "starvation mode" where the body is rumored to almost shut down, with fat loss grinding to a screeching halt. I've even heard some claim that they are getting fatter by **decreasing** calories. I hear them crying, "Oh help! What the heck is going on!?"

It's time to get to the bottom of this issue. Even if you **don't** have any problems with your metabolism, these tips will help make sure that you maintain a healthy, functioning metabolism and that it never becomes an obstacle on your path to success.

Is Metabolic Damage Real?

Pssst! Tell Mike I'm real!

I have a confession: I used to think that jackalopes were real. Yes, I'm talking about those crazy critters that appear to be a cross between a stag and a hare. Why did I believe such a ludicrous thing? Well, my Grandma would always send me postcards featuring them while she was out on her travels, telling me about how they'd spotted a few of them on the way. Years later, I learned it was a joke…But I heard the tale so many times I really thought they **MUST** be real! To that same end, the mere fact that you hear the term "metabolic damage" all the time does not alone validate its existence.

Metabolic Damage Research

While I love research, I will be the first to admit that it does not provide an answer to every question. Science is a slow, gradual process, and may not have the "perfect" study to answer all of our burning questions today. That does not mean it is useless though. Research provides an excellent starting point to investigate what is really going on with physiology. Let's look at a few studies to help shed light on the issue of metabolic damage.

The classic study that is commonly referenced is by Bryner RW et al. from 1999. In this study, they took twenty subjects (17 women, three men), mean age 38 years, and randomly assigned them to either standard treatment control plus diet (C+D) or resistance exercise plus diet (R+D) (Bryner et al., 1999). Here is the kicker: both groups consumed 800 kcal/day liquid formula diets for 12 weeks. Yep, **800 calories!**
It gets better. The C+D group exercised 1 hour four times/week by walking, biking, or stair climbing (no weight training). The R+D group however performed resistance training 3 days/week at 10 stations increasing from two sets of 8 to 15 repetitions to four sets of 8 to 15 repetitions.

What did they find?

The C+D group lost a bit more body weight than our weight training friends in the study, but the C+D group lost 4 kg (8.8 lbs) of fat free mass (FFM). FFM is everything that is **not fat.** Organs, muscle, bone, and connective tissue are all considered FFM. While FFM changed here, this study is quite short in the grand scheme and it is pretty safe to assume that most of that loss in this study was from muscle mass. No bueno. However, there was no decrease in FFM observed in the weight training (R+D) group! Keep this fact in mind and we will come back to it.

What about metabolic rate though?

The R+D group (the ones who did strength training) actually had an ***increase*** in resting metabolic rate (RMR). Conversely, RMR ***decreased*** in the C+D group (the non weight trainers).

Why You Should Care

This is an extreme example, and yes this study does have its limitations. The takeaway is that even with a super low calorie plan over 12 weeks, RMR actually went up a bit **if** the subjects picked stuff up and set it down again (i.e. weight trained). FFM was also well-preserved. That's yet another point for good ol' weight training!

Research Part 2

Recently, Camps, SG et al. investigated what happens in diet-induced weight loss and adaptive thermogenesis (fancy words to see if there was any long term change in RMR) (Camps, Verhoef, & Westerterp, 2013). They studied 22 men and 69 women who followed a very-low-energy diet for 8 weeks and then a 44-wk period of weight maintenance.

Body composition and RMR were assessed with super-accurate fancy lab stuff that you don't care to read about. They found that RMR **did** *decrease*, and the decrease was sustained after 20 weeks, and even at **1 year** after the low calorie diet.

Holy jumping jackalopes, Batman! Metabolic damage **is** real. (See, I knew Dude Brah 23 was right!) I knew it!! Baw hahaha. The catch is that while RMR was lower at almost 1 year out, the calories came out to about 79 kcal/ day lower. That's about half a Twinkie.

3 Strikes?

I have **one more** for you. Rattan et al. in 1989 investigated this issue. Yes, it was the 80s and despite the bad music that was popular, "Don't Be Cruel" to research conducted during that decade. (Hat tip to everyone who is old enough to catch the lame Bobby Brown reference there.)

Erhm…Anyway, back on track…Scientists were examining this whole issue way back then too.

> *"It has been argued that excessive lean body mass is lost with very restricted energy intake regimens which compromises metabolic rate and sabotages weight maintenance." –Rattan S. et al. 1999*

In other words, Rattan and friends were hip to the possible existence of metabolic damage. In this study (Rattan, Coxon, Kreitzman, & Lemons, 1989), they grabbed 39 people who had lost an average of 12.3 kg during an 8 week VLCD (very low calorie diet) trial and immediately put them on a fun 1500 kcal per day meal plan of solid foods. They found that that the VLCD did not produce losses of RMR beyond that expected from the loss of weight. While I don't recommend you try this tomorrow, surprisingly, they reported no difficulty with subjects maintaining weight for 8 weeks on 1500 kcal/day. (I still find this suspicious though.)

Metabolic Rate Research Recap

To date, while the research is very limited, there does **not** appear to be a massive drop in RMR, even on a low calorie diet. Yes, yes, all of these studies do have their limitations; one of the biggest problems is the time frames they employed, which are relatively short. 8-12 weeks is nothing. In the real world, people stay on very low calorie diets for many months/years at a time.

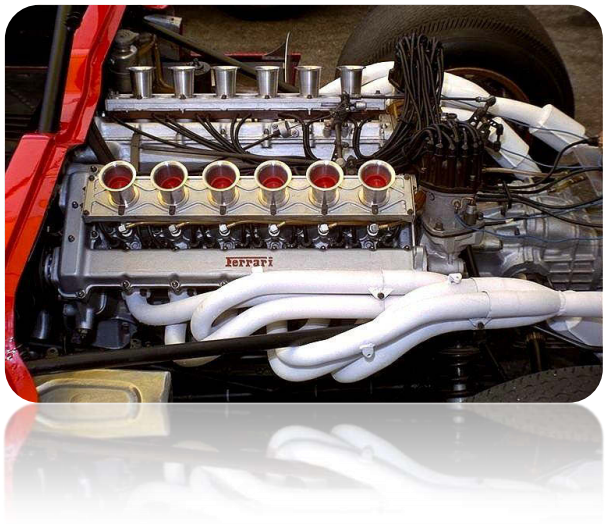
Key Concepts

One of the main hinge-points to consider is your body's RMR. Your RMR is how much energy it would take to run your body if you simply laid around all day and did nothing. Your RMR accounts for 60-70% of all the calories you burn in one day (Stiegler & Cunliffe, 2006). Of this, fat free mass (which you learned is everything that is **not** fat) is responsible for most of the RMR (Ravussin et al., 1988; Seidell, Muller, Sorkin, & Andres, 1992; Stiegler & Cunliffe, 2006).

The take away is that anything we can do to increase or preserve FFM (especially muscle) will keep RMR humming along nicely. This is a very important part of reaching your fat loss goals and avoiding/recovering from metabolic damage.

What Is Normal?

We don't need to get too caught up in what a "normal" RMR is since that number can change over time and is dependent upon a whole bunch of factors. Metabolic damage may be characterized as a **rapid decrease** in RMR, thus making it much harder to lose body fat.



Imagine hopping in a big V12 Ferrari. How good do you figure the gas mileage is on this beast? If you can afford one, you don't give 2 craps about miles per gallon, but a big engine takes **a lot** of fuel. Two years ago, I went up to Alaska with my wife and family. It was a great time and a friend took us out on his yacht for a cruise. This particular vessel was quite efficient as far as yachts go, but it was still only getting 3.5 mpg. Yep, it was sucking a ton of gas due to its massive twin-engines.

Compare this to a 4 cylinder Ford Fiesta that gets about 40 mpg. Of course, it's not going to burn close to the same amount of fuel as the massive Ferrari engine (and it won't look as cool either). Your RMR is like an engine; the bigger the motor, the more fuel you burn, thus making it easier to lose weight.

If you're built like a Fiesta (we will call him Frank), only burning a total of (say) 1200 total calories per day (RMR plus all your other activities), that is not much food just to "break even." Not many people want to be Fiesta Frank.

Compare that to our Ferrari-built friend (we will call Fred), who would still burn 2500 calories per day even if he just laid on the couch and watched re-runs of *Married With Children*. Which one will have an easier time losing fat? Ferrari Fred of course, since he can eat almost twice as much food and still break even. In general, you want to have a high RMR since that will "eat up" most of the calories you burn during the day.

But what about exercise? Doesn't that burn a lot of calories? The harsh reality is that with exercise alone, it will be very difficult to consistently make up for the difference. According to the Cleveland Clinic Center for Consumer Health, a runner who weighs 130 lb. will burn 2,224 calories during a marathon; a 165 lb. runner will burn 2,822 calories. Unless you are running an ultra-marathon day-in/day-out, you'll either need to reduce your calories or increase your RMR. Trying to make up for the difference with exercise alone would be very difficult (and time consuming).

Of course, exercise **is** important, but it is unfortunately not a major burner of calories during a typical day. It does serve a **very** important purpose though, so read on and don't lose all hope.

Why Keep Muscle?

Retention of lean body mass serves several important functions. The primary component of FFM is muscle. Not only does muscle look awesome, it also functions as the largest disposal site for post-meal glucose and lipids (fats) (Petitt, Arngrimsson, & Cureton, 2003). It's also the greatest determinant of our RMR (Johnstone, Murison, Duncan, Rance, & Speakman, 2005). Keeping as much skeletal muscle is a key component in the battle against future weight gain (Tipton & Wolfe, 2004). It is **much** easier for most to lose weight than it is to keep the weight off long term. Keeping your RMR up will help make your fat loss permanent.

Protein Matters

Blah blah blah, protein, protein, protein…I love protein! Now, I am sure I know what you're thinking. "Oh man, Mike's going to go off about protein yet AGAIN."

Yep!

…But it's for a very good reason, so hang in there. Protein serves many physiologic functions, with our main interest here being an increase in RMR due to higher protein turnover and (as a result) increased muscle mass (Evans, 2001).

Replacing all that muscle protein in your body is a very expensive, fuel sucking activity. Protein also produces a higher thermogeneic effect compared to fats and carbs; thus you literally "burn more fuel" by eating protein (Scott, Fernandes, & Lehman, 2007; Stiegler & Cunliffe, 2006).

How Much Protein?

Recent data has suggested that increasing the amount of protein in the diet, especially when calories are below maintenance (read – fat loss), may offer a slight metabolic benefit by maintaining FFM while selectively decreasing body fat (Layman et al., 2005; Mettler, Mitchell, & Tipton, 2010; Walberg et al., 1988).

"For athletes interested in losing mass and experiencing negative energy balance, a relatively high protein intake may be warranted." (Tipton & Witard, 2007)

Translation: **keep the muscle and lose the muffin top.** This effect can be further enhanced by the use of weight training.

Unfortunately, there is not a ton of data on people who do intense exercise compared to the “large body” (bad humor attempt I know) of literature on the overweight/obese population. It goes without saying that athletes differ from the overweight population in many ways from insulin sensitivity to amino acid utilization for repair/growth. Athletic populations also feature very few metabolic disease/predisease states; thus they may respond differently to the same intervention (Abete, Astrup, Martinez, Thorsdottir, & Zulet, 2010; Lewis et al., 2010; Phillips, Tang, & Moore, 2009).

Data observed from a few well-controlled studies (Farnsworth et al., 2003; Noakes, Keogh, Foster, & Clifton, 2005; Tipton & Wolfe, 2004) on the use of a higher-protein diet on both weight loss and body-composition changes during energy restriction in obese individuals showed that more of the weight loss came from fat mass while simultaneously promoting a greater retention of fat free mass (Luscombe, Clifton, Noakes, Farnsworth, & Wittert, 2003). It should be emphasized that this is for the average population however, and may not be optimal for athletic population.

Hold on to your shorts as we skim over a few important studies to beat this dead horse into submission.

Protein Dead Horse Beating #1

Layman et al. in 2005 conducted a 16 week randomized study on 48 women aged 40–56 years which consisted of 5 days per week walking and 2 days per week of resistive exercise (Layman et al., 2005). Supervised weight training (resistance exercise for you geeks) consisted of 7 Nautilus® weight machines with each subject performing a single 12-repetition set for each exercise.

The level of protein in the diet was varied along with carbohydrate levels, while fat was left consistent at 30% of daily calories. The higher protein group received 1.5 g protein/kg body mass/day (a 220 lb person would be eating 150 grams of protein per day), while the lower protein group received about 0.8 g protein/kg body mass/day (roughly half of the other group).

Whole-body composition was determined by dual energy X-ray absorptiometry (DXA) which has been shown to be very accurate (Van Der Ploeg, Withers, & Laforgia, 2003). What did they find? All groups lost significant body weight and displayed changes in body composition, but the higher protein and exercise group decreased their body fat by almost 6%, with almost all weight loss coming from fat and not lean body mass. This is great, since it showed a *selective loss of body fat* without losing muscle. Boo-yah!

The group that consumed a lower protein diet and did not exercise still lost almost 8 kg (17.6 lbs) but only 64% of their weight loss was from fat, with 2.7 kg (about 6 lbs.) of lean body mass being lost. **Oh no!** They lost a crap-ton of weight, but that **included** their precious fat free mass (muscle). It can take months to years in some cases to gain 6 lbs. of lean mass. To see it vanish in a few weeks is awful. This type of diet/lifestyle combo can drop your RMR further and could send you down the wrong path.

All Is Not Lost

Now, before you freak out completely, it should be noted that the low protein group who **did** exercise (walking 5 days per week and only 2 days per week of strength training) only lost 1 kg (2.2 lbs) of lean body mass. Whew…

This demonstrates that exercise, especially strength training is **extremely** important if you want to hold on to your muscle tissue. Keep in mind that this study compared protein intake levels and exercise. The low protein group who did not exercise lost the greatest amount of lean tissue.

Analogy: Built To Survive

Think of it this way: your body is survival-oriented. It will do whatever it can to keep itself going. When you get into the gym and lift stuff on a regular basis, you are literally tearing your muscle tissue apart. Your body sees a large load (weights) done for many, many reps and the adaptive process springs into action…boing!

Remember, if your body wants to survive it has to rebuild this "broken" muscle tissue just in case you subject it to that particular load again in the future. (I know you will). Your body will build bigger and stronger muscle tissue so that it is literally better at handling the loads applied to it by weight training.

Your body **wants** to be ready for the next assault. Fast-forward through time, over several sessions, and holding onto muscle tissue is going to become a pretty high priority. Your body is literally thinking, "Oh crap, this crazy person is going to lift stuff yet again, and this time it is a bit heavier than last time. I had better keep all this expensive muscle tissue around, 'cause I'm gonna need it!" (I have seriously heard my body say this!)

Strength training is a **massive** stimulus to hold on to muscle tissue. Whatever **builds** muscle will also **maintain** muscle. Remember that the raw material for strengthening or repairing/enlarging a muscle is dietary protein.

Summary: Protein + lifting stuff = powerful stimulus to hold onto muscle

These data show that to drop the most body fat without much (if any) lean body mass loss, exercise and a higher protein intake of around 1.5 g protein/kg/day may be needed.

Beating the Dead Protein Horse…Again

Now I am going to proceed to flog the dead horse just a bit more, as I can hear some doubters out there cry, "…But that was a poor exercise routine, and the subjects weren't lean athletes. Therefore, it does not apply to me!"

While it may be true that the participants of the aforementioned study do not necessarily represent you, I will now present a study by Mettler S, et al. who studied 20 athletes that had been exercising for over 6 months before the study began (Mettler et al., 2010). While these may not be considered elite athletes "per say", they had quite the extensive training background for study participants. They also exercised on average about 360 minutes per week over 5 training sessions, and they were relatively lean (about 16.5% body fat).

They were divided into a control group (low protein) and a high protein intervention group. After a familiarization period, all subjects were fed a hypocaloric (weight loss) diet of 60% of their habitual intake.

Yep, they dropped their calories by 60% **overnight!** I would **never** recommend this in the real world, since it is just not necessary for fat loss, but it **is** fun to see what happens under an extreme research condition.

The diet was set to 50% carbohydrates, 35% protein and 15% fat. The control (low protein) group had protein intake set at about 1.0 g protein/kg body mass (a 220 lb person would eat 100 grams of protein) per day while the high protein group was set at about 2.3 g protein/kg body mass per day (a 220 lb. man would eat 230 grams per day, approximately 1 g/lb. of bodyweight). The fat content of the control group was increased to keep the total calories between the two groups the same. This is important as calories **do** matter!

Body mass loss, as measured by DXA, was significantly greater in the control group compared to the high protein group, while fat mass loss was about the same - around 1.5 kg lost in both groups. That sounds bad right off the bat, as it seems the low protein group lost more fat, but hold on.

The higher protein group lost 0.3 kg of lean mass compared to the low protein group, who lost over 5x as much at 1.6 kg. Keep in mind that exercise was not controlled in this study as subjects were instructed to keep their current routine the same (although no performance change was seen at the end of the 4 weeks).

Summary

By increasing your protein intake to about 1 gram of protein per pound of body weight, you dramatically reduce the rate of muscle loss on a low calorie diet. This is in an absolute worst-case where calories are cut by 60% overnight.

Walberg et al. conducted a similar study in addition to work by Mero et al. and provided further data to drive home the point that higher protein intakes combined with exercise (especially resistance training) can result in selective *loss of fat* accompanied by simultaneous *retention of lean body tissue* (Mero et al., 2010; Walberg et al., 1988). Remember, more lean body mass equates to a less significant reduction in RMR (and there may even be an improvement).

4 Step Plan to Combat Metabolic Damage

Step 1 – Eat More Protein

As I've demonstrated, this is the most important thing you can do to fight off metabolic damage. Gradually work up to 1 gram/lb. of bodyweight of protein, per day. While this number may be on the higher end of the spectrum, high levels of protein intake in healthy individuals have *not* been associated with kidney damage and all sorts of other horrible things (Lowery & Devia, 2009a; Lowery & Devia, 2009b).

Yes, that seems like a lot, and I don't expect you to get there tomorrow. This is an end goal. If it takes you several weeks, that is perfectly fine. Better is better.

Step 2 – Lift Weights

As shown earlier, weight training is a massive stimulus to hold onto as much muscle tissue as possible.

While the research is across the board, training in the 3-12 rep range will do the trick. Like always, keep track of your performance and make sure it is increasing over time. The key is to maintain (and potentially add) muscle to sustain a healthy RMR.

Step 3 – Calories

At the start, I mentioned that your RMR is not set in stone. It turns out that as you eat more, your RMR tends to increase. Yep, you read that right: **as you eat more, your RMR goes up**. Now, before you go crazy at the neighborhood KFC, while your RMR does increase in response to a caloric load, it may not elevate at the same *rate* as your incoming calorie; thus halting or even reversing your fat loss progress.

The key is to **slowly** increase calories over time and monitor your performance and body composition. In step #1, I discussed increasing protein, so that is the main goal

initially. Protein is well-tolerated by most people, whereas carb tolerance tends to vary widely from one person to the next.

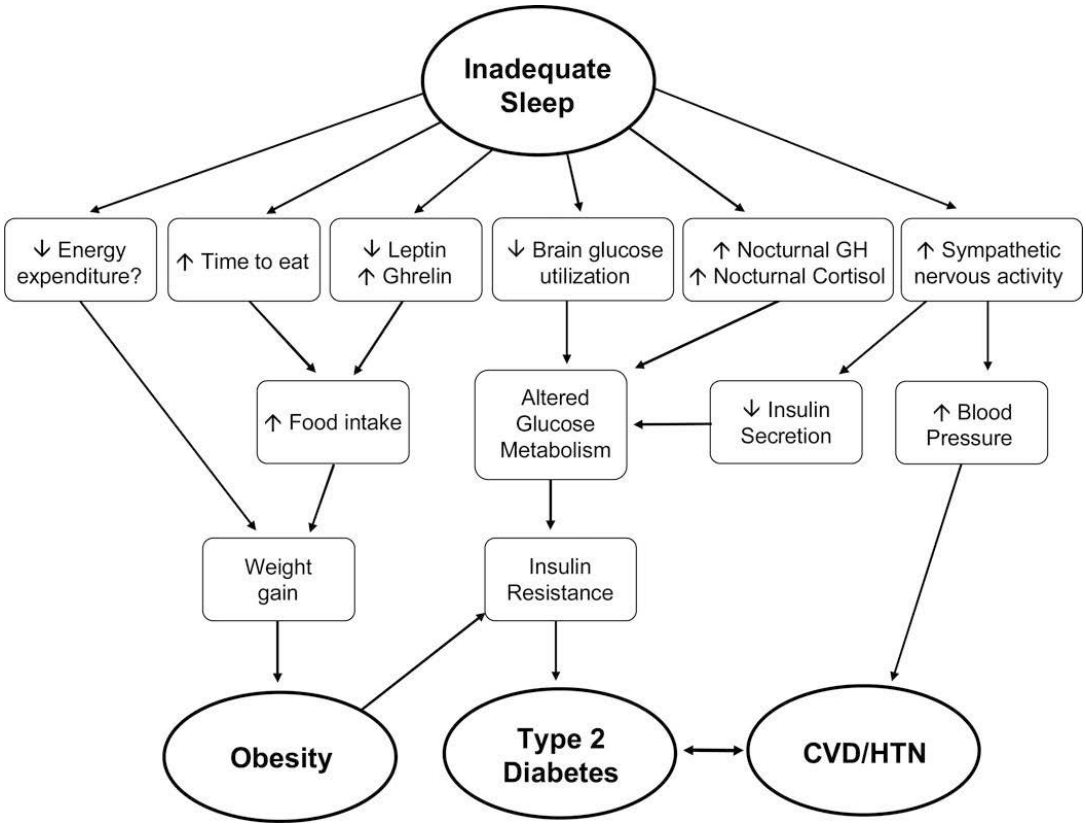
Once you have your protein intake up for 2 weeks, add about 25 grams of carbs in and see how it goes. Getting them is the first goal, and where you schedule them is a lesser goal. If I had to pick a time, I would add them around your training (either before or after is fine).

I know that is vague, but your goal is to slowly increase your caloric intake over time to help build your RMR back up. You are already lifting stuff (as in step #2) so now your goal is to upgrade to a bigger engine.

This part can be frustrating, as the amount of time will vary again, but stay with it. You did not get to where you are now overnight, and you won't fix all of your problems overnight either. Steady progress is better than no progress.

Step 4 – Sleep

Sleep is a **crucial** period of your daily cycle. Many of your bodily functions will be thrown off by a lack of sleep, and new research is showing that a lack of sleep is associated with all sorts of metabolic issues (Collop, Salas, Delayo, & Gamaldo, 2008; Hursel, Rutters, Gonnissen, Martens, & Westerterp-Plantenga, 2011; Knutson, 2012; Najafian, Mohamadifard, Siadat, Sadri, & Rahmati, 2013; Rutters et al., 2012; St-Onge et al., 2012). For this reason, I suggest that you prioritize sleep in the same fashion that you would prioritize your nutrition and training. Not only is it a necessary component of achieving optimal muscle retention, but when you are sleeping, you are not eating (unless you took too much Ambien). Sleeping is a great time to burn fat!



Schematic representation of possible mechanistic pathways (from modified from Knutson 2010).

Furthermore, a recent study by Hursel R, et al. measured substrate (carbs or fat) use over 48 hours while subjects were in a respiratory chamber (think of a huge room where they account for all the calories going in and out) (Hursel et al., 2011).

What they found was fascinating!

Fifteen generally healthy subjects of average body fat (about 21%) were "locked up" in the chamber for 2 whole days. They used a crossover design, so each person served as their own control. This is a great way to decrease outside variability since different people tend to do different things. Trying to account for all the deviations can drive you batty!

During one of their 2 day stays in the chamber, they were allowed to sleep normally (sleep was measured by EEG). However, during the other stay, they fragmented their

sleep and only allowed them to sleep for 1 hour at a time, yet for the same duration of sleep. Fragmenting is where they literally woke them up once an hour. **Bugger!** Now that sounds a bit unrealistic, but I've measured my own sleep using EEG (via Zeo) and it is not that far off at times. Most people are aware that they wake up once or twice during a night, but in reality it can happen more frequently than they realize. You will not normally have any recollection of every instance you awaken during sleep, so this was a great variable to throw into the study.

To quote the researchers:

> *"Fragmentation of sleep was accomplished with approximately hourly wake-up calls that varied in frequency of between 500-2000 Hz and in intensity of between 40-110 dB; subjects confirmed waking up by turning off their alarms after 2 min"*

What they found in the fragmented sleep group was a direct impairment of fat oxidation, thus decreasing their fat loss results. In plain English: **waking up multiple times during the night did not allow their body to burn body fat as well!"** To boot, there was significant reduction, clocking in at 2x less fat oxidation than during the non-fragmented stays. Fat oxidation was 61 g/d in the non-fragmented sleep group and 29 g/d in the fragmented group.

If you extrapolate that out to only 1 month and use an overly-simplified "calories burned" model, **that equates to 2 lbs. a month of fat gain!** That's kind of a big deal. While fat loss was not accounted for in this particular study, this is great data to show that just by increasing the quality of your sleep, you can literally wake up leaner every day.

If that was not enough, Shechter A, et al. showed that sleep reduction is associated with increased energy intake and weight gain too (Shechter et al., 2012). Hopefully I am convincing you to get some more shut eye.

The Big Sleep

Getting enough sleep is crucial to reach your goals. Not only can poor sleep disrupt your body's ability to use fat directly, it is also associated with weight gain. Poor sleep can mess up your performance at the gym and thus reducing the stimulus to keep muscle (and RMR).

6 Steps for Better Sleep:

1. Try to minimize how much water you drink before bed.
2. Use ear plugs to keep down the noise or have a nice "chat" with your neighbors.
3. If ear plugs don't work, add in some white noise like a fan.
4. Make your bedroom a cave - cool and pitch black.
5. Try to go to bed and get up at the same times each day, most of the time.
6. Turn the lights down low about 2 hours before bed.

These 6 tips will increase your sleep quality and improve your fat loss results.

Summary

I just unloaded more than you probably wanted to know about metabolic damage, from the research side of things to the real-world effects. Oft-regarded as a myth, this exercise/fat loss-devouring beast appears to be real (unlike the jackalope), but direct evidence of its existence is currently scarce. There is evidence that metabolic rate will decrease, but it does not appear to plummet to epically low levels as some have stated. Unfortunately, there is not any current research on athletes doing very low calorie diets for many months combined with hours on end of cardio either. What does appear to be very real is a plateau in weight loss in which a decreased metabolic rate **does** play a role.

In the end, metabolic damage is a sign of a decreased resting metabolic rate due to loss of lean body mass rather than some surreptitious, irreparable malfunction. You **can**

recover from metabolic damage (downregulation), and the prescription is a combination of consistent protein intake, resistance training, and a slowly increasing caloric intake.

Armed with this knowledge, you can take the appropriate actions to help get back on the right track or avoid metabolic damage altogether. Follow the steps above in order; once you get the first one down, move onto the next. Be patient, monitor your goals and performance, and in time you **will** get there. Your metabolism is not set in stone and your goals **can** be achieved.

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