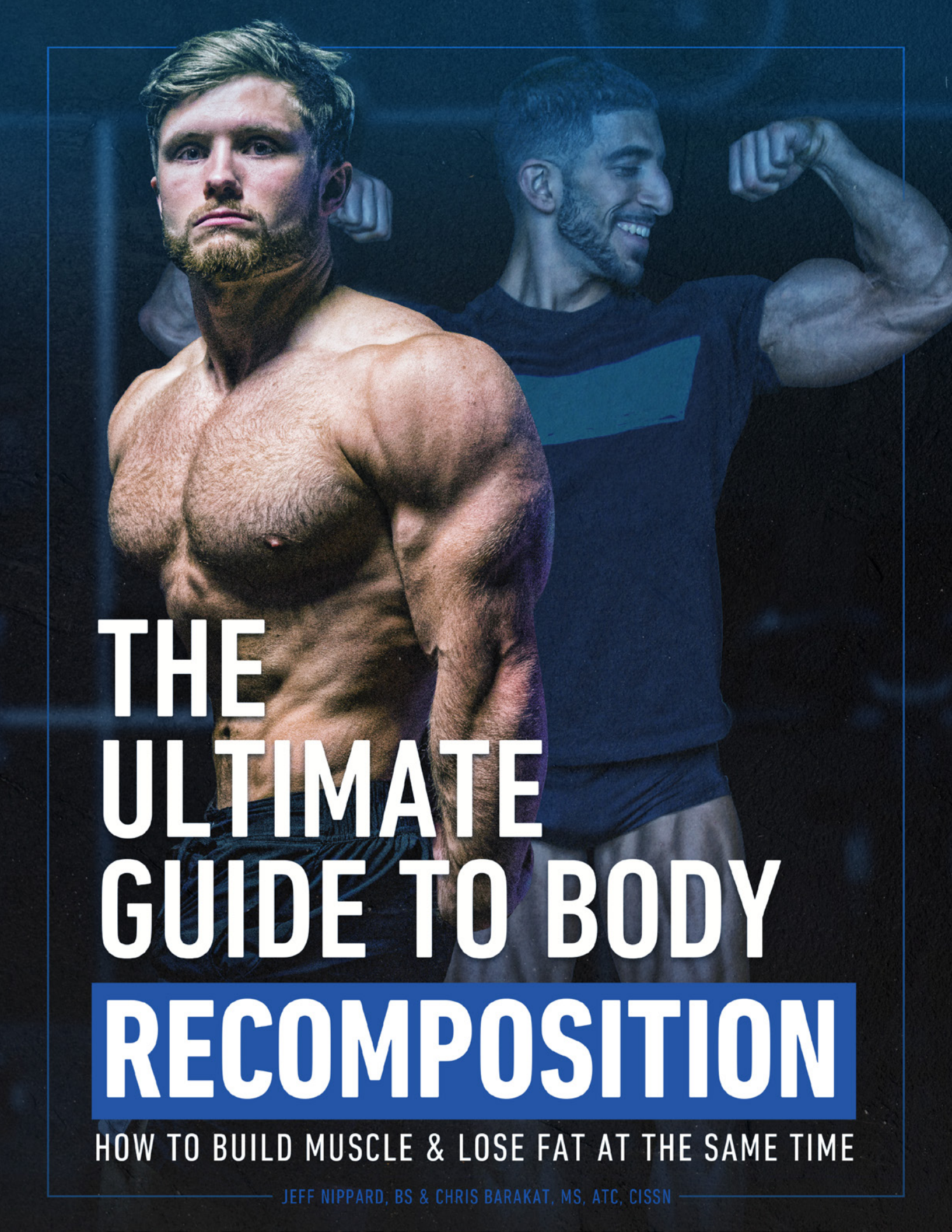

THE ULTIMATE GUIDE TO BODY RECOMPOSITION

HOW TO BUILD MUSCLE & LOSE FAT AT THE SAME TIME

JEFF NIPPARD, BS & CHRIS BARAKAT, MS, ATC, CISSN

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INTRODUCTION

Congrats on purchasing your Ultimate Guide To Body Recomposition! We are pumped about your decision to optimize your body composition and thrilled to assist you in complementing your hard work in the gym with the latest nutritional science.

In the pages ahead, you will learn to separate the gym hearsay and daresay from the voice of current science. Then, once you have grasped the key nutritional tenets of building muscle and losing fat, we will guide you through an easy-to-implement application of this science.

Our goal in writing this e-book is not to present a humdrum regurgitation of "bodybuilding nutrition 101" basics. We will not merely teach you about energy balance, how to track macros and tell you that you should eat one gram of protein per pound of bodyweight.

While we will do a quick recap of the nutrition fundamentals at the beginning of each chapter to make sure everyone is keeping up with the plot, our goal is to teach you how to optimize your body composition. This means that most of the content in this book will be dedicated to digging a layer deeper.

As Beverly Sills points out, "There are no shortcuts to any place worth going." This of course does not mean the longer route has to be arduous. Nor does it mean that understanding the essentials of nutrition to the degree that it will shift your body composition towards optimization requires a PhD in nutritional science.

We will present knowledge on how to optimize your nutritional approach as a means to

improve your performance in the gym, maximize your recovery out of the gym and make the greatest gains possible. When we say optimize, we mean that we are valuing the most effective approach over the most time-efficient approach.

There are surely simpler nutritional approaches that can get you good results for less work than the ones laid out here. We will indeed outline those basics. We believe however, that to get the best results you can, it is important to cross more t's and dot more i's than what following the simplest path will provide.

As you will see, body recomposition (building muscle while losing fat) is not quite as straightforward as merely losing fat or merely building muscle. In our opinion, achieving both of these goals at the same time will require more attention to detail and a more optimized approach than your typical run-of-the-mill bulking or cutting diet. In this book, our goal is to get everything just right. This is what we mean when we say optimization.

From the outset, it's worth noting that what is most optimal for you may not necessarily be most optimal for your gym buddy, or even for us. That's mostly because your genetic ability to build muscle and lose fat may be different than someone else's ability. In light of these individual differences, we will lay out specific principles and tools and teach you how to tailor them to your specific needs.

We are grateful for your confidence in us to provide you with the most current and relevant knowledge that will empower you along your fitness journey. Please know that we will be on the sidelines cheering for you every rep of the way.


01

CHAPTER 01

THE START LINE

"EVERYTHING SHOULD BE MADE AS SIMPLE AS POSSIBLE, NOT SIMPLER"- ALBERT EINSTEIN

Sometimes I get a rush watching sprinters as they stand at their start line, ready to explode from their starting block. Have you ever noticed that look in their eyes? The concentration ... the resolve ... the pinned up potential, ready to launch ... It's inspiring to see. For the athlete, there is something special, even motivating, about being at the start line.

There is an old adage that says, "It's not how you start that matters, but rather how you finish." Maybe you have heard it, or even said it yourself.

Although there is certainly some truth to this platitude, it's not our favorite line because it robs value from the importance of the start of any initiative. At the risk of propagating a cliché, or sounding overly philosophical, in some sense, every day is a new beginning - a new start line to reassess, adjust and aim to improve. We would rather proclaim, "Pay attention to how you start because it will not only determine how you finish, but determine your fulfillment along the way." As we see it, one of the reasons so many people end up not finishing what they started is because they didn't start the right, or most optimal, way.

As you begin this book, it may help to think of it as your start block - a launching pad that

can catapult you toward progress you may have previously thought unattainable. Gathering new knowledge is vital to the acquisition of new gains. We are hopeful that this book will be the source of that new knowledge.

For some, the information you read here may be a means of focusing your attention to what you already know and if so, can serve as an injection of motivation to get you applying that knowledge. When it comes to optimizing your approach to get to your goals, knowledge without application places you no further ahead than those who do not know.

So why not embrace the information and tools in these pages to spring from today's start line with a resolve to build the best physique you can; one for which you have dreamed about for too long?

Go ahead. Get that Usain Bolt, Florence Griffith-Joyner look in your eye and let's begin.

KEEP IT SIMPLE, BUT NOT TOO SIMPLE

One of the things we like about taking a science-based approach to training and nutrition is that it allows you to cut through the noise. In today's influencer-based fitness landscape you have trainers and gurus throwing so much information out there that it can be difficult to figure out what actually matters.

In our opinion, the best way to figure out what really matters is through science. In this sense, the science of exercise and nutrition serves to simplify one's approach. It cancels out the noise. Unfortunately, many people in the fitness industry have taken this simplification too far. Now, many are oversimplifying the many complexities of the human body to such a degree that they are falsifying how it really works.

If you've heard that it's impossible to build muscle and lose fat at the same time, you have

been presented with such oversimplified, misleading and false information. If you've heard that you MUST be in a calorie surplus to gain muscle or that you MUST be in a calorie deficit to lose fat, you have once again been nudged towards oversimplification.

In the spirit of optimizing your approach, in this book we will be taking a closer, more accurate look at the many variables that drive progress. Paying attention to more variables then, will require more of a conscious effort, especially in the early stages of a new approach to body recomposition.

Once your radars have been turned on to detect these previously undetected success factors, with time, the power of habit will release you from a more intentional focus. This closer attention to detail will reward you by yielding greater returns (gains) over time.

Before we continue, those of you now bemoaning the presumption that we are about to unleash a super strict diet plan with an extremely rigid structure, or a needlessly convoluted approach before "majoring in the minors," may exhale at this point. That is far from our approach.

Unless you are a dietary masochist, restrictive and rigid diets simply aren't sustainable. We are assuming you are in this for the long haul, not just for the next month or two, so our approach will deviate from this method of deprivation or overcomplication.

Our goal is to provide you with a deeper understanding of the foundational body recomposition principles, as well as the finer details of nutrition necessary for not only getting you good results, but the best results you can achieve.

With this increased level of knowledge, you'll gain power and control of your body composition without having to acquire the discipline of a stoic monk.

RECOGNIZE YOUR STARTING PLACE

Like most facets of life, experience matters. To get to where you want to be, you first need to know where you are right now. Your starting line will most likely be different than others', meaning the route to your end point may also differ.

With this understanding, pause and decide where on the beginner-veteran spectrum you are currently positioned. Your experience level, both in the gym and in the kitchen, is going to significantly impact how detail-oriented you need to be with your approach.

BEGINNER (0-2 YEARS OF LIFTING EXPERIENCE)

The truth of the matter is, a true beginner can concurrently build muscle and lose fat quite easily. This is because as a new lifter, your physiology is the most primed for muscle growth that it will ever be.

As you accrue more and more lifting experience in the gym, your muscles become more and more adapted (that is, less and less responsive) to training stimuli. As a result, with increasing training advancement, building new muscle becomes slower and harder.

Also, because building muscle is an energetically-demanding process, and beginners have the ability to build muscle faster, calories can be pulled from stored body fat to fuel the muscle building process. This implies that newbies can achieve impressive body recomposition without paying attention to every detail of their nutrition. Recomposition is both easier and simpler for a beginner.

As long as you meet the three criteria outlined below, you should be able to build muscle and lose fat as a beginner without the same level of optimization that an intermediate or advanced trainee would need:

1. Your caloric intake isn't too high or too low (meaning, you are eating either in a small caloric deficit or a small caloric surplus). We will revisit specific examples later, when we set up the diet.

2. Your protein intake is adequate. We will outline the specifics in Chapter Eight when we set up macronutrients.

3. You are weight training with a focus on progressive overload (incrementally adding either weight, volume or improving technique over time). We will later outline the specifics of training for recomposition.

Of course, that isn't to say that as a beginner you can put the book down now. Following the recommendations outlined in the upcoming pages will yield even more impressive results for the beginner who begins with a certain inherent advantage. These strategies have the power to take you from getting good results to getting great results.

INTERMEDIATE (~2-5 YEARS LIFTING) TO ADVANCED (~5 OR MORE YEARS LIFTING EXPERIENCE)

Progressing towards the other end of the spectrum, the longer you've been resistance training, the closer you are to your genetic potential. If you are a weight room veteran, you will have to fight for continued progress. We believe this is where the often overlooked and oversimplified details of nutritional science really move the needle to optimize results.

For an intermediate to advanced level lifter, simply meeting the three criteria outlined above will most likely not be sufficient to optimize results. Sure, they will get you part of the way there, but since your body will become more and more resistant to progress with time, more fine-tuning may be necessary to get the best results possible.

So while reductionistic fitness industry thought may work just fine for the beginner, the intermediate-advanced trainee will need to think harder. Concepts like "calories-in versus calories-out," "a carb is a carb" and "eat according to your schedule" can be powerful approximations for a beginner, but can be misleading and limiting to those with more experience. We want to lift topics from the soup of fitness discourse, put them on the table, shine a light on them and have a closer look than most do.

In addition to unpacking topics that are often overlooked and misunderstood, we will bring some new nutritional concepts to the forefront. We're going to combine scientific findings with our time-tested strategies so you can optimize your nutritional approach, regardless of your beginner or veteran standing!

UNDERSTANDING RECOMPOSITION

To be clear, when we say body recomposition, we are referring to a reduction in body fat percentage alongside an increase in lean body mass (more specifically, muscle mass). In both women and men, this is most commonly achieved under four circumstances:

1. **NEW LIFTERS (BEGINNERS):** As we discussed above, the body is most primed for growth when weight training is still a new stimulus. To fuel the speedy muscle building process, the body can "easily" tap into body fat stores to yield impressive recomposition.

2. **DETRAINED LIFTERS (DETRAINEES):** The detrained lifter is anyone who has lifted for a significant period of time, built a significant amount of muscle but then stopped training due to injury, lack of motivation or some other impediment to regular lifting. Similar to the new trainee, the detrainee is able to build a lot of muscle very quickly, making recomposition common. We will revisit this phenomenon later when we discuss muscle memory.

3. **OBESE INDIVIDUALS:** Because obese individuals have a very large energy reserve (bodyfat), it's simple enough for them to eat in a caloric deficit and still have plenty of stored energy to fuel the muscle building process. As a result, when obese individuals train, it's common for them to build muscle and lose fat at the same time.

4. **ANABOLIC STEROID USERS**: Using anabolic steroids puts you in a similar camp to the new trainee and the detrainee in that it allows most people to build relatively large amounts of muscle mass very quickly. Again, to fuel that speedy muscle building process, the body can tap into body fat stores, resulting in impressive recomposition.

Although these are the most common routes to recomposition, they do not exhaust all possible routes to that destination. As we will explain throughout this book, even if neither of those four scenarios applies to you, you can still build muscle and lose fat at the same time.

We affirm that body recomposition can happen at any stage throughout one's training career and there are indeed various ways to achieve this highly sought after outcome.

UNDERSTANDING RECOMPOSITION - ONE LAYER DEEPER

If you turn to the internet to figure out the definition of body recomposition, you will most likely find an answer something like, "Body recomposition: to build muscle while losing body fat." For our intents and purposes, this is a good definition. However, for the sake of completeness (this is the Ultimate Guide to Body Recomposition, after all) we would like to expand this definition to include three possible scenarios that will all count as body recomposition in our books:

1. YOU BUILD MUSCLE WHILE SIMULTANEOUSLY LOSING FAT.

This is the most straight-forward type of body recomposition and the most commonly considered scenario. In a perfect world, this is also the most ideal outcome in that you look more jacked and shredded at the same time. This scenario will be most common in the four circumstances outlined above and while many of you who follow this plan will get exactly this result, this isn't the only route to recomp.

2. YOU BUILD MUSCLE MASS WHILE MAINTAINING BODY FAT MASS.

In this scenario, although you aren't actually losing fat mass, you are still lowering your body fat percentage because you are building new lean mass. Let's illustrate this scenario with some numbers. Let's say you currently weigh 180 pounds and are 20 percent body fat. This means you have 36 pounds of fat on your body.

After following our plan, you build 10 pounds of muscle and lose 0 pounds of fat. So you have built muscle, but neither lost nor gained any fat. Now you weigh 190 pounds and still have 36 pounds of fat on your body. Because your lean mass increased, even though you still have the same amount of total fat, your bodyfat percentage is now lower.

36 LBS FAT MASS / 190 LBS TOTAL MASS = 18.9% BODY FAT

In this example, you went from 20 percent body fat to 18.9 percent body fat, even though you didn't technically lose any fat. So, you may not have technically built muscle and lost fat on an absolute scale, but you have still built muscle while getting leaner.

We will therefore count this scenario as body recomposition. Under this scenario, your body will look more aesthetic as the muscle gained in the absence of any fat gain will still lead to a more muscular and tighter appearance. This scenario will be more common in trainees who are already quite lean.

3. YOU LOSE FAT WHILE MAINTAINING MUSCLE MASS.

Although you aren't building new muscle mass here, you are still lowering your body fat percentage by getting leaner. To clarify, let's run some numbers again.

Let's say you weigh 180 pounds at 20 percent body fat (36 pounds of fat on your body). After implementing the information in this book, you lose five pounds of fat and neither gain nor lose any muscle. You have lost fat while maintaining your muscle mass. After the fat loss, you now weigh 175 pounds and have 31 pounds of fat on your body. Once again, your body fat percentage has lowered.

31 LBS FAT MASS / 175 LBS = 17.7% BODY FAT.

Because your body fat has decreased while holding onto all of your existing muscle, you will create the appearance of being both leaner and more muscular. This is because your ratios, balance and overall aesthetics will improve.

The reason we are counting this as body recomposition is because typically when people lose weight, they will lose a combination of lean mass and fat mass. This can be due to a multitude of factors including decreased training performance (strength) and poor nutritional approach (inadequate daily protein intake, infrequent feedings, et cetera).

So, if one can maintain all the muscle mass they've already built while losing pure fat mass (or near pure fat mass) on a cut, we will count that as body recomposition as well.

This third scenario will be most common in highly advanced trainees who have the goal of being very lean, but who have already maxed out (or nearly maxed out) their natural genetic potential for muscle mass, or anyone who has optimized their dietary approach, but isn't weight training hard or smart enough to spark new muscle growth.

Now that we've clearly defined what body recomposition is and under what circumstances it can occur, it's time to turn to application and implementation. Because body recomposition is much more complex than just losing weight or gaining weight, to accurately track your progress over time, you will need to utilize various tools and monitor a few variables.

In the following chapter, we will discuss two compartments in your metaphorical toolbox for your recomposition project. We also outline what specific variables we need to track.


02

CHAPTER 02

THE TOOLS OF TITANS

"GIVE ORDINARY PEOPLE THE RIGHT TOOLS AND THEY WILL BUILD THE MOST EXTRAORDINARY THINGS."– NEIL GERSHENFELD

In this chapter, you will be introduced to tools that will assist you in measuring and tracking your body recomposition. This is vital to our success because if we are setting out with the goal of building muscle and losing fat, we are going to need some gauge by which to measure whether or not we're actually following through with that goal.

As we lay out various tools and assessment methods, keep in mind that body composition assessment is at its basic level, an attempt to simplify an inherently complex process. Also, be aware that each assessment method varies in its level of precision, reliability, cost and availability. In other words, each method has its respective strengths and weaknesses.

Measuring weight loss is super simple: stand on a body weight scale. If the number is going down, you're losing weight. Good job (assuming you're cutting).

Measuring weight gain is equally simple: Stand on the same scale. If the numbers go up, you're gaining weight. Good job (assuming you're bulking).

Measuring body recomposition is a bit more tricky, however. How exactly should we do that? Well, having the number go down on the scale might hint toward fat loss, but then how are we supposed to tell if we're gaining muscle or not?

Similarly, having the number go up on the scale might hint toward muscle gain. But, how are we supposed to tell if not not merely gaining fat?

As a third possibility, maybe the number on the scale stays exactly the same. Does that imply that we're gaining muscle at the exact same rate that we're losing fat? This would be the perfect recomp! But then again, maybe it means that progress has completely stalled and we're neither gaining any new muscle nor losing any fat at all. Yikes!

Clearly, the body weight scale can be difficult to interpret in the context of body recomposition and isn't going to be a sufficient tool on its own for measuring and tracking progress. Still, we believe that it has an important place in the "body recomp toolkit" and as such, will be the first tool we discuss.

As we peek inside our toolbox, we will first of all split the toolkit into two different compartments. One will contain "mandatory tools" that everyone can and should use consistently. These will be our day-to-day assessment tools for tracking progress.

The second compartment we will label our "special tools." Here, we will find the less accessible instruments that many readers will either have to purchase, rent, or find special access to. Although they can be quite helpful, they are by no means required to achieve and track a successful recomp. Since the Mandatory Toolbox is more generally applicable, accessible and suitable to our needs, let's begin here.

MANDATORY TOOLS

This compartment of our metaphorical toolbox contains four key tools: Body weight Scale, Measuring Tape, Camera (Progress Photos) and a Food Scale.

1. WEIGHT SCALE

The weight scale is about as common in the typical home as is the television. Interestingly enough, information from both can be misleading. It is extremely common to see trainees develop an unhealthy relationship with the scale and create an attachment to specific body weight values.

While it's normal to have this tendency to strive toward being a certain weight, we encourage you to avoid any kind of emotional attachment to specific numbers on the scale. They are only data points. And, because the weight scale is one of the bluntest instruments of them all, the data points it collects can be the most misleading and unnecessarily disappointing.

It's important to realize that one's weight speaks little, if anything, to the composition of the body. As mentioned above, weight gain on the scale could mean many different things, not limited to:

- Pure fat gain
- Pure muscle gain
- A combination of fat gain and muscle gain
- A lot of muscle gain combined with a little bit of fat loss (so that bodyweight still increases)

But despite its shortcomings, changes in body weight are nonetheless very easy to track and when combined with the other tools outlined in the following pages, can provide some very valuable insights and estimations.

For consistency purposes, we recommend tracking your body weight for four-seven days per week at the same time of day for consistency purposes.

For the most accurate weigh ins, we suggest weighing as soon as you wake up, after using the bathroom and before drinking any water or eating any food.

We also recommend using a digital scale that is sensitive enough to measure in 0.2 pound increments. Using those four-seven body weight measurements, you will tabulate a weekly average. You will then compare that weekly average to future weekly averages to determine whether your weight is trending up or down over time. Let's use the first two weeks in October as an example and assume these were your morning weigh-ins:

OCT 1 – 170.4 LBS
OCT 2 - 171.2 LBS
OCT 3 – 169.8 LBS
OCT 5 – 170.2 LBS
OCT 7 - 170.6 LBS

From this set of five weigh-ins across the week, you would calculate the first weekly average weigh-in of the month to be 170.4 pounds.

The next week, you would collect more weigh ins:

OCT 8 – 170.8 LBS
OCT 9 – 171.4 LBS
OCT 11 – 169.8 LBS
OCT 12 – 170.6 LBS
OCT 13 – 170.6 LBS
OCT 14 – 171.0 LBS

For this set of six weigh-ins across the week, you would calculate the second weekly average weigh in of the month to be 170.7 pounds.

Over time, you will collect average weekly weigh-ins to assess whether your bodyweight is trending up or down. Note that you do not need to weigh in every single day to get an average measurement (unless you find that convenient). Also, the fact that the weigh-ins fluctuate is completely normal and to be expected.

Every individual weigh-in doesn't need to trend in a given direction for the averages to trend in a given direction. Keep in mind that many variables like stress levels, water intake, sodium intake, carbohydrate intake, food volume, the menstrual cycle (for women) and bowel movements can impact your body weight on a daily basis.

Because merely measuring body weight will not be enough to tell us about body composition, let's now turn our attention to the rest of the "mandatory toolbox."

2. MEASURING TAPE

The ying to the weight scale's yang is the old-school measuring tape. A measuring tape will be used to obtain two primary bits of information: waist circumference and other body measurements (shoulders, glutes, chest, legs, arms and calves).

Waist Circumference: A waist measurement will help indicate whether or not fat is being lost. For example, if your body weight is increasing but your waist circumference is decreasing, that is a very reliable sign that you are building muscle while losing fat and as a result, reshaping your body.

To ensure consistency, when taking waist measurements, take the measurement at the belly button or at the smallest site on your waist. The most important thing is to be consistent with the measurement location over time.

Other Body Measurements: While taking individual body measurements are not required, they can provide a very simple, yet accurate way of tracking exactly where you're building muscle.

When taking body part measurements, measure at the largest site on the muscle. For the Legs-Thighs, Biceps, Triceps and Calves, be sure to record both a left and a right measurement. This will allow you to track any asymmetry and thereby modify your training to correct for imbalances.

Similar to the scale, realize that body part measurements are not a perfect science. For example, as you lose fat, many of these measurements may actually decrease, despite a gain in muscle to the area (if you happen to lose more fat from the area than you added muscle to the area). As such, you should use this information to compliment the weight and waist measurements.

When losing body fat, waist circumference is the one area that seems to change the most and even if you're adding muscle to your abdominals, it will not drastically change the size of your waist. For all intents and purposes, a reduction in waist circumference is a very good indicator of fat loss.

Phrased another way, in a body recomposition context, waist measurements are a more reliable indicator of fat loss than other body part measurements.

To avoid fluctuations due to water retention, we suggest taking waist circumference measurements one to two times per month, on the same days each month.

The other body part measurements can be taken once every one to three months when assessing muscular progress on specific areas or weak points.

3. CAMERA (PROGRESS PHOTOS)

Sometimes referred to as the Bodybuilder's Selfie, progress photos may be the most valuable tool of all. One of the all-time natural bodybuilding greats, Brian Whitacre, insists on using only visual tracking methods, so as to not get too consumed with numbers.

At the end of the day, as bodybuilders of one sort or another, we are mostly concerned with achieving a certain look; not a certain number on the scale or measurement on the tape. So if you want to assess how your physique is progressing, you need to be looking at your physique!

Rather than constantly checking yourself in the mirror, which can lead to false and inaccurate assessments due to changes in lighting, level of hydration, et cetera, we recommend taking progress photos at regular intervals with consistent lighting and camera set up.

This video from science-based natural pro bodybuilding collective 3DMJ, explains how to position the camera and light source to take quality, consistent progress photos. Here is a basic explanation of the set up: YOU - CAMERA/PHONE - LIGHT SOURCE/ WINDOW

Although extremely valuable, tracking progress using photos can be tricky. This is because the visual significance of any changes is going to depend on several factors, including:

A. GENETIC FACTORS:

Some people build muscle and lose fat much more easily than others.

B. YOUR EXPERIENCE LEVEL:

As you get increasingly more advanced (and near your "natural genetic limitation"), it will become increasingly difficult to notice visual changes in your physique. For example, someone with only one year of training experience will be able to literally see muscles grow on their physique from month to month much more easily than someone who has already been lifting for 10 years.

The key point with regard to the first two factors is to not be discouraged by your progress photos. If you are not immediately seeing noticeable visual changes due to your genetics or experience level, it is important to recognize that these factors are out of your control. They also will not hold you back from making any progress at all. They simply can make progress occur more or less quickly, in which case it is important to practice patience and stick-to-itiveness.

C. YOUR CURRENT BODY FAT PERCENTAGE:

This may seem counterintuitive to some. The leaner you currently are, the more likely you are to see noticeable changes in your progress photos. For example, if you are a 250 pound male at 30 percent body fat, chances are you won't look much different if you were to lose five pounds of body fat.

Conversely, someone who weighs 160 pounds at 10 percent body fat, will look much leaner after losing five pounds of body fat. As you get leaner, each pound of fat loss makes up a larger percentage of your total fat mass, making visual changes much more apparent. Therefore, it is important to be more forgiving on your first few months of progress photos, especially if you have significant fat to lose.

It may take several months before you start to visually detect how much fat you've actually lost (again highlighting the importance of having multiple tools in your toolbox).

We recommend taking progress photos one to four times monthly.

Because taking progress photos can be an annoyance, you should get into the habit of taking them on the same day each week, or on the same day every month. For example, every Sunday could be your "progress photo day" or as another example, you could shoot pics on the first of every month.

The problem with shooting pics too frequently is that changes will be less detectable. The

problem with shooting too infrequently is that you may start forgetting to take photos at all. The bottom line is finding a sweet spot that allows you to be consistent with this very important progress tool.

Follow the suggestions below to ensure you take the most accurate and useful progress photos possible:

- A) Use the same environment/location (ideally using natural light from a window or doorway);
- B) Shoot at the same time of the day (preferably fasted on an empty stomach);
- C) Shoot on the same day of the week;
- D) Use the same angle for each picture. Set up your camera in the same spot, at the same height;
- E) Use a self-timer or record a video and take screen shots, and
- F) Include your full body in several different poses. Include front, back and side pics. If you can perform mandatory bodybuilding poses, they are ideal for assessing muscular

detail and balance.

4. FOOD SCALE

Tracking macronutrient (fat, carbohydrate and protein) intake is a very powerful and effective way to manipulate body composition. In Chapter Eight, we will provide detailed macro recommendations, so it is important that you are able to accurately track what you're consuming.

It's worth mentioning that you do not need to track everything you eat to achieve some progress. It's fine to have periods of time where you choose not to track macros and will still be able to make progress by ball parking intake mentally, paying close attention to internal signals (hunger/appetite) and being consistent with food choices (eating meals of similar size and composition day to day). While progress can still occur using these intuitive or auto-regulated eating methods, we think that this approach may be too blunt for those with body recomposition goals.

If you just so happen to be eating the appropriate amount of each macronutrient, body recomposition can still occur without tracking macros. However, we think that to optimize your results, you need to be more intentional and proactive about your intake. For this reason, we recommend a fairly rigorous tracking-based approach when body recomposition is the goal.

We highly recommend you use a food scale when possible rather than using volumetric tools such as a measuring cup. A food scale can cost anywhere from ten to thirty dollars and is an extremely valuable tool to ensure you're consuming the proper portions of each food source for your specific goals.

Volume metrics can be much more inaccurate and unintentionally over or under consuming calories can slow your rate of progress. Due to the dehydration effect cooking has on many foods, we recommend weighing food raw (before cooking) since this is a more precise way

to measure.

As an example, consider one serving of oatmeal. Typically, it is listed as 45 grams or one half of a cup. If you were to use a measuring cup, you may end up with 60 grams of oats for the same half of a cup. This unaccounted mistake might lead you to consuming an additional 58 calories (1g fat, 9.9g carbs and 2.5g pro) per day.

If you were to make such a relatively small mistake with many of your food sources, incrementally, you could be missing your calorie and macro goals by a fairly large margin.

It is essential that you track your protein, fat and carbohydrate intake from all foods you eat. For the food sources that have nutrition facts labels, there should always be a specified weight that corresponds to each serving size. For foods that don't have a food label (such as fruits and vegetables), you can easily search for their nutritional information on various websites and apps (i.e. **http://nutritiondata.self.com/** or MyFitnessPal).

For the sake of convenience, we recommend tracking your food intake through mobile apps like MyFitnessPal, My Macros+, FitGenie or Calorie King. These apps also have technology that enables you to scan the barcode of whatever food product you're eating and provide the relevant nutrition facts. They also have many corporate franchise restaurants in their database, so when dining out, you can get a fair estimate on the calorie/macronutrient profiles of various dishes.

The more experience you have with tracking, the more flexible you can be and the better job you'll likely do at estimating your food intake. If you don't have much experience with tracking, we recommend doing your best to be as accurate as possible until you gain more general nutritional IQ.

Throughout this tracking period you will learn a great deal about the nutritional profiles of different foods, and as you gain experience, you'll become much more proficient at estimating the macronutrient content of different dishes.

As a general rule, we recommend hitting macros within +/-10 grams for carbs and protein and +/-5 grams for fats. If you plan on eating out frequently, make an effort to stick to lower fat meals, which will decrease the margin of error between the reported nutritional content and the actual nutritional content.

SPECIAL TOOLS

Now that we've looked inside the Mandatory Toolbox, we would like to describe three special tools that can be useful under certain circumstances, but may also be more inconvenient for some.

1. SKIN CALIPERS

While not as accurate as some of the more high-tech tools we will discuss next, a skinfold caliper is still an incredible tool for estimating body fat percentage. In fact, it is the only tool that directly calculates subcutaneous body fat (the fat directly underneath your skin) – exactly the type of fat we are most concerned with losing! If your skin-fold thickness decreases, you will look leaner, no question.

There are several different types of skin fold calipers available including disposable, plastic, digital, professional and scientific models. They all do the same basic thing: obtain "skinfold thickness" measurements by pinching a roll of skin and the underlying fat tissue (but not any muscle).

This can then be used to estimate body fat percentage by use of formulas that extend beyond the scope of this book. Skinfold measurements can be taken from different sites on the body, although for consistency purposes, we suggest pinching one inch to the side of your belly button. Simply measure changes in thickness (in mm) over time in that same spot to measure how your level of body fat is changing over time.

Using the tracking sheet provided (see Supplemental Materials – Chapter 17), you can complete either a three-site or seven-site skinfold assessment to estimate body fat percentage. If you decide to use the three site assessment, pinch the belly, tricep and anterior thigh. If using the seven test assessment, pinch the chest, belly, thigh, tricep, subscap, hip and midaxillary areas.

We recommend taking skinfold measurements as frequently as once or twice per month or according to your personal preference for tracking.

2. BIOELECTRICAL IMPEDANCE (BIA)

BIA sends a low level, imperceptible electrical current through the body to estimate body fat mass in relation to lean mass. Roughly speaking, because fat mass and lean mass have different densities, the electrical current will travel at different speeds through different body tissues to register information about body composition.

Although different models vary with regard to accuracy, BIAs are fairly accessible and often quite cost effective. There are two common household models of BIA equipment: bodyweight/BIA hybrid scales and handheld BIA devices.

The body scale option will only collect information from the lower body and use that information to estimate the bodyfat percentage of your entire body. As a result, if you store more fat on your legs than your upper body, the body fat reading may be higher than the true value.

The other common BIA tool is a handheld device which only sends a current through the upper body and then creates a full body estimation off that information. Even though these devices will not be 100 percent accurate, they are still quite useful for tracking changes.

For example, let's say your true body fat percentage is 15 percent, but your at-home BIA scale registers an estimate of 20 percent. As you lose bodyfat in the coming months, the estimated

reading drops to 17 percent which implies that your true body fat is now somewhere around 12 percent. The specific numbers are not of particular importance. It is the trend we observe by tracking changes over time that makes this tool useful.

The best BIA tool to date is the InBody technology that analyzes both upper and lower body information to give you specific skeletal muscle mass data, fat mass, and body fat percentage. Since these InBody scans are becoming more readily available, it may be worth doing a simple search to see if you can access this technology locally.

Similar to the caliper measurements, you can optionally use a BIA device to estimate body fat percentage as frequently as once or twice per month, or according to your personal preference for tracking detail.

3. DUAL ENERGY X-RAY ABSORPTIOMETRY (DEXA)

A DEXA scan sends a beam of low dose X-ray energy through the body, separating body composition into three components: bone mass, lean mass and fat mass. Typically, the scan takes about six minutes to complete and most importantly, is painless and safe.

Because it uses X-ray energy, we advise against pregnant women using this tool. Granted, the level of radiation from a DEXA scan is not particularly concerning: It provides a similar level of radiation as a flight from NY to Boston.

Although DEXAs aren't extremely accessible, they are becoming more popular and availability to the general public has increased with some commercial businesses now offering assessment. For further insight on how a dexa scan operates, you can check out Jeff getting a DEXA at Chris' lab in Tampa back in 2016 (7.4 percent body fat). Watch the full **vlog from that day**.

If you are looking to get really objective and accurate with your tracking and have the ability

to get a DEXA scan, this is a tool we suggest you use. Similar to the other special tools, it is by no means required to assess whether or not body recomposition is occurring.


03

CHAPTER 03

BELIEF BUSTING

"A WISE MAN PROPORTIONS HIS BELIEF TO THE EVIDENCE."
– DAVID HUME

The "calories in versus calories out" debate (also known as the "is a calorie a calorie?" debate) has been the source of many an internet brawl. Five years ago or so, it was a near daily occurrence in online fitness circles to see two bros going at it over whether or not you can get just as lean eating nothing but junk food as you can eating a chicken-and-broccoli diet, as long as calories are matched.

On one side, you had flexible dieters/IIFYM-ers/If-It-Fits-Your-Macros-ers arguing that calories, proteins, carbs, and fats (the macros) are all that matters for fat loss. On the other side, you had "clean eaters" yelling just as loudly that the macros don't matter: you need to eat clean foods in order to lose fat or build muscle.

Flash forward to present day, and I think most people who engaged in this grand debate can confidently say that neither side got it perfectly right. It isn't our goal to argue for one position or the other because as you will see, as the chapters unfold, a truly optimized nutritional approach cannot be simplified into a single soundbite.

Clearly calories and macronutrients matter for body composition, but we definitely cannot

say that they are the only things that matter. As such, we will quickly outline the fundamentals of energy balance as the foundation upon which to build our tower of nutritional knowledge. In a nutshell, energy balance is the relationship between the calories you consume (by eating food) and the calories you expend (by exercising, having a heartbeat, digesting food, fidgeting at your desk, running to the car, et cetera).

A calorie is simply a unit of energy. And "energy balance" simply refers to the relationship between energy coming in and energy going out. Over a specific time scale, energy balance is said to be positive if you are storing more calories than you are burning. Generally speaking, this means you are in a caloric surplus and should gain weight.

Conversely, energy balance is said to be negative if you are burning more calories than you are storing. In this case, you are in a caloric deficit and should lose weight. Again, for the most part, bigger caloric surpluses will lead to faster weight gain and bigger caloric deficits will lead to faster weight loss.

Put simply, the energy balance equation in relation to calories and weight loss looks like this:

WEIGHT CHANGE = CALORIES IN – CALORIES OUT.

However, the human body is a fascinating organism with thousands of complex metabolic reactions taking place simultaneously and while the energy balance equation does a great job of predicting changes in weight loss, it doesn't paint the full picture of what is possible in terms of body recomposition on its own.

In other words, if your goal is to simply lose weight, then you simply need to focus on eating fewer calories and/or burning more calories. If your goal is to simply gain weight, then you need to simply focus on eating more calories and/or burning fewer calories. But since you're reading this book, it's probably safe to assume that what you really want is to lose fat and gain muscle, not to merely lose or gain weight.

DEPOSITING AND WITHDRAWING

Of course, we're not implying that the laws of thermodynamics are somehow broken in cases of recomposition, but just that as a matter of practical application, only focusing on calories in and calories out will likely shortchange your results.

It's also common to see people misapply the logic of the energy balance equation. For example, many folks will just assume that an anabolic process like building muscle can't happen concurrently with a catabolic process like losing fat. But, as we'll see, this simply isn't true.

Because fat tissue and muscle tissue are separate systems, it's perfectly possible to lose a significant amount of fat due to the caloric deficit, while still building muscle from the progressive training stimulus (and sufficient protein).

Let's illustrate this by way of analogy. Imagine you have two different bank accounts. Let's say you withdraw $20 from one account while at the same time depositing $5 into the other account. As a matter of net financial balance, you have withdrawn $15, despite monetary gain in one of the accounts.

Similarly, there is nothing written in the energy balance equation that would prevent you from "withdrawing" 20 pounds of fat from your "fat account" while "depositing" 5 pounds of muscle into your "muscle account."

For the sake of being as precise as possible, it's worth noting that fat and muscle tissues have different energy densities. Because muscle is made up mostly of water, it has much less stored energy than fat does. One kilogram (~2.2 pounds) of muscle contains 1,800 calories while one kilogram of fat has 9,400 calories.

Let's run the net energy balance math on the example above, assuming you were to lose 20 pounds (9.1kg) of fat while gaining 5 pounds (2.3kg) of muscle over a full year:

9.1 KILOGRAMS OF FAT LOST = 85,540 CALORIES LOST
2.3 KILOGRAMS OF MUSCLE GAINED = 4,140 CALORIES GAINED
NET ENERGY BALANCE = ENERGY GAINED – ENERGY EXPENDED = -81,400 CALORIES

In other words, in order to achieve this body recomposition, you must have been in a 81,400 calorie deficit over the course of the year. Since there are 365 days in a year, that would amount to: 81,400 yearly calorie deficit / 365 days = a 223 calorie deficit per day.

The point to take home here is that despite being in a net caloric deficit, muscle was still gained, proving that the energy balance equation does not imply that fat loss and muscle gain cannot occur at the same time. They simply CAN! And, as we'll see below, they simply DO!

MEANWHILE, BACK AT THE LAB

When many people in the fitness industry talk about body recomposition, they typically mention how it is most common under the four circumstances we outlined in Chapter 1: beginners, detrainees, obese individuals, or steroid-users. It's even common to hear statements like, "it's impossible for well-trained individuals to lose fat and build muscle at the same time."

Allow us to be very clear here when we affirm that this truly isn't the case.

There is a popularly referenced 2016 study by Maltais et al. that took 26 overweight sarcopenic men (60 years +) and put them on a resistance training protocol while increasing their daily protein intake through protein supplementation (83).

On average, the subjects lost 2.4 pounds of fat mass while gaining 3.7 pounds of lean mass. And although this certainly serves as a well-cited, real-world example of pretty impressive body recomposition, this study is probably not the most convincing to readers of this book, as chances are, you're not a 60 year old sarcopenic male picking up a dumbbell for the first time. Let's keep looking.

I (Chris) see body recomposition occur frequently with subjects in the lab, with clients of mine, and even in collegiate athletes. Consider some of my published scientific data for instances of body recomposition.

In 2017, I was a co-investigator on a very interesting training study at the University of Tampa. We were looking at the effects of different training regimens on collegiate female volleyball players (104). Even though we didn't find a difference between the two training styles tested, because we also tracked the athletes' nutrition (monitored by a registered dietician), we discovered that in just seven weeks, these collegiate athletes achieved significant body recomposition.

One group lost nearly six pounds of fat mass while at the same time, gaining six lbs of lean mass over just seven weeks! Granted, while this level of recomposition is impressive, it is dealing with one specific population: elite female volleyball players. This study also used training styles focused on improving explosive power and muscular performance on the court, not high-volume resistance training like the typical gymrat reader of this book would use. And, while these subjects were incredible athletes, they were likely best classified as intermediates, having only a few years of training experience.

Yet, this data demonstrates the power of an evidence-based nutritional approach (subjects were consuming approximately 0.81 grams of protein/pound of body weight), coupled with a progressive training stimulus.

Having seen that recomposition is certainly possible, even common, in the literature, can it happen in more advanced trainees? The next study we're about to look at shouts a resounding, yes!

This was actually the first research project I was a co-investigator on during my graduate studies and I think it has some really interesting pieces of data. As a side note, the point of the study was to figure out if autoregulating exercise selection would impact strength and size gains. Without realizing I was a co-author on this paper, Jeff covered the results in a video back in 2017 (**here**) if you're interested in hearing a summary of what we found (105).

More to the point, our subjects were 17 highly trained males with a minimum of three years of continuous training experience. As a minimum standard, they also had to be capable of squatting 1.75 times their bodyweight and bench pressing 1.3 times their body weight to even be included in the study (although many subjects well exceeded this standard). For example, if a subject weighed 180 pounds, he would have to be capable of squatting at least 315 pounds and bench pressing 235 pounds to participate.

These subjects spent the next nine weeks performing high volume, full body training sessions,

three times per week. I personally tracked each subject's nutritional intake to make sure that after each and every training session, subjects were provided with a serving of whey protein post workout. Their average protein intake was 1.8 grams per kilogram per day (~0.8g/lb).

At the end of the nine weeks, we found that both groups gained lean body mass and fat mass on average. Now you're probably thinking, "Wait! If they gained lean mass and fat mass, then that isn't body recomposition!"

Well, it's important to note that they gained significantly more lean mass than fat mass, thus lowering their average body fat percentage.

Similar to what we outlined in scenario three from Chapter One, because the subjects gained more muscle than fat, their body fat percentage decreased. They built muscle while getting leaner on a relative scale. In our opinion, this can be said to count as body recomposition.

More importantly, what truly fascinated me at the end of data collection was the drastic individual differences between subjects! Five out of the seventeen subjects did in fact lose fat AND gain muscle at the same time. The most incredible recomposition from this study came from a subject who gained over eight pounds of lean mass while at the same time losing over four pounds of fat mass! Keep in mind, this was only a nine week transformation!

For the sake of completeness, it's worth mentioning that a few subjects experienced what we might call "reverse recomposition." They lost lean mass and gained fat mass throughout the study. This is not an outcome anyone wants to see after nine weeks of intense training.

We speculate that this was due to being under-recovered or over-trained. It's possible that the training volume and/or intensity was simply too high for these subjects. Or perhaps their protein intake was too low to promote full recovery. Perhaps their sleep quality was poor, or there were outside stresses negatively impacting their recovery. These are just a few of the extraneous factors that can impact one's ability to recomp that we will cover in the coming

chapters.

Of course, it wasn't the goal of this study to figure out if recomposition was possible or not. It was simply something we observed as a "side effect" of our protocol. If we were actually trying to create recomposition in these subjects, we could have done things differently (and more optimally). For our purposes in this book, the take-away from this study is to show that body recomposition can and does occur in highly trained individuals.

Before we wrap this section up, I want to share some fresh new data from our latest training study. At the time of this writing, it has yet to be published and will be presented at the 2019 NSCA National Conference. (Aube et al. Publication date TBD)

In this study, we examined the effects of different training volumes (12 sets, 18 sets, 24 sets per week) on highly trained individuals. This was a lower-body training study in which subjects trained legs twice per week. Once again, we tracked their nutritional intake to ensure subjects were getting enough protein to support their training demands.

This time, after 10 weeks of training, all three groups experienced true, undisputed body recomposition where lean body mass was gained AND fat mass was lost. For example, the group with the best results (doing 12 sets of legs per week, for the record) gained nearly four pounds of lean mass while losing 1.5 pounds of fat mass. That's some impressive recomposition in only 10 weeks!

Again, as before, a few individuals saw the opposite effect where they actually lost lean mass. This is pretty normal in training research because despite everyone having a unique recovery ability, every subject in any given group will be running the exact same program.

Again, our goal in outlining this data is not to prove that everyone experiences body recomposition, but rather to show that recomposition is certainly possible – even in highly trained lifters.

In fact, one subject in this latest study gained over 20 pounds of lean mass and lost of fat admittedly, was the most outrageous thing I've ever witnessed in a research setting. He walked into our lab looking like a well-built college basketball player and left looking like a professional natural bodybuilder, ready to battle with the best. If we're really checking our egos, this guy probably would've taken both of us out on a bodybuilding stage.

I (Jeff) often hear in lifting circles that one of the advantages of staying natural (not taking steroids) is that you will be able to maintain your physique forever. Many folks are under the impression that if you "earn your muscle naturally," you will be able to keep it for life.

In my 13 years of training experience, I can confidently say that this is complete bogus. Certainly, there are many good reasons to stay natural, but the idea that it allows you to maintain the physique you built forever isn't one of them. Throughout my training career I have noticed that my level of muscularity, hardness and definition waxes and wanes with the peak and valleys in my training and nutrition protocols.

In other words, when I am very serious and disciplined about training, my physique improves. When I am taking my training and nutrition less seriously, my physique worsens. Much of the time, this results in periods where I have clearly both lost muscle and gained fat (the "anti-recomp" effect) and other periods where I have clearly gained (or re-gained) muscle and lost fat.

Even as an advanced trainee, it's perfectly clear that if you're not being diligent with your training and nutrition, your physique can take a turn for the worse. I lay this out to say that if you believe the common trope that "if you built it naturally, you'll always keep it," you could be simply giving yourself an excuse to be lazy with your future training and diet habits. This could eventually derail what you worked so hard for.

But our outlook here doesn't need to be grim! As long as we apply the principles laid out in this book, we're guaranteed to make sure the body recomposition process is occuring in the

right direction.

THE POWER OF BELIEF

The reason we're sharing this with you is because it's crucial to not impose self-limiting beliefs on what you can accomplish. We don't mean "belief" in the vacuous sense that "if you just believe it hard enough, you can achieve anything you set your mind to." That's nonsense. Obviously there are limits to what the human body can do.

No matter how much we believe in the possibility of human flight, without the aid of technology, we will simply meet the pavement every time we try. Our human aerodynamics won't permit it. When we refer to not imposing self-limiting beliefs we are referring to opening yourself up to what the evidence actually suggests. If you think you can only gain one pound of muscle per year, well guess what? That's probably all you'll accomplish. If you think you're "too well trained" to achieve body recomposition, then you might as well be. In this context, Henry Ford's take on this is enlightening: "Whether you think you can or you think you can't, you are probably right."

The first reminder of just how powerful self-imposed cultural groupthink can be is the 4-minute barrier imposed on runners prior to 1954. At the time, society as a whole submitted to the belief that it was humanly impossible for anyone to run a mile in less than four minutes. That was until 1954, when Roger Bannister broke through this barrier of perception. Since that famous day, thousands have accomplished this previously "impossible" goal.

Although we no longer struggle with belief in the four minute mile, in the fitness industry it is still commonly thought that we cannot build muscle while losing fat. We believe this is due to reductionist thinking about energy balance, lack of research data awareness and the inevitable groupthink effect. Just because many people believe something, doesn't mean it

is necessarily true.

Body recomposition is ultimately achieved through the construction of one new tissue (muscle) and the breakdown of another tissue (fat). In order to understand how this process works, it's important that we first understand how energy is handled by the body.

Straight ahead, we will turn our attention to the topic of metabolism. What is it that people mean when they say "my metabolism"? And how does having a "fast" or "slow" metabolism impact your ability to build muscle and lose fat?


04

CHAPTER 04

DECODING METABOLISM

"I DON'T HAVE A WEIGHT PROBLEM. I HAVE A METABOLISM PROBLEM."- UNKNOWN

Recall from the previous chapter that we're setting up the energy balance equation like this: Weight change = calories in – calories out.

The 'calories in' part of this equation is very straightforward: you eat food - and that pretty much covers that segment. The 'calories out' aspect is much more complex and requires further explanation to understand how each of these two factors influence body recomposition.

When scientists or fitness enthusiasts speak of metabolism or metabolic rate they are usually loosely referring to total daily energy expenditure (TDEE): the total number of calories you burn each day. It is sometimes referred to as your net metabolic rate. As shown in the chart below, three key factors determine the number of calories we burn each day.

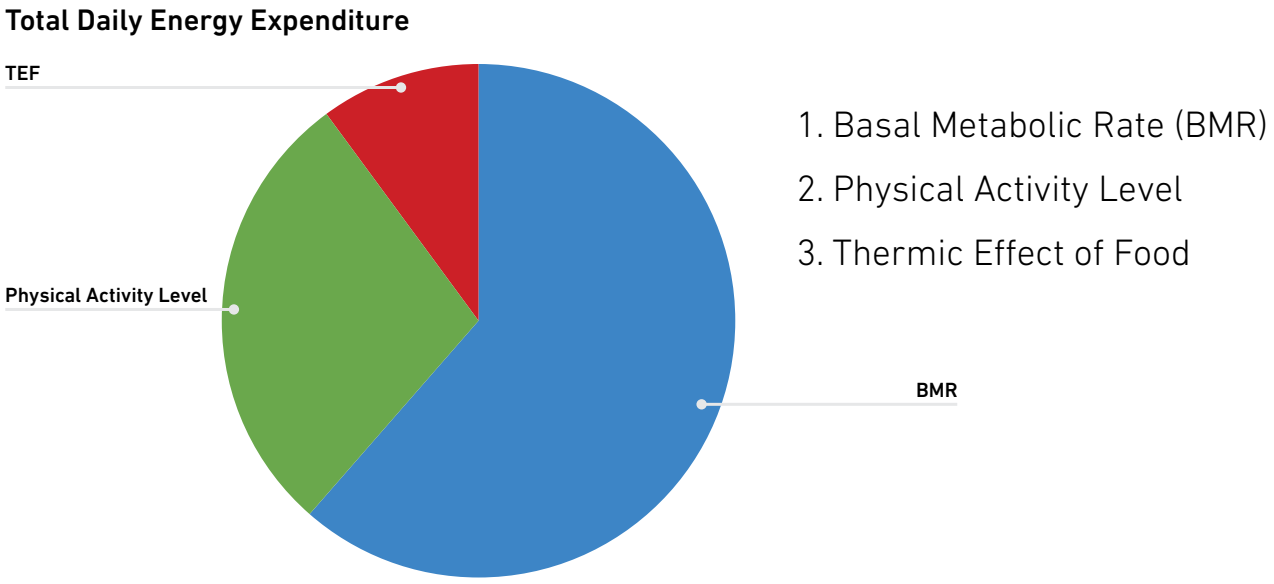


Figure 4A: Three Components of your Total Daily Energy Expenditure (TDEE)

Let's have a look at each of the three components of metabolism separately, to gain a better understanding of how we burn calories.

1. BASAL METABOLIC RATE (BMR).

Your BMR is essentially how many calories your body burns per day in order to perform all of its basic metabolic functions and maintain its body mass at rest. If you sat on the couch all day long and did nothing but breathe, this would be roughly the number of calories you'd burn.

As shown in Figure 4A above, BMR typically accounts for 50-70 percent of your daily energy needs. The other two components demanding energy are your physical activity level and the thermic effect of the food you're consuming.

Since your BMR comprises such a large portion of your total daily energy outflow, it is worthwhile to determine roughly how many calories it contributes to the total daily burn.

There are multiple ways to assess and calculate your basal metabolic rate. In scientific laboratories, an expensive piece of technology called the metabolic cart can assess your

resting metabolic rate by measuring the exchange ratio between oxygen and carbon dioxide when exhaling at rest.

Fortunately, after assessing thousands of people, scientists have been able to create equations so that anybody can obtain a very close estimation of their BMR.

For those of you who like math and objective numbers, we recommend using the Mifflin St. Jeor formula (below) to calculate your BMR. As you can see, this formula takes four variables into consideration: gender, age, height and weight. However, there are additional variables that are not, and can not be accounted for. This is one reason why this formula is very good, but not perfect.

BELOW ARE THE MIFFLIN ST. JEOR FORMULA FOR MALES & FEMALES:

BMR = 10 x weight(kg) + 6.25 x height(cm) - 5 x age(y) + 5 (man)

BMR = 10 x weight(kg) + 6.25 x height(cm) - 5 x age(y) - 161 (woman)

For those less interested in math, a more practical way to estimate BMR is to take your body weight (lbs) and multiply it by 10. For example, if you are 160 pounds your BMR would be roughly: 160lbs x 10 = 1600 Calories. In other words if you just sat around all day, you'd burn about 1600 calories.

As you'd probably expect, while this rule of thumb is generally accurate for getting a ballpark figure, there are still individual differences in BMR due to the variables listed below:

- Gender (85)
- Age
- Height
- Weight
- Body composition. This isn't taken into consideration with any BMR formula, despite the fact that lean body mass (such as muscle) is more metabolically active and therefore

demands more energy to maintain. If, for example, you took two individuals of the same gender, age, height, and weight but one was 20 percent body fat and the other was 10 percent body fat, the leaner individual will most likely have a higher BMR and require more calories to maintain their weight.

- Genetics
- Dietary History (124)
- Gut Microbiome (50,64,107)
- Overall 'health' - diseased states(103)
- Prescription Medications and/or Drugs
- Ambient & Body Temperature
- Hormonal Factors
- Sympathetic Nervous System Activity

Since there are a plethora of factors that can impact your individual calorie requirements, it's important to recognize that your calorie intake may not be comparable to someone else's, even if you are the same weight and have the same goals. We also do not want you to get too caught up in the specific number just yet. Remember that BMR is just one of three components of metabolic rate.

2. PHYSICAL ACTIVITY LEVELS.

The second component of your metabolic rate is captured through how many calories you burn by "moving around". For most people, daily physical activity makes up 20-35 percent of total caloric expenditure. These values can be lower if you are more sedentary or higher if you're more active than average.

It's worth highlighting that this component of metabolism is not limited to the number of calories you burn while formally exercising (lifting weights and cardio). It includes the calories burned from all of your daily activities, including typing at your desk, bringing groceries to the car and singing in the shower.

The calories burned from these non-exercise activities make up NEAT: Non-Exercise Activity

Thermogenesis. NEAT can vary greatly between individuals, directly impacting the number of calories they burn through daily physical activity (77).

High levels of NEAT is advantageous from a fat loss perspective and is believed to be largely responsible for the massive differences in total metabolic rate we see.

Did you ever wonder why your friend who is exactly the same age, weight and bodyfat as you can eat 1,000 calories more than you and still stay just as lean? It's probably largely because he or she has higher levels of NEAT. But NEAT isn't only good for burning extra calories. It also improves hormonal factors such as insulin sensitivity and may improve carbohydrate tolerance (13).

With this in mind, if you live a very sedentary lifestyle and have fat loss goals, it would be important to create some active habits to increase levels of NEAT. For example, taking a walk first thing in the morning, taking the stairs instead of the elevator, parking far away from the grocery store, or even getting a standing desk (111) can all assist in increasing total

daily caloric burn.

This component of metabolism also explains why there is a drastic difference in caloric expenditure when comparing someone who works a labor intensive job, such as a construction worker, to someone who is regularly sitting at a desk job. With these metabolic factors in mind, we will make specific recommendations for formal cardio in Chapter 12.

Interestingly enough, when in a caloric deficit for an extended period of time, your body senses the decline in food intake and automatically decreases energy expenditure by downregulating NEAT. This can result in something as simple as fidgeting less, but can also present as severe fatigue if you diet for too hard or too long.

This is part of the reason why your net metabolic rate is not a fixed number. As you diet longer and get leaner, your body finds intriguing subconscious ways to preserve energy. This is a key driver of the slowed metabolism that you often see with chronic dieters and is one of the reasons why throughout the book, we recommend more moderate caloric deficits and surpluses.

In the next chapter, we will put this information to use by determining your caloric needs based on your net metabolic rate. Keep your daily activity levels (including NEAT) in mind when we introduce you to the "activity multiplier" which is intended to individualize activity levels when calculating metabolic rate. (see Chapter Five for details).

3. THERMIC EFFECT OF FOOD.

Sometimes referred to as dietary thermogenesis, the third component of your Total Daily Energy Expenditure is the amount of energy expended by breaking down and processing food for use and storage. Simply put, your body burns calories as it digests, absorbs, transports and stores food that you eat.

Just as each macronutrient (carbohydrates, fats or proteins) provides us with a different

number of calories **(see Table 4A below)**, they also require different amounts of energy to digest, absorb, and utilize. Because of this, each macronutrient has a different thermic effect.

In fact, every food source is slightly different in this regard. Some foods require more energy to digest and absorb than others.

It's important to understand that each macronutrient provides us with a different amount of energy (calories), as seen in the chart below, and each macronutrient differs from a thermogenic standpoint.

MACRONUTRIENT	CALORIES/GRAM	THERMIC EFFECT (RANKED)
Fat	~9 Cal/gram	Lowest TEF (burns the least calories while being digested/absorbed)
Carbohydrates	~4 Cal/gram	Medium TEF
Protein	~4 Cal/gram	Highest TEF (burns the most calories while being digested/absorbed)

Table 4A: The Caloric Content and Thermic Effect of Different Macronutrients

Protein is the most thermogenic macronutrient. This means eating a higher protein diet will result in more calories burned because it requires more energy to digest and absorb that protein. This is one of the many reasons why high protein diets typically result in greater fat loss and better improvements in body composition, even when caloric intakes are equated. (7,29,88)

This fact serves as another example of why the expression "a calorie is a calorie" fails to capture the more complex and nuanced ways in which each of the different macronutrients are handled by our bodies.

To illustrate, let's compare complex carbohydrates and simple carbohydrates. Complex carbohydrates are primarily made up of long chains of carbs (polysaccharides) that need to be digested and broken down into smaller molecules (disaccharides, monosaccharides) before being used for energy. On the other hand, most simple carbohydrates are already in

a usable form and do not need to be digested per se. They simply need to be absorbed and can be utilized for energy or stored right away.

For example, 200 grams of sweet potato and 43 grams of Gatorade will both deliver roughly 40 grams of carbohydrates. However, the thermic effect of these two foods are quite different. Your body will expend more energy digesting and absorbing the carbohydrates from the sweet potato than it will the Gatorade.

This isn't to say that one of these carbohydrate sources is good and the other is bad, but rather that they may be more and less suitable in certain contexts. We will revisit this topic in later chapters when we discuss carbohydrate sources and peri-workout nutrition.

METABOLISM DEMYSTIFIED

By now, it should be clear that the 'calories out' side of the energy balance equation is not as simple as merely the number of calories you burn while doing cardio. How many calories you burn in a day is determined by your body's baseline functions (BMR), your activity (both exercise and non-exercise (NEAT)) and even the types of foods you consume (TEF). These are important truths to keep in mind as we move forward with setting up the diet and cardio protocols in the following chapters.


05

CHAPTER 05

SETTING UP THE DIET: CALORIE INTAKE

"FAILING TO PLAN IS PLANNING TO FAIL."
- ALAN LAKEIN

Now that we have covered the basic fundamentals of body recomposition and the tools required for tracking progress, it is time to set up the specific strategy to make that goal a reality.

When setting up a diet that will cause the simultaneous loss of one tissue (fat) and gain of another tissue (muscle) we need to consider four different dietary tenants, organized in order of importance:

- **1. CALORIE INTAKE:** As mentioned previously, whole body changes in energy balance will be driven primarily by total calorie intake. In this chapter, we will determine how many calories to eat for body composition based on your personal needs.

- **2. MACRONUTRIENT BREAKDOWN**: After determining calorie intake, it is crucial to know where those calories are coming from. In Chapter Eight we will set up the best ratios of protein, carbs and fat to optimize muscle mass and training performance.

- **3. NUTRIENT TIMING AND MEAL DISTRIBUTION:** Once we know what calories and macros will yield the best body recomp, we need to figure out how to organize those macros into meals so that we can maximize muscle gain/retention and fuel performance and recovery. This will be the topic of Chapters Nine and Eleven.

- **4. FOOD SOURCES:** Where our calories and macronutrients are coming from also matter for driving positive body composition changes forward. We will discuss this in the context of nutrient quality in Chapter Nine and Ten.

Before digging into calorie intake, it is important to establish that these nutrition recommendations are intended to optimize body composition. While having a relatively lean body composition is strongly linked to positive health outcomes, the hierarchy is arranged in the particular order above with the goal of optimizing body composition.

As such, while we do not want to undermine the importance of eating for health, our attention will be focused on eating for body recomposition. Of course, these two goals can (and should) be in perfect sync with one another, even if their primary areas of focus slightly differ.

CALORIE INTAKE: HOW MANY CALORIES SHOULD I EAT?

Although some people may prefer a black and white, on-the-nose answer for a calorie target, simply giving a cookie cutter calculation isn't going to cut it for the Ultimate Guide to Body Recomposition.

Exactly how many calories you need to eat for body recomposition will depend primarily on three individual factors: your primary goal, your current body composition and your level of training experience. Although these three factors are outlined with specific examples in Table 5A, it is important to understand their conceptual basis first. Let's start with the primary goal.

1. YOUR PRIMARY GOAL

Obviously, the goal with body recomposition is to build muscle AND lose fat (not to pick one or the other). However, we think it is important that even if you have the goal of achieving both, it is still important to pick what goal is more important to you.

For example, if you currently feel small and lacking in the muscularity department but are also already decently lean, even though you may want to remain lean, you might decide that building muscle is a more important goal to you.

But, if you are currently overweight, even though you want to be more muscular as well, it might be more important that you get leaner.

Then there is another scenario where you may be "skinny fat" (meaning you have a very low level of muscularity but also have a relatively high body fat percentage). Even in this situation, it is important to decide what is most important to you. Will your primary goal be to look more muscular or to look leaner?

The reason we insist on choosing a primary goal is that it will contribute to the determination of how many calories you should eat. If your primary goal is to lose fat, we recommend a moderate caloric deficit, whereas if you mostly want to build muscle, then a moderate caloric surplus is best suited for your goal. If both objectives are equally important, eating at caloric maintenance is our suggestion for you.

While this is simple enough, we will see that your current body composition and experience level can also influence how you set up your calorie intake.

2. CURRENT BODY COMPOSITION

Your current body composition ties in strongly to your primary goal factor. Surely, people with a higher starting body fat percentage will be wise to select the primary goal of losing fat and people with a low starting body fat percentage will be wise to select the primary goal

of building muscle. Still, for the sake of being as thorough as possible, we have separated these factors into separate categories because your primary goal may not always be obvious to you.

For example, at 12 percent body fat, Joe may be satisfied with his level of leanness and decide that building muscle is more important to him. 12 percent body fat, Jim however, may decide that he'd still rather be a bit leaner. In this situation, Joe would want to favor a slight caloric surplus, while Jim would want to favor a slight caloric deficit, despite being at the same body fat percentage and training age.

Defining Body Composition: For our purposes here, we will split body composition into three categories:
Low Bodyfat: 8-12% bodyfat for men, 18-22% for women
Moderate Bodyfat: 12-18% bodyfat for men, 22-28% for women
High Bodyfat: 18-20+% bodyfat for men, 28-30%+ for women

As a general rule of thumb, we suggest that for those with a lean physique, the best way for you to transform your physique and achieve body recomp is to enter a caloric surplus. If an already lean individual was to enter a caloric deficit, or even stay at maintenance, he or she would inhibit the ability to build muscle at an appropriate rate. This could end up in the person not making any significant progress with either muscle gain or fat loss.

On the other end of the spectrum, if you're currently at a higher body fat percentage, entering a caloric surplus would be detrimental to your goal of recomping since it will stunt fat loss. In this case, a caloric deficit will ensure that fat loss occurs as the progressive resistance training and adequate protein intake facilitate muscle growth.

As a third scenario, some of you may fall in between these two body fat categorizations into a sort of moderate body fat classification. In this case, we recommend staying closer to maintenance calories, with the goal of losing fat and building muscle being on roughly

even footing. In this case, you can also default to your primary goal determinant to decide whether you should stay at true maintenance, or enter a slight surplus, or a slight deficit.

3. TRAINING EXPERIENCE

As mentioned previously, the more training experience you have, the closer you will be to your natural genetic limitation for muscle mass and consequently, it will be more difficult for you to gain lean mass. Conversely, someone who is still relatively new to weight training will be able to gain muscle mass much faster.

This is important to keep in mind because it implies that beginners can use larger surpluses to build muscle without accruing excessive fat mass. In other words, the more advanced you are, the more likely it is that large caloric surpluses will lead to fat gain rather than muscle gain (since you will be more resistant to muscle gain). For the purposes of this section, we will define beginner, intermediate and advanced as follows:

- **BEGINNER** - Making progressive overload gains on a week to week basis and significant visual changes month to month (usually 0-2 years of lifting).

- **INTERMEDIATE** - Able to progressively overload on a month to month basis. Physique progress is evident every couple of months (usually 2-5 years of lifting).

- **ADVANCED** - Takes multiple months or even years to see visual progress and ability to overload lifts is much more difficult (usually 5+ years of serious lifting).

As an example, consider someone with only six months of lifting experience whose primary goal is to build muscle (let's assume they are already pretty lean). Because their body is so primed for muscle growth, a relatively large (25 percent) caloric surplus will return much more lean gains than a 25 percent caloric surplus would for an advanced trainee. So, assuming their caloric maintenance (calories needed to maintain weight) is 2500 calories, a 25 percent caloric surplus would be: 2,500 calories (maintenance) + 25 percent = 3,125 calories for recomp.

Compare this with someone with five years of lifting experience. Because they are much closer to their genetic muscular ceiling, a large caloric surplus will yield more fat gain than muscle gain - not ideal for someone with a body recomp goal. Assuming they also have the primary goal of building muscle, in this case, we would recommend a smaller (~10 percent) caloric surplus: 2,500 calories (maintenance) + 10 percent = 2,750 calories for recomp.

On the other hand, your training age will not directly impact how big your deficit should be since one's ability to lose fat is not diminished with increased training experience. For the most part, beginners and veterans to the weight room will not differ in their ability to lose fat. For this reason, experience level only impacts the recommended size of a caloric surplus, not a caloric deficit.

4. OTHER FACTORS

While the three primary factors outlined above will mostly determine how many calories you should eat (whether you should be in a caloric surplus, deficit or at maintenance), there are still a few other factors that may influence this decision.

BIOFEEDBACK.

Throughout the process of recomping, it is important to pay attention to biofeedback (your recovery and hunger). If your training volume or intensity is higher than normal for example, it may be necessary to increase your caloric intake during this period of increased training demands. Also, sometimes an amplified training stimulus will result in an increased appetite, perhaps as a signal that you require more nutrients to fuel proper recovery.

While you should be cautious with using your appetite to dictate your calorie intake (since your appetite generally doesn't care about your goals), paying attention to this biofeedback can provide useful information when it comes to adjusting calorie intake.

THE DETRAINEE.

Body recomposition is extremely common for those who previously resistance trained, built a lot of muscle, but later stopped resistance training for an extended period of time and ended up losing muscle as a result.

Long before scientific research was able to explain it, bodybuilders talked about the phenomenon of "muscle memory." Basically, it's much easier to build muscle back than it was to build that muscle from scratch. Back in the day, bodybuilders simply noticed that it happened. Today, we have a much deeper understanding of how and why it works.

When we weight train and cause muscle fibers to grow in size (hypertrophy), we also increase the number of nuclei (myonuclei) in the muscle (34). You can think of myonuclei as the control center of the muscle fiber. Even though the muscle fiber itself loses size (atrophy) when we skip the gym for too long, these control centers (myonuclei) are never lost (23). As soon as

we get back to training again, myonuclei that were built months or years ago can now start cranking out commands to ramp up the production of new muscle much faster than if you had never trained in the past.

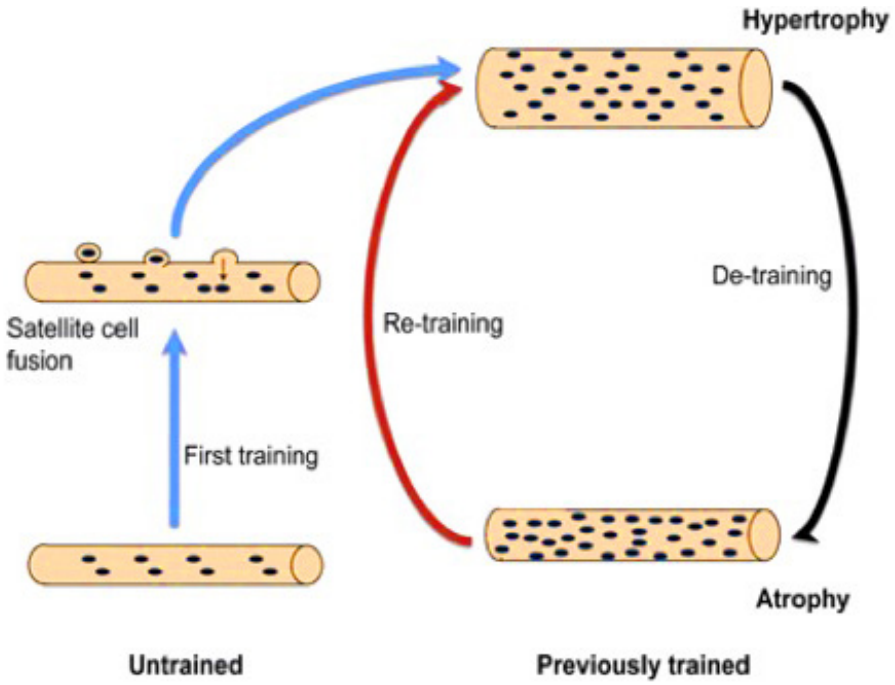


Figure 5A: "Muscle Memory" - A Model for the Connection Between Muscle Size and Myonuclei (23)

You may think of this like a 900 pound polar bear losing weight during hibernation season - a time of both inactivity and starvation. Once the bear resumes normal eating again, she quickly regains that lost body mass as both muscle and fat. It takes years for a bear to reach their full adult size, but after losing a significant amount of weight/mass during hibernation, it is able to get back to its full grown "physique" in just a few short months.

This would be comparable to someone training for 10 years and getting close to their genetic potential in terms of muscle mass but then completely abandoning their training regimen for a year or two. They would probably lose almost all of their hard-earned decade's worth of muscle mass and their body composition would change for the worse. However, thanks to those persistent myonuclei, they'd be able to regain that lost muscle mass in just a few short months, compared to the 10 years it took them to build it from ground zero!

While it will depend on the other factors we have just outlined (Does the detrainee have

a specific primary goal? Are they starting at a high or low bodyfat?), eating at caloric maintenance is often a safe starting point to begin losing fat and building muscle for the detrainee. In many respects, the detrainee can be treated more like a beginner in the sense that they are often able to achieve impressive recomposition in a relatively short time frame.

HITTING YOUR TARGET

When it comes to making nutritional recommendations for weight loss or weight gain, it is common to see a specific number of calories added to or subtracted from maintenance. For example, it's commonly suggested that if your goal is to lose one pound of fat per week, you should eat 500 calories below your maintenance. So, assuming you'd maintain your weight on 2,500 calories, if you eat 2,000 calories per day, you'll supposedly lose about one pound per week. These suggestions are usually based on the concept that there are 3500 calories in one pound of fat, however, research indicates that this figure often overestimates predicted weight loss and undermines the adaptive nature of our metabolism (55).

It is also common to see weight gain recommendations based on a target percentage of bodyweight gain per month. For example, one popular model suggests that lean beginners aim to gain 1 - 1.5 percent of body weight per month (89).

While these guidelines are valuable as rough approximations, they undermine the fact that the rate at which our bodies are capable of transforming is not the same from person to person. So for example, if we simply recommend that all lean beginners gain 1-1.5 percent of total body weight per month, we would inevitably be limiting some individuals from gaining as much muscle as they could have.

Let's think of a lean male beginner who weighs 150 pounds. A gain of 1-1.5 percent of bodyweight per month, would translate to 1.5-2.25 pounds gained per month. This is a reasonable ballpark figure for many beginners seeking lean gains. However, this particular

beginner might have been capable of gaining five pounds of lean mass per month! That would amount to 20 pounds of new lean mass in four months of training. So by following a generic percentage-based formula that spit out 1.5-2.25 pounds of recommended weight gain, he may have missed out on 11-14 pounds of lean mass over that four month period.

For these reasons, we have set up calorie targets as percent changes from maintenance calories. For example, for a male beginner with a lean starting body fat (8-12 percent), we would recommend a caloric surplus of approximately 25 percent. This means he would add 25 percent to his maintenance calorie intake.

Table 5A condenses all of the information laid out above into a framework for application. To find the caloric target for your situation, simply determine your primary goal, current body composition and experience level. Keep in mind that this table, while very comprehensive, will not capture every possible scenario and that there will be some exceptions, which we will describe next.

PRIMARY GOAL	EXPERIENCE LEVEL	CURRENT BODY COMPOSITION	SUGGESTED APPROACH
Lose Fat	Beginner	Male - Body Fat % ≥ 18-20 + Female - Body Fat & ≥ 28-30 +	Caloric Deficit (~20% reduction below theoretical maintenance)
Build Muscle	Beginner	Male - Body Fat % ≤ 8-12 Female - Body Fat & ≤ 18-22	Caloric Surplus (~25% above theoretical maintenance)
Lose Fat & Build Muscle Equally	Beginner	Male - Body Fat % ~12-18 Female - Body Fat % ~22-28	Theoretical Caloric Maintenance
Lose Fat	Intermediate	Male - Body Fat % ≥ 18-20 + Female - Body Fat & ≥ 28-30 +	Caloric Deficit (~20% reduction below theoretical maintenance)

Build Muscle	Intermediate	Male - Body Fat % ≤ 8-12 Female - Body Fat & ≤ 18-22	Caloric Surplus (~15-20% above theoretical maintenance)
Lose Fat & Build Muscle Equally	Intermediate	Male - Body Fat % ~12-18 Female - Body Fat % ~22-28	Theoretical Caloric Maintenance
Lose Fat	Advanced	Male - Body Fat % ≥ 18-20 + Female - Body Fat & ≥ 28-30 +	Caloric Deficit (~20% reduction below theoretical maintenance)
Build Muscle	Advanced	Male - Body Fat % ≤ 8-12 Female - Body Fat & ≤ 18-22	Caloric Surplus (~10-15% above theoretical maintenance)
See 'Suggested Approach' for considerations	Advanced	Male - Body Fat % ~12-18 Female - Body Fat % ~22-28	Either a small caloric deficit or surplus (+/- 5-10%) depending on the primary goal (fat loss: deficit, muscle gain: surplus)
See 'Suggested Approach' for considerations	Detrained	Male - Body Fat % ~12-18 Female - Body Fat % ~22-28	If current body weight is lower than it was when you were trained, enter a caloric surplus (~20%). If body weight is similar, but body composition has regressed, start at theoretical maintenance.
See 'Suggested Approach' for considerations	Detrained	Male - Body Fat % ~18-20+ Female - Body Fat % ~28-30+	If current body weight is higher than it was when you were trained, enter a small deficit (~20%). If body weight is similar, but body composition has regressed, start at theoretical maintenance.

Table 5A: Examples of Calorie Intake Based on Training Experience and Current Body Composition

EXCEPTIONS

While the above table will capture the vast majority of you, there will be some cases that fall outside the purview of the recommendations above. According to the law of averages, these exceptions probably do not apply to you.

EXCEPTION 1: THE MUSCLE FREAK

Above, we recommended that a lean beginner enter an approximate 25 percent caloric

surplus. For more than 90 percent of beginners, this intake will be high enough to fuel speedy muscle gain, yet not so high that it causes excessive fat gain.

However, some people are genetically blessed with an ability to add lean tissue much faster than average. While the technology is still in its infancy for accurate genetic testing as it pertains to muscular potential, there are still ways to estimate whether or not you have a high genetic ability to gain muscle. If most of the following apply to you, Exception 1 MAY apply:

- You have a large frame: Broad shoulders, thick wrists and ankles.
- You have muscular parents and/or multiple muscular relatives.
- You are generally gifted at sports.
- You have noticed you can build muscle quickly.
- Men only: You have a high 2D:4D ratio (your ring finger is significantly longer than your index finger)

If you decide that this exception applies to you, you may want to increase the recommended calorie surplus by 5-10 percent, especially as a beginner-intermediate, so as to maximize on your muscular potential.

EXCEPTION 2: THE OVERWEIGHT/OBESE

If you are currently well above 25 percent body fat for men or 35 percent for women, it may be wise for you to enter a larger caloric deficit than that set out in the recommendations above. For obese individuals, a caloric deficit in the range of 20-30 percent will facilitate faster fat loss as progressive weight training drives muscle growth.

Regardless of your primary goal, experience level and current body composition, all scenarios require an estimation of caloric maintenance. In order to know how many calories to eat per day, it is important to know how many calories you currently burn in a day (caloric maintenance). Once you determine your caloric maintenance, you can then determine your

caloric goal based on the figures laid out in Table 5A above.

ESTIMATING THEORETICAL MAINTENANCE

Estimating theoretical maintenance is surprisingly straightforward. The goal is to simply determine how many calories you need to eat per day to maintain your current weight. As we discussed in Chapter Four, maintenance calories should not be thought of as a fixed number, but rather as a moving target that will change based on your changing body composition, NEAT levels and various other metabolic factors. At this point, we will present you with two ways to estimate your caloric maintenance: using a formula or using a guess-and-check method.

1.USING A FORMULA.

Remember the Mifflin St. Jeor formula we laid out in Chapter Four for determining BMR? Well, it's time to put that to use. In case you forgot, here it is again:

BMR (MALE) = 10 X WEIGHT(KG) + 6.25 X HEIGHT(CM) - 5 X AGE(Y) + 5
BMR (FEMALE) = 10 X WEIGHT(KG) + 6.25 X HEIGHT(CM) - 5 X AGE(Y) - 161

As a rougher calculation of BMR, you can simply use the calculation, BMR (rough) = 10 x weight(lbs).

The above formulas are used to estimate your basal metabolic rate: how many calories you'd burn per day if you did nothing. However, to accurately determine maintenance calories, we also need an estimate of how many calories you're burning per day through activity (both exercise and NEAT). We estimate this by using the "activity multipliers" laid out in Table 5B below.

LIFESTYLE & TRAINING FREQUENCY	EXAMPLE	ACTIVITY MULTIPLIER
Sedentary + Training 3-6x/wk	Works a desk job, very little activity outside of lifting	1.2 - 1.5
Lightly Active + Training 3-6x/wk	Works a desk job, takes pet for a walk most days in addition to lifting	1.5 - 1.8
Moderately Active + Training 3-6x/wk	Works as a full-time waitress, occasionally plays tennis in addition to lifting	1.8 - 2.0
Highly Active + Training 3-6x/wk	Works as a construction worker, regular hiking in addition to lifting	2.0 - 2.2

Table 5B: Activity Multipliers According To Lifestyle/Training Frequency (89)

For clarity on using the above table, consider a 5'7", 150 pound male with a BMR of approximately 1,639 Calories according to the Mifflin St. Jeor formula. He works a desk job, but walks the dog on most days. According to Table 5B, he decides to use a "lightly active" activity multiplier based on this lifestyle.

GUESSTIMATED MAINTENANCE = BMR (DETERMINED USING MIFFLIN ST. JEOR) X ACTIVITY MULTIPLIER
GUESSTIMATED MAINTENANCE = 1639 X 1.6
GUESSTIMATED MAINTENANCE = 2,622 CALORIES

2. USING A GUESS-AND-CHECK METHOD.

Another option you can use to estimate your maintenance calories is a guess-and-check method. The steps include:

1. Track your bodyweight and caloric intake every day for two weeks
2. Determine the average values for week one and week two.
3. Determine the average weight gained or lost from week one to week two.
4. Determine maintenance based off weight change.
    a. If you maintained weight from week one to week two, then whatever your average caloric intake was can be set as your maintenance calories.

b. If you lost weight from week one to week two:

i. Assuming you need about a 500 calorie deficit per day to lose one pound of weight, you can determine maintenance by figuring out how much of a deficit you were in.

EXAMPLE 1: If you ate 3,000 calories per day on average and lost one pound from week one to week two, then your maintenance would be (3,000 + 500 calories = 3,500 calories).

EXAMPLE 2: If you ate 2,000 calories per day on average and lost 0.4 pounds from the first week to the second, then your maintenance would be (2,000 + 0.4 x 500 calories = 2,000+ 200 calories = 2,200 calories).

c. If you gained weight from week one to week two:

i. Assuming you need about a 500 calorie surplus per day to gain one pound of weight, you can determine maintenance by figuring out how much of a surplus you were in.

EXAMPLE 1: If you ate 3,000 calories per day on average and gained one pound from the first week to the second, then your maintenance would be (3,000 - 500 calories = 2,500 calories).

EXAMPLE 2: If you ate 2,600 calories per day on average and gained 0.4 pounds from week to week, then your maintenance would be (2,600 - 0.4 x 500 calories = 2,600 - 200 calories = 2,400 calories).

The benefit of using the formula-based approach is that you can figure out your maintenance calorie intake right away. The downside of using a generic calculation is that it may not be truly fine-tuned to your individual situation.

The benefit of using the guess-and-check method is that you are basing your estimation off your body's actual response to food intake. The downside of using guess-and-check is that it takes at least two weeks to get a decent idea of what your maintenance is, which can be a drag if you are eager to get started right away.

Whatever method you choose, as long as you get a good idea of how many calories you need to maintain your weight, you can then use Table 5A to figure out whether you should increase calories, decrease calories (and by how much) or if you should eat exactly at maintenance intake.

Once you have adjusted your maintenance intake by adding or removing the appropriate percentage based on the factors in Table 5A, you officially have figured out how many calories you should eat per day to get you started on your recomp journey.

CARB/CALORIE CYCLING & REFEEDS

For the purposes of this book, we will define a refeed as a 24 hour period during which caloric intake is increased (normally through increased carb intake). Generally, refeeds are employed in dieters for four main reasons:

1. To acutely improve training performance (which is often impeded on low calorie/carb intakes);
2. To provide a mental break from the monotony of a fat loss diet;
3. To acutely reverse some of the negative hormonal adaptations associated with low caloric intakes and low body fat percentages, such as reduced leptin; and
4. To improve adherence to the diet.

Since our recommendations in this book are set toward achieving body recomposition, we are neither recommending very large caloric deficits nor very low end-goal body fat percentages. As such, scheduled weekly refeeds are not required, since they tend to offer benefit only to those who are very lean and/or on very low calories. Still, we believe that some would respond most optimally to a non-linear daily intake of carbohydrate (meaning carb intake will vary throughout the week) for reasons we will outline below.

In particular, we are recommending two options, depending on your specific goals and circumstances:

1. A LINEAR APPROACH (NO REFEEDS OR CARB CYCLING)

A linear approach to daily caloric intake means that you will eat the same caloric intake and the same macros every day without refeeds, high carb days or calorie cycling. This approach would be most appropriate for anyone with the primary goal of building muscle and in a caloric surplus. When in a caloric surplus, it is of relatively less importance to vary your carbohydrate intake throughout the week. Since there is already an excess of nutrients to fuel performance, the diet should not be mentally strenuous and there should be no negative hormonal adaptations to reverse.

Additionally, for some individuals, establishing consistent daily habits and building trust in your ability to follow through each and every day will be better achieved by simply hitting a set target for a given period of time. (See Chapter 6 for examples of how your caloric requirements may change over time)

As long as you are being flexible with your food choices, not eating the exact same foods every day and not excessively restricting calories, high carb days may not feel necessary. If there is a particular event or special occasion that will make hitting your macronutrient targets more difficult, you can simply account for the increase in calorie intake by making a conscious effort to be more active that day (or in the coming few days), or by doing your best to estimate the nutritional content of the meal without stressing or obsessing over the specifics.

Sometimes, the best approach from a psychological perspective is to simply enjoy the occasional "free meal" or "cheat night" and get back on track the next day. In the grand scheme, the occasional missed day will not hold you back as long as you don't allow it to derail your overall commitment to the plan.

Since a linear approach to calories and macros is the simplest approach, it is likely attractive to those who find adhering to the diet easier without having extra variables to worry about from day to day. This would mean that on training days, non-training days, the weekends, et cetera, you would have the same daily calorie and macro target to hit.

To recap, a linear approach would be best suited for individuals who are in a caloric surplus, looking for the simplest approach for adherence purposes or prefer stability and lack of change throughout the week.

2. LOGICAL CARB CYCLING (NON-LINEAR CARB INTAKE)

For those who are either in a deficit, or at caloric maintenance and are seeking to optimize every area of their diet, we are suggesting a "logical carb cycling" approach.

We believe that, on the whole, carb-cycling has gotten more public attention than it deserves. The idea that you can somehow "trick your body" or "keep your metabolism" guessing by cycling through high carb, moderate carb and low carb days has no basis in the scientific literature. Ultimately, fat loss will be determined by energy balance throughout the week, so

arbitrarily increasing and decreasing carb intakes throughout the week will not provide any extra metabolic benefits. For example, setting Monday as your high carb day, Tuesday as your moderate carb day and Wednesday as your low carb day, has no metabolic advantage from a fat loss perspective to simply eating a moderate carb intake on all three days. However, there may still be merit in cycling carb intake in a more logical fashion from a body recomposition perspective.

We have concluded that for those with more limited calories to spare, partitioning more of your energy intake on days that you train is a tool to prioritize the timing of nutrients around the workout (a concept we will revisit in Chapter 11 on peri-workout nutrition). It should be pretty intuitive: you will allocate more carbohydrates on days that you train, which will fuel your training better and may compound over time to yield greater results. This would imply that on days you are resting from the gym, you would eat slightly less carbohydrate (and slightly less calories overall).

As a simple rule of thumb for those taking the non-linear route, we recommend reducing total daily carb intake by to approximately 20 percent on non-training days.

You may also utilize this logical carb cycling approach by increasing your calories (primarily via carbs) on a day your caloric expenditure is abnormally high. For example, if you normally weight train 5x per week but happen to play two hours of basketball on top of your normal exercise regimen, you can adjust for that increased calorie expenditure by taking a refeed. If your physical activity is significantly higher than your norm, you can consider increasing carb intake by ~20% for that day.

To recap, a non-linear approach would be best suited for individuals who are in a caloric deficit or at maintenance, are looking for the most optimal approach for fueling training or prefer a more dynamic and less monotonous approach throughout the week.

For further clarification, we have provided sample meal plans for both training and non-

training days at the end of the book.

Ultimately, our goal is to empower you to be your own scientist with your own physique. Our aim is to give you tools and knowledge to set up your own diet, without getting too attached to black and white suggestions.

We also want you to make adjustments to your calorie intake based on the feedback obtained from the body recomposition toolkit outlined in the second chapter. How is your physique looking? How are your strength levels in the gym? How is the number on the scale changing in response to your caloric intake?

In the next chapter, we will outline some suggestions on how to make adjustments to your caloric intake over time so you can avoid plateaus and continue driving progress forward as your physique and goals change.


06

CHAPTER 06

THE ART OF SELF-COACHING

" IF YOU COULD KICK THE PERSON IN THE PANTS RESPONSIBLE FOR MOST OF YOUR TROUBLE, YOU WOULDN'T SIT FOR A MONTH."
- THEODORE ROOSEVELT

At this point, you have set up your calorie target, which will be the main nutritional variable driving your progress forward. However, this number should be thought of as a moving target rather than a fixed total to follow for the rest of time.

On your recomposition journey, you will eventually have to make adjustments to caloric intake as your metabolism adapts, your body composition changes and as your goals change as well. If taking on this journey under the counsel of a coach, they will be responsible for determining if and when changes need to be made. However, if you are taking on this journey without the guiding eye of a coach, we think it will be useful to provide you with general guidelines for adjusting your approach as time goes by.

When self-coaching, it is important that you use the mandatory toolkit to periodically self-assess your progress, and use those periodic assessments to make adjustments to the diet when necessary.

It would also be wise to regularly remind yourself to trust the process throughout this journey. When self-coaching, it can often be tempting to second guess your methods and make adjustments to the plan more frequently than you should. While to do the entirety of self-coaching justice would require another book in itself, in this section we'd like to offer some guiding principles to help keep you going in the right direction as you move along.

Below is a reminder of how frequently you should be using the mandatory toolkit to assess progress.

FREQUENCY REQUIRED FOR MANDATORY TOOLS:

1. Body weight Scale: 4-7x per week to calculate a 7-day avg.
2. Circumference Measurement: Biweekly or Monthly (the less experience your are, the more frequently you should implement)
3. Progress Photos: 1-4x per month (higher frequency for those with less experienced as progress is typically faster)

IF IT'S NOT BROKE, DON'T FIX IT

In general, we recommend doing a complete self-assessment once or twice monthly, where you take a look at the collective data from your toolkit. If the tools collectively indicate that you are making progress with your primary goal, then we recommend not adjusting the plan. If it's working, keep going. Making adjustments more frequently than this can result in flip-flopping on your goals, paralysis by analysis and less reflective judgement.

Consider a few examples of when it would NOT be appropriate to adjust calories:

1. You're losing fat. If your primary goal was to lose body fat and after one month you find that your waist circumference is down, your progress photos are looking leaner and tighter and your weekly bodyweight average is lower, the same or similar, then this feedback collectively indicates that you have lost fat while building muscle. It's working. No need for

an adjustment.

2. You're building muscle. If building muscle is your primary goal and after one month the number on the scale is up, your waist circumference is lower or the same and you are looking wider across the shoulders in your progress photos, this indicates that you have definitely built muscle while losing or maintaining fat mass. It's working. No need for an adjustment.

3. You're losing fat and building muscle. Now let's say your primary goal was to build muscle and lose fat equally. After one month, you find that the number on the scale is the same or slightly up, but your waist circumference is down and your progress photos are looking tighter and more muscular. This collective data indicates that you have built muscle while losing body fat. It's working. No need for an adjustment.

Next, consider some examples of when it would be appropriate to adjust calories:

1. You're NOT losing fat. If your primary goal was to lose body fat and after one month you find that your waist circumference is up or unchanged, your progress photos are looking exactly the same and your weekly bodyweight average is the same or up, then this feedback indicates that you have not lost fat, although you may have built some muscle! In this case, since your primary goal was to lose fat, an adjustment to caloric intake may be required to get fat loss moving at a faster rate.

We recommend increasing the caloric deficit through one of two means. You may want to simply reduce calories. To help get fat loss moving faster, why not increase the deficit by removing 100-250 calories from the diet? We suggest removing these calories from your carb and/or fat intake, but never protein. If increasing the deficit by removing fats, be sure to never let your total daily fat intake drop below 20 percent of total calories.

Alternatively, you can make an adjustment by increasing cardio. If you would rather not

remove calories further from your diet, you can also get fat loss moving faster by adding extra cardio. Add only one or two 30 minute low-intensity steady state (LISS) cardio sessions per week or make an effort to increase NEAT through simple strategies to move around more and fidget throughout the day. If making an increase to cardio, be sure not to exceed the maximum cardio recommendations laid out in Chapter Twelve.

2. You're NOT building muscle. If your primary goal is to build muscle and after one month, you find that your bodyweight is the same (or down), your waist circumference is unchanged (or down) and your progress photos are looking a bit leaner but not more muscular, this feedback collectively indicates that you may have lost fat, but you may not have built much muscle.

Since muscle gain can be more difficult to detect than fat loss, before jumping to conclusions, you can look to other tools for guidance. For example, are you gaining strength in the gym? If so, despite the feedback from the other three tools, it is still possible that you have built muscle while losing fat. Keep going and stick to the plan. You can also check body part circumference measurements (chest, arms, thighs) to get a better idea of whether or not you have built muscle.

Muscle gain is also simply less detectable in more advanced trainees, so we advise that those with more training years under their belt be even more patient when making adjustments. Still, in this case, since your primary goal was to build muscle, an adjustment to caloric intake may be required to get you gaining lean mass at a faster rate. We recommend increasing the caloric surplus by adding 100-500 calories to the diet.

How many calories you add will depend on whether you were losing weight, maintaining weight, or gaining weight at a slower rate than you'd like. The faster you want to pick up the rate of progress, the more aggressive you should be with a caloric increase. We suggest adding these calories through the addition of carbs and/or fats, while still keeping the ratios in check with the numbers outlined in Chapter Eight.

Outside of these scenarios, we recommend being patient and trusting the process. Rather than constantly switching up your calories and macros, you should pay closer attention to peri-workout nutrition (Chapter Eleven), your quality of work in the gym (Chapter Fifteen) and your quality of sleep (Chapter Fourteen).

SWITCHING GOALS (LONG TERM ADJUSTMENTS)

For this third aspect of self-coaching, let's assume you've achieved a significant amount of body recomposition and are considering switching your primary goal from losing fat to building muscle (or vice versa). Below are some guiding principles for making such a switch.

When you should switch from caloric deficit (recomp/cutting) to a caloric surplus (recomp/lean-bulking):

- Your primary goal has shifted from fat loss to muscle building.
- You have made significant progress and are happy with your current body fat level and overall composition.
- You've been in a calorie deficit for a long period of time and are experiencing negative side effects (i.e. irritable, food-focused, hormonal disruption, poor gym performance, decreased mood, extreme fatigue) (74,124)
- You're extremely lean and it's negatively impacting your health. (74,124)
- You've been in a caloric deficit for a long period of time and are no longer progressing in the gym (27)

At this point in time, we recommend going back through the steps laid out in Chapter 5 and setting yourself up with new calories based on your new goals. If you have been in a prolonged, aggressive caloric deficit, you may gradually increase calories over the course of two to three weeks as you transition from deficit to surplus, although such a transition is not required.

When you should switch from caloric surplus (recomp/lean-bulking) to a caloric deficit

(recomp/cutting).

- Your primary goal has shifted from building muscle to losing fat.
- You've unintentionally accumulated more body fat than you'd like throughout your recomp process and are now decreasing your overall health, wellness and fitness levels.
- You've been bulking for a while, previously made progress, but progress has significantly slowed.
- You're no longer getting good pumps in the gym, are feeling tired after your carbohydrate meals, and rarely have an appetite.

At this point in time, we also recommend going back through the steps laid out in Chapter 5 and setting yourself up with new calories based on your new goals. There is no need to gradually transition from a surplus intake to a deficit intake. Begin your new calories/macros right away.


HELP
07

CHAPTER 07

THE "SKINNY FAT" DILEMMA

THE BEST PROJECT YOU WILL EVER WORK ON IS YOU"
- SONNY FRANCO

'Skinny fat' is a popular buzz-term used to describe someone who is of normal body weight but has a high level of body fat. In visual terms, it would describe an individual with low muscularity but relatively high bodyfat. We will define a skinny fat male as having more than 20 percent body fat with low muscularity and a skinny fat female as having more than 35 percent body fat with low muscularity.

Therefore, if your body fat levels are not this high, despite having low muscularity you would not qualify as being truly skinny fat and should instead simply set up your calories as outlined.

If this label does fit, a bulking approach may be tempting because you would like to look more muscular. However, a bulking phase will most often lead to an even fatter appearance and exacerbate the potential health concerns associated with having a higher body fat percentage.

People who are skinny fat (despite their normal body weight) have an increased risk of developing metabolic syndrome. They also tend to have insulin-resistance, excess visceral fat, high blood triglycerides, elevated blood pressure and may be at a greater risk for

developing cardiovascular disease (108,109). For this reason, we generally advise against a caloric surplus for skinny fat individuals.

Likewise, while an aggressive cutting approach may improve health outcomes by lowering body fat levels, it will also most likely result in an even skinnier appearance. This is why we believe body recomposition to be the ideal route for someone who is indeed skinny fat.

First, if you fall within this criteria, just know you're not alone. In 2008, the National Health and Nutrition Examination Survey found that 24 percent of normal-weight American adults were metabolically abnormal (133). An outstanding one in four individuals who are of normal weight, can be classified as skinny-fat.

Our objective is to help anyone who fits this criteria improve their body composition, overall health and build the physique of their dreams.

One important thing to note is that most people who lack muscle mass don't have much resistance-training experience and as such, are far away from their genetic potential. Therefore, even if it may seem like the cards are stacked against you, in reality, you are in a superb position to recomp with a very high likelihood of gaining muscle while losing fat.

For both body composition and health purposes, we generally advise that reducing body fat percentage be set as the primary dietary goal while the weight training and high protein intake drive the muscle building process.

Depending on whether you are "more skinny than fat" or "more fat than skinny", it may be more important that you focus on losing fat first, building muscle first or do both concurrently. Below is a schematic of our recommended approach depending on which boat you find yourself in.

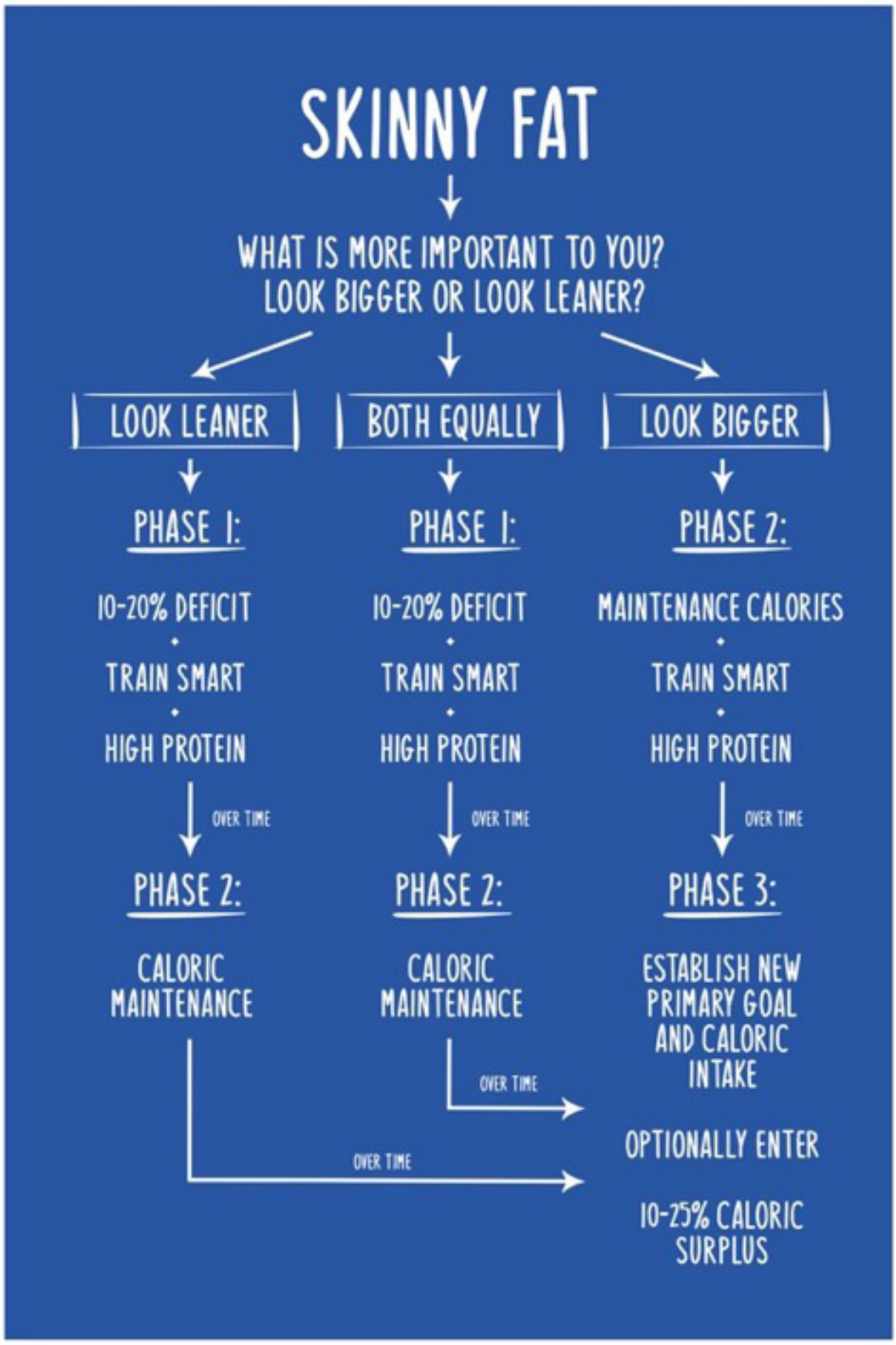


Figure 7A: Schematic For Skinny Fat

As you can see in the figure above, as your body composition improves, you will enter different phases of recomposition. Below, we will outline one such example of a skinny-fat individual who prioritized looking leaner first.

PHASE 1: LOWER BODY FAT PERCENTAGE (~10-20% CALORIC DEFICIT)

As mentioned above, assuming the primary goal is to look leaner, we suggest a 10-20 percent deficit to start off your recomposition phase. Even if you would like to achieve both goals equally, it may be well-advised to put your overall health at the forefront. Also, prioritizing being leaner will allow measures like insulin sensitivity to improve, which can actually benefit body recomposition over the long run by improving nutrient partitioning.

Of course, we do not recommend that you remain in a calorie deficit indefinitely, as this will eventually impede your muscle building potential. Once you have lost a significant amount of body fat, seen significant reductions in your waist circumference and leaner progress photos, we recommend transitioning out of a calorie deficit and into Phase 2: Caloric Maintenance.

For context, it would be appropriate to begin the transition from Phase 1 to Phase 2 after going from approximately 20 percent body fat to approximately 15 percent as a male or from about 35 percent body fat to around 28 percent as a female. Generally, Phase 1 can last anywhere from two to six months, depending on the extent of fat loss required.

PHASE 2: GAIN LEAN MASS AND LOWER BODY FAT PERCENTAGE (~CALORIC MAINTENANCE)

Now that you have achieved a lower body fat percentage, it is time to transition to caloric maintenance so that muscle can be built at a faster rate. This may require recalculation of your current caloric needs based on your new body weight, body composition and activity level as covered earlier in this chapter.

By decreasing your fat mass in Phase 1, you will now be more insulin sensitive and can begin to shift your macronutrient ratios as well. We will cover macronutrients in detail in

Chapter Eight, but for now, we generally recommend increasing your carbohydrate intake and decreasing your fat intake as you get leaner and more muscular.

For example, if your were consuming 35 percent of your total calories from fat in Phase 1, you may now reduce fat intake to make up 25-30 percent of total calories in Phase 2. This shift should lead to improved training performance, better pumps in the gym and increased muscle fullness.

Phase 2 would involve taking the male who got down to approximately 15 percent body fat in Phase 1, down even further to 10-12 percent (as muscle mass gain naturally lowers body fat percentage).

For the female that ended Phase 1 at about 28 percent, she may get down to 20-25 percent body fat in Phase 2. Generally, Phase 2 can take anywhere from 1-12 months depending on the individual's needs and goals. For example, you may only need a few months at caloric maintenance before you are ready to prioritize building muscle and enter Phase 3.

On the other hand, it is fine to stay in Phase 2 for an extended period of time if you would prefer to continue recomping by gradually losing fat and building muscle, without prioritizing one over the other.

It is common however, for people to notice their physique making the greatest progress when shifting from a fat loss-focused phase to a muscle building phase. A proper shift to Phase 3 can result in just about pure muscle gain, in a near absence of any fat gain.

You are now primed to make the most impressive visual progress by shifting into Phase 3: a moderate caloric surplus.

PHASE 3: ESTABLISH NEW PRIMARY GOALS (~10-25% CALORIC SURPLUS)

At this point, you have prioritized fat loss in Phase 1, lowered your body fat percentage while increasing muscle mass more substantially in Phase 2 and may now be ready to prioritize a faster rate of muscle gain by entering a caloric surplus.

Just as with Phase 2, this may require recalculation of your current caloric needs as laid out earlier in this chapter. Also, since your body fat percentage continued to decrease during Phase 2, insulin sensitivity has continued to improve and macronutrient ratios can be further adjusted to include more carbohydrates with less fats (but never allowing fats to drop below 20 percent of your total calories).

At this point, we recommend gradually increasing your total calorie intake up to around 10-25 percent. If you are more concerned with staying leaner and avoiding fat gain, we recommend sticking to slower calorie increases and a smaller overall caloric surplus (closer to 10 percent). If you are more concerned with building muscle and are comfortable with adding some fat, we recommend going with faster calorie increases and a larger overall caloric surplus (closer to 25 percent).
Generally, Phase 3 can last anywhere from 2-12 months, depending on the individual's needs and goals. After Phase 3, it is simply a matter of continuing to periodically reassess progress using the Tools of the Titans (Chapter Two) and updating your calorie and macronutrient needs based on your changing goals.

Please refer back to the "Art of Self-Coaching" chapter for further elaboration beyond Phase 3.

Now that target calorie intake has been determined and it's clear how they should be adjusted over time, figuring out macronutrient targets is the next step.

Once you have set your macronutrient targets in place, we will take a dive deep into how to

optimize your nutritional approach as a means to enhance performance in the gym, recovery out of the gym, and thus have the greatest impact on your body composition.


08

CHAPTER 08

UNPACKING MACROS AND MICROS

"THE HISTORY OF MODERN NUTRITIONISM HAS BEEN A HISTORY OF MACRONUTRIENTS AT WAR: PROTEIN AGAINST CARBS; CARBS AGAINST PROTEIN, AND THEN FATS; FATS AGAINST CARBS."
-MICHAEL POLLON

Now that we have established a baseline caloric intake to fuel positive body composition change based on your specific needs and goals, it is time to get even more specific and determine where those calories should be coming from.

In particular, we need to figure out the ideal amounts of each of the three macronutrients required to maximize lean mass, while minimizing fat mass. Although most of you will likely be familiar with the basic terminology, it's important to make sure everyone is on the same page before digging into the scientific research and the deeper complexities therein.

MACRONUTRIENTS

There are three key macronutrients which make up the calories we consume in food. The prefix MACRO refers to the nutrients our bodies use in BIG amounts to function properly (on the scale of grams). The macros we will discuss in this chapter are protein, carbs and fats.

MICRONUTRIENTS

Micronutrients, on the other hand, are nutrients like vitamins and minerals that our bodies use in small amounts (on the scale of milligrams).

While vitamins and minerals are absolutely vital to a well-functioning and healthy human body, we aren't going to spend a lot of time on them in this book. Granted, there are a few ways that deficiency in certain micronutrients could stunt or halt a recomp. As one example, a diet deficient in zinc has been linked to lower testosterone (67), impaired insulin sensitivity and depression (51).

Of course, the downstream effect of these possibilities include impaired training performance, lack of motivation, decreased dietary adherence and unfavorable changes in body composition. Clearly, getting enough Zinc in your diet matters for body recomposition. Still, with there being 13 essential vitamins and 16 essential minerals, to go through each one individually and speculate on its recomposition implications would require a separate book in its own right. Instead, we have laid out the Six Micronutrient Commandments to ensure that all micronutrient bases are covered.

It is safe to assume that if you follow the guidelines below, you probably don't need to spend any more time worrying about missing out on micronutrient targets as far as body recomp is concerned. Whether or not these guidelines are sufficient on their own to maximize every area of health is not a dispute we will try to settle between these covers.

THE SIX MICRONUTRIENT COMMANDMENTS:

1. Aim for at least three or four servings of green vegetables per day.
   - Examples of one serving: Typically "1 cup" counts as a serving of vegetables. 1 cup of broccoli (more specifically: 100g raw), or ~10 broccoli florets; 100g raw spinach (~3 & ⅓ cups raw, or ½ cup cooked), or ½ cup asparagus (~65g or 6 spears).

2. Aim for at least two servings of fruit per day.
   - Examples of one serving: one kiwi or one banana (typically 80-150g raw weight depending on fruit source).
3. Try to regularly eat a variety of fruits and vegetables of different colours and rotate food sources.
4. Consume fatty fish once or twice per week (otherwise, consider fish oil supplements. See Chapter Thirteen).
5. Eat a varied, balanced diet. If eliminating grains, dairy or meat, consider supplementation of vitamin B12, vitamin D, omega-3 fatty acids, iodine, iron, calcium, and zinc under the guidance of a medical professional.
6. Generally, stick to a whole food, minimally-processed, nutrient-dense diet.

With these commandments in mind, our main focus in this section will be aimed toward the macronutrients, since along with total calorie intake, they will be the main nutritional drivers of body recomposition. Let's start with the most important macronutrient of the three - protein.

HOW MUCH PROTEIN SHOULD WE EAT FOR RECOMP?

The amount of protein you need to optimize your body composition is a controversial topic that is being continuously researched and updated by scientists.

What we do know for certain is that protein is the most essential macronutrient when it comes to repairing and building muscle (29). We also know that protein is the most thermogenic macronutrient, meaning it leads to more caloric expenditure than carbs or fats. In addition, protein tends to be the most satiating macronutrient (96), meaning you will feel fuller for a given number of calories consumed.

The combined effect of these properties is that protein is essentially the "super-macro": It

is the most important for both muscle gain and fat loss. So as trainees interested in both of these goals, it is of the utmost importance that we figure out how much of it we need to eat. Before proceeding with the scientific literature, we think it's worth outlining our general philosophy on protein intake for body recomposition.

First, a short history lesson. For ages, people have been arguing that one gram of protein per pound of bodyweight is the magic number for maximum gains. This would mean that if you weigh 180 pounds, then you'll want to eat 180 grams of protein per day, and there isn't much more to it than that.

More recently, some science-minded folks have revolted back against this mainstream bodybuilding thought, insisting that, well, one gram per pound is actually a major overkill and you can "get away with" much less protein than that. Usually, this camp settles on a number somewhere around 0.75 grams per pound. So if you weighed 180 pounds, you'd get all the anabolic bang for your buck you could ever want out of just 130 grams of protein per day.

As it turns out, we don't fit neatly into either of these camps. When it comes to body recomposition, we believe that protein is king. As alluded to above, protein is the best muscle-building and the best fat-burning macronutrient. For this reason, we think it is far better to have too much protein than too little.

If you consume too little, you could be leaving potential gains on the table and missing out on fat loss, just because you didn't want to eat an extra chicken breast or protein shake. In this sense, we think of having a high protein intake as a sort of anabolic insurance. It covers you in a similar way as car insurance in that you may not necessarily need it, but it's a good idea to have it just in case.

For the record, since we are advocating for a high protein diet, it's worth noting that a high protein diet is very safe and the current literature has consistently shown no negative side

effects of very high protein diets on blood lipids, liver, bone or kidney function (5,37).

We also believe that just like people of different starting body fat percentages will require different calorie intakes, they will also require different protein intakes. How much protein YOU need to eat, depends not only on your bodyweight, but also on your body fat. So it isn't quite as simple as just recommending a single target for everyone (like one gram per pound). We'll discuss all of this and the relevant science in the next few pages.

Because our daily protein intake calculations depend on an estimation of your bodyfat percentage (to determine lean body mass), we have provided a visual representation of various bodyfat percentages in Figure 8 below to help you estimate your bodyfat percentage in case you do not have access to the more reliable measurement tools laid out in Chapter 2. Your bodyfat percent estimation does not need to be precise in order for you to get in the right ball park for setting up your macronutrients. Being consistent and adjusting your intake appropriately over time will ultimately determine your success, so try not to get too bogged down with the initial estimation.

Figure 8: A Visual Representation of Various Bodyfat Percentages (Male and Female)

OUR SLIDING MODEL FOR PROTEIN INTAKE

First up, there is direct evidence that increasing protein intake leads to body recomposition. Several studies have shown that very high protein intakes (protein overfeeding) leads to body recomposition by either reducing fat mass, increasing lean mass, or both (7,28). We will later dig into those studies in more detail.

Keep in mind that while the literature tends to express protein intakes in grams per kilogram of bodyweight (g/kg), we will be mainly using grams per pound of bodyweight (g/lb). Our reasoning for this is that historically, lifters always expressed protein figures this way and as a result, these units have become more accessible to the average reader. To convert to g/kg, simply multiply any g/lb figures provided by 2.2.

Previous literature has suggested that consuming 0.54-1.0 gram per pound (1.2-2.2g/kg)

of protein is enough to support training adaptations for those eating at maintenance or in a caloric surplus (75,100). So, as a high-end figure for those who are in a caloric surplus or at maintenance, the mainstream bodybuilding recommendation of one gram per pound was pretty spot on.

However, for those who are looking to optimize body composition, as we will see below, higher protein intakes are evidently warranted (4,28,56,62).

One limitation with general recommendations regarding protein intake in the scientific literature is that the suggested values utilize total body mass, not lean body mass. This is important to mention because, as previously noted, body composition and body weight are very different things.

The higher your body fat percentage, the less likely you are to lose muscle in a calorie deficit because your body has so much fat to use for fuel. On the other hand, the leaner you are, the more likely you are to lose muscle in a calorie deficit because there is more limited fat for fuel. Therefore, we propose that the leaner you are, the more protein you need to eat to preserve (or gain) muscle mass.

This is why we recommend a sliding protein target ranging between 1.2 - 1.6 grams per pound of lean body mass. This sliding scale takes into consideration your current body composition. The leaner you are, the closer you will want to be to the 1.6 grams per pound figure. The more body fat you have, the closer you will want to be to the 1.2 grams per pound figure.

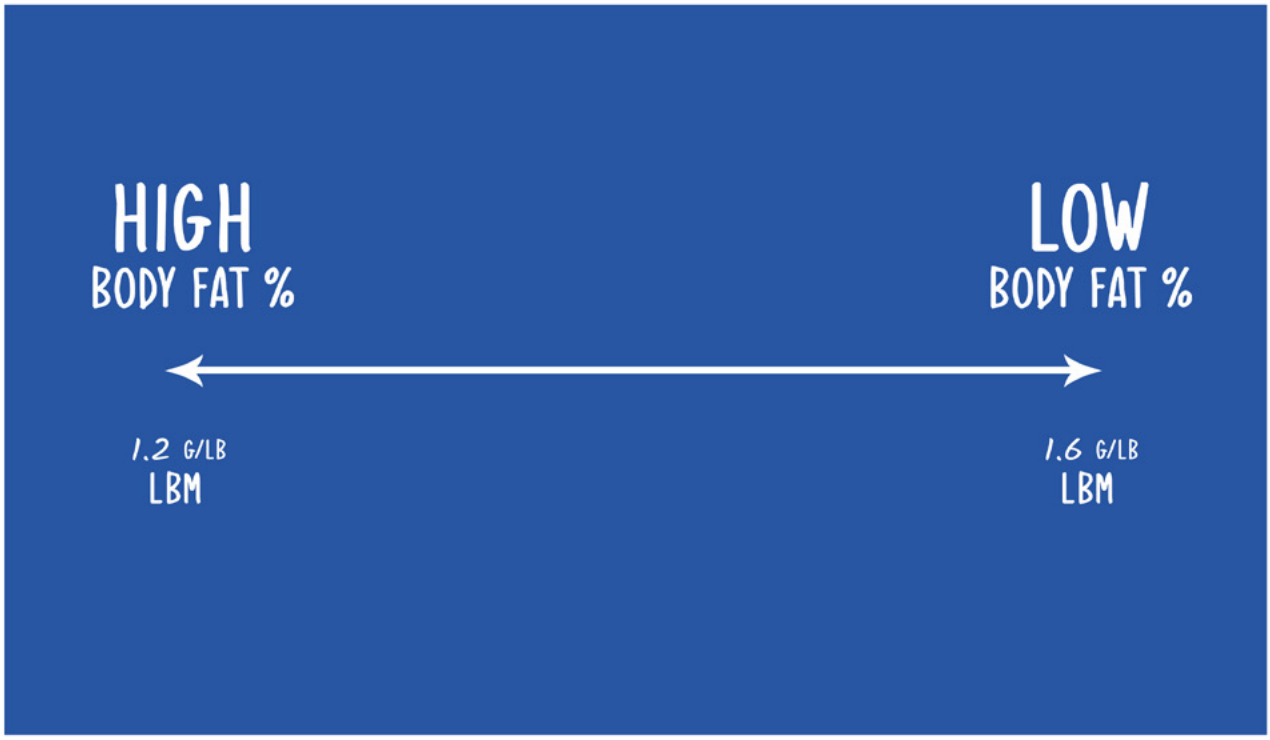


Figure 8A: The Sliding Model of Protein Intake (Based On LBM)

To put this model in context, let's compare two mock examples below.

	JUNIOR	BILL
SEX & AGE	MALE - 25	MALE - 25
HEIGHT	5'7	5'7
WEIGHT	150 LBS	240 LBS
BODY FAT %	10%	30%
LEAN BODY MASS (LBM)	135 POUNDS	168 POUNDS
RECOMMENDED PROTEIN INTAKE	1.5G/LB LEAN BODY MASS (LBM)	1.2 G/LB LEAN BODY MASS (LBM)
PROTEIN PER DAY	202.5G PROTEIN (~200G)	201.6G PROTEIN (~200G)

Table 8A: Two Examples of Protein Intake Calculations (Male)

As you can see in the table above, Junior and Bill are the same age and the same height, but have different body weights, different body fat percentages and different lean body masses (LBM). Junior is lean while Bill is carrying excess body fat.

In this example, if we told Junior to go with the mainstream recommendation to consume one gram of protein per pound of body weight (150 grams each day), this may be enough to keep his muscle hanging around, but we could be inhibiting his ability to maximize his muscle building capabilities due to his low body fat percentage (10 percent).

In this case, 150 grams of protein per day might not quite cut it, especially if he is also training very hard. And since we are thinking of protein as anabolic insurance, we'd much rather overshoot than undershoot on intake.

Continuing with the example, using the sliding scale outlined above, Junior would be better off consuming about 1.5 grams of protein per pound of lean body mass (since he is lean, he should be closer to the 1.6 figure to the far right of the spectrum). For Junior, plugging the numbers in would come out to 135 pounds (LBM) x 1.5 = 202.5 grams of protein per day. For practical purposes, he could just round this figure to the nearest whole number, setting his marker at 200 grams of daily protein. As we'll discuss in Chapter Nine, it would be wise to split this intake evenly across four or five meals per day (that is, 40 grams of protein per meal, fives times per day).

On the other end of the spectrum, if we told Bill to go with the mainstream bodybuilding advice to consume one gram of protein per pound of body weight, he'd be consuming 240 grams of protein every day! For someone of Bill's high body fat percentage, that high of a protein intake would undoubtedly be overkill.

Recall how we previously learned that the higher your body fat percentage, the less you need to worry about losing lean mass. In Bill's case, it would be more appropriate to consume 1.2 grams per pound of lean body mass (since he is not lean, he should be closer to the 1.2 figure to the far left of the spectrum).

When Bill plugs his numbers in, it will look like this: 168 pounds (LBM) x 1.2 = 201.6 grams of protein per day. Like Junior, Bill could round this to be 200 grams per day.

As you can see from the examples above, even though Junior and Bill are much different in terms of body weight and body fat, they both should end up eating the same amount of protein per day.

Clearly, while the mainstream recommendation of one gram of protein per pound of body weight may work well for some people to get them in the right ballpark, it surely is not specific enough to optimize progress for many.

Consider the two similar female examples in the table below.

	SALLY	HELGA
SEX & AGE	FEMALE - 25	FEMALE - 25
HEIGHT	5'4	5'4
WEIGHT	135 LBS	200 LBS
BODY FAT %	25%	40%
LEAN BODY MASS (LBM)	101 LBS	120 LBS
RECOMMENDED PROTEIN INTAKE	1.5G/LB LEAN BODY MASS (LBM)	1.2G/LB LEAN BODY MASS (LBM)
PROTEIN PER DAY	151G PROTEIN (~150G)	144G PROTEIN (~145G)

Table 8B: Two Examples of Protein Intake Calculations (Female)

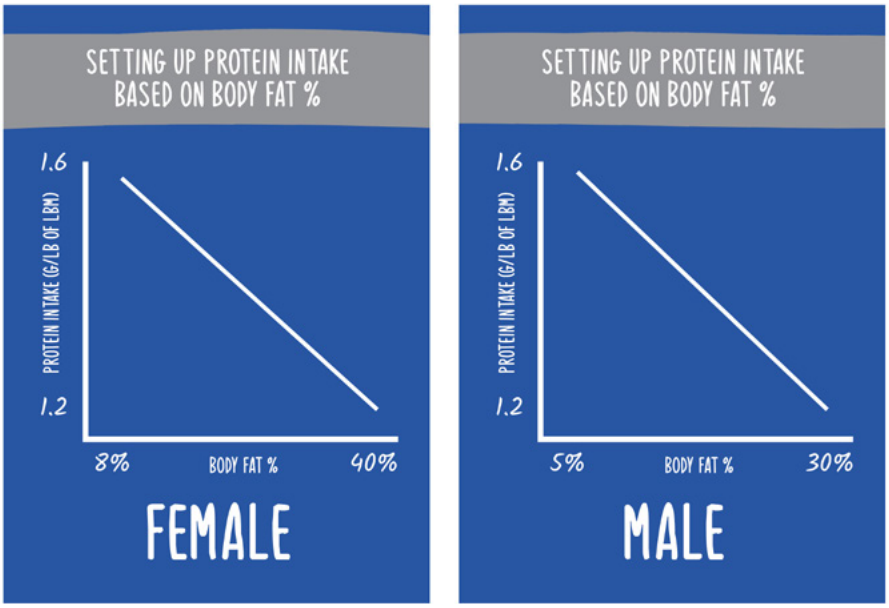


Figure 8B - Setting Up Protein Intake Based on Bodyfat Percentage. The leaner you are, the more protein you need.

Body recomposition is not going to happen by accident. You need to make sure you are putting yourself in the best nutritional state to support this process. To expand on the figures laid out in the sliding model above, (1.2-1.6 g/lb LBM) we'd like to take a deeper look at what the scientific literature has found with regard to body recomposition and protein intake.

WHAT THE SCIENCE REALLY SAYS

A study by our friend Dr. Bill Campbell out of the University of South Florida compared the effects of a low versus high protein intake among aspiring female physique athletes undergoing an eight week resistance training protocol (28). In this study, the low protein group was not allowed to consume more than 0.55 grams of protein per pound of body weight. The high protein group was prescribed to consume a minimum of 1.1 grams of protein per pound of weight, but could exceed this amount if they wanted to.

To get more specific protein intake values, I (Chris) extrapolated the subjects' body composition data and macronutrient intakes reported in the study to determine how much protein they were eating per pound of lean body mass (LBM) - the metric we are most interested in.

On average, the low protein group consumed 0.52 grams of protein per pound of fat free mass, and the high protein group consumed an average of 1.44 grams of protein per pound of fat free mass. Interestingly, both groups gained muscle and lost fat, but the high protein group saw significantly more lean gain and fat loss.

Specifically, the high protein group gained 4.6 pounds of fat free mass while losing 2.4 pounds of fat mass, reducing their total body fat by two percent. The low protein group only gained 1.32 pounds of fat free mass while losing 1.76 pounds of fat mass, changing their body fat percent by 1.1 percent.

It is important to note these females had previous resistance training experience and were

required to deadlift 1.5 times their body weight to participate in the study. Moreover, they were lean, compared to their societal peers, starting off this study at about 22 percent body fat, with the norm being about 30 percent.

Lastly, these researchers provided us with a great visual representation of how much individual responses to protein intake varied. It's also worth noting that every single subject in the high protein group gained lean mass, whereas some subjects in the low protein group actually lost lean mass.

Although the group averages reported positive body composition changes for both groups, we should note that some subjects did in fact lose muscle when consuming the lower protein intake. This individual variability really highlights our point that it is better to "play it safe" and eat a higher protein intake, so you don't end up like some of the subjects who lost muscle in the low protein group.

Lastly, worthy of consideration is that the high protein group was eating significantly more calories on a daily basis (1839kcal vs 1416kcal on average), yet still lost more fat mass. While it is possible that there was some misreporting of calorie intake, we do believe that this finding speaks to the power of protein and its thermogenic and satiating effects.

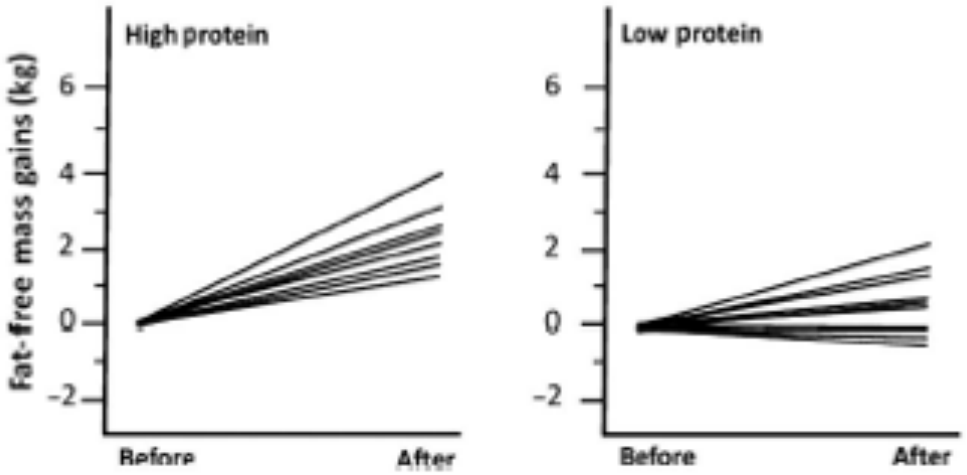


Figure 8C: Individual Responses to a High Protein (left) vs Low Protein (Right) Diet (28)

As you can see in the figure above, both groups gained fat free mass (muscle), but the high protein group gained significantly more (the lines showing lean mass gains all point upward, and at a greater slope in the high protein group).

Another study that demonstrated body recomposition through the use of increased protein intake was conducted by Dr. Jose Anontio at Nova Southeastern University. He compared the effects of an already high protein diet (labelled as the "control group") to an even higher protein diet in seventy-three resistance trained individuals.

The control group was instructed to maintain the same dietary habits over the duration of the study. In other words, they were not instructed to consume any specific amount of protein, but rather to continue eating as they normally would. Subjects in the control group were consuming about 0.82-1.05 grams per pound of protein per day on average. When compared to the rest of the literature, this would already be considered a high protein intake. The experimental group was asked to consume a minimum of 1.36 grams of protein per pound each day but were allowed to eat more if they desired. On average, they ended up consuming 1.55 grams per pound each day.

Recall that we prefer to make protein recommendations based on lean body mass to account for differences in body fat. For context on the figures below, also recall our sliding model where we suggest eating between 1.2 - 1.6 grams of protein per pound of lean body mass. After extrapolating the data to account for lean body mass, the 'normal protein' group (which was technically high) was consuming 1.1 grams of protein per pound of lean body mass, whereas the 'high protein' group consumed about 1.88 grams of protein per pound of lean body mass (which is very, very high - even higher than our recommendations).

Interestingly, both groups gained about 3.3 pounds of lean body mass on average. However, the very high protein group lost significantly more fat compared to the control group (-3.52 pounds of fat mass versus -0.66 pounds of fat mass, respectively). This is even more interesting because the very high protein group was consuming more calories per day

(~400kcal more), yet still lost more body fat!

These authors also provided a visual representation of the individual responses of their subjects, which you can see in Figure 8D below. Although both groups lowered their body fat percentage on average, the higher protein group decreased their body fat percentage by more.

As is the case with research, although not every subject experienced body recomposition, perhaps owing to a plethora of other factors including their training, nutrient timing, stress levels, sleep quality, et cetera, the trends clearly indicate that a higher protein intake is better for recomp.

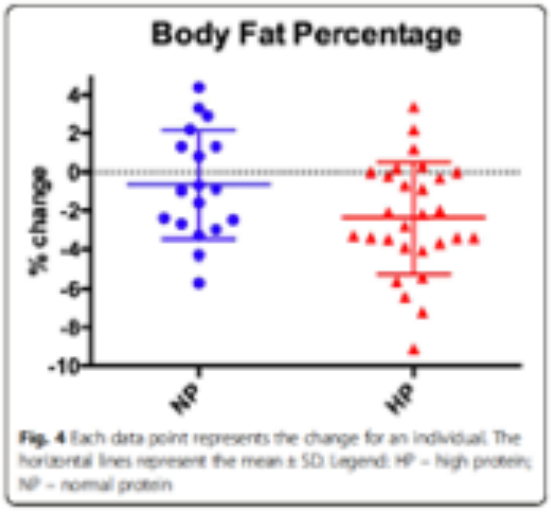


Figure 8D: Individual Body Fat Responses To A Normal Protein (NP) vs High Protein (HP) Diet (Antonio et al, 2015)

After reviewing the literature, including the extrapolation of individual data, combined with our personal experiences as competitive natural bodybuilders and coaches, it should be clear why we recommend a high protein intake range of 1.2-1.6 grams of protein per pound of lean body mass.

We will return to the topic of protein quality when we discuss the different food sources in the following chapter. For now, having covered how much total protein you should eat per

day, let's move onto the remaining macronutrients so you can complete your daily macro targets.

PROTEIN INTAKE SUMMARY:

- Eat 1.2-1.6 grams of protein per lb of lean body mass (LBM).
- Calculate your LBM using your bodyweight and bodyfat percentage (see examples in Tables 6A and 6B)
- Be closer to 1.6 g/lb LBM the leaner you are. Be closer to 1.2 g/lb LBM the more bodyfat you have. (Use Figure 8B as a guide for more specific values)

LOW FAT? LOW CARB? OR NEITHER?

Historically, fats and carbs have both been praised and demonized. Currently, within fitness culture, there seems to be a divide between those who hate carbohydrates and those who hate fats.

Without getting too off-topic over the respective roles of each of these macronutrients in the body, it is important that we not view either nutrient as 'good' or 'bad'. We believe that both carbs and fats play an important role in fueling training performance and driving positive body composition change.

To keep things simple, fats are essential for survival and carbohydrates are not. This means that we must consume dietary fat, whereas our metabolism can adapt to a complete absence of carbohydrate intake by shifting the primary energy source to ketone bodies (a tangent we won't explore in this book). Still, just because we can survive without carbs does not imply that eliminating them from the diet is the most effective route to body recomp.

While carbs may be generally more frowned upon in the current fitness landscape, unfortunately, many folks still assume that dietary fat intake is the root of all body fat storage.

Many people fear that "eating fat will make them fat."

Of course, dietary fat serves many purposes in the human body apart from being stored as adipose tissue, including regulating many metabolic processes, playing a large role in hormonal production, and enabling our bodies to absorb and utilize certain vitamins (A, D, E, & K). Because of the many metabolic pathways that depend on fat availability, it is much more likely that fat-phobia will hinder your body recomposition goals rather than help them. We imagine that something as simple as changing the terminology from dietary fat to dietary lipids and from body fat to adipose tissue might help shift this negative connotation.

We recommend that as long as body recomposition is the goal, one should never eliminate any macronutrient entirely. All three macros should be present in harmony with one another at the appropriate intake for the individual's needs and goals.

HOW MUCH FAT SHOULD WE EAT FOR RECOMP?

The amount of fat you should eat for recomp will depend on three main factors: your current body fat percentage, your activity level and your personal preferences.

We generally advise that 20-35 percent of your total calories come from dietary fat. By ensuring you never drop your fats below 20 percent of total calories, you reduce your risk of becoming deficient in fat soluble vitamins and experiencing negative hormonal side effects such as reduced testosterone.

As we discuss in more detail below in our carbohydrate section, there is a strong relationship between body fat percentage and insulin sensitivity (87). The higher your body fat percentage, the lower your insulin sensitivity. Thus, the higher your starting body fat percentage is, the lower your carbohydrate intake should be. Therefore, we suggest those with higher levels of body fat stay toward the higher end of our recommended range of 20-35 percent of total calories.

Moreover, you should take your activity levels into consideration when determining how much of your caloric intake should come from fats. Those that are more active would benefit from a lower fat intake, as they can more easily utilize carbohydrates for energy, while those with less active lifestyles would be better off with a higher fat and lower carb intake.

For example purposes, imagine there are two identical twins (same height, weight and body comp), but one has an office job where he sits down all day, and the other is a waiter, on his feet all day servings tables (high NEAT). The twin brother with the high physical activity level would likely feel better (in and out of the gym) with a lower fat, higher carb approach. We would suggest that the office twin stay closer to the 35 percent figure for fat intake and the waiter twin stay closer to the 20 percent figure for fat intake.

Lastly, considering personal preferences will ensure you actually adhere to the dietary

plan. If you simply enjoy eating higher fat foods and don't crave carbs that much, your adherence will likely be best on a higher fat diet. In contrast, if you prefer carbohydrates and regularly select low-fat foods, you should take that into consideration when establishing your macronutrient goals.

Once you determine your dietary fat and protein intake, you fill in the remaining calories of your daily goal from carbohydrates.

HOW MUCH CARBOHYDRATE SHOULD WE EAT FOR RECOMP?

Carbohydrates are our bodies' preferred energy source as they are utilized most efficiently (especially for those of us who are not 'fat adapted' or in a state of dietary ketosis). Moreover, carbohydrates are a great tool for improving training performance (6), as plenty of research has shown that extreme carbohydrate restriction can negatively impact strength training (60,63,76).

As noted above, a strong relationship between body fat percentage and insulin resistance has been demonstrated in the scientific literature (21,36,45,68,84,87). This implies that those who carry more body fat have a decreased ability to utilize carbohydrates efficiently.

Thus, they should reduce their total carbohydrate intake and consume a larger percentage of calories from fat. This relationship is why we suggest those of you with higher body fat levels consume fewer carbs and more fats, while those of you who are leaner and have less body fat should consume more carbs and less fat.

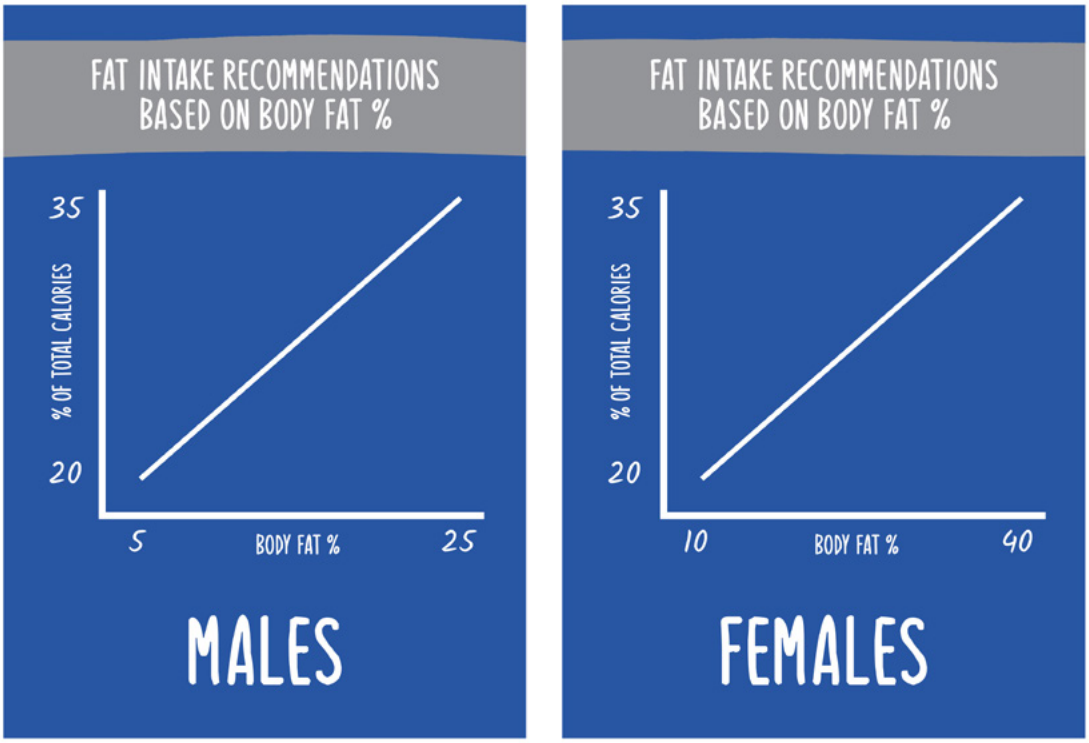


Figure 8E: Relationship Between Fat Intake Recommendations & Body Fat % (Male and Female)

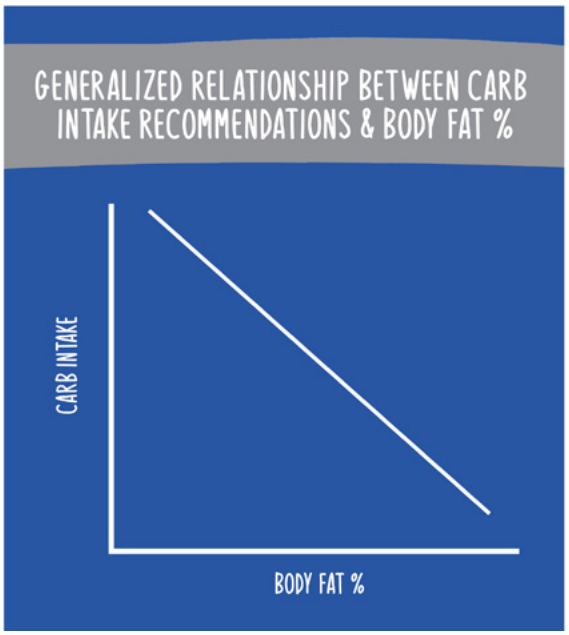


Figure 8F: Generalized Relationship Between Carb Intake Recommendations & Body Fat %. Those with lower body fat percentages should eat more carbs, and vice versa.

Similar to determining dietary fat, it is also important to take into consideration your daily activity level, NEAT, lifestyle, and dietary preferences so as to improve sustainability and adherence when setting up carbohydrate intake.

To conclude macronutrient set-up, several examples are provided for putting the information, evidence and methods provided so far to use.

Before we get to specific examples in the table below, it may be helpful to outline the exact steps from start to finish for calculating your calorie and macro targets for body recomposition.

STEP-BY-STEP GUIDE FOR SETTING UP RECOMP MACROS:

- Step 1: Weigh yourself and calculate your body fat % (via BIA, Skin Calipers, DEXA, or guesstimation)
- Step 2. Calculate LBM: Bodyweight x (0.XX as % of lean mass) i.e. if you weigh 170lbs at 15% bodyfat, you have 85% lean mass. Your LBM would be: 170lbs x 0.85 = 144.5lbs LBM
- Step 3: Estimate your Basal Metabolic Rate (BMR) using the according to Mifflin St. Jeor Formula or (more roughly) bodyweight(lbs) x 10.
- Step 4: Apply the appropriate activity multiplier to determine your theoretical maintenance calories. Alternatively, use a 2 week guess-and-check method to determine maintenance calories.
- Step 5: Determine whether you should be in a caloric surplus, caloric deficit or at maintenance to drive body recomposition. Apply the surplus/deficit to your theoretical maintenance to determine your recomp calorie intake. (Important step!)
- Step 6: Set up your protein intake by multiplying your LBM by 1.2-1.6 (closer to 1.6 the leaner you are).
- Step 7: Determine what percentage of calories should come from fat (20-35%). Closer to 20 percent the leaner you are.
- Step 8: Calculate your fat intake by multiplying your recomp calorie intake by the percentage in Step 7 and dividing by 9. (9 calories per gram of fat)
- Step 9: Calculate your "remaining calories" by subtracting the calories from protein (protein intake x 4) and the calories from fat (fat intake x 9).
- Step 10: Calculate your carb intake from the "remaining calories" by dividing by 4. (4 calories per gram of carbs)

	A	B	C	D	E	F
Experience Level	Beginner	Beginner	Intermediate	Beginner	Intermediate	Advanced
Sex	Male	Male	Male	Female	Female	Female
Age	25	25	18	20	20	35
Height	5'7	5'7	6'2	5'3	5'3	5'5
Weight (lbs)	150	240	200	130	150	145
Body Fat %	10%	30%	14%	25%	35%	22%
Lean Body Mass (LBM) (lbs)	135	168	172	97.5	97.5	113.1
Step 1: Estimate BMR (according to Mifflin St. Jeor Formula)	1624kcal	2032kcal	1997kcal	1329kcal	1420kcal	1354kcal
Step 2: Apply Appropriate Activity Level Multiplier	1.8 x BMR = 1.8 x 1624	1.5 x BMR = 1.5 x 2032	2.0 x BMR = 2.0 x 1997	1.5 x BMR = 1.5 x 1329	1.5 x BMR = 1.5 x 1420	1.8 x BMR = 1.8 x 1354
STEP 3: DETERMINE PREDICTED MAINTENANCE CALORIES	2923	3048	3994	1994	2130	2437
STEP 4: SETTING CALORIE GOAL TO BEST RECOMP (THEORETICAL MAINTENANCE, DEFICIT, OR SURPLUS),	Maintenance to start, lean bulk over time	Deficit (~20% below theoretical maintenance) 3048 x 0.8 = 2438.4kcal	Maintenance	Maintenance	Deficit (~20% below theoretical maintenance) 2130 x 0.8 = 1704kcal	Surplus (~10% above theoretical maintenance) 2437 x 1.1 = 2680kcal
STEP 5: SET PROTEIN INTAKE (1.2 - 1.6G / LBS OF LBM)	1.5 x 135= 202.5 202.5 x 4 = 810kcal	1.2 x 168 = 201.6 201.6 x 4 = 806kcal	1.4 x 172 = 240.8 240.8 x 4 = 963.2kcal	1.35 x 97.5 = 131.6 131.6 x 4 = 526.5kcal	1.35 x 97.5 = 131.6 131.6 x 4 = 526.5kcal	1.5 x 113.1 = 169.5 169.5 x 4 = 678kcal
STEP 6: DETERMINE WHAT % OF TOTAL CALS WILL COME FROM FAT (20-35%)	23	35	25	25	30	25
STEP 7: CALCULATE FAT INTAKE	2923 x 0.23 = 627.29 kcal / 9 = 74g Fat	2438.4 x 0.35 = 853.44 kcal / 9 = 94g Fat	3994 x 0.25 = 998.5 kcal / 9 = 110.9g Fat	1994 x 0.25 = 498.5 kcal / 9 = 55.4g Fat	1704 x 0.3 = 511.2kcal / 9 = 56.8g Fat	2680 x 0.25 = 670kcal / 9 = 74.4g Fat
STEP 8: CALCULATE REMAINING CALS	810 + 627.29 = 1437.29 2923 - 1437.29 = 1485.71	806 + 853.44 = 1659.44 2438.4 - 1659.44 = 778.96	963.2 + 998.5 = 1961.7 3994 - 1961.7 = 2032.3	526.5 + 498.5 = 1025 1994 - 1025 = 969	526.5 + 511.2 = 1037.7 1704 - 1037.7 = 666.3	678 + 670 = 1348 2680 - 1348 = 1332

STEP 9: CALCULATE CARB INTAKE	1485.71 / 4 = 371.4	778.96 / 4 = 194.74	2032.3 / 4 = 508	969 / 4 = 242.25	666.3 / 4 = 166.57	1332 / 4 = 333
FINAL MACROS	75g Fat/ 370g Carb/ 200g Pro	95g Fat/ 195g Carb/ 200g Pro	110g Fat/ 510g Carb/ 240g Pro	55g Fat/ 240g Carb/ 130g Pro	55g Fat/ 165g Carb/ 130g Pro	75g Fat/ 335g Carb/ 170g Pro

Table 8C: Several Examples Of Macronutrient Setups For Body Recomposition

Now that you understand how to set-up your macronutrient targets for recomp, let's reveal how you can further optimize your protein intake by looking at what food sources to focus on in the next chapter.


09

CHAPTER 09

SOLVING THE MYSTERIES OF PROTEIN

"WHEN LIFE GIVES YOU LEMONS, ASK FOR SOMETHING HIGHER IN PROTEIN."
-UNKNOWN

Where should your protein come from?

Ask a typical gym bro and you will likely get a knee-jerk response, "egg whites, chicken or whey protein". Ask a more macro-savvy lifter and they may suggest that it doesn't matter where your protein comes from, as long as you hit your macros.

While we would agree that hitting your daily protein target is the most important factor, it may not be enough to optimize progress on its own. In this chapter we will consider protein quality (Are some protein sources more anabolic per gram?), protein timing (What time of day should you eat protein?) and protein distribution (How should we space our protein intake our across the day?). First, let's look at protein quality.

1. PROTEIN QUALITY: WHAT FOOD SOURCES ARE MOST ANABOLIC?

Are all proteins created equal? In short, no.

Protein quality is typically defined based on its amino acid profile (122). Generally speaking, complete proteins are food sources which provide you with all of the nine essential amino acids. These essential amino acids are exactly what they sound like: essential. We need to consume them in our diet for proper functioning and survival as they play critical roles in various metabolic pathways.

One such pathway we will discuss in detail is muscle protein synthesis (MPS). This process of synthesizing (or building) new muscle protein requires that all nine essential amino acids be present (see Table 9A), since skeletal muscle protein is itself made up of these nine essential amino acids. The same way we cannot build a brick house without bricks, we also cannot build muscle without essential amino acids.

But before we get ahead of ourselves in discussing the makeup of protein, how quality varies from food source to food source and the nitty gritty of muscle protein synthesis, let's take a glimpse at the nine essential amino acids.

ESSENTIAL AMINO ACIDS	NONESSENTIAL AMINO ACIDS
HISTIDINE	ARGININE
ISOLEUCINE *	ALANINE
LEUCINE **	ASPARAGINE
LYSINE	ASPARTATE

METHIONINE	GLUTAMATE
PHENYLALANINE	GLUTAMINE
THREONINE	GLYCINE
TRYPTOPHAN	PROLINE
VALINE *	

Table 9A: The Essential and Non-Essential Amino Acids. * = Branch Chain Amino Acids, ** = Leucine: the key branch chain amino acid for MPS (93)

Since these essential amino acids (EAAs) will ultimately fuel muscle protein synthesis, it's important to focus on consuming high-quality, complete protein sources. Although simply following our total daily protein recommendations outlined in Chapter Eight will almost guarantee that you will naturally consume plenty of complete protein sources with a full spectrum of essential amino acids, we still need to make sure we're optimizing our approach as much as possible. Remember, our goal is to teach you how to get the MOST out of your diet.

VEGAN CONSIDERATIONS FOR PROTEIN SOURCES

The importance of focusing on consuming foods with a full spectrum of EAAs may present a challenge to some vegans. Generally speaking, it can be more difficult for vegans to reach our recommended intake of total protein per day and the quality of protein (based on amino acid profile) from vegan sources is typically lower when compared to animal products.

One potential solution vegans use to overcome the quality problem is to pair two or more incomplete protein sources to create a complete meal. A common pairing of two incomplete food sources to create a complete meal would be rice and beans (lentils).

As you can see in Figure 9A below, rice is an incomplete protein source as it's missing the EAA lysine and lentils are missing the EAA methionine. But when they are paired together in a single meal, it's possible to take in all nine essential amino acids.

So even though rice and beans on their own would be incomplete, when combined, they make a complete meal containing all nine essential amino acids required for muscle building. We demonstrate this in the example below.

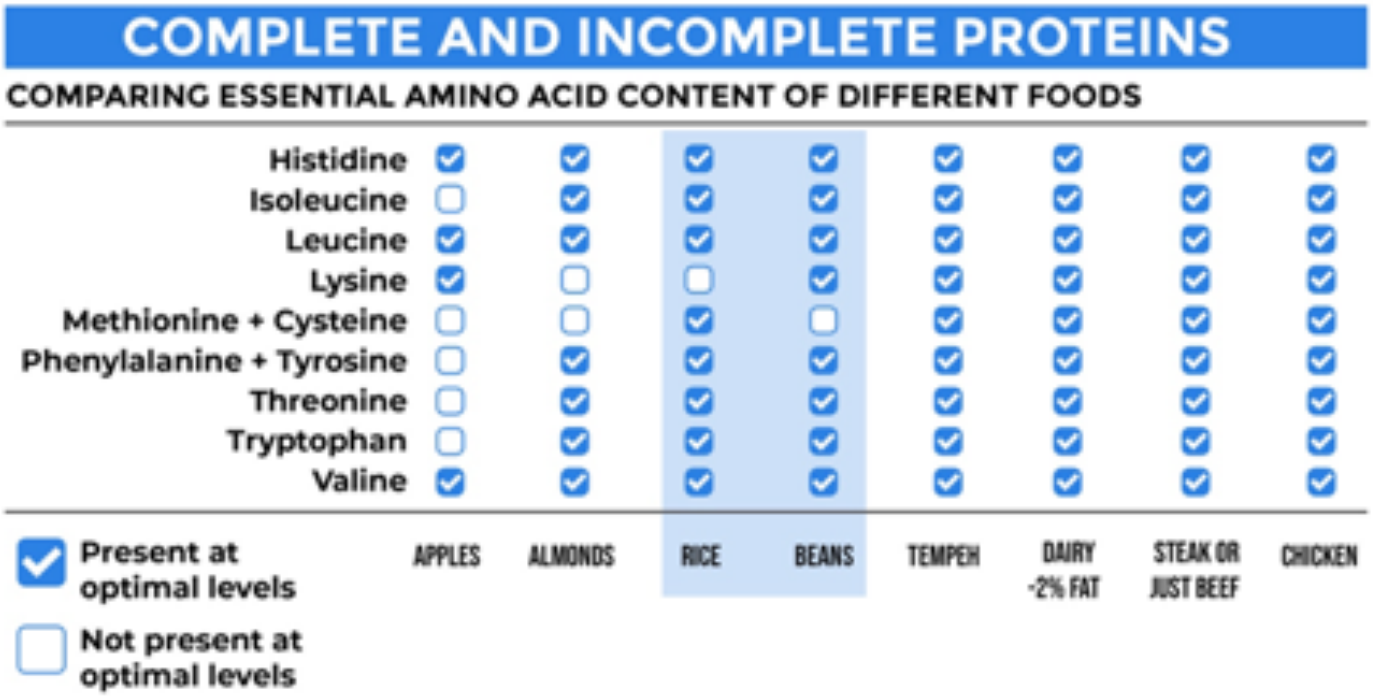


Figure 9A: Essential Amino Acid Content of Complete vs Incomplete Protein Sources

Unfortunately, this strategy still poses a slight problem: the total quantity of amino acids are still generally much lower from vegan protein sources. One serving of rice, as an example, only provides about four grams of protein; not nearly enough to maximize the anabolic response.

But, when combined with one serving of lentils, we get an additional 13 grams of protein. Of course, one must then deal with getting an extra 70 grams of carbs to go along with that protein from these two food sources.

To fully illustrate this, let's quickly compare the difference in amino acid profile and total protein content of one serving of rice and lentils to one serving of chicken breast.

AMINO ACID (MG)	RICE (56G - 2OZ)	LENTILS (56G -2OZ)	CHICKEN BREAST (4OZ)
TRYPTOPHAN	56.6	N/A	302.4
THREONINE	163	506	1092
ISOLEUCINE*	188.2	502	1364
LEUCINE**	368	966	1940
LYSINE	169.6	1096	2196
METHIONINE	100.2	161.8	716
CYSTINE	53.8	514	331.6
PHENYLALANINE	230	680	1028
TYROSINE	166.8	388	872
VALINE*	260	614	1284
ARGININE	338	940	1560
HISTIDINE	113.2	396	804
ALANINE	260	548	1412
ASPARTIC ACID	416	2208	2304
GLUTAMIC ACID	906	1938	3872
GLYCINE	218	492	1272
PROLINE	208	548	1064
SERINE	230	762	888
TOTAL PROTEIN (G)	**4.4454**	**13.2598**	**24.302**

Table 9B: Comparing the Amino Acid Profiles of Vegan (Rice & Lentils) and Animal Protein Sources (Chicken Breast)

As you can see in Table 9B above, the animal source (chicken breast) is much richer in the nine EAAs and the branch chain amino acids (BCAAs). As such, it packs a much more powerful anabolic punch per gram of protein. And even though there certainly are some complete vegan protein sources, unfortunately, most of these foods are still higher in carbohydrates than they are in protein.

Quinoa, for example, receives a lot of praise for being a complete protein, yet contains 70 percent carbohydrate by weight. Further, to get the same twenty-four total grams of protein

that you'd get from a four ounce serving of chicken breast (with ~0g of additional carbs), you'd end up consuming an additional 109 grams of carbohydrates from quinoa.

But don't worry! If you are vegan, not all hope is lost. While it can be more challenging for vegans to hit total protein intakes and consume high protein meals of sufficient quality, it is still doable.

Fortunately, in recent years, many supplement companies have made large strides in improving high quality vegan protein powders with a full spectrum of essential amino acids. We therefore strongly recommend supplementing with a vegan protein blend that uses rice and pea protein as their primary sources. This specific blend has been coined "vegan whey", as it has a comparable amino acid profile to whey protein!

In the early days, these vegan protein supplements would contain high levels of trace carbs, but more recently, supplement companies have been able to drastically increase the total protein by weight. Lastly, and importantly, because these supplemental options are so similar to whey, they are also rich in EAAs, BCAAs, and pack a powerful anabolic punch per gram.

Apart from supplementing a rice and pea protein blend, BCAA supplementation is worth considering for vegans to maximize the protein synthetic response of each meal. Since any complete protein-containing meal will contain all three BCAAs by default, we would not say supplementation is required, but may assist in making the most of each meal, especially if it is naturally lower in total BCAA content.

We suggest that vegans consuming meals naturally low in leucine can optionally consume an additional five grams of BCAAs (2:1:1 ratio) via supplementation with meals (most importantly pre/postworkout) to maximize the muscle protein synthetic response.

WHY ARE BCAA'S SO POPULAR & WHAT PURPOSE DO THEY SERVE?

On the topic of branch chain amino acids (BCAAs), it's no secret that they have become one of the most popular sports supplements on the market. Perhaps this is because the three BCAAs (leucine, isoleucine and valine) have been identified as the key amino acids for initiating muscle protein synthesis (20). Leucine in particular has been shown to be the main amino acid responsible upregulating this process (93). Sounds awesome, right? Well, don't get out your wallet and buy a tub just yet.

DO BCAAS ACTUALLY MATTER?

Yes, and no. Every time you eat a meal, you have an opportunity to maximize MPS and over time, your muscle building potential. Since leucine is responsible for triggering MPS, if you're consuming food sources that are low in BCAAs (especially leucine), you are leaving potential gains on the table.

Generally speaking, the more leucine in a meal the more MPS will be elevated, up to a point. This means that consuming protein sources higher in leucine (such as whey or other animal sources) will increase MPS more. It also means that, assuming you have two meals of equal leucine content, the meal with more total protein will increase MPS more.

However, there is a limit to how much you can crank MPS up. Past this limit, adding more leucine or more protein won't do anything extra for synthesizing new muscle proteins.

Let's illustrate this by way of analogy. Think about turning up muscle protein synthesis (MPS) like turning up the dial on a light dimmer. Just like there is a limit to how bright you can turn up a lightbulb with a dimmer switch, there is a limit to how much you can turn up MPS by consuming more leucine. Turning the dial past maximum brightness won't make the bulb any brighter.

Now we'd like to conceptualize the importance of having both BCAAs and a full spectrum of EAAs in a maximally anabolic meal by using the analogy of a car. In this case, you can think of BCAAs as the key to the car. The key is required to turn on the vehicle (just as BCAAs are required to turn on MPS) and gasoline is the fuel source required to keep the car running (just as EAAs are required to keep the muscle building process going).

Therefore, while BCAAs do play an important role in getting the muscle building process started, we cannot simply consume BCAAs on their own and expect to build new muscle. For this reason, we recommend consuming foods high in BCAAs and EAAs and, except for in the case of some vegan exceptions, recommend against BCAA supplementation.

This isn't because additional BCAAs will hinder the muscle building process, but rather that they most likely won't actually help a diet already high in protein build any extra muscle (remember the dimmer analogy) (41).

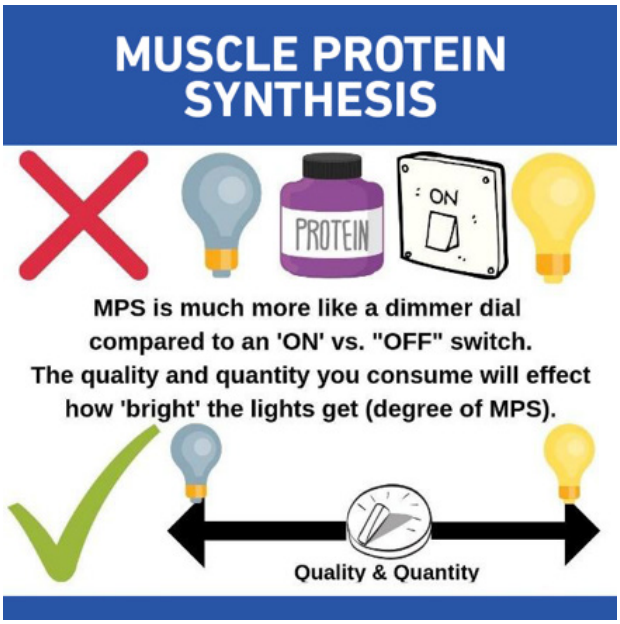


Figure 9C: Comparing Muscle Protein Synthesis To A Dimmer Dial

SUGGESTED PROTEIN SOURCES

Below are a list of high quality, protein rich foods that we recommend including in your diet regularly. These foods were selected based on the completeness of their amino acid profile and total leucine content.

Because we endorse a flexible approach to nutrition, you do not need to restrict yourself to only these foods. It is also important that you track protein intake from all food sources, including those with trace or incomplete proteins and those not included on the list below.

PROTEIN SOURCES LIST:

Whey Protein

Eggs

Egg Whites

Meat (Chicken, Beef, Pork, Turkey, Elk, Game, etc)

Fish (all kinds)

Dairy (i.e. yogurt, cheese)

Vegan Protein Powder (Rice + Pea Blends)

Soy Protein Isolate

Seaweed, Spirulina

2. PROTEIN DISTRIBUTION: HOW SHOULD WE SPACE OUT OUR PROTEIN THROUGHOUT THE DAY?

Now that we have established what sources of protein are best for maximizing muscle growth, it is important to consider how we should distribute that protein throughout the day.

HOW MUCH PROTEIN CAN WE ABSORB IN ONE MEAL?

A popular nutrition myth is that you can only absorb X amount of protein in one sitting. Some people say 20 grams, some say 30 while others say 40. They argue that if you eat more than this amount in a single sitting, the rest simply goes to waste.

Let's clarify from the outset that we think this is a massive oversimplification. First of all, you technically can absorb an enormous amount of protein in a single meal, since absorption simply refers to the passage of nutrients from the intestine into the blood. You could eat 300 grams of protein or more in one sitting and absorb all (or almost all) of it just fine.

What people really mean when they ask this question is, "How much protein can be used in a single meal for building muscle?" In order to answer this question, we need to look at what the scientific evidence has to say.

As it turns out, early studies actually supported the idea of the maximum amount landing somewhere in the 20-25 grams per meal range. Two studies showed that 20-25 grams of a high-quality protein source such as whey protein was enough to maximize post-workout muscle protein synthesis (90,137) and another study comparing 20 grams to 40 grams of

protein found no difference in muscle protein synthesis between the two (136). At the time, this data seemed to imply that anything over 20 grams of protein in a single meal wouldn't do anything additional for building muscle.

However, if we peel back a layer on this early research, we can see that the results may not apply to those of us seeking body recomposition, as their training protocols were far too basic. For example, subjects in these early studies would only perform one exercise for one muscle group, eat their post "workout" (note the quotation marks) protein and then have the anabolic response of their muscle measured. When was the last time you went to the gym, did four sets of leg extensions and called it a full workout? Hopefully, never. Us neither.

To address this potential flaw, in 2016, another group of researchers designed a new and improved study with a training regimen more relevant to what the typical lifter would actually do in the gym (80).

Rather than doing a few sets for one muscle group and calling it a day, these subjects performed a full body workout including the bench press, leg press, lat pulldown, et cetera. After the workout, the researchers compared the MPS response of 20 grams of whey protein versus 40 grams.

In contrast to the earlier studies, this time, 40 grams of whey did significantly increase MPS compared to 20 grams. This data opened up the idea that maybe the upper limit of how much protein can be used in a single meal for building muscle may be higher than previously thought, depending on how you train.

"Line represents the mean for each condition. Mean ± SD of myofibrillar FSR following the ingestion of 20 and 40 g whey protein isolate for both groups combined (B). *Significant difference between doses with all participants of each group combined (P = 0.005). FSR was determined over the 0–5 h period following protein ingestion."

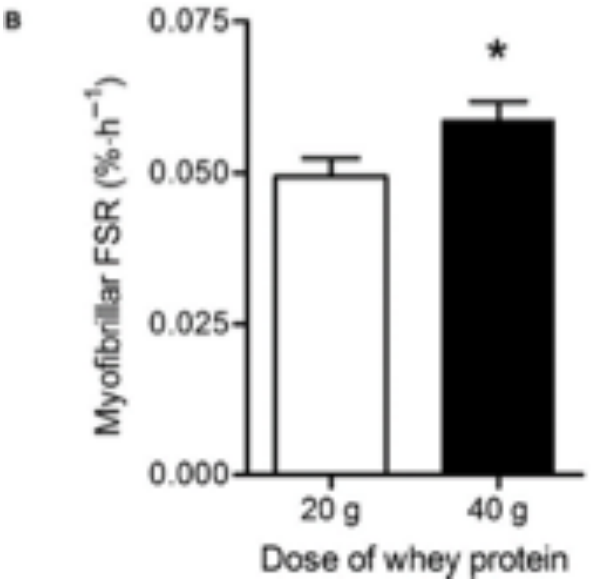


Figure 9C: 40g Of Whey Protein Is More Effective Than 20g At Increasing FSR/MPS (80)

This should make intuitive sense because if you only train one muscle (or do a very low volume session), you won't break down nearly as much muscle during the workout as you would by doing a high volume full body training session. As such, you would not expect to utilize as much protein in a single post-workout meal after the low volume protocol.

The amount of protein needed to recover from an intense leg day is likely more than what is needed after a quick arm-pump. So how much protein you can utilize in a single meal seems to depend on the type of training you do, with higher volume sessions involving more total muscle, utilizing more protein per meal.

How much protein you need per meal also depends on how much total muscle mass you have. For example, a 120 pound female will require less total daily protein than a 180 pound male, but will also be able to utilize less protein per meal for building new muscle.

As you can see, how much protein you can utilize in a single meal for building muscle depends on a variety of factors, including your training style and muscle mass. The more muscle you train in a workout and the more total muscle you have, the more protein you should be able to utilize per meal.

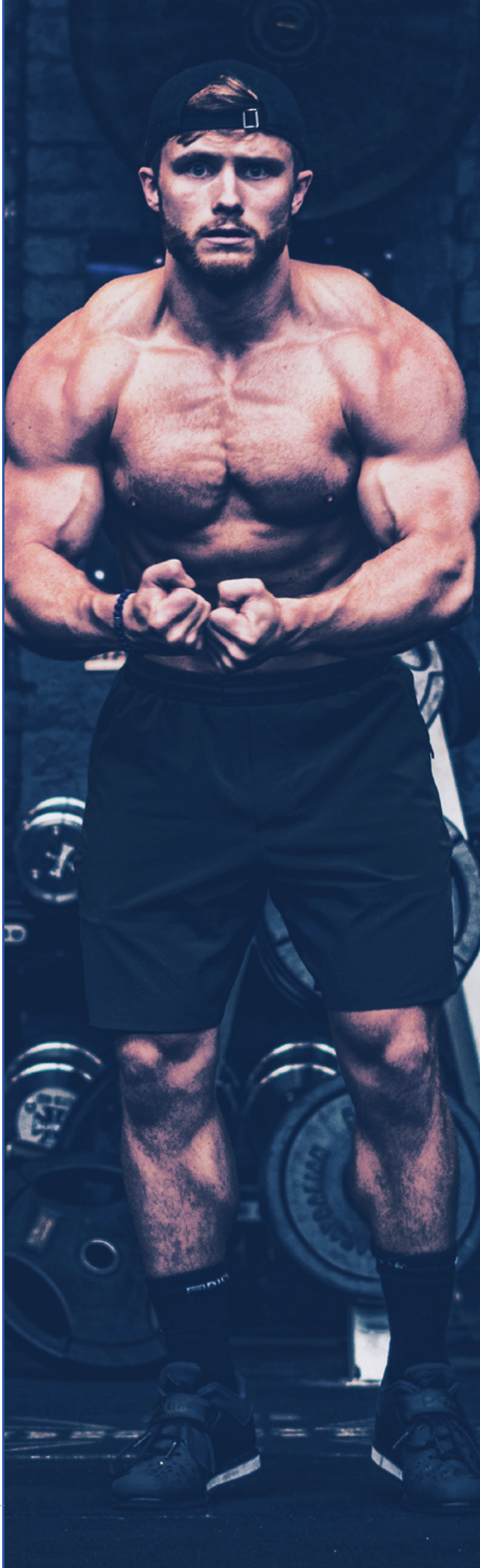
With the research background and individual factors in mind (training style and total muscle mass), let's turn to practical calculations for determining exactly how much protein YOU should be eating per meal.

HOW MUCH PROTEIN SHOULD WE EAT PER MEAL?

As mentioned previously, while we need a full spectrum of essential amino acids in order to actually build new muscle tissue, the branch chain amino acid leucine is the primary trigger (key) for sparking new muscle growth (MPS). If we are going to answer the question of how much protein we should eat per meal, it is important therefore to know how much leucine we should eat per meal. If we can determine the maximum amount of leucine (past which extra leucine doesn't add extra MPS) then we can figure out how much protein we would need from leucine-rich food sources to maximize the MPS response of any given meal.

Luckily for us, one of the world's most renowned protein researchers has discovered what that leucine threshold in humans seems to be. As we sift through Dr. Stuart Phillips' data and findings, we encourage you to not get too caught up in the numbers.

It isn't important that you know the exact leucine content of every meal in order to know how much



protein to eat per meal (that would drive us crazy too!). We are simply outlining all of the data to show clearly where our recommendations are coming from. If you prefer to skip to the bottom line, you may check out the "Main Takeaways for Protein Distribution" at the end of this section. For the rest of us, let's carry on.

Dr. Phillips reported that 0.045 grams of leucine per kilogram of body weight (0.0205g/lb) per meal is the amount needed to optimize muscle protein synthesis (99). For example, if you weigh 170 pounds (~77kg), you would need about 3.5 grams of leucine per meal to maximize the protein synthetic response. If you weigh 125 pounds (~55kg), you would need about 2.5 grams of leucine per meal to maximize the MPS response. For this person, 2.5 grams of leucine could be referred to as her leucine threshold.

Adding more leucine to this meal (either through more protein or a scoop of BCAAs) would be like turning the dimmer dial past the light bulb's maximum brightness. You can turn the dial further, but it isn't going to make the bulb any brighter.

With this information in mind, let's have a look at the graph below comparing multiple food sources and how much of each would be necessary to consume 2.5 grams of Leucine.

FOOD SOURCE	SERVING SIZE	LEUCINE (G)	TOTAL CALORIES
WHEY PROTEIN ISOLATE	23G	2.5	92
SOY PROTEIN ISOLATE	31G	2.5	125
SKIM MILK	374 ML (3.7 SERVINGS)	2.5	333
BEEF (RAW WEIGH	142G	2.5	391
WHOLE WHEAT BREAD	641G	2.5	3462
CHICKEN (RAW WEIGHT)	142G	2.5	147
PEANUTS	149G	2.5	876
GREEK YOGURT	250G	2.5	143
EGGS	4.6 EGGS	2.5	321

Figure 9D: Servings of Different Foods Required To Reach 2.5g of Leucine

The above figure is intended to show how much of various foods a 125 pound individual would have to eat per meal in order to maximize the MPS response of that meal. It should be clear that how much protein you need per meal, will depend in part on what foods that protein is coming from.

Although it's smart to have an idea of what foods are high in leucine and be aware that not every 20-30 gram source of protein will have the same anabolic power (see our Protein Sources List for suggestions), we certainly do not expect you to determine the leucine content of every food and then use that to calculate how much protein you should eat in each meal.

In fact, as you will see in the examples below, if you simply focus on hitting your total daily protein target, primarily choose food sources from our Protein Sources List and consume four to six evenly spaced meals per day, you will maximize the anabolic potential of each meal by default.

With the above theory in mind, let's look at two examples of how much protein from various food sources that different individuals would need per meal to maximize muscle protein synthesis. Let's roll with two of our mock subjects from Chapter Six. This time we'll call Subject C, Charles and Subject F, Florence.

CHARLES	FLORENCE
INTERMEDIATE	ADVANCED
MALE	FEMALE
AGE - 18	35
HEIGHT - 6'2	5'5
WEIGHT – 200 LBS	145 LBS

Table 9C: Two Example Subjects And Their Stats

EXAMPLE 1: CHARLES

Let's figure out how much protein 200 pound Charles should eat per meal, based on his stats above. Charles' macro targets are set at 110 grams Fat/ 510 grams Carb/ 240 grams Pro.

Using Dr. Stuart Phillip's 0.045 g/kg/meal "leucine threshold," we can calculate how much protein Charles would need per meal to maximize MPS. Charles's "leucine threshold" calculation: 90.9kg x 0.045 = 4.09 grams of leucine per meal to maximize MPS.

Knowing the leucine content of various protein sources, we can now calculate how much protein Charles would need to eat from each food to hit 4.09 grams of leucine. To maximize the anabolic potential of each meal, he would need to eat 37 grams of whey, 8.29oz Top Round Beef, 8.29oz Chicken Breast, 7.5 whole eggs or 51 grams of soy protein isolate.

8.29OZ CHICKEN = 228 CALORIES, 51G PRO, 4.09G LEU
8.29OZ TOP ROUND BEEF =394 CALORIES, 51G PRO, 4.09G LEU
7.5 WHOLE EGGS = 525 CALORIES, 45G PRO, 4.09G LEU
51G SOY ISOLATE = 172 CALORIES, 41G PRO, 4.09G LEU
37G WHEY ISOLATE = 142 CALORIES, 31G PRO, 4.09G LEU

So as you can see above, all of these protein servings have the same anabolic power in the amounts given (since they have the same total amount of leucine and a complete essential amino acid profile). Notice that the amount of protein needed ranges from 31 grams to 51 grams.

Generally speaking then, Charles should aim to consume about 30-50 grams of protein per meal, depending on what food source he's eating.

However, calculating the leucine content of every meal would be annoying and impractical, so the best approach would be to evenly distribute his total protein goal of 240 grams per day across five meals. In doing so, he gets about 48 grams of protein per meal and is pretty much guaranteed to maximize the muscle protein synthetic response each time.

EXAMPLE 2: FLORENCE

Using one more example, let's figure out how much protein 145 pound Florence should eat

per meal based on her stats in Table 9C above. Florence's macro targets are set at 75grams Fat/335grams carb/ **170grams pro.**
Again, using Dr. Stuart Phillip's 0.045 g/kg/meal "leucine threshold" we can calculate how much protein Florence would need per meal to maximize MPS. Florence's leucine threshold calculation: 65.9 x 0.045 = 2.97 grams of leucine per meal to maximize MPS.

2.97 grams of leucine can be found in 27 grams of whey, 6oz Top Round Beef, 6oz Chicken Breast, 5.5 whole eggs or 36 grams of soy protein isolate.

Therefore, based on the range above, Florence should aim to consume anywhere between 24-38 grams of protein per meal, depending on the food source. The best and most practical approach for her would again be to simply evenly distribute her total protein intake across five meals, each containing about 34 grams of protein.

HOW MANY MEALS SHOULD I EAT PER DAY?

As you can probably tell from the examples above, we generally recommend splitting your protein up across multiple meals per day so as to maximize the anabolic potential of each meal. From an optimization standpoint, we believe that spreading protein intake more evenly throughout the day will have a better effect on both maintaining and building muscle than skewing your protein intake to be eaten in just one or two massive meals.

Of course, simply reaching your total daily protein target is still the most important thing, but may not be enough to maximize results. Theoretically speaking, since there is a maximum threshold for upregulating MPS in one feeding, increasing the frequency of feedings (up to a point) should enhance muscle building capabilities. Let's have a look at what science has to say.

One group of researchers (9) looked at the effect of splitting a high protein diet across three meals per day versus six meals per day on body composition. To determine whether there was a difference between being in a caloric deficit or at caloric maintenance, they had

subjects eat at caloric maintenance for 28 days and then put them in a 25 percent caloric deficit for 28 days.

Group 1 - Traditional (low protein) diet: 3 meals per day, macro ratio: ~24% fat/61% carb/16% pro

Group 2 - High protein diet: 3 meals per day, macro ratio: ~22% fat/45% carb/34% pro

Group 3 - High protein diet: 6 meals per day, macro ratio: ~22%fat/45%carb/33%pro

During the first 28 days at caloric maintenance, both high protein groups achieved body recomposition and during the 25 percent caloric deficit phase, all groups lost weight. However, the high protein group that ate six meals per day (Group 3) saw the greatest decrease in body fat percentage (2.8 percent), abdominal fat, and was the only group that gained lean body mass from start to finish (1.32 pounds)!

This may be in part due to these subjects getting to stimulate muscle protein synthesis six times per day vs only three times per day. It is also important to note that these male and female subjects were either overweight or obese; not well trained, athletic subjects.

Despite this potential limitation, the study's control (9) was fantastic. Unlike many other studies based on dietary recall (which significantly increases error and lack of validity (53,97)), this study provided a seven day menu plan to all participants for the entire 62 day intervention.

We believe this study counts as evidence for the idea that consuming more than three protein-containing meals per day may be more anabolic than consuming three or fewer meals per day.

INTERMITTENT FASTING

The above theoretical discussion may pose some challenges for those of you practicing intermittent fasting.

So everyone is on the same page, intermittent fasting (IF) is a dietary practice in which you extend your fasting period, thus consuming fewer meals per day. This can come in more extreme forms such as having only one meal per day and less extreme forms such as having an eight hour eating window, which ultimately amounts to just skipping breakfast. The less extreme version, for example, might involve having three or four meals from 12pm-8pm and then fasting for the remaining 16 hours of the day.

While it should be clear from the above discussion that we do not think IF is the best way to optimize a body recomposition plan, it can certainly still work as long as total macronutrient targets are reached and training performance is not hindered.

Still, based on the data above, we suggest that if you are going to use intermittent fasting as an adherence tool on your body recomposition journey, you use the less extreme version that avoids very long fasts, coupled with very short feeding windows.

Furthermore, if using intermittent fasting, we recommend that you still try to space your protein out more evenly across your eating window.

For example, if you were restricting eating from 12pm-8pm, you could eat a serving of protein at 12pm, 3pm, 5pm, and 8pm so that you still stimulate MPS four times per day. Additionally, you can take advantage of different digestion rates to further mitigate the potential catabolic effects of fasting. For example, for your last meal at 8pm, you could consume a slow digesting protein source (such as beef or casein) as part of a high fiber meal so that protein digestion and absorption of amino acids extends well into the fasting period. We will address this in more detail in the next section on specific protein timing.

MAIN TAKEAWAYS FOR PROTEIN DISTRIBUTION:

To maximize the anabolic response of each meal, we suggest splitting your total protein intake across 4 to 6 high-protein meals per day, spaced by roughly 3-5 hours between meals

(besides your overnight fast, when you're sleeping (i.e. 6-9 hours)). Note that "meals" can also include protein shakes/meal replacements.

3. PROTEIN TIMING: WHEN ARE THE IMPORTANT TIMES TO EAT PROTEIN?

In the previous section, we outlined why it is wise to space your protein out somewhat evenly throughout the day. Next, we are going to answer the question of whether or not there are specific times during the day when it is more important to consume protein. For example, is it important to consume whey protein after training? Should we eat a slow-digesting protein before bed?

First, it is important to acknowledge that if you are already hitting your total daily protein targets and eating four to six high-protein meals per day, the specific timing of those meals is of relatively less importance. We believe that the exact times that you eat your meals can be dictated largely by personal preference, scheduling and your own biofeedback signals (such as hunger and satiety).

We do not recommend force-feeding just because "it's time to eat!" We also do not recommend impatiently waiting by the clock for the appropriate amount of time to pass before you eat your next meal. These habits can be destructive to dietary adherence and lifestyle balance over time and may eventually lead to a negative relationship with food.

With that said, physiologically speaking, different protein sources and food combinations will have different rates of digestion, which can impact when they are most ideally consumed.

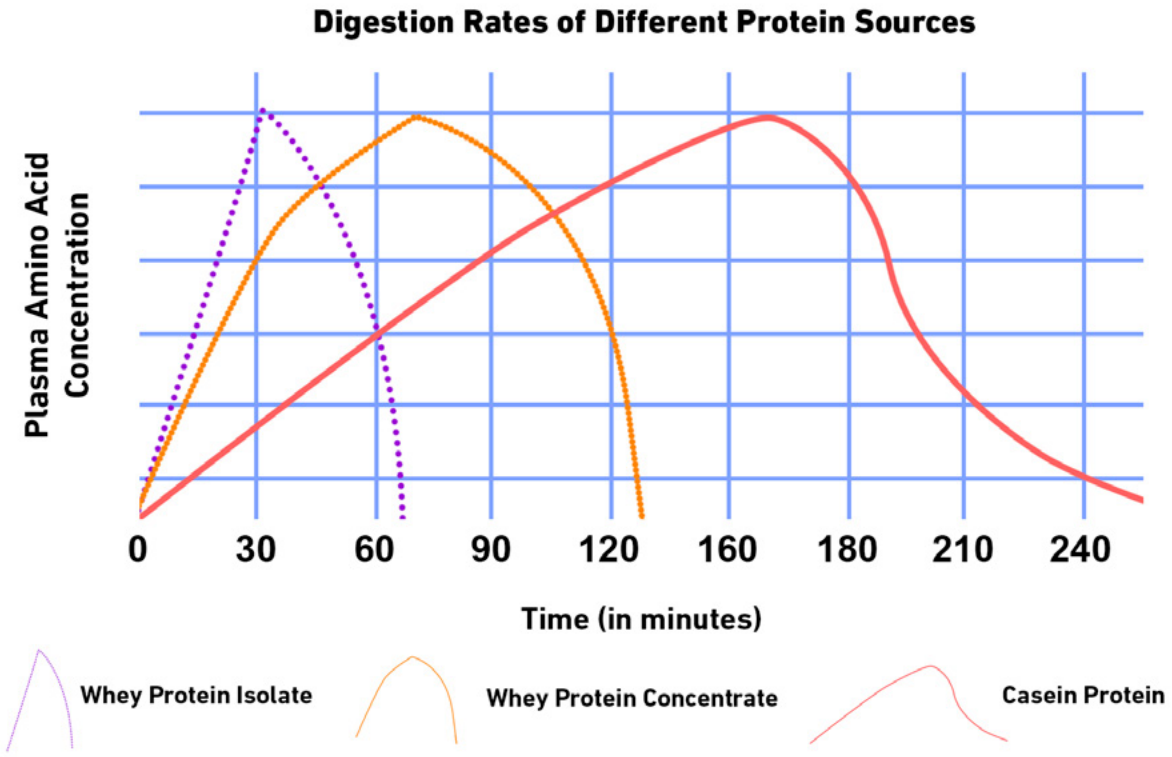


Figure 9E: Rates of Digestion for Different Protein Sources

As you can see in the figure above, different proteins have different digestion rates because of differences in the structure of the protein itself. Whey protein, for example, is digested

very quickly, resulting in a rapid influx of amino acids into the bloodstream. For this reason, it has been heavily marketed as a post-workout supplement.
On the other hand, casein (another protein found in milk) digests much more slowly, providing a slower, steady drip of amino acids into the bloodstream. For this reason, casein protein powders have been heavily marketed as a pre-bed protein source.

As we will explain in Chapter Eleven, while there is nothing particularly urgent about consuming a fast-digesting protein immediately after training and while consuming a slow-digesting protein before bed is certainly not as important as hitting total protein intake, specific timing strategies are still worth considering as you organize your meals throughout the day.

For example, because cod fish has a faster digestion rate than steak, a meal containing six ounces of cod with white rice will digest more quickly than six ounces of beef with white rice. However, because increasing the fiber and fat content of any meal will slow digestion rate, if you were to add fibrous vegetables and butter to either meal, the digestion rate would decrease.

You can use these timing principles to your advantage when expecting to go longer durations without food (such as before bed or if you need to skip a meal). For example, you can extend the anabolic response of any meal by eating protein sources with slower digestion rates or by consuming meals that are higher in fat and/or fiber.

For this reason, we recommend consuming both a high quality and high quantity of protein before bed so as to maximize your muscle building and recovery potential as you sleep. You can slow the digestion rate of the pre-bed meal by simply eating more protein, choosing a slower-digesting protein such as casein or steak and/or by adding a serving of vegetables or some fats before hitting the hay.

A NOTE ABOUT FAT

Rather than devote an entire chapter to fats, we have decided to instead leave a note here reminding you about why fats are important.
While fats are essential for survival and can positively impact your health in many ways, we think they have a relatively smaller role in optimizing body composition than protein and carbohydrates.

As we have seen, protein is responsible for building new muscle protein, promoting an increased feeling of satiety and increasing dietary thermogenesis. As we will see in the next chapter, carbohydrates play a central role in fueling training performance, which will ultimately drive muscle growth. With that said, fats still play several key roles on our path to body recomposition.

Because fats, such as cholesterol, make up the building blocks for steroid hormones, dietary fat plays a crucial role in regulating natural levels of several anabolic hormones, including testosterone. A diet low in overall fat intake has also been shown to suppress testosterone levels and as a result may hinder the muscle building and fat loss process (127).

Furthermore, omega-3 and omega-6 fatty acids are essential nutrients responsible for regulating several metabolic processes, including inflammation, which may have implications for recovery from training. For this reason, we recommend consuming one or two servings of fatty fish per week or consider fish oil supplementation (see Chapter Thirteen for details). All fat-soluble vitamins also require dietary fat to facilitate absorption. Since deficiency in these vitamins can lead to health and recovery problems, it's clear that eating sufficient dietary fat is central to proper health and performance.

Because the biochemical complexities of dietary lipids are beyond the scope of this book and are not likely to have any practical relevance for body recomposition, we will end this short section with a reminder that not all fats are created equal and it would be short-sighted to avoid dietary fat out of fear of having them "make you fat". We also suggest that you limit and avoid trans-fats whenever possible because of their negative impact on heart

health (91).

Other than these clarifications, we suggest that you focus your attention on hitting your total daily fat intake, take into account pre- and post-workout considerations in Chapter Eleven and use a variety of the suggested fat sources below to balance out your meals.

SUGGESTED FAT SOURCES

Below are a list of fat-rich foods that we recommend including in your diet regularly. Because we endorse a flexible approach to nutrition, you do not need to restrict yourself to only these foods. We encourage you to eat a variety of foods and there are no foods that are off-limits (just some that are better reserved for moderation).

We recommend an 80/20 rule when it comes to food selection: ensure at least 80 percent of your fats are coming from whole, minimally processed foods such as those below. The other 20 percent can be filled in with foods you personally enjoy or find convenient.

FAT SOURCES LIST:

- salmon and other fatty fish (or fish oil supplements)
- whole eggs
- seeds (flax, chia, etc.)
- nuts (walnuts, almonds, macadamia nuts, peanuts, etc.)
- nut butters (peanut butter, almond butter, etc.)


10

CHAPTER 10

SOLVING THE MYSTERIES OF CARBOHYDRATES

"THE THREE MOST HARMFUL ADDICTIONS ARE HEROIN, CARBOHYDRATES AND A MONTHLY SALARY."-NASSIM NICHOLAS TALEB

In the previous chapter, we discussed why protein quality and distribution matter for maximizing progress. In this chapter, we will cover the same ground with respect to carbohydrates.

Carbohydrates are a non-essential macronutrient. Unlike protein and certain fats, you can technically survive without eating any carbs for the rest of your life. Carbohydrates also do not have the same anabolic properties as protein, since they do not directly impact muscle protein synthesis.

Despite this, carbohydrates still play a crucial role in the body recomposition process by fueling training performance, which will ultimately drive muscle growth. Different types of carbohydrates can also differentially impact things like hunger, digestion and mood state -

all of which we will unpack in this chapter.

THE BEST CARB SOURCES FOR RECOMP

Recall how we previously emphasized that not all proteins are created equal. In this chapter, we begin by saying, neither are all carbohydrates!

Let's be clear about what we're saying here. For simple weight loss purposes, you can certainly treat "a carb as a carb" and the caloric deficit will take care of the weight loss. Swapping brown rice for Gatorade, for example, may not significantly affect your weight loss progress, but, such a swap may very well negatively impact other variables like your training performance and your adherence to the diet protocol.

We encourage you to view carbohydrates neither in a black and white fashion (as good carbs or bad carbs), nor as being completely equal. Therefore, we want to expose why there are many shades of grey, so to speak.

Before digging into the best carb sources for fueling training, it is important to understand the basic carbohydrate science from a structural standpoint so that we can all achieve a better understanding of our practical recommendations.

All carbohydrates have a few things in common: They are all made up of carbon, hydrogen and oxygen atoms (hence the name Carb-OH-hydrates), they all hold about three grams of water per gram when stored as muscle glycogen and they all taste amazing (for the most part).

Carbohydrates can also be categorized in several different ways. For our recomp purposes here, we will focus on two such categorizations: simple versus complex carbs and high glycemic versus low glycemic carbs.

SIMPLE VS COMPLEX CARBS

The phrase “simple carbs” implies exactly what it sounds like: They are the smallest and simplest types of carbohydrates. For the most part, they make up what we collectively call sugars.

There are many different types of sugars. The simplest of all are the mono-saccharides. The prefix mono means alone and saccharide is science-speak for sugar. There are only three of these sugars that exist on their own: glucose - our body’s primary energy source under normal circumstances (6,19,48), fructose - as found in fruit and galactose (the sugar type mostly found in milk products).

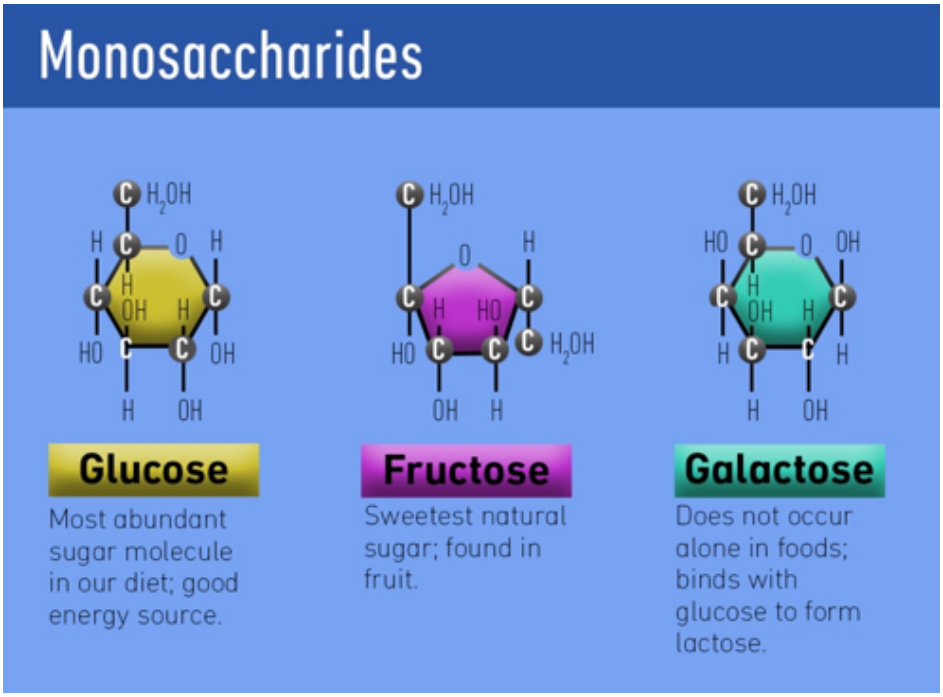


Figure 10A: Simple Carbs - The Monosaccharides.

In certain foods, these monosaccharides link up with one another to form sugar pairs called di-saccharides. As you might guess from the di prefix, this involves two of the sugars above linking together to form a slightly bigger type of sugar (see Figure 10B below for examples). We still classify these sugar pairs as simple carbs.

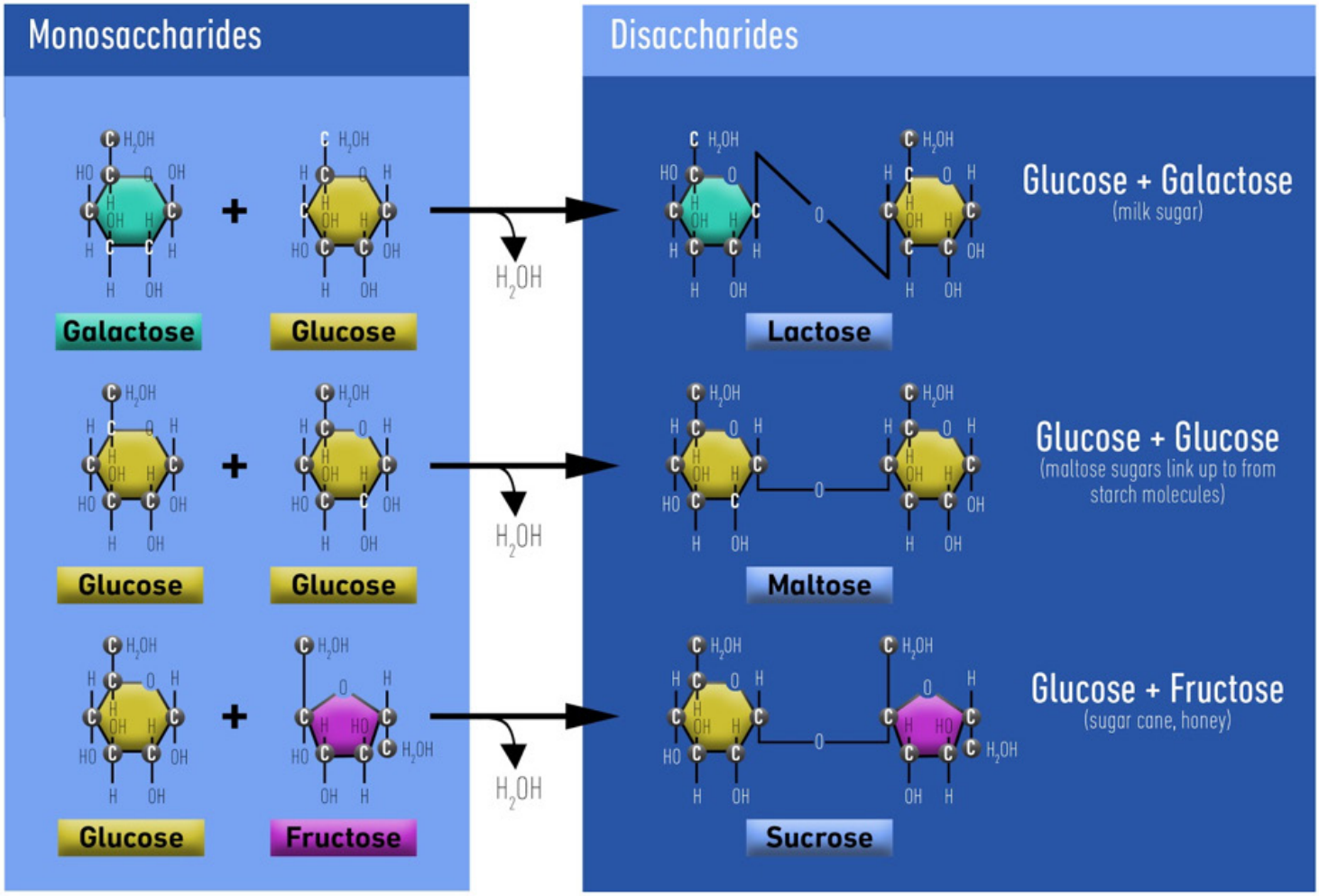


Figure 10B: Simple Carbs - The Disaccharides

While you do not need to understand all of the underlying chemistry to know what foods to eat, it is important to have a fundamental grasp on what makes a simple carb," simple. "Because simple carbs are so small, they can be absorbed very quickly and without significant digestion.

This will be important later, when we discuss pre, intra and post workout nutrition in Chapter Eleven. Examples of simple carbs include: candy, table sugar, the sugar found in milk and the sugar found in fruit (although there are also complex carbs in fruit).

Complex carbs, on the other hand, are much bigger and bulkier. They are made up of chains of simple sugars linked together. These complex carbohydrate chains are referred to as poly-saccharides (poly, referring to many and saccharide, indicating sugar).

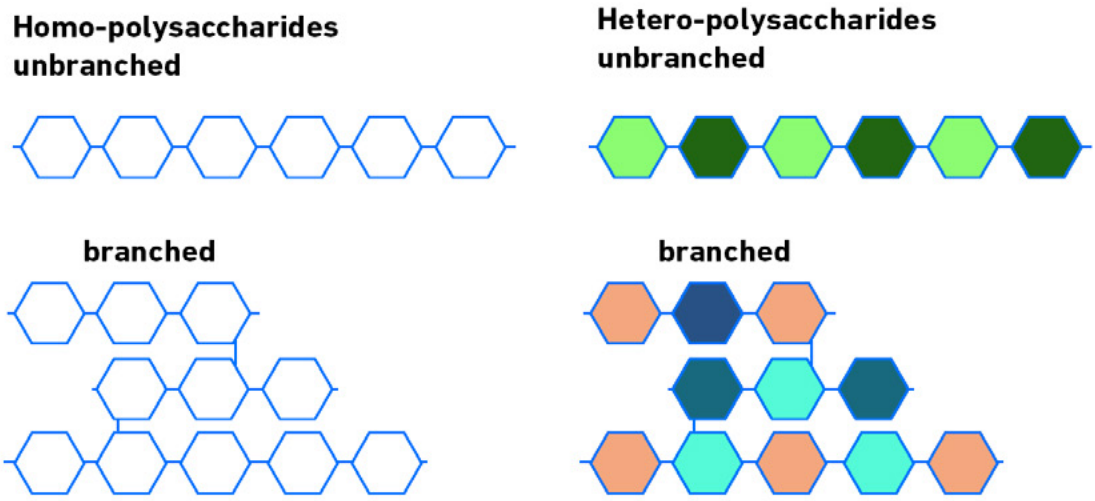


Figure 10C: Complex Carbs - The Polysaccharides

Because complex carbs are so large and often branched, they must be broken down (digested) into their smaller, simple components before they can be absorbed and used for energy. This has two important implications: Complex carbs are absorbed more slowly, over a longer time frame - something to keep in mind for later when we discuss carb timing in Chapter Eleven - and complex carbs have a higher thermic effect (recall from Chapter Four that the thermic effect of food refers to how many calories the body burns to break down that food).

Examples of complex carbs include whole grains, vegetables, legumes, rice and pasta.

UNTANGLING FIBER

Some foods that are high in complex carbohydrates also contain fiber (a type of polysaccharide). Fiber is important to mention because it has profound impacts on gut functioning.

From a recomposition perspective, foods higher in fiber will assist with regular bowel movements. This can help improve nutrient absorption and prevent inconsistent weigh ins, resulting in more accurate recomp tracking. Fiber also promotes a healthier gut in general. Insoluble fibers (found in whole grains, beans, potatoes and many fruits) are transformed into short chain fatty acids by our gut's microbes, which confer a multitude of health benefits

(102).

Despite fiber having many health benefits, there can be too much of a good thing. Excessive fiber intake can lead to bloating, poor nutrient absorption and irregular bowel movements. For these reasons, we recommend keeping fiber intake between 25 and 75 grams per day.

The higher your total carb intake, the higher your fiber intake should be. Use the figures below for approximate daily carb intake as a rough guideline for determining daily fiber intake.

<200G CARB: ~25G FIBER
200G CARB: ~35G FIBER
300G CARB: ~45G FIBER
400G CARB: ~55G FIBER
500G CARB: ~65G FIBER
600G CARB: ~75G FIBER

Before making specific food recommendations, let's quickly look at another carbohydrate property worth considering: the glycemic index.

GLYCEMIC INDEX

The glycemic index has been the source of a lot of unnecessary dietary confusion. Many people seem to think that high-glycemic carbs are the "bad carbs", destined to be stored as body fat the second they touch your tongue. Low-glycemic carbs on the other hand, are often referred to as the "good carbs", hoarding all the health and performance benefits foods can offer.

While there are important relevant differences between these carb types, we encourage you to avoid black and white thinking on this topic and recognize that both types can be useful depending on context.

To keep it simple, the glycemic index (GI) is a measure of how much a given food impacts blood sugar levels on a scale of 1-100. The higher the number, the more eating that food will raise blood sugar.

	GLYCEMIC INDEX
High Glycemic	> 70
Medium Glycemic	55-69
Low Glycemic	< 55

Table 10A: High, Medium and Low Glycemic Values

Common Carbohydrates (Glycemic Index)

Low (<55)	Medium (56-69)	High (>70)
Grapefruit (25)	Ice Cream (57)	Sweet Potato (70)
Kidney Bean (29)	Grapes (59)	Whole Wheat Bread (71)
Wheat Tortilla (30)	Corn on the Cob (60)	White Rice (73)
Yogurt (33)	Hamburger Bun (61)	Gatorade (78)
Apple (39)	Honey (61)	Pretzels (83)
Orange (40)	Banana, Ripe (62)	Baked Potato (111)
100% Whole Grain Bread (51)	Raisins(64)	Baguette, White (95)
Quinoa (53)	Couscous (65)	Glucose / Sugar (100)

Table 10B: The Glycemic Index of Common Foods

It's important to note that the values in Table 10B only apply when these carbs are eaten on their own. The glycemic response of a full meal depends not only on the carb source in the meal, but everything else on your plate.

White rice, as an example, is considered a high-glycemic carb source on its own but can you think of the last time you ate a plate of white rice by itself? Chances are, you will be combining that white rice with a protein source, such as steak and (hopefully) a vegetable such as broccoli. Because the protein in the steak and the fiber in the broccoli will both require a large amount of digestion before they can be absorbed, the carbs from the rice will be absorbed much more slowly as well. As such, the blood sugar spike that would normally be high from eating white rice, will be significantly blunted. That is, the glycemic response of

the meal will be much lower.

At this point, you may be wondering if the glycemic index matters at all. We believe that the glycemic response of any given meal or food in isolation is not a primary driver of either muscle gain or fat loss (those titles belong to resistance training and energy balance). However, the glycemic index of different carbohydrates is worth considering for two reasons: energy levels and hunger.

1. ENERGY LEVELS

About a year ago, just before we started writing this book, I (Jeff) started noticing that every time I trained, I would feel weak and dizzy about half way through the workout. Sometimes, when you get to extremely low levels of body fat (usually below seven to eight percent for me), this happens simply as a result of low energy availability. But this was happening deep in winter, during a period of self-experimentation I called "bear mode."

Without getting into the details, I was definitely not short on total calories or body fat. Something else was definitely going on.

It was actually after several phone calls with Chris, that I discovered the issue. I was skipping breakfast in the morning and then having a pre-workout meal that consisted only of extra lean ground chicken, white rice and salsa. Because this was my only meal prior to training, and there was minimal fat or fiber present to slow digestion down, my blood sugar was sky-rocketing from the high glycemic white rice and then crashing mid-workout. After figuring out the problem, I did two things to fix it.

First, I stopped skipping breakfast. In other words, I started eating two meals before training. I realize not everyone can do this because of scheduling concerns, but this allowed me to replenish any lost glycogen from the overnight fast to provide more sustained energy during the workout. I also switched to a lower glycemic carb source. Rather than having chicken and white rice, I switched to whole wheat bread and made a chicken sandwich instead.

There are other things I've done since then to further optimize my pre- and intra-workout nutrition that we will cover in the next chapter.

The main takeaway here is that something as simple and unsuspecting as the glycemic index of your carb sources can have an impact on your energy levels during your training session and at various time points throughout the day.

2. HUNGER

Another thing the glycemic index of a food can impact is hunger and satiety (how full you feel after eating). In 1999, Dr. Ludwig's research group investigated the effects of glycemic index on hunger responses (79). The scientists had three groups of subjects consume a meal of similar caloric value. One group consumed a low-glycemic meal, one group a medium-glycemic meal, and the third, a high-glycemic meal.

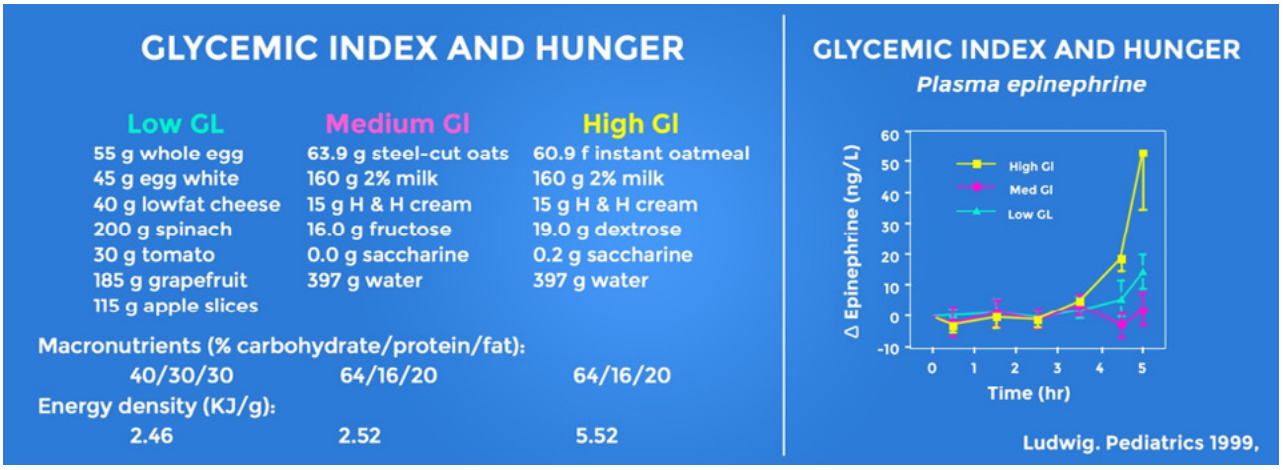


Figure 10D: Glycemic Index and Hunger (Adapted from Ludwig et al, 1999) (79)

As expected, the high-glycemic group had the largest spike in insulin, followed by a blood sugar crash. They also demonstrated the greatest increase in adrenaline, which the authors attributed to the corresponding increase in hunger (perhaps due to mimicking a starvation response).

After the meal, all three groups were given free access to food and as you might expect, the high-glycemic group ended up eating approximately 650 extra calories in their next meal compared to the other two groups!

The implication for recomposition is that choosing low-glycemic carbohydrates for most of your meals will likely improve your adherence to the macronutrient targets by helping you feel more full after each meal.

SUGGESTED CARB SOURCES

Below are a list of carbohydrate rich foods that we recommend including in your diet regularly. Because we endorse a flexible approach to nutrition, you do not need to restrict yourself to only these foods. We encourage you to eat a variety of foods and there are no foods that are off-limits (just some that are better reserved for moderation).

We recommend an 80/20 rule when it comes to food selection: ensure about 80 percent of your carbs are coming from whole, minimally processed foods such as those below. The other 20 percent can be filled in with foods you personally enjoy or find convenient.

CARB SOURCES LIST:

Whole wheat bread, oatmeal, brown rice, long grain rice, all rice derivatives (i.e. cream of rice, rice crisp cereal, etc.) legumes (peas, beans, etc.), starchy vegetables (potatoes, carrots, corn), quinoa, bulgur (wheat derivatives), all fruit (kiwi, bananas, apples, oranges, etc.), all berries (raspberries, blueberries, blackberries, etc.), all fibrous vegetables (broccoli, spinach, kale, lettuce, etc.)

HOW MUCH SUGAR IS OKAY?

While foods like ice cream, cookies and sugary cereals are fine in moderation, we do recommend limiting them to a time when they are less likely to result in a crash during training. For example, it would be much more appropriate to consume these foods as part of a post-workout meal than a pre-workout meal.

Furthermore, we suggest limiting total daily sugar intake to roughly 100 grams per day as a soft maximum. Of course, some of you with high caloric requirements will be fine exceeding this limit, and some of you with lower caloric intakes should rarely reach this amount if you are sticking to the 80/20 rule.

Also, if the majority of your sugar intake is coming from fruit, you may exceed the 100 gram limit. We wanted to include this as a ballpark figure to be aware of, as opposed to a universal limit that can never be exceeded.

You may now be wondering how all of this going to affect your ability to achieve body recomposition? In the next chapter, we will outline how to organize your macronutrient intake around training so as to optimize performance in the gym and recovery after training.


11

CHAPTER 11

THE NUTRITION-WORKOUT LINK

"WORK OUT. EAT WELL. BE PATIENT. YOUR BODY WILL THANK YOU!"
-ANONYMOUS

Pre and post workout nutrition has been the source of much disagreement and controversy in the fitness and bodybuilding world. On the one hand, the bros will argue that if you do not chug back your protein shake within seconds of finishing your last set, you might as well have skipped your workout because you just missed the anabolic window of opportunity to build muscle.

As a response to this, some new-age practitioners have taken the extreme opposite stance by rebutting that nutrient timing around the workout doesn't matter at all as long as you hit your daily macro targets. It does not matter when you eat, they say.

Let's state from the outset that we strongly disagree with both of these oversimplified stances.

Remember that when it comes to body recomposition, the training stimulus will ultimately drive muscle growth. As such, the timing of nutrients around the workout to support performance and recovery is an important variable to account for.

As we will see, there is much more to nutrient timing than just drinking a post-workout shake. Pre-workout, intra-workout and post-workout nutrition all deserve to be treated separately and what you consume at each time point can impact your training performance and recovery differently.

We refer to the collective meals around and during the workout as periworkout nutrition.

WHEN DOES PERIWORKOUT NUTRITION MATTER?

There are various individual factors that can influence how important periworkout nutrition is for achieving recomposition: starting body fat percentage, total caloric intake and training style.

1. BODY FAT PERCENTAGE

The first factor that will impact the importance of peri-workout nutrition is your current level of body fat. The higher your body fat, the more energy your body has in reserve (in adipose tissue as fat and in muscle tissue as glycogen), making the timing of nutrients around the workout less urgent.

On the flip side, trainees with lower energy reserves (leaner individuals) would be wise to pay closer attention to their periworkout nutrition because they do not have an abundance of stored energy which increases the importance of optimizing energy utilization from food.

2. TOTAL CALORIC INTAKE

How many calories you are eating in total also impacts the importance of nutrient timing around training. An individual with a lower caloric intake would be advised to allocate a reasonable portion of their nutrient intake around the training session so their performance and recovery is not further impeded by the lower overall energy intake.

That isn't to say those with a higher calorie target can ignore periworkout nutrition, but just that it is of relatively less importance for them.

3. TRAINING STYLE

Your specific style of training can also impact how much you should pay attention to nutrient timing. Let's use a few examples to illustrate.

A powerlifter training with heavy weights for low reps (1-6 reps) will likely not deplete as much carbohydrate during their training session as a traditional bodybuilder who trains with more moderate to high reps (6-20 reps) and high volume. This is because high intensity, low volume training will rely more heavily on the phosphocreatine (PCr) energy system (using creatine phosphate for fuel), whereas the moderate intensity, high volume training will rely more heavily on the glycolytic system (burning carbohydrates for fuel).

Presumably, the bodybuilder in our example would deplete more glycogen during training and would stand to benefit more from timing carbohydrates around the workout.

The total length of the workout and type of split you're running can also come into play. For example, the nutrients depleted and calories expended during an intense two hour leg day will be significantly higher than a 45 minute shoulder and arm workout.

Summing all three factors together, let's consider Fred who has been eating in a caloric surplus and is at 20 percent body fat. Fred should be able to perform pretty well in the gym with or without a fully optimized pre-workout meal in his system.

Conversely, Joe, a male at six percent body fat, who has been in a caloric deficit for months and is very glycogen depleted, would likely perform much better with properly fine-tuned nutrition around the workout. Failure to optimize Joe's periworkout nutrition would place him at a greater risk to lose muscle tissue as well.

With that information tucked away for future consideration, let's discuss the goals of all three components of your periworkout nutrition and how to approach each aspect.

PRE-WORKOUT NUTRITION

In our opinion, THIS is the MOST important meal of the day for body recomposition. As such, we will give it the most attention. Optimizing the pre-workout meal will ensure that you are properly fueled to perform at your best and generate the ideal anabolic environment to maximize the muscle building process.

As such, there are two primary purposes of the pre-workout meal: to fuel training and to create an anabolic environment for building muscle. Let's start with fuelling the workout.

1. FUEL THE WORKOUT

The preworkout meal should consist of all three macronutrients and water. Because the right carbohydrates in the right quantity will be most effective for providing sustainable energy throughout the workout (138), we will focus on carbs first.

What type of carbs should you eat pre-workout? Recall from Chapter Ten that choosing lower glycemic carbohydrates will be more likely to keep blood glucose levels stable during training. For this reason, we recommend selecting carb sources on the lower end of the glycemic index and/or composing a meal that will induce a lower glycemic response (such as by adding a protein with some fiber and fats) (138).

A pre-workout meal consisting primarily of high glycemic carbs may cause blood glucose levels to dip below baseline, putting you in a hypoglycemic state (139). Similar to the case when I (Jeff) was eating plain chicken and white rice as a pre-workout meal, this hypoglycemic state can lead to weakness, light-headedness, dizziness, and will definitely negatively impact your training performance if it occurs.

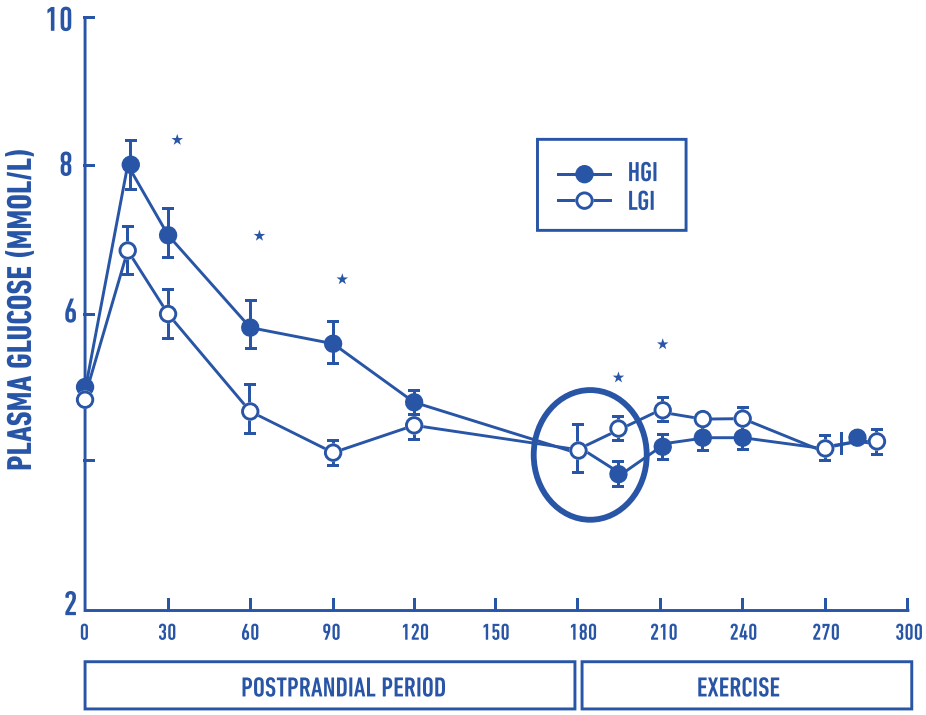


Figure 11A: High GI carbohydrates result in a rapid spike in blood glucose, followed by a faster fall, a dip below baseline (hypoglycemic), and less overall blood glucose stability (138)

Low glycemic carbohydrates have also demonstrated higher amounts of fat oxidation and improved time-to-exhaustion. Despite being an acute response, making better pre-workout carb choices will clearly improve body composition by enhancing workout quality over time!

We also recommend including carbohydrate sources that require the use of multiple carbohydrate transporters for absorption in your pre-workout meal.

Remember the three different monosaccharides (simple sugars) we discussed earlier (glucose, fructose and galactose)? Well, these three sugars each use different transporters to get them from the digestive tract into the bloodstream where they can be used for energy. The main reason why it's smart to include carbohydrates that utilize multiple transporters is that they will provide a more sustainable and consistent energy source throughout a training session (52). In other words, if you simply consume one type of carbohydrate, you will only be able to utilize one transporter for absorption. If you consume two (or more) types of carbohydrates, you will be able to utilize several different transporters that funnel the carbs through at different rates. This will result in a much more efficient influx of carbohydrates

in the bloodstream and a more sustainable supply of energy.

Let's illustrate this by way of analogy. Consuming 80 grams of carbohydrates from rice (a string of glucose molecules only), would be like trying to funnel 80 students in one classroom through one exit door. In this analogy, the single transport protein being used for absorption is the one exit door.

On the other hand, if you were to still consume 80 grams of carbohydrates, but this time split the carbs between 60 grams coming from rice (a string of glucose only) and 20 grams coming from fruit (a combination of glucose and fructose), you would now be able to absorb the glucose and fructose through different transporters.

This second scenario would be like creating a whole new exit door for 20 students. If all 80 students need to get out of the classroom, the scenario with two exit doors would clearly be more efficient.

While this analogy does not capture all of the complexity of nutrient absorption (since different transporters also have different transport rates), it serves to illustrate that including carbohydrate sources that utilize different transporters (such as fruit) in the pre-workout meal can have implications for energy availability and training performance.

This idea is supported in the scientific literature as well, where we see the use of multiple transportable carbs improving endurance performance (38). We suspect that a similar effect would be observed for resistance training performance, especially when considering difficult, high volume training sessions (52).

With all of this information provided, we recommend that your pre-workout meal consist of starchy, low glycemic carbohydrates and a fruit source. We further suggest eating at least two servings of fruit per day, with at least one of those servings coming from your pre-workout meal. It is important that you select food sources that you digest well and

don't cause any stomach discomfort. When resistance training, you don't want to feel full or bloated. Consume food sources that you feel well eating and time the meal appropriately to ensure adequate digestion before training.

HOW MANY CARBS TO EAT PRE-WORKOUT

Now that we understand what kind of carbohydrate sources are best to include in your pre-workout meal, let's turn our attention to how much of them we should eat.

While there will be individual differences, generally speaking, we recommend hitting a minimum of one gram of carbohydrate per kilogram of body weight. For example, a 175 pound male (~80kg) should consume approximately 80 grams of carbs in his pre-workout meal. A 120 pound female (~55kg) would perform best with at least 55 grams of carbs in her pre-workout meal.

Of course, depending on your total daily calorie and carb intake, you may be required to eat more or less than this amount. This however, is our soft minimum target for optimizing training performance.

As mentioned previously, higher volume and longer duration training sessions generally require higher amounts of carbohydrates to fuel properly, so use discretion when adjusting the one gram per kilogram figure to fit your specific training needs.

We also recommend consuming fiber in moderation in the pre-workout meal. To avoid interference with nutrient absorption and unnecessary bloating, fiber should be kept around 5-15 grams in the preworkout meal as a ballpark estimate. The further away your training session is, the more fiber you can get away with and even utilize as a tool in your favor. The sooner your training session is, the less fiber you should consume.

For similar reasons, we recommend consuming a more moderate fat intake before training. While this will be individual, we recommend keeping fat intake no higher than 0-20 grams in the pre-workout meal. Individuals with higher overall caloric intakes may require higher fat intakes in the pre-workout meal. Also, the closer the pre-workout meal is to the training session itself, the lower fat it should contain to prevent digestion-training overlap.

With clarity on pre-workout carbohydrates and their vital role in lifting performance, let's now turn to pre-workout protein intake.

2. CREATE AN ANABOLIC ENVIRONMENT DURING TRAINING

In addition to fueling performance, it's also important that your pre-workout meal create an anabolic physiological environment leading into the training session. This is not primarily achieved through carbohydrates and the insulin response, but rather, the quality and quantity of protein in the pre-workout meal.

Consuming adequate protein in the pre-workout meal will stimulate the appropriate muscle protein synthetic machinery to crank up the anabolic dial during training (100,122). In addition, it will help tip the balance in favour of synthesis and anabolism over proteolysis and breakdown.

Based on information outlined previously, we recommend consuming approximately 0.45-0.75 grams of protein per kilogram of bodyweight in the pre-workout meal, ideally coming from a complete protein source such as whey, meat, poultry or fish. (See Chapter Seven for vegan considerations).

Putting all of this information together, some example pre-workout meals are given in the table below.

MEAL EXAMPLES (SITUATION DEPENDENT)		
SUBJECT 1: 175lbs Male, Training in 60-90 mins	**SUBJECT 2:** 120lbs Female, Training in 90-120 mins	**SUBJECT 3:** Weight N/A, Training in 30 mins (hasn't eaten in 3-5+ hours)
MACRO GOAL: • 10g Fat/ 80g Carb/ 45g Pro • 80g Oats (5.5g Fat/ 53g Carb/ 13.5g Pro) • 100g Banana (0g Fat/ 22g Carb/ 1g Pro) • 45g Whey (0g Fat/ 5g Carb/ 34g Pro) • 5g Coconut Oil (4.6g Fat/ 0g Carb/ 0g Pro) • 1-5g Cinnamon • 1/8th- 1/4th tsp Pink/Sea Salt/Table Salt	**MACRO GOAL:** • 9g Fat/ 55g Carb/ 30g Pro • 150g Sweet Potato (0g Fat/ • 30g Carb/ 4g Pro) • 4oz Salmon w/ skin (9g Fat/ 0g Carb/ 20g Pro) • 80-100g Green Fibrous Veg (~0g Fat/ 5g Carb/ 2g Pro) • 100g Apple (0g Fat/ 12g Carb/ 1g Pro) • 1-5g Cinnamon • 1/4th tsp Pink/Sea Salt/ Table Salt	**MACRO GOAL: N/A** • 100g Banana (0g Fat/ 22g Carb/ 1g Pro) • 30g Whey Protein (0g Fat/ 3g Carb/ 25g Pro)

Table 11A: Examples Of Pre-Workout Meals Depending on Context

WHEN SHOULD THE PRE-WORKOUT MEAL BE EATEN?

In the examples above, you may have noticed that the carbohydrate and protein sources vary depending on how much time there is between the pre-workout meal and the training session itself. Sometimes you are forced to train on short notice and may eat your pre-workout meal within 30 minutes of training, while other times there will be one to two hours between eating and training.

Generally, we suggest eating 30-120 minutes before training, depending on your schedule, preferences and what you find provides the best energy while lifting. The composition of the

pre-workout meal can then be fine-tuned to fit your particular needs.

The closer the meal is to the workout, the more you should focus on consuming faster digesting foods such as whey protein and a banana (which is lower in fiber than an apple). You may also reduce total carbohydrate intake when on a rushed schedule for faster energy availability and to avoid an overlap of digestion and training.

Notice how Subject 3, who only had 30 minutes between eating and training consumed only 25 grams of carbs, whereas Subjects 1 and 2 more than doubled that intake owing to more time separation.

THERE ARE A FEW OTHER POINTS TO NOTE CONCERNING THE EXAMPLES ABOVE:

- All meals utilize multiple transportable carbs by including a fruit source.
- All subjects lightly salted their meals to improve electrolyte balance. You may notice that Subject 2 included a larger serving of salt, despite being the smallest person. This

increase in salt is indented to optimize the sodium-potassium (Na+:K+) ratio of the meal. Subject 2 consumed sweet potato, which is extremely rich in potassium. When eating meals high in potassium, salting the meal slightly more liberally is acceptable.

- All subjects also added a serving of cinnamon to their meal. Cinnamon has been shown to decrease the glycemic response of a meal and help keep blood sugar levels stable (3,12). Try adding cinnamon to your pre-workout meal and note if it improves how you feel and perform in the gym.
- Having the essentials of your pre-workout meal determined, you can be confident that your training performance will improve.

THE IMPORTANCE OF HYDRATION

An underappreciated and often neglected component of fueling your training is proper hydration. Research has shown that a mere three percent dehydration status can significantly decrease strength, total volume/reps and recovery between sets, all while increasing perceived exertion scores (the workout feels harder) (72). So if you haven't prioritized hydration in the past, below are some specific, science-based guidelines for those of you who like objective targets. (115)

GENERAL GUIDELINE FOR TO OPTIMIZE HYDRATION STATUS
- Main Guideline: ~1ml fluids per 1kcal of energy needs throughout the day. (e.g. someone eating 2500 calories per day, should drink at least 2500ml (~84oz = 0.65 gallon))
- ~5-10ml/kg total body mass in 2-4 hours pre-workout (e.g. 160lbs male (72.7kg) should consume ~550ml of water (~18.5oz) leading into their training session)
- 0.4-0.8 liters/hour of activity (up to 2.4 liters/hour with outdoor activity)
- Rehydration post-training (1.25-1.5 liters/kg of body weight lost during training)

For the rest of us, meticulously tracking water intake can be cumbersome and unnecessary. The good news is that adhering to the specific guidelines above is not required if you simply make a guided effort to stay well-hydrated throughout the day.

Perhaps the simplest way to assess hydration status is by noting the color of your urine (142). Urine that is more clear and less yellow is indicative of proper hydration. The goal is

to keep your urine looking more like lemonade and less like apple juice.

If gazing into the toilet at the hue of your urine doesn't have much of an appeal, you can simply pay more attention to biofeedback. In order words, pay close attention to your subjective levels of thirst. The thirst mechanism is surprisingly reliable: if you're thirsty, chances are you are already dehydrated. For many of us, the best advice is to keep it simple by making it a habit to drink fluids consistently throughout the day.

PRE-WORKOUT NUTRITION: PUTTING IT ALL TOGETHER

Your preworkout meal should consist of:

- ~1g of carbohydrates per kg of bodyweight, coming from a low glycemic carb source plus a serving of fruit.
- ~0.5g of protein per kg of bodyweight coming from a high quality protein source (or combination of sources)
- 0-20g of fat, depending on total caloric intake and the length of time before training
- Enough water to support proper hydration status before training without excessive interruption from frequent urination

INTRA-WORKOUT NUTRITION

The purpose of intra-workout nutrition (nutrients consumed during the training session) is to improve performance and prolong time to fatigue. Similar to the pre-workout meal, those who have lower energy reserves (less body fat and glycogen) will likely yield the greatest benefit from utilizing intra-workout nutrition. The value of an intra-workout meal will also depend on the volume and duration of your training. We generally recommend intra-workout nutrition under the circumstances listed below. If none of the following considerations apply, an intra-workout feeding is not needed at all.

- Your workouts are longer than 60 minutes.

- You train on an empty stomach (fasted).
- It has been three to five hours since your pre-workout meal.

Assuming one of the three above considerations apply to you, providing your body with a fuel source such as glucose during training can help spare muscle glycogen and reduce muscle protein breakdown. It can also increase hyperemia, leading to better pumps in the gym. This will create more enjoyable training sessions and potentially improve the mind-muscle connection.

Furthermore, while debate is ongoing in academic circles as to its specific role, muscle cell swelling has been proposed as a contributing factor for hypertrophy (112). Paying attention to intra-workout nutrition will also help easily maintain adequate hydration status and electrolyte balance and can also improve mood and ability to focus.

Given all of these potential upsides and no obvious downsides, including a simple intra-workout feeding as part of your regular training routine seems like a no brainer.

WHAT TO EAT INTRA-WORKOUT

We recommend that intra-workout nutrition come from liquid carbohydrates and optional liquid protein/amino acid supplements. Liquid sources are used for quick consumption and digestion and to prevent a full or bloated feeling while training.

In the table below, we have ranked some popular intra-workout options in order of practicality. It is worth noting that intra workout carb or protein powders are not required supplements. We are including our opinions on the most popular options for the sake of completeness.

EXAMPLES OF CARBOHYDRATE POWDERS	EXAMPLES OF PROTEIN/AMINO ACIDS
- **Dextrose (ex. Gatorade)** - Simple, effective and affordable	- **Whey Protein Isolate** - Very fast absorption, complete EAA profile, more affordable, but may not be worth the cost for some
- **Sucrose (ex. Kool-Aid)** - Simple, effective and affordable	- **Essential Amino Acids (EAA)** - May promote anabolism, but may not be worth the cost for some
- **High Fructose Corn Syrup (ex. Powerade)** - Simple, effective and affordable	- **Whey Protein Hydrolysate** - Very fast absorption but may not be worth the cost for some
- **Highly Branched Cyclic Dextrin** - Low glycemic, quick absorption, but quite expensive	- **Branch Chain Amino Acids (BCAA)** - Very little supporting research - Not recommended due to high cost
- **Maltodextrin** - Not recommended due to gastric distress and cost	

Table 11B: Examples of Popular Intra-Workout Supplements & Powders

Some of these supplements and powders have theoretical advantages, while others lack scientific support, despite their popularity. For example, the complex carbohydrate Highly Branched Cyclic Dextrin (HBCD) is a larger molecule compared to dextrose (the simple sugar found in Gatorade) and research has found it to have a faster gastric clearance rate than most other liquid carb sources (121). However, despite the fact that there may be some theoretical advantage to using HBCD, the financial cost difference is so substantial when compared to other intra-workout carb sources that we personally don't recommend using it.

A much simpler and more affordable option such as Gatorade, Powerade or Kool-Aid will confer similar benefits for a fraction of the cost.

One carb source that is undeservedly popular in the supplement industry is maltodextrin. Maltodextrin (which is essentially corn starch) is hyper-allergenic, often causes gastrointestinal distress and has been shown to cause post-meal glycaemia, which is generally less than desirable from a health perspective (59). Supplement companies often include it in their products as a cheap filler and we don't recommend using it as an intra-workout carb source.

Similarly, the different protein and amino acid supplements in Table 11B are not all created equal. For example, BCAAs remain one of the most popular sports supplements in the industry, despite minimal evidence supporting their efficacy (41). Although BCAAs are crucial for upregulating MPS, it is well understood that all nine EAAs are required to synthesize new muscle proteins (141). Therefore, rather than using intra-workout BCAAs, we recommend consuming an EAA supplement or a whey protein isolate shake instead.

For those interested in what can be found at the very tip of the iceberg, it is interesting that our bodies have the ability to absorb di- and tripeptides (two or three amino acids linked together) directly from the small intestine. Despite these molecules being larger in size compared to a single, free floating amino acid, they have a faster gastric clearance rate (116,123,130).

In theory, this could make something like hydrolyzed whey protein isolate the ideal intra-workout protein source. All things considered, given the price point for such a specialized protein powder, a cost-benefit analysis would be advised before purchasing a tub.

Having covered background on the different sources of intra-workout nutrition, we must now consider the appropriate quantity of each source.

HOW MUCH TO EAT INTRA-WORKOUT

Consuming too many carbohydrates or too much protein during training can lead to gastrointestinal discomfort and negatively impact training performance. The literature has shown that carbohydrate oxidation rates tend to plateau at 1-1.2 grams per minute (65), so consuming more than one gram of carbohydrate per minute of training would be unnecessary for fueling performance.

We generally recommend 0.5 grams of carbs per minute of weight training, beginning about 30 minutes into the workout. For example, if training for 90 minutes, you would consume a total of 30 grams of carbs during the workout, starting 30 minutes in.

It seems that intra-workout carbs are more important than intra-workout protein for fueling performance and therefore we view intra-workout protein more as extra-protection anabolic insurance than a requirement for growth to occur. This is especially true if you have followed our advice in regard to the pre-workout meal.

INTRA-WORKOUT EXAMPLES (CONTEXT DEPENDENT)			
SUBJECT 1 Status: Fasted (no preworkout meal)	**SUBJECT 2** Status: Optimized Pre-WO meal 2 hours ago (currently in a calorie deficit)	**SUBJECT 3** Status: Poor Pre-WO Nutrition, ate 3+ hours ago (in a caloric surplus & struggles to reach macros)	**SUBJECT 4** Status: Optimized Pre-WO meal 2 hours ago (currently in a calorie deficit), on a tight money budget
Training: Full Body - 60 minutes	Training: Shoulders & Arms - 60 minutes	Training: Leg Hypertrophy (high volume) - 120 minutes	Training: Upper Body - 90 minutes
Suggested Nutrition: 20-30g Carbs via HBCD or Dextrose Gatorade) + 10g Whey Isolate or EAA	Suggested Nutrition: 10-25g Carbs via HBCD or Dextrose Gatorade) + 10g optional Whey Isolate or EAA. Additional protein supplementation is not required.	Suggested Nutrition: 60g Carbs via HBCD or Dextrose (Gatorade) + 20g Whey Isolate or EAA	Suggested Nutrition: 10-25g Carbs via Dextrose (Gatorade. Additional protein supplementation is not required.

Table 11C: Intra-Workout Nutrition Examples Depending on Individual Context

For those of you in a caloric deficit, you may not want to waste calories on liquid sources for satiety purposes. In this case, we would simply recommend consuming a very minimal amount (5-10 grams) of carbohydrates intra-workout. In our experience, even five grams of carbohydrates can be sufficient for stabilizing blood glucose and turning a bad workout around.

It may sound unbelievable, but there is also considerable data supporting the use of carbohydrate mouth rinsing (CHO-MR) as a way to improve performance in endurance activities such as cycling (22,30,33). One group of researchers also observed improved resistance training performance from CHO-MR (40).

The proposed mechanisms are likely neurologically mediated. Researchers have proposed that the presence of carbohydrates in the mouth can increase dopamine release (31) which cannot only increase feelings of pleasure and motivation, but also increase motor output. For those of you who would prefer not to waste precious carbs, you may be able to reap

similar benefits by simply rinsing your mouth with Gatorade rather than actually drinking it.

INTRA-WORKOUT NUTRITION: PUTTING IT ALL TOGETHER

Intra-workout nutrition should consist of:

- **~0.5g of liquid carbohydrates per minute, starting 30 minutes into the workout.**
  - **Sources include Gatorade, Powerade or HBCD**
- **Optionally add 10-20g of whey protein isolate or EAA's**

  Intra-workout protein/amino acid supplementation is of less importance for those who have already optimized the pre-workout meal and/or if financial cost is a concern.
- **Intra-workout nutrition should be considered an optional optimization strategy of relatively less importance if a high quality pre-workout meal has been consumed.**

POST-WORKOUT NUTRITION

While the post-workout anabolic window has gotten more attention than it deserves in bodybuilding circles, a post-workout meal still has a meaningful role in the peri-workout trio of feedings. Since the primary goal of the post-workout meal is to begin the recovery process, we will start with the most anabolic macronutrient, protein.

PROTEIN

The most important aspect of post-workout nutrition is stimulating muscle protein synthesis and sparking the muscle repair process for tissue that was damaged during training. To this end, we recommend consuming approximately 0.5 grams of protein per kilogram of bodyweight in the post-workout meal, ideally coming from a complete protein source such as whey, meat, poultry or fish (see Chapter Nine for vegan considerations). Of course, you can simply consume one of your evenly spaced protein-containing meals as discussed in Chapter Nine.

CARBS

A second objective of post-workout nutrition is to replenish glycogen stores. While it is unlikely that glycogen stores will be significantly depleted, assuming the pre- and intra-workout guidelines have been followed, ensuring full glycogen replenishment becomes more important if you are training multiple times per day or if you train the same muscle group on consecutive days such as when following a high frequency full body split.

Because rates of glycogen synthesis are highest within the first two hours following training, we recommend consuming 1-1.5 grams of carbohydrate per kilogram of bodyweight post-workout. This may also be a good time to include a high glycemic carb source, since they have been shown to optimize glycogen synthesis compared to low-glycemic carbs following training (26).

Similar to your pre-workout meal, we suggest consuming another fruit source in your post workout meal. With our general nutrition goal of consuming two servings of fruit per day, placing them in your pre and post-workout meal is a simple and effective way to improve accountability.

FATS/FIBER

Mirroring the suggestions for the pre-workout meal, the post workout meal should contain roughly 0-20 grams of fat, depending on total caloric intake and food preferences. As a ballpark maximum, fiber should be kept around 5-15 grams in the post-workout meal.

Since the workout is already completed and the anabolic machinery has already been activated from the weight training, higher fat or fiber content in the post-workout meal is of less consequence than in the pre-workout meal. In other words, because properly fueling training performance is most important for body recomposition, there is more room for flexibility with fats and fiber in the post workout meal.

MEAL EXAMPLES (SITUATION DEPENDENT)		
Subject 1: 175lbs Male, full body training split	Subject 2: 120lbs Female, full body training split	Subject 3: Weight N/A *Snack before whole food meal*, full body training split
Hypothetical Macro Goal (based on total daily targets) 0-5g Fat/ 120g Carb/ 50g Pro - 60g Whey (0g Fat/ 8g Carb/ 44g Pro) - 100g Cream of Rice (0g Fat/ 80g Carb/ 4.4g Pro) - 100g Banana (0g Fat/ 22g Carb/ 1g Pro) - 11g Honey (0/10/0) - 1/8th- 1/4th tsp Pink/Sea Salt (if sweating a lot)	Hypothetical Macro Goal (based on total daily targets) 5g Fat/ 80g Carb/ 41g Pro - 4oz Chicken Breast (1.5g Fat/ 0g Carb/ 24g Pro) - 225g White Rice (0g Fat/ 55g Carb/ 6.5g Pro) - 80-100g Green Fibrous Veg (~0g Fat/ 5g Carb/ 2g Pro) - 160g Watermelon (0g Fat/ 12g Carb/ 1g Pro) - 1/4th tsp Pink/Sea Salt (if sweating a lot)	Macro Goal: N/A - 30g Whey Isolate (0g Fat/ 3g Carb/ 25g Pro) - 100g Banana (0g Fat/ 22g Carb/ 1g Pro) - 2 Rice Cakes (0g Fat/ 22g Carb/ 2g Pro) *followed by a balanced whole food meal ~2 hours later

Table 11D: Examples of Post-Workout Meals Depending On Context

In the above examples, you can see that we have prioritized a high quality protein source and adequate carb intake (including fruit). Collectively, these components will accomplish the main goals of a post-workout meal!

WHEN TO EAT POST-WORKOUT

While the bros may insist that the post-workout meal must be eaten immediately after training, recent evidence suggests that the anabolic window may be wider than previously thought (8).

In line with this evidence, the urgency of the post-workout meal seems to depend on how recently the pre-workout meal was consumed. We advise that the pre- and post-workout meals not be separated by more than four to five hours.

For example, if you consume your pre-workout meal two hours before training and then

train for two hours, you should consume your post-workout meal within one hour following training. If you consume your pre-workout meal one hour before training and then only train for one hour, your post-workout meal is much less urgent and could be consumed two to three hours after the workout has ended.

We feel that it would be somewhat irresponsible to unnecessarily prolong the post-workout meal merely because there is evidence suggesting that you can do so. If there is potentially something to gain and nothing to lose by consuming your post workout meal as soon as you reasonably can after training, that sounds like the most logical advice.

POST-WORKOUT NUTRITION: PUTTING IT ALL TOGETHER

Post-workout nutrition should consist of:

- **~0.5 g of protein per kg of bodyweight**
- **~1-1.5 grams of carbohydrate per kilogram of bodyweight**
  - **High glycemic sources will expedite glycogen resynthesis if following high frequency/ full body training**
- **0-20g of fat, depending on total caloric intake**
- **Pre and post workout meals should be spaced apart by no more than 4-5 hours**


12

CHAPTER 12

CARDIO: TO-DO OR NOT-TO-DO

"THERE ARE TWO THINGS I LIKE: 1. WEIGHTLIFTING AND 2. NOT CARDIO"
-UNKNOWN

Remember that with the goal of body recomposition, we are trying to build muscle and lose fat. The muscle building component will be taken care of primarily through progressive resistance training and adequate protein intake. The fat loss component will come primarily through establishing a caloric deficit. Such a caloric deficit can be achieved by reducing your caloric intake, by increasing activity (including cardio) or through a combination of both (57).

On a typical weight-loss program, cardio is often prescribed to help impose a caloric deficit so the individual doesn't have to excessively restrict calories from their diet. However, where the aim of this book is to establish a plan for body recomposition, and not fat loss on its own, we are recommending very moderate caloric deficits (up to 20 percent) even if fat loss is the primary goal.

Additionally, given the fact that cardio has the potential to interfere with resistance training adaptations (135), we recommend keeping cardio to an effective minimum while seeking body recomposition. If cardio is to be used as a fat loss tool, we recommend performing it in such a way that muscle loss is minimized as much as possible.

The combination of resistance training and endurance exercise has been termed concurrent training in the scientific literature (134). Whether or not concurrent training will negatively impact your gains seems to depend on three main factors: frequency, intensity and modality.

FREQUENCY

Research shows that, with all else equal, the more cardio you do, the more likely it is to interfere with your muscle building potential. This may be due to some mechanistic interference at the molecular level, or something as simple as spreading your ability to recover too thin.

While it will depend on the individual, we generally recommend keeping formal cardio sessions within the five sessions per week range. Individuals with significant weight to lose or those with less active lifestyles may want to be closer to the high end of that range, while leaner individuals or those with more active lifestyles, may want to stay closer to the low end of that range.

In general, it seems that the majority of your training energy should be allocated to weight training, since that is what will ultimately drive muscle growth. Furthermore, your fat loss goals should be achieved primarily through dietary measures rather than over-reliance on cardio. We have outlined specific examples to help you decide on the proper cardio frequency in Table 12A.

INTENSITY

Research has also suggested that higher intensity cardio is more likely to interfere with muscle building goals, especially when performed frequently.

In bodybuilding coaching circles, we generally split cardio into two groups based on intensity: Low Intensity Steady State (or LISS) and High Intensity Interval Training (or HIIT). An example of an HIIT session would be repeating 20-second all out sprints on a stationary bike for six times. Each sprint would be spaced with 40 seconds to two minutes of light cycling at a low intensity. This HIIT session would only last 10-20 minutes, including a light warm up and

cool down. An example of a LISS session would be walking on an incline treadmill for 30 minutes at a moderate pace. There are pros and cons with each.

Many people praise the superior fat-burning effects of HIIT on the basis that you will supposedly burn more calories after the session is over because of the EPOC or caloric afterburn effect. However, according to a 2006 research review by Lyle McDonald, when subjects performed fully 80 minutes of HIIT (a very long session, indeed), it only amounted to approximately 80 extra calories burned. This was most likely due to EPOC (140).

A more recent systematic review and meta-analysis examining 28 studies underplayed HIIT even more, concluding that "benefits may be short lived and diminish as little as one hour following exercise. Overall, it appears that EPOC is unlikely to account for any apparent greater fat loss potential with HIIT." (66)

All in all, the main pros for HIIT are that it may be more time-efficient and can be less boring. A few cons are that it tends to be harder to recover from (meaning you can't do them as often as low intensity sessions), it is more likely to interfere with resistance training and it may actually be redundant if you're already doing intense weight training, which trains similar systems and yields similar adaptations.

The main pros for LISS are that it is much easier to recover from and less likely to interfere with muscle building. The cons are that it can be more boring and somewhat less time efficient.

Given all this, we would recommend limiting HIIT cardio to one or two sessions per week and seek to create any further caloric deficit required for fat loss through reduced food intake or steady state cardio.

MODALITY

The scientific literature generally finds that higher impact cardio is more likely to interfere

with muscle building goals(135).

Running on pavement, for example, would qualify as higher impact exercise compared to cycling or swimming. Although there are many different cardio regimens you can implement, including running, cycling, swimming, hiking and rollerblading, we recommend making an effort to prioritize modalities that will have a lower impact on your musculoskeletal and nervous systems so as to reduce interference with weight training.

LIFESTYLE FACTORS

Assuming fat loss is your primary goal, it may also be worth considering your lifestyle and daily activity levels to help determine how much and what kind of cardio would be best for you. If you live a more sedentary lifestyle (have a job that requires you to be seated most of the day), incorporating some cardio into your daily routine will likely improve your overall health, decrease stress, and ensure you are using physical activity to augment your diet.

On the other hand, if you work a labor-intensive job and your NEAT is much higher (construction worker, landscaper, etc.), additional cardio would most likely be unnecessary and more likely to impede your muscle building goals.

ACTIVITY TRACKERS

In today's world, we have a ton of tools that aim to monitor our daily activity levels. From smart watches to cell phones, there are many devices that can quantify our activity level to some degree. Using these tools can be beneficial to monitor your activity level and ensure you hit some sort of daily minimum. For example, if you live a very sedentary lifestyle and average 3,000 steps per day, you can easily increase your daily activity by aiming for 8,000 steps per day.

It is important though, to keep in mind that although these tools can be beneficial for goal setting and tracking changes in activity, they also have a large margin of error, especially when it comes to calculating calories expended (43).

Besides the lack of precision, many of these tools increase the risk of developing obsessive habits with compulsively tracking energy output or activity levels. For this reason, we suggest either setting up a weekly time goal for cardio (for example, 2 x 30minute LISS sessions per week) or a rough daily step goal (for example, 8,000 steps per day).

As you can see, how much cardio you perform will require fine-tuning to fit your specific needs and goals. In general, while seeking body recomposition, take the words "effective minimum" to heart and use the examples below to help you land on a figure that will work best for you.

CONTEXT	LEVEL OF IMPORTANCE (LOW/ MED/ HIGH)	EXAMPLE OF APPROPRIATE CARDIO RECOMMENDATION (SPECIFICITY INCREASE)
Mary Jane, 24 years old, 35% body fat, resistance trains 5x/week, sedentary office job (2,500 steps per day)	High	- 30 minutes of LISS 5x per week - Intensity @ ~120 BPM (~60% HR Max) - Or aim for ~8,000 steps in per cardio session
Jane Doe, 24 years old, 25% body fat, resistance trains 5x/week, physically active job (waitress), 15,000 steps per day	Low	- LISS not needed - Optionally utilize HIIT post-workout 1-2x/week to maximize cardiovascular health - E.g. 6x 20-sec all stationary bike sprints with 40-sec light pedaling between sprints
John Smith, 19 years old, 30% body fat, resistance trains 3x/week, sedentary lifestyle (college student), no job, low NEAT (3,000 steps per day)	High	- 30 minutes of LISS 5x per week - Intensity @ ~120 BPM (~60% HR Max) - ~8,000 steps in one cardio session

John Smith, 19 years old, 20% body fat, resistance trains 5x/week, sedentary lifestyle (college student), no job, low NEAT (3,000 steps per day), previously played basketball in high-school	Medium	- Play Basketball 2x/week on Non-Training Days - Optionally do HIIT Post-workout 1-2x per week E.g. 6x 20-sec all stationary bike sprints with 40-sec light pedaling between sprints
Bill Smith, 38-year-old, 28% Body Fat, Resistance Trains 3x/week, Sedentary lifestyle, Corporate Office Job, low NEAT (3,000 steps per day), pet owner (dog)	High	- Take a walk during lunch break - Take stairs instead of elevator - Park further away from grocery store to increase NEAT - Take dog on walks frequently - Increase average steps/day to ~10,00
Jake Smith, 24-years-old,12% bodyfat, follows The Ultimate Body Recomposition Guide to a T, moderate NEAT (~8,000 steps/day), primary goal of building muscle	Low	- LISS not needed - Optionally utilize HIIT post workout 1x/week to maximize cardiovascular health - E.g. 6, 20-sec all out stationary bike sprints with 40-sec active recovery

Table 12A: Examples of Different Cardio Regimes for Body Recomposition

WHEN SHOULD YOU DO CARDIO?

Now that you understand that cardio is simply a tool that you can use to assist with establishing the appropriate energy balance for your goals, you may be wondering if the timing of your cardio matters. Should you do it pre- or post-workout? Does doing fasted cardio increase fat loss?

There is a substantial amount of scientific data that suggests the time of day you perform cardiovascular exercise will not impact your overall body composition and overall fat loss (1,57).

With this in mind, we recommend that you perform cardio whenever it best fits your schedule or at a time that will allow you to be consistent with the protocol. This can be something as simple as making a promise to yourself to use the stairs over the elevator in your apartment building (if that fits your needs) or doing 30 minutes of cycling after every leg day.

The only time of day we generally advise against doing cardio is immediately before weight training. A short 5-10 minute warm up is a good idea, whereas long or intense cardio sessions can zap you of energy that will be required to lift weights with the appropriate intensity and volume. Remember that when it comes to training, we should prioritize building muscle first.

It's also worth noting that while fasted cardio may not have any additional benefits in terms of overall fat loss, it may have special application in the case of so-called "stubborn fat. "

Fasted cardio has not been shown to have any significant detriment either. Therefore, if you find that getting your cardio done first thing in the morning is an enjoyable and proactive way to get you energized for the day, then doing cardio on an empty stomach is perfectly reasonable.

CARDIO: PUTTING IT ALL TOGETHER

- Your cardio plan should be tailored to your specific needs and goals
- In general, we recommend keeping cardio to an effective minimum for fat loss
- Low intensity steady state (LISS) cardio can be performed for up to 30-45 minutes 0-5x per week (depending on your lifestyle and primary goal)
- High intensity interval training (HIIT) should be used more sparingly at a maximum of 1-2 sessions per week
- Individuals with low levels of NEAT and fat loss goals can set a ballpark step goal to increase daily activity levels (for ex. ~8,000 steps per day)


13

CHAPTER 13

SETTLING THE SUPPLEMENT DILEMMA

"IF YOU AREN'T TAKING SUPPLEMENTS, ENJOY YOUR LACK OF GAINS."
– DARREN HARDY

In this chapter, we want to highlight some of what we believe to be the more important supplements that will contribute to your recomposition goals. Hopefully, by now we have convinced you that your nutritional approach will be the primary means to support your training performance and recovery. At this point, we'd like to provide you with some general supplement suggestions that may help fill in the diet gaps.

It is important to note that supplements are not required to improve body composition. They are, by definition, supplemental. Investing more time, energy and money in improving your training and nutrition will positively impact your physique far more than any natural supplement ever could.

There are a few supplements nonetheless with sufficient scientific backing to make them worth taking. These supplements will be presented in their order of importance for body

recomposition, starting with our favourite macronutrient, protein.

WHICH SUPPLEMENTS SHOULD YOU CONSIDER TAKING?

Not all supplements are created equal, and while this may seem pretty obvious when viewing the vast landscape of supplements available on the market, this statement holds true even for the one we are recommending in this book. For this reason, we've decided to breakdown these supplements into tiers. As opposed to a normal ranked list (best to worst), this approach does a better job of showing where the truly significant gaps in evidence and effectiveness between supplements lie. Basically, this means that supplements in the higher tiers (Tier 1 being the highest) are the ones you should first consider taking before looking at the lower tiers. That said, before we dive into Tier 1, let's first quickly touch on the thought process of how these tiers were created.

When approaching supplements, it is important to consider three key factors: safety, efficacy, and cost.

1. Safety, although self-explanatory, is the most important. It appeases any concern whether or not taking a specific supplement will result in any negative side effects? Be assured that when taken at appropriate dosages, all of the supplements we are going to lay out have a very low risk of negative side effects. That said, we have still noted under a few of these supplements where you might want to be slightly more cautious.

2. Efficacy simply refers to whether or not the supplements actually work. That is, does the supplement actually do what it claims to do? Specifically, the two major factors that determine the efficacy of a supplement are: 1) How much does it improve performance, muscle growth, or overall health? 2) What is the quality and quantity of the research that supports its usage? For example, if a supplement has countless studies supporting

it, many of which are very well controlled, and it also seems to improve performance, muscle growth, or overall health in a practically meaningful way, then this supplement would be ranked highly for efficacy, as it likely provides a meaningful benefit. On the other hand, a supplement with merely a few studies of mixed quality that report a small effect on strength, size or health, would be ranked lower on the list.

3. Lastly, there is the cost of the supplement: given the efficacy of this supplement, is it worth the price? For this factor, it is important to emphasize once again that supplements are not required to improve your physique or performance. However, if you have a larger budget and supplements are something you're interested in to get some extra benefit, then this list should help you spend your money more wisely. For the most part, these rankings are based on efficacy (lack of safety having automatically excluded any supplement from being listed), so it will be up to you to determine if a supplement is worth the financial cost.

With all of that having been said, let's finally jump into Tier 1!

TIER 1

Tier 1 is where the three factors of safety, efficacy, and cost really shine. Not only are there mountains of quality research to support these supplements, but they are also fairly inexpensive and most likely to make a meaningful impact on your performance and/or physique. For most of you who have some extra money to spend on supplements, this is a perfectly reasonable tier to begin and end with. Taking just creatine, caffeine, and a protein powder will probably give you most of the benefits supplementation can offer.

PROTEIN POWDER

We have dedicated a large portion of this book to emphasizing the importance of sufficient protein intake for body recomposition, so it should come as no surprise that it makes the

top of our supplement short list. Despite its importance however, consuming high levels of protein on a daily basis can be challenging, especially when eating only whole food sources. As you'll recall from Chapter Nine, whey protein powder is at the very top of the list for leucine content and protein quality. Therefore, supplementing your diet with a high quality protein powder is a convenient and effective way to help you reach your daily protein target. High-quality whey protein (any time of day), casein protein (especially before bed), and vegan protein powders (such as soy, pea and brown rice protein powder) are all practical options to add to your diet arsenal (18,29,80,132,136).

CREATINE

Being the most studied supplement in the world, the data on creatine is very clear. Creatine significantly improves strength and power performance, enhances muscle hydration and increases muscle size (24). The international society of sports nutrition deemed creatine to be the safest and most effective ergogenic aid. More recent data has even shown it to have neuroprotective properties as well (16).

Creatine is produced naturally by the liver and is stored in our skeletal muscle as phosphocreatine. Phosphocreatine is the fuel source for the Phosphagen Energy System - predominantly utilized for short duration, high intensity work such as heavy weight training, sprinting, et cetera.

Looking at the cellular level, ATP (adenosine triphosphate) breaks down to form ADP (adenosine diphosphate), a phosphate molecule and energy that can be used by our muscles. By supplementing creatine, we are able to increase phosphocreatine stores, allowing our bodies to rapidly replenish that lost phosphate molecule, meaning more ATP and ultimately more usable energy for quickly contracting muscles.

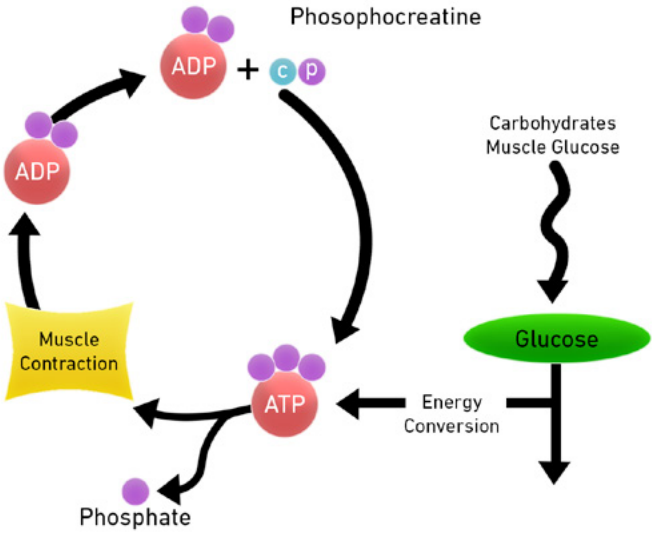


Figure 13A: The Phosphagen Energy System

We recommend that anyone with muscle and strength building goals, supplement five grams of creatine monohydrate per day. This translates to about one teaspoon full.

Contrary to popular belief, loading phases such as taking 20 grams per day for one week are not necessary, but will increase creatine stores in those who have never supplemented with creatine before. So when it comes to loading, while it may help you reap the strength benefits slightly faster than someone just starting with five grams per day, over the course of a month, progress should be just about the same, whether you loaded or not.

Some data has suggested that creatine uptake is slightly enhanced when taken post-workout with carbohydrates and protein (35). However, the body of literature as a whole hasn't found a strong timing effect, so the time of day you supplement with creatine is certainly much less important than simply being consistent with actually taking that five grams per day dosage (24).

CAFFEINE

Caffeine has a large body of evidence supporting its use for cognitive function, increasing strength, prolonging fatigue, maximizing acute fat oxidation, sparing glycogen and much more (25,73). These benefits are why you find it at the number three spot on our supplement

list.

For those with the primary goal of fat loss or alertness, supplementing with a low dose of caffeine may be beneficial before doing cardio (1-2 mg/kg).

As an example, someone weighing 170 pounds (77 kg) would supplement 77-154 milligrams of caffeine. However, if you're looking to maximize strength performance, a much higher dose (3-6mg/kg) can be utilized up to two times per week.

The same person weighing 170 pounds (77 kg) could supplement 231-462 milligrams of caffeine. While such a dose is recommended in the literature, it would be wise to assess your personal tolerance for the substance before jumping to this high of an intake.

The more frequently you utilize high doses of caffeine for acute resistance training enhancements, the less effective it becomes and the faster you build a tolerance (10). Therefore, it may be wise to reserve caffeine supplementation for your heaviest and most demanding training sessions.

Before you get too excited about our praise for caffeine, keep in mind that excessive caffeine supplementation has been shown to decrease sleep quality. As we will see in the next chapter, poor sleep can derail a recomposition journey in a hurry! With this caveat in mind, be sure to use caffeine appropriately and responsibly.

TIER 2

The supplements in this tier (multivitamins and fish oil) are unique as their effectiveness will depend much more on your overall diet. Similar to how protein powder would not be needed if you can hit your protein target with whole foods, these supplements would likely be unnecessary if you already have a diverse diet filled with lots of fruits and vegetables and

eat fatty fish once or twice a week. For most people, you can think of the supplements in Tier 2 as a kind of insurance policy: if you have low dietary quantities of omega 3 fatty acids or a certain vitamin or mineral, taking these two supplements will help insure your overall health requirements. The reason these two do not fall into Tier 1 is simply due to their lack of direct carryover to performance and body composition and the fact that their effectiveness will be more individual. Even so, in terms of general health, these two supplements are definitely still worth considering.

MULTIVITAMINS

Research reveals that it is not always easy to get micronutrient requirements from food alone, especially for athletes. Of course, if you follow the micronutrient and food choice guidelines laid out in this book, multivitamin supplementation may not be necessary.

Still, eating a nutritionally optimal diet can be challenging, especially while in a caloric deficit. In one study examining nationally ranked bodybuilders, men consumed just 46 percent of the RDA for vitamin D (0 percent for women!), only 52 percent for calcium and fell short on zinc, copper and chromium, among others (70).

As we discussed earlier, being deficient in zinc may reduce testosterone levels and several other vitamins are important in regulating metabolic pathways linked to fat loss(70).

For these reasons, and the fact that it is relatively cheap and low-risk, we recommend considering supplementation of a daily multivitamin to ensure you are getting a wide spectrum of water-soluble and fat-soluble vitamins. Whether you decide to take a multivitamin as a sort of micronutrient insurance or not, it is still important to consume a variety of food sources while rotating different fruits and vegetables in your diet.

Furthermore, there is a difference between an optimal and adequate micronutrient consumption (101). Many of the recommended daily allowances are based on amounts required to prevent diseases, not to optimize health.

Body recomposition aside, taking care of our health should be a top priority. Supplementing with a high-quality multivitamin may be a step toward enhancing your health, improving your energy levels, and minimizing your risk of micronutrient deficiency (2).

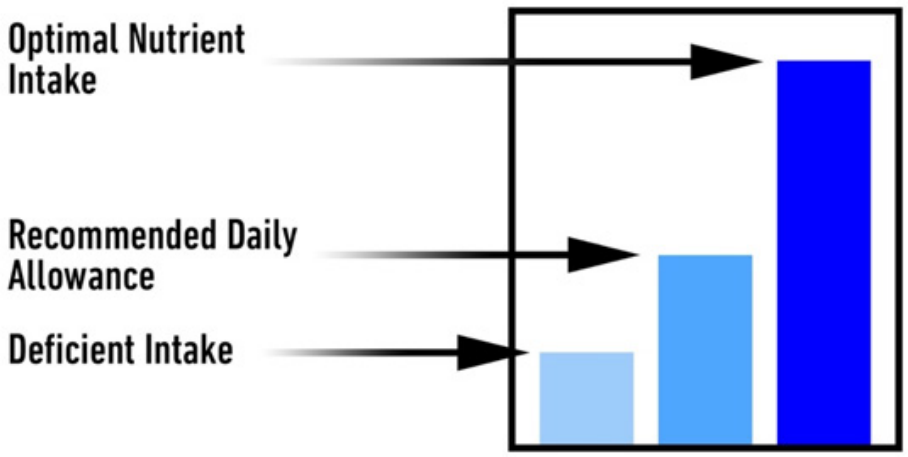


Figure 13B: The Difference Between Adequate and Optimal Intakes

True for nearly all supplements, there can be a huge discrepancy in quality from one source to another. For example, the chemical form of each vitamin or mineral present can significantly

impact their bioavailability. Some multivitamins include vitamins that are cheap and easy to produce, but significantly less bioavailable when consumed.

Also, consuming large doses in one pill (some one-a-day pills) may inhibit your body's ability to absorb and utilize the micronutrients appropriately. We strongly recommend using resources such as Examine.com to learn about specific forms having the greatest bioavailability and what dosage is appropriate for your needs. We also recommend LabDoor.com for information on the quality and purity of different supplements.

FISH OIL (ESSENTIAL FATTY ACIDS (EFA'S - EPA + DHA))

The typical North American diet is deficient in omega-3 fatty acids (61). Omega-3 fatty acids, specifically eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are two fatty acids found in fish, seaweed, algae and can be synthesized from some vegetarian sources such as chia seeds and flax seeds.

Research indicates that you should at least consume 0.3-0.5 grams of combined EPA+DHA per day and that multiple health markers are optimized when consuming anywhere from four to six grams per day (94). Yet, most people only consume 0.1 - 0.2 grams per day.

Again, it is important to highlight the difference between recommended daily intake (RDI) and optimal intake (44). RDIs are values suggested to prevent disease but there is a big difference between not being sick and being optimally healthy.

Deficiency in Omega 3 fatty acids can lead to fatigue, poor cognition/memory, distributed mood/depression, increased risk of cardiovascular disease and several other negative symptoms (78). Collectively, these effects may negatively impact your muscle building and fat loss goals as well. You can naturally increase your Omega-3 intake in your diet by consuming more fatty fish, grass-fed meats, free-range egg yolk, flaxseed, walnuts, chia seeds and spinach, to name a few sources.

Another way to increase your Omega 3 consumption is through supplementation. However, similar to multivitamins, some fish oil supplements on the market are of low quality, potentially high in mercury, and as such, may be more detrimental to your health than beneficial.

Once again, it is important to research the brand you are using and make an effort to supplement either with a high-quality product, or rely on whole food sources. We suggest you aim for two grams per day of EPA/DHA combined.

TIER 3

This tier is where we will cover supplements that have the potential to be beneficial, but the effect is relatively small, the results are mixed, and there is a lower quality and/or lower quantity of studies supporting their use. For these supplements, it is especially important to consider the financial cost tobenefit ratio for your specific situation.

GREEN TEA (EGCG)

Green tea contains a high amount of catechin polyphenols, the most abundant and active of which being EpiGalloCatechin-3-Gallate, commonly known as EGCG. EGCG has demonstrated a multitude of positive health effects but since our focus here is body recomposition, we will alert you to some evidence supporting its use for fat loss.

One study examining the effects of green tea supplementation by Dulloo et al. (42) compared 90 milligrams of EGCG and 50 milligrams of caffeine combined, 50 milligrams of caffeine without EGCG and a placebo treatment which received neither caffeine nor EGCG. Researchers found that the group consuming EGCG showed four percent increased energy expenditure at rest when compared to the caffeine treatment alone. This may sound like a modest increase, but does nonetheless, demonstrate green tea's positive thermogenic effect.
Another study by Maki et al. (82) examined the effects of EGCG on over 100 obese individuals over a 12 week period. One group consumed green tea with low-dose (39mg) caffeine and

the other group consumed low-dose (39mg) caffeine on its own. Both groups exercised three hours per week.

While the results were not statistically significant, the group stacking EGCG with caffeine reported a greater trend for greater weight loss. More importantly, the group supplementing EGCG lost more abdominal fat (-7.7 percent vs -0.3 percent): a finding relevant to body recomposition goals.

This data shows that 125-250 milligrams of EGCG paired with only 50 milligrams of caffeine is sufficient to improve metabolic rate and fat loss.

Certainly more data is needed, especially in healthier, leaner, more athletic subjects, but at this point we can say with some confidence that supplementing green tea/EGCG might aid with body recomposition by enhancing fat loss.

ASHWAGANDHA

A natural herbal adaptogen, ashwagandha is commonly utilized to reduce stress and anxiety, as research has demonstrated its ability to decrease both objective (i.e. cortisol) and subjective (well-being) measures of stress (32). Further research has suggested it may improve strength performance, glucose uptake, and even testosterone levels (110).

Wankhede et al. (129) observed increases in one rep max strength and reductions in muscle damage with ashwagandha supplementation. In a study on 64 subjects with chronic stress, Chandrasekhar et al. (32) found that ashwagandha was able to reduce serum cortisol levels (commonly labeled the stress hormone) by 27.9 percent. All subjective mood stress scores significantly improved as well!

As a potentially powerful, effective and safe herbal supplement, we recommend giving ashwagandha a try and assessing your own experience. Start with 500 milligrams per day. If you are not noticing any benefits at this intake, you can increase your dose to 1000

milligrams per day. Some studies have used 6000 milligrams daily (2000mg/3x/day) with no negative side effects.

When searching for an ashwagandha product, look for one that uses the KSM-66 strand, as it has been most studied in the literature. We suggest taking the supplement post-exercise (when cortisol levels are naturally going to be elevated) and/or with your final meal before bed.

L-CITRULLINE

Out of all the supplements that claim to enhance performance and gains over time, L-Citrulline is one of the few that has a reasonably large amount of scientific support (11,17,47,98). Unfortunately, many companies either underdose L-Citrulline in pre-workout formulations or hide the true amount behind what they call a proprietary blend.

Many pre workout pump products also make the mistake of using L-Arginine instead of L-Citrulline, under the faulty assumption that L-Arginine will significantly increase nitric oxide (NO) levels in the blood, resulting in skin-tearing pumps.

In reality, supplementing with L-Citrulline is actually more effective at increasing blood arginine levels than supplementing with arginine itself. This is because, unlike L-Arginine, L-Citrulline is able to bypass hepatic metabolism, meaning it doesn't get broken down in the liver. Once in the bloodstream, L-Citrulline is able to increase blood vessel diameter (vasodilation) via nitric oxide production, allowing blood to flow to your tissues more effectively. This increase in blood flow leads to more efficient oxygen delivery.

When exercising, your muscles need more oxygen to maintain performance, which is one reason why L-Citrulline has been shown to significantly increase muscular endurance during exercise. Also, with this increased blood flow, not only is oxygen delivery enhanced, but other nutrients such as glucose and amino acids can be transported to the exercising muscle more efficiently.

Like us, you may have taken a pre-workout supplement and noticed a great pump the first few times you use it, but over time the effects seem to diminish and you feel like the product no longer works.

This can happen for a few reasons. Perhaps your product doesn't contain a clinically effective dose of four to ten grams. Or perhaps your body has grown less sensitive to the ingredients. With citrulline in particular, your body can upregulate arginase (an enzyme that breaks down arginine) and over time, may not produce the same response. To combat this, we recommend cycling on and off L-Citrulline periodically, such as during a deload block of training.

TIER 4

The reason that Yohimbine HCL is in its own tier, at the bottom of our recommended supplements list, is because while it may provide some benefit for fat loss, the lack of research compounded with a greater potential for negative side effects make it harder to

recommend broadly. As with Tier 3 however, it is included so that you can make an educated decision for yourself on whether or not to take it based on your own cost - benefit calculation.

YOHIMBINE HCL

Yohimbine is a supplement derived from Yohimbe Tree Bark that has been shown to enhance fat loss (95) and decrease appetite by increasing adrenaline (also known as epinephrine) while inhibiting processes that suppress fat loss.

To oversimplify a lot of complex biochemistry, to maximize lipolysis (fat breakdown), basically we want epinephrine to bind to beta receptors (instead of alpha receptors) on fat cells. Yohimbine works by binding to alpha receptors, leaving more beta receptors open for epinephrine to bind to, ultimately increasing fat breakdown. Again, to keep things really simple, from a fat loss perspective, alpha receptors are "bad" and beta receptors are "good."

As you might expect, obese people tend to have more bad alpha receptors while lean people tend to have more good beta receptors. Interestingly, men and women differ in terms of where those bad alpha receptors are distributed in the body: women tend to have more on their hips, men tend to have more on their abdominals. This is probably part of the reason why men and women tend to store body fat in a different manner. You have most likely heard of the fat in these problematic areas referred to as stubborn body fat.

If you've been following the plot, you can probably guess that Yohimbine supplementation may have utility in mobilizing and breaking down these stubborn fat stores. This is especially the case when it is stacked with caffeine and taken on an empty stomach before performing fasted cardio or two hours after a low glycemic meal (insulin inhibits yohimbine's lipolytic mechanism).

Most studies show a benefit with supplementation of 0.2 milligrams of Yohimbine per kilogram of bodyweight. However, taking an altered form such as Yohimbine HCl may provide the same benefit with a smaller dose due to increased bioavailability.

It's worth mentioning that although yohimbine may help with appetite suppression and fat breakdown, it may also lead to increased anxiety, increased heart rate and mean arterial blood pressure. Because of this possibility, we suggest that you start with a low dose Yohimbine HCl (2.5mg/50lbs per day) as you assess your tolerance. If tolerated well, you can increase your dose to 2.5mg/25lbs 15 minutes before training. So for example, if you weigh approximately 150 pounds, start with 7.5mg of yohimbine. Over time, if you have no negative side effects, that same person can take 15mg of yohimbine pre workout.

With all of this information, while the data is incomplete, based on the above information a potentially helpful strategy for targeting so-called stubborn fat would be to take 1mg/kg of caffeine, 125-250mg of EGCG (or green tea) and 2.5mg/lb yohimbine HCl. Using the same 150lbs person for reference, that would translate to ~70mg caffeine, ~250mg EGCG and up to 15mg yohimbine hcl.

SUPPLEMENTATION: PUTTING IT ALL TOGETHER

HERE IS OUR BODY RECOMP SUPPLEMENT "CHEAT SHEET":

- High quality protein powder
  - As needed to hit daily protein targets
- Creatine monohydrate
  - 5g (~1 tsp) per day
- Caffeine:
  -1-2 mg/kg bodyweight for general alertness, cardio, and acute fat oxidation benefits
  -3-6mg/kg bodyweight for maximizing strength performance up to 1-2x per week
  (always gradually assess your own tolerance before jumping to a high dose)
- Multivitamin
  - as needed to address gaps in diet
- Fish Oil
  - 2g combined EPA/DHA per day
- Green Tea (EGCG)

- 125-250mg of EGCG paired with only 50mg of caffeine for fat loss
- Ideally taken before cardio

- Ashwagandha (KSM-66)
  - Start with 500mg per day. After assessing response, optionally increase dose to 1000mg per day
- Yohimbine HCl
  - (2.5mg/50lbs per day) per day
  - Ideally taken before cardio on an empty stomach
  - Only to be used as an “advanced” stubborn fat strategy
- L-Citrulline
  - 4-10 g taken preworkout


14

CHAPTER 14

SLEEP AND STRESS: THE DARK HORSE OF BODY RECOMP

"SLEEP IS THE GOLDEN CHAIN THAT TIES HEALTH AND OUR BODIES TOGETHER." -THOMAS DEKKER

For most of this book so far, we have focused on the variables that everyone thinks of when they think of losing fat and building muscle. How many calories should I eat? How much protein do I need? And so on.

Up until now there has been no talk of two painfully underrated variables that can impact your recomp success on an enormous scale: sleep and stress. We're calling these combined factors the "dark horse" of body recomp because they are so infrequently acknowledged as the major factors that they are.

While many of us may wish it weren't true, in terms of both muscle gain and fat loss, we cannot possibly overstate how critical sleep and stress are to your success.

In this chapter we will check out what the science has to say about sleep and stress and

describe how even making small improvements in these areas can catapult your progress forward.

SLEEP

Despite the fact that today's culture seems to glorify lack of sleep, as if sleeping less were synonymous with the hard-working, disciplined individual, the reality is that just because you prioritize sleep doesn't mean you're lazy. In fact, sleep is extremely important.

It affects the functioning of almost every type of tissue and system in the body (the brain, heart, lungs, and others), and as such, nearly every physiological parameter, including metabolism and immune function. Research and coaching experience indicate that sleep is probably the most underappreciated and often neglected component of body recomposition. An incredibly fascinating study demonstrating the connection between sleep and body recomposition was published in 2018 by Wang and colleagues (128). The results are simply mind-blowing.

Participants went on an eight week fat loss diet. The researchers split the subjects up into a "sleep restricted" group and a "normal sleep" group. All things were equal except the sleep restricted group slept one hour less than the other group, five nights per week. The sleep restricted group was allowed to sleep one more hour per night on the weekends to test if it was possible to catch up on lost sleep. The other group slept normally the entire time.

Brace yourself for the results: Although there were no significant differences in total weight lost, there was an enormous difference in where that weight was lost from (that is, whether weight was lost from fat or muscle). For the subjects that slept normally, 83 percent of weight loss was lost as fat. For the subjects that were sleep restricted, this completely flipped: approximately 85 percent of weight loss was lost as fat-free mass!

Put another way, subjects sleeping normally lost most of their weight as fat, while subjects sleeping poorly lost most of their weight as lean mass (including muscle). And all of this was from just one hour of sleep less per night, five days per week!

This finding really highlights just how much sleep matters for recomposition goals and provides yet another example of how weight loss and fat loss are not always synonymous in the real world. If we want as much of our weight loss to come from fat tissue as possible, we simply have to pay attention to how much sleep we're getting.

It's worth mentioning that the participants in this study were not weight training. They were merely placed in a calorie deficit. Undoubtedly, lifting weights would have shifted the results to some degree, but could not possibly offset the massive difference between the groups. Another study compared subjects getting either 8.5 or 5.5 hours of sleep per night while in a caloric deficit. (92) Once again the results were incredible. Even though both groups lost about 6.5 pounds of body weight on average, the sleep-restricted group only lost about 1.3 pounds of fat. This means that fully 80 percent of their weight loss came from fat-free mass (including muscle).

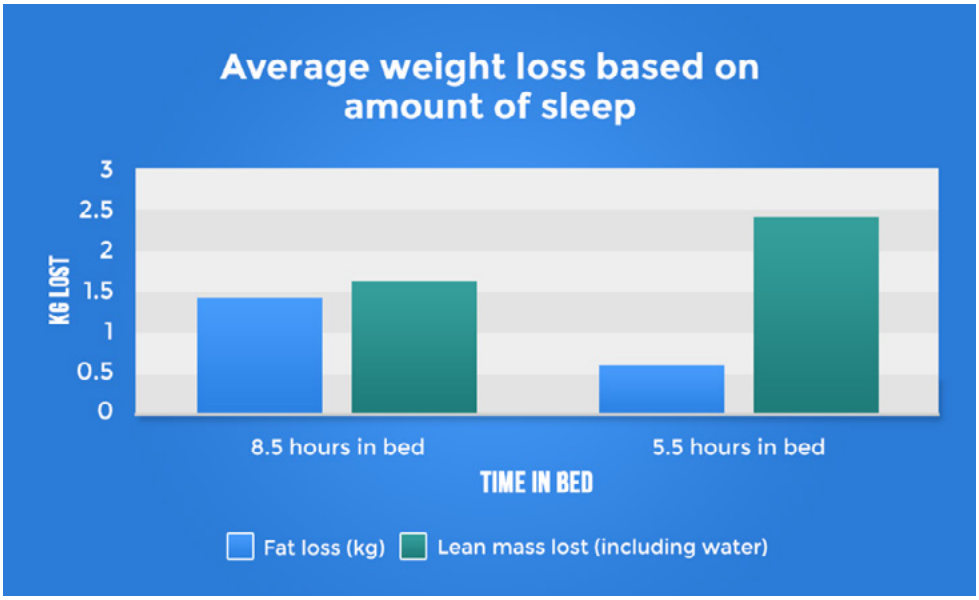


Figure 14A: Fat and Lean Mass Loss Differences Between 8.5 and 5.5 hours In Bed (92)

It was actually even worse than this for the sleep restricted group. In addition to the unfavorable body composition results, there was also a significant spike in ghrelin (a hormone responsible for ramping up hunger levels). So sleeping less will not only negatively impact your body recomposition goals in its own right, it will also make hitting your calorie and macro targets even more difficult by making you feel hungrier than usual.

This really seems like a slam-dunk case that even though you can still lose the same weight with less sleep (assuming your will power is enough to overpower the spike in ghrelin), much more of that weight loss is going to come from lean mass: the exact opposite of what we want.

So why does sleep restriction cause more muscle loss as opposed to fat loss? This anti-recomposition effect is probably owed to the catabolic hormonal cocktail it imposes on the body: higher cortisol, lower myostatin, lower testosterone and lower IGF-1. (109) Collectively, these processes reduce muscle protein synthesis and increase muscle protein breakdown. As you likely know, any one of these hormonal changes on their own would have the potential

to rob you of muscle, so combining all of these changes can be truly detrimental.

Before you toss this book out and give up, because you're simply unable to sleep as much as you'd like due to important personal, family or work-related demands, there is still hope for you! Keep in mind that the subjects in the research above were not optimizing their training and nutrition. While it isn't likely that an optimized diet and training program would fully rescue the negative impacts of sleep restriction, they would undoubtedly make these results seem less scary. In fact, one of my (Jeff) most successful clients ever, achieved this amazing transformation getting only four to five hours of sleep per night.

Figure 14B: Client Transformation Getting Just 4-5 Hours Of Sleep Per Night While Optimizing Training and Nutrition Variables

While I have no doubt that Patrick would've gotten even better results had he prioritized his sleep more, his results should provide some solace to those of you who simply won't be able to prioritize sleep due to other demands in your life. Before looking at how many hours

of sleep per night is enough and how much is optimal, let's have a quick look at how sleep impacts training performance in the gym.

SLEEP AND TRAINING

Have you tried hitting a max set of deadlifts after pulling an all-nighter? If you have, it probably sucked and you're not alone.

In 1994, researchers (106) restricted subjects who usually slept eight hours per night, to only three hours per night for three days in a row. Being sleep deprived, the participants performed 20 repetitions at 35-45 percent of their 1RM on the biceps curl, bench press, leg press and deadlift.

As you'd expect, there was a significant and linear decrement in the maximal weight lifted for bench, deadlift and leg press that got worse as the three days went by. Maximum strength on the bicep curl decreased as well, but did not reach statistical significance. This finding led the researchers to speculate that perhaps larger, more complicated movements are more negatively affected from missed sleep.

Partial sleep deprivation (PSD) also caused an increase in perception of effort with a given weight. (106) This rings true to anyone who has tried lifting on low sleep: even if you can move the weight, it just feels heavier.

SLEEP EXTENSION

Sleep extension has also been the subject of much excitement in the sports world, especially at the elite level. One such study on the elite Stanford University NCAA men's and women's swimming teams (125) found that when swimmers extended their sleep to 10 hours per night, their average sprint time, reaction time, turn time and kick speed all improved, with many of the swimmers setting personal, school and NCAA records throughout the study

duration.

Study author Cheri Mah (81), concluded that "these results begin to elucidate the importance of sleep on athletic performance and, more importantly, how sleep is a significant factor in achieving peak performance. Athletes who get an extra amount of sleep are likely to improve their performance."

Mah et al. 2011 (81) is another study worth taking a look at. Varsity NCAA female basketball players found that subjects improved shooting accuracy (a nine percent improvement on free throws and a 9.2 percent improvement on three-pointers) when they spent at least 10 hours per night in bed (and were encouraged to get as much sleep per night as possible).

Researchers were convinced that it was far from a coincidence that The Stanford Women's Basketball Team in this study went on to play for the NCAA Championship that year. "If people understood how much of a difference getting more sleep could make athletically, they'd incorporate it into their lives and not focus solely on nutrition and exercise," remarked one of the researchers. It seems sleep really is a dark horse worth saddling!

By now, hopefully we have convinced you that how successful your recomp is will depend largely on how much sleep you are getting. Even if all of the relevant nutrition and training factors are perfectly in place, consistently poor sleep patterns can rob you of getting the results you deserve. The questions left unanswered is, "How much sleep is enough?" And "How little is too little?" These are the questions we will turn to next.

HOW MUCH SLEEP DO WE NEED FOR BODY RECOMPOSITION?

The National Sleep Foundation recommends seven to nine hours of sleep per night for young adults and adults seeking general health and well-being (58). However, based on the

benefits seen in the literature in terms of performance and recovery with sleep extension and the fact that resistance training imposes a significant recovery demand, we recommend a slightly higher target of eight to nine hours of sleep per night to optimize progress.

To be clear, we still believe that body recomposition is possible with lower levels of sleep. However this target range is an ideal we can strive for in hopes of attaining the most optimal result.

I (Jeff) am personally aiming for eight to nine hours per night in bed (11pm-7/8am) and recently read that Lebron James aims for 10-11 hours of sleep per night. Since this may not be a realistic standard for many readers, it is worth considering what to do if you fall short on sleep.

Let's say you sleep poorly for a few nights during the week because of work or school. Researchers sometimes refer to this lack of optimal sleep as a "sleep debt." So the question is, can a sleep debt be made up for by sleeping "extra" later on (such as over the weekend)? Well, the answer is, kind of, but not as easily as we might hope.

One study found that just one hour of sleep debt can take four days of optimal sleep time to fully recover from (69). So unless you're really just sleeping the weekend away, the idea that you can make up for a full week of poor sleep in a single weekend may be a bit of a stretch. Still, making some kind of effort to rescue the negative impacts of sleep debt is worthwhile. For people who simply cannot reach the ideal target of eight to nine hours per night, we offer a few consolations:

- Realize that any improvement in your nightly sleep duration is an improvement. Six hours is still better than five hours, and seven hours is still better than six. You don't have to reach optimality to still get results, so don't be too hard on yourself if our target is not doable or not worth it for you.

- Naps are your friend. Research shows that napping has many benefits, especially for those who work night shifts or have sleep disorders (86). We recommend taking naps without restriction, as long as they don't start interrupting your main sleep at night.

- Make an effort to sleep extra on the weekends or whenever you can. Even though it may not be possible for you to fully repay a sleep debt in a single night or two, we believe that this will still likely have a beneficial impact on your training and overall body recomposition success.

If you are not sure about the amount of sleep you are getting, there are a few ways to determine your current standing.

SLEEP TRACKING DEVICES

Tracking sleep through smart technology has become a relatively novel means of assessing your sleep patterns and total sleeping hours. Utilizing smartphone apps and wearable objects such as Fitbits and smart watches to collect and analyze sleep data is becoming more popular. However, because these technologies are still so new, the accuracy of most remain questionable – especially compared to medical grade devices. At the time of writing, we are therefore, hesitant to make specific recommendations.

At the risk of sounding old-school, we believe there is some credence in using more subjective measures. If you are intentional enough to tune in to feedback from your body, those signals can provide some degree of certainty as to whether or not you are getting sufficient sleep.

Consider your answers to these questions: Do you feel tired? Is your strength in the gym suffering? Are you waking up frequently during the night and having trouble falling back to sleep? Are you always waking up to an alarm? Answering "yes" to these questions, especially when combined, point toward less than ideal sleep. For completion sake, there is a caveat

here worth mentioning.

We are often not as good as we'd like to think at self-assessing. Whether critiquing our own body language, determining our influence on others, assessing our own strengths/weaknesses or guesstimating the effect our current sleep is having on our daily performances, there seem to exist too many biases and blind spots to accurately gauge the specifics.

For our purposes here, we are reminded that as our sleep is disrupted, so is our ability to self-assess the effects it is having on our fitness and body recomp goals. This does not mean, of course, that self-analysis of how we feel and how we perform cannot be taken seriously but rather serves as a caveat. Experimenting with additional sleep and monitoring its effect on performance may be a more practical means in reaching a conclusion as to whether you are operating in a sleep-deprived state.

For ethical reasons, long term studies of the effects on people functioning in a state of sleep deprivation over extended time periods are extremely rare. We are quite certain however, we got the picture on this one.

Because sleep deprivation often overlaps and interconnects with corresponding stress levels, it is worth shedding some light on the perils of stress with regard to our recomp objectives.

STRESS

If you're like us, you have probably noticed how stress negatively affects what would otherwise be routine endeavours. Exam time, tax audits, a death of a loved one, a major illness, a job loss or being the subject of a nasty rumor can all reign down on our well-being, including our muscle to fat ratios.

One 2008 study found that when subjects underwent a 12 week strength training program,

(15) the subjects with higher levels of stress (as determined by a questionnaire that evaluates positive and negative life events experienced by each participant), gained significantly less strength in bench and squat. They also gained less size on their arms and thighs (the trend did not reach statistical significance, however).

Several other studies in this field have suggested that lifestyle stress can take a profound toll on recovery from training (39,118–120). It is a fair conclusion to say high stress levels are not doing your body recomposition goals any favours.

SUGGESTIONS AND TIPS

In dealing with the stressors in my life, I often resort to two main forms of relief: Meditation and an activity that evokes a state of "flow" - being in the zone.

Meditation relaxes my fragmented mind, reduces stress, helps with my concentration, brings be back to the present and centers my state of thinking and being.

If you are a beginner or simply curious about meditating, I suggest giving one of the various popular mindfulness meditation apps available a try. I would further recommend that you begin with short, 10 -15 minute guided meditations to help keep you on track.

Then, there is my second go-to means of reducing stress.

The idea here is to find some activity that puts you in a state of "flow". For me (Jeff) this is playing basketball. When I am playing basketball, I forget about everything else that is going on in the back of my mind and focus completely on my game. This is not an intentional process, it simply happens (especially if I am actually playing a game and not just shooting around).

This sensation of flow where athletes tune out the noise in the crowd, the pressure of the game and all other distractions to become fully present in the moment, isn't limited to sports. Gardeners, musicians, surgeons, artists, authors, singers and video gamers all report experiencing this same phenomenon from time to time. It's a peculiar paradox where time seems to stand still, and yet the activity appears to be completed in an instant.

Psychologist Mihaly Csikszentmihalyi coined this genuinely satisfying state of consciousness as flow. When the challenge of the task at hand is at its highest point and intersects with the highest level of your skillset, the activity itself becomes the reward. It is here, flow originates. For some, lifting weights itself is sufficient to elicit this flow state. For others, it is more monotonous. We recommend that you think about and experiment with enjoyable activities until you discover one that brings that similar stress-free experience.

In addition, give some thought to other common stress relievers such as the list we have compiled below:

- Use the supplement ashwagandha, as described in Chapter Thirteen.
- Find a physical activity that you enjoy enough that it doesn't require much discipline to regularly participate in.

- Spend time with family and friends who add positivity to your life.
- Referee your self-talk and train your thinking so that you can switch off any destructive or debilitating thoughts by replacing it with a more empowering thought.
- Start a daily gratitude list (it is virtually impossible to be grateful and feel stressed at the same time)
- Take an inventory of habits that steal from your long term joy. Then, adjust accordingly.
- Learn to forgive yourself and be kind to yourself, as you would to others.
- Celebrate often – even the smallest of victories!
- Avoid unhealthy choices as a means of coping (substance abuse, smoking, overeating, gambling, et cetera).
- If these steps fail to help reduce stress, consider enrolling in a stress management course or seeking medical help.

In addition to stress busters, we have listed a few tips to improve your sleep as well:

- Set a schedule – go to bed and wake up at the same time each day.
- Exercise, but no later than a few hours before going to bed.
- Avoid caffeine late in the day (after 5pm) and alcoholic drinks before bed.
- Relax before bed – try a warm bath, reading, or another relaxing routine.
- Design the environment you are sleeping in for maximum facilitation towards sleeping: Get a comfortable mattress and pillow. Remove bright lights from computers, laptops or phones. Minimize or eliminate loud, irregular sounds. Adjust the room temperature to make it conducive to your sleeping. Avoid watching TV in your bedroom if you find it keeps you awake.
- If you are worrying about something to the degree that it is keeping you awake, set a time in your mind – even get up and write it down – to deal with it the next day. You will deal with it at noon tomorrow, for example. This settles your worrying mind that the issue will be dealt with.
- Don't tackle big jobs or stressful topics before sleep.
- Avoid going to bed on an empty stomach. Ensure you have saved enough calories/macros for a satiating meal before bed.

If after trying some of these suggestions consistently and you continue to struggle with sleeping or if you feel unusually tired during each day, make an appointment with your family doctor and discuss the condition with him or her. Most sleep disorders, such as sleep apnea, can be treated and there is usually no need to live, suffering from insomnia or a chronic state of sleep deprivation without seeking help.

In conclusion, we challenge you to no longer think of your training as what happens in the gym. Consider sleep and the reduction of stress as part of the training regimen, equally important and demanding as much attention as the workout itself.


15

CHAPTER 15

WEIGHT TRAINING – THE DRIVING FORCE OF BODY RECOMPOSITION

"THE BARBELLS AND DUMBBELLS YOU HOLD IN YOUR HANDS AND THE WAY YOU USE THEM HAVE STORIES TO TELL." - CRAIG CECIL

Let's start this chapter by saying that it is easy to lose fat by using diet alone, but nearly impossible to build muscle without weight training. This fact has led many experts in the field to conclude that when it comes to building muscle, nutrition is permissive to weight training. This means that you can have the most optimal diet, eat the ideal amount of perfectly distributed protein every day, and you still won't build any appreciable muscle without a training stimulus.

As such, we believe that weight training can be considered the driving force of body recomposition. To better understand this, let's use the analogy of a car. We can think of our training as the engine and our nutrition as the gasoline needed to fuel performance. The

better the fuel (macronutrients, micronutrients, nutrient timing, et cetera), the better the performance. However, without the engine, the car simply won't move, regardless of the fuel's quality.

We can then think of other variables such as sleep and stress management as the tune-ups, oil changes and tire rotations required to keep the system moving along.

Clearly, weight training is paramount to building muscle and improving body composition. (46,112,126) However, similar to your nutritional approach, there are a virtually infinite number of variables that can impact how you should structure your training. Some of these variables include, but are not limited to, your primary goal, experience level, exercise preferences, preferred training style, scheduling concerns, equipment availability, previous injuries, and on and on.

Once these individual components have been identified, we can outline specific training recommendations in terms of key variables like volume, exercise selection, frequency, splits and more when constructing a training program.

Since nutrition is the primary focus of this book and we have limited our discussion of training to a single chapter, to do all of these factors justice would surely require a whole other book. With that said, because proper training is so crucial to body recomposition success, we would like to provide you with some insight, science, and clarity on the key training variables responsible for driving muscle growth. Let's dig in!

PROGRESSIVE OVERLOAD IS KEY

Progressive overload is the gradual increase in the amount of stress placed on the body from exercise (71). In other words, if no greater stress is placed on the muscle over time, the muscle has no reason to grow in order to overcome that stress.

In its most basic form, progressive overload simply means doing more, over time. Practically speaking, this usually takes the form of simply adding more weight to a given exercise from workout to workout. However, there are several different ways to apply progressive overload:

1) increase load
2) increase repetitions with same load
3) increase sets
4) improve form
5) increase rep duration (such as by slowing the eccentric/negative)

There are surely other creative ways to overload as well and it should be noted that these techniques can be used in combination. For true beginners, some form of progress should be achieved each and every workout. However, as an individual gains experience, progress will gradually slow.

As you become more advanced it may be important to apply progressive overload over a longer time scale and through less objective means such as by improving technique, lifting tempo and the mind-muscle connection on certain exercises.

When it comes to progression, we urge you to prioritize quality over quantity. The concept of progressive overload (more specifically, progressive tension overload) is effective mainly because it provides a simple method for increasing mechanical tension - a key player in muscle hypertrophy (112,126).

Adding load to the bar will only lead to progressive tension overload if form and execution are kept consistent. Therefore, it is well-advised to not add any load if it comes at the expense of hindering proper technique. While controlled cheating can be employed occasionally on specific exercises as an advanced training technique, generally speaking, adding more weight through the use of more momentum, by decreasing your range of motion, or by altering your lifting mechanics, does not count as true progressive overload in our books.

VOLUME IS A DRIVER OF GROWTH

At the most basic level, training volume refers to the amount of work you are doing. While volume load is calculated in the scientific literature according to the formula, sets x reps x load, in practical training circles, it is usually approximated as the number of working sets (not including warm up sets) performed per session or per week.

It has been suggested that there is a dose-response relationship between training volume and muscle hypertrophy (113,114), meaning more training volume tends to lead to more muscle growth. However, the literature is inconclusive as recent evidence suggests that more volume is not always better and how much you need depends on other training variables (14).

As we will see, not all volume is created equal and how much volume you need to maximize growth may also depend on the body part you're training. The muscles of the back, for example, may require higher training volumes than the biceps in order to maximize growth. However, as a general rule, based on our coaching experience and the body of scientific research, most trainees should be performing somewhere in the range of 10-20 sets per body part per week. Some advanced trainees or trainees with impressive recovery abilities may require higher volumes for continued progress.

To explore these numbers further, my colleagues and I (Chris) recently investigated the effects of different training volumes on the lower body utilizing 12, 18, and 24 sets per week (Aube at al. 2019 - publication pending). Our hypertrophy results between all three groups were similar throughout the eight-week training study.

However, what I think is most important to extrapolate from our findings, is how different the individual responses were in all three groups!

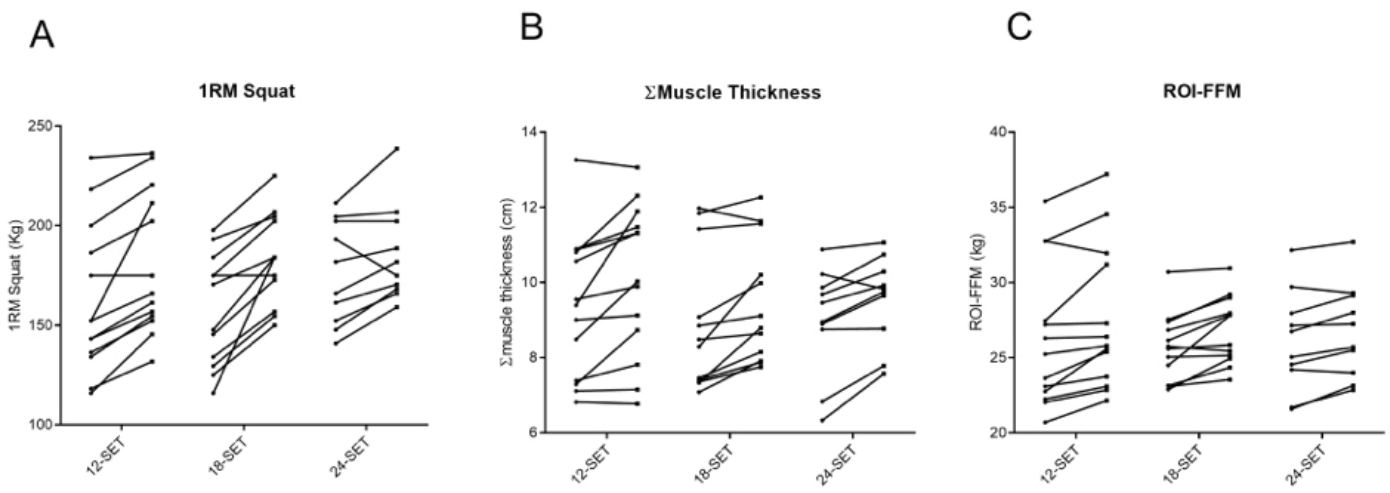


Figure 15A: Individual Responses To Different Training Volumes (Aube at al. 2019 - publication pending)

Regardless of the amount of volume they were performing, most people gained strength and size. However, the magnitude of gains was very different from person to person. We believe this implies that the amount of volume you need must be tailored to your specific goals and based on the individual variables laid out at the beginning of the chapter.

GENERAL VOLUME PRINCIPLES

- Your current training status and previous training experience will play a large role in determining how much volume you should perform.
- Generally, beginners should train with lower volumes than advanced trainees.
- We recommend starting with relatively low volumes at the beginning of a program and gradually increasing volume over time.
- Volume can be increased by adding working sets and/or by lifting more load (weight) and/or adding more reps per set.
- More isn't always better! Adding too much volume can result in overtraining or injury and can be counterproductive to body recomposition.
- Increasing volume isn't the only way to drive progress. We think it is better to underestimate your optimal volume initially and focus first on mastering variables like technique and effort before turning to increasing volume.

Below are some figures to help explain that there is always a sweet spot for volume that will need to be fine-tuned to the individual.

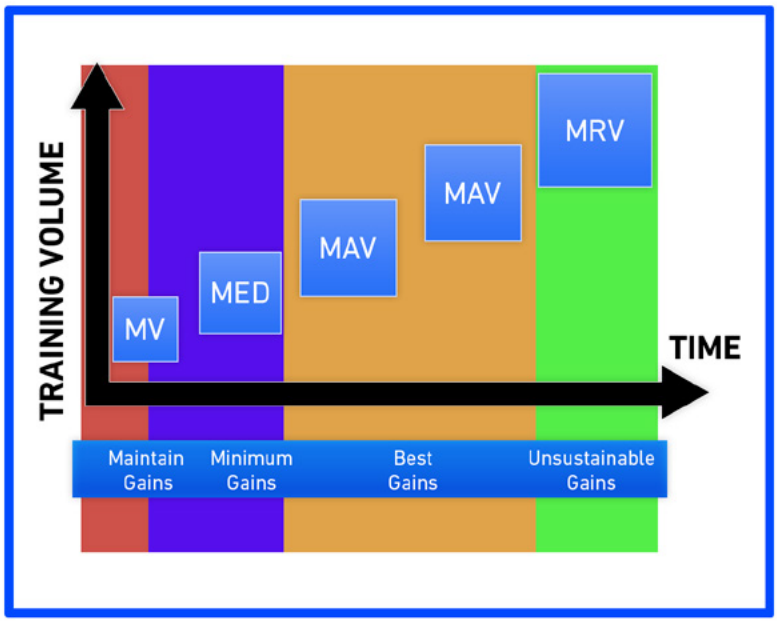


Figure 15B: The Best Gains Are Not Always Found With The Highest Training Volumes

KEY TERMS:

MV = Maintenance volume. Volume required to maintain your current physique. (No loss, no gains)

MED = Minimum effective dose. This is the least volume you need to see some growth, but not maximize growth.

MAV = Maximum adaptive volume. This is the proverbial sweet spot for volume: You are able to maximize progress without accumulating excessive fatigue.

MRV = Maximum recoverable volume. This is the most volume you can do and still recover from. Increasing volume further would likely lead to a detriment in performance and/or muscle size.

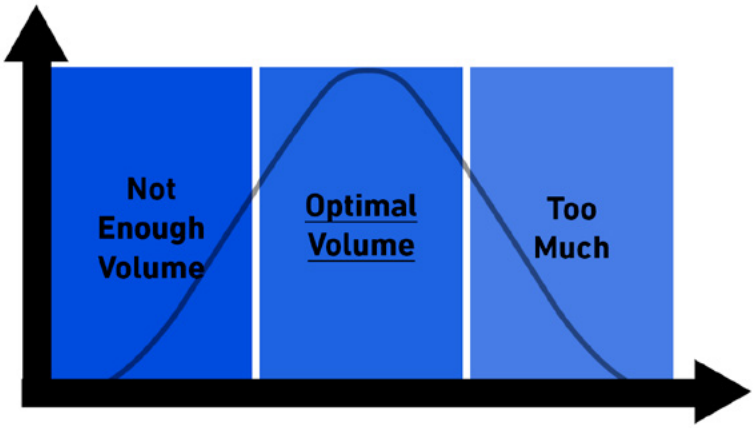


FIGURE 15C: Too Much And Too Little Training Volume Can Lead To Suboptimal Gains

NOT ALL VOLUME IS CREATED EQUAL

As one final note on volume, we would like to remind you that not all volume is created equal. There is a much higher level of skill and effort required to perform some lifts than others. For example, one set of bench press will offer more hypertrophic bang for your buck than one set of pec deck. Likewise, performing four sets of squats will impose a higher local and systemic fatigue demand than four sets of leg press.

Different exercises can also result in different patterns of hypertrophy across a given muscle group, even when volume is matched. This was exemplified in one 2014 study which showed that even when total volume was matched, a group performing four different exercises (squat, leg press, lunges and deadlift) saw significant hypertrophy in all four heads of the quadriceps, while the group performing only one exercise (squats), made significantly less gains in two heads of the quad (including the "tear-drop" head)(49).

This research implies that it is important to not only consider volume, but to also include a variety of exercises to maximize growth potential.

NOT ALL EXERCISES ARE CREATED EQUAL

It should be clear from the research above that including a variety of exercises is ideal for optimizing complete development of a muscle group. We also believe that some exercises are simply more effective at building muscle than others.

Generally speaking, it is important to emphasize multi-joint, compound movements that utilize large amounts of muscle mass in any complete training program. This will not only improve general strength that can then be carried over to other exercises but will also make training more time-efficient (since a single compound exercise is able to activate a large degree of muscle mass). Below are some basic compound exercises we suggest including in your program:

- Legs: Squat variation, lunge, leg press, deadlift variation, hip thrust
- Back/biceps: Horizontal pull (row variation), vertical pull (pullup/pulldown)
- Chest/triceps: Horizontal press (dumbbell, barbell, machine)
- Shoulders: Vertical press (barbell, dumbbell)

While compound exercises should make up the bread and butter of your training program, certain muscles are better targeted through single-joint isolation exercises. Below are some basic isolation exercises we suggest including in your program, especially if any of these muscles are lagging on your physique:

- Rear deltoids: Reverse pec deck, reverse flyes (cable or dumbbell)
- Side deltoids: Lateral raise (cable, dumbbell, machine)
- Biceps: Curl variation (dumbbell, barbell, cable)
- Triceps: Cable pressdown, overhead extension, skullcrusher
- Hamstrings: Leg curl variation (lying, seated, GHR)
- Calves: Calf raise (standing, seated)
- Abs/obliques: Crunch (cable, weighted), leg raise, planks, anti-rotation

While these movements should be prioritized in your training, other exercises not included on this list certainly can be added to your program depending on your specific needs, goals and preferences.

TRAINING HARD

Another way that training volumes differ is in terms of how hard the sets are. Should we be pushing sets all the way to failure or should we stop shy of failure?

While the scientific literature is currently unclear as to exactly how often we should be taking sets to failure to maximize growth, it is clear that if you want to make continued progress past the beginner level, it is important to put in a high level of effort when training (54).

This does not imply that every set should be taken to failure, since consistently taking sets to complete fatigue can lead to overtraining and reduced overall volume, potentially hindering growth. As a general rule, we recommend leaving one to three reps in the tank on most compound exercises. Isolation exercises can be taken more routinely to failure without the same risk of fatigue accumulation, however, we still recommend reserving failure for the last set of any given exercise.

WHAT IS THE BEST REP RANGE FOR MUSCLE GROWTH?

As long as you are applying appropriate effort, with appropriate volume, research shows that you can achieve very similar levels of hypertrophy with low reps (heavy weight) and high reps (light weight). So, again, assuming you're training sufficiently hard, what specific rep range you work in may matter less for hypertrophy than many people think.

With that said, we still believe that there is a "practical hypertrophy zone" where the majority of working sets should come from. That practical rep zone is 6-15 reps. There are two main reasons why we believe this rep zone is preferable for the goal of building muscle.

First, as you increase the rep count beyond 15 reps, you will begin to accumulate more metabolic fatigue, which can be very taxing, both psychologically and physiologically. As such, since you can achieve the same hypertrophy with lower reps, generally, we recommend reserving high rep work (15-25+ reps) for isolation exercises to be performed near the end of the workout.

By the same token, sets with a rep count lower than six tend to run a higher risk of injury due to heavy loading and can make it more difficult to accumulate an appropriate amount of total training volume.

So while in theory, there isn't anything magical about the 6-15 rep range, in practice, it is the most reasonable, as it allows you to perform enough work safely and comfortably without running into the recovery issues that we tend to see at the rep range extremes.

This also doesn't imply that there is no place for "pure strength work" (i.e. <6 rep sets) or "pure pump work" (i.e. >15 rep sets). We suggest allocating approximately 75 percent of your weekly training volume to the 6-15 rep zone.

TRAINING FREQUENCY AND TRAINING SPLITS

Should you train each body part once a week? Twice a week? Every day?

It seems that as a whole, the scientific literature suggests that training each muscle twice per week is better than only training each muscle once per week. Whether or not frequencies higher than that are better, seems to depend on the individual.

This finding has a few implications for training splits. For example, the traditional bodybuilding bro split where chest is hit on Monday, back is hit on Tuesday, et cetera, is not likely to maximize progress due to suboptimal training frequency.

There are a virtually infinite number of ways that you can split up your training during the week to meet the two times frequency minimum. Below are a few examples of splits we have had success with:

THE UPPER LOWER SPLIT (BEGINNER-INTERMEDIATE)

- Day 1 - Upper
- Day 2 – Rest
- Day 3 – Lower
- Day 4 – Rest
- Day 5 – Upper
- Day 6 – Rest
- Day 7 – Lower

THE UPPER LOWER SPLIT (INTERMEDIATE-ADVANCED)

- Day 1 - Upper
- Day 2 – Lower
- Day 3 – Upper
- Day 4 – Lower
- Day 5 – Upper
- Day 6 – Lower
- Day 7 – Rest

THE PUSH PULL LEGS SPLIT (INTERMEDIATE-ADVANCED)

- Day 1 – Push
- Day 2 – Pull
- Day 3 – Legs
- Day 4 – Push
- Day 5 – Pull
- Day 6 – Legs
- Day 7 – Rest

THE FULL BODY SPLIT (BEGINNER-INTERMEDIATE)

- Day 1 – Full Body
- Day 2 – Rest
- Day 3 – Rest
- Day 4 – Full Body
- Day 5 – Rest
- Day 6 – Full Body
- Day 7 – Rest

THE FULL BODY SPLIT (ADVANCED-ELITE)

- Day 1 – Full Body
- Day 2 – Full Body
- Day 3 – Full Body
- Day 4 – Full Body
- Day 5 – Full Body
- Day 6 – Rest
- Day 7 – Rest

*note the volume and intensity (effort) should be reduced on all training days to ensure proper recovery

There is so much more we could discuss regarding training. However, as mentioned at the beginning of the chapter, this would require another book entirely. The practical concepts in these pages will be sufficient to get your recomposition engine running properly.

If you would like to further maximize your approach, we recommend checking out the training programs offered at JeffNippard.com and SchoolOfGainz.com. There, you will find comprehensive training programs based on years of coaching experience, scientific literature, and a community of trainees, working on becoming the best version of themselves.

CONCLUSION

CONCLUSION

"WE ARE WHAT WE REPEATEDLY DO. EXCELLENCE THEN, IS NOT AN ACT, BUT A HABIT." - ARISTOTLE

Congrats on making it through the volumes of information that we believe will serve as a reliable blueprint for sculpting your body through recomposition. If you have made it to this point, it indicates your desire to maximize your results by complementing your hard work in the gym with scientific nutrition application. We applaud you for that!

Because change is a process, rather than a single act, it is now time to take the information that is best applicable to you and begin turning your knowledge into results. Daily, utilizing one piece of new nutritional insight at a time, before long, new and rewarding results will start emerging from your persistent consistency of application.

As you begin to apply what you have learned throughout the book, you will likely have to revisit certain chapters and sections to review and reacquaint yourself with the specifics. This will be especially important for beginners who may be experiencing some information overload.

Regardless of your experience in the gym or knowledge of nutrition, we recommend going back through the chapters and highlighting your most relevant parts. This not only contributes to familiarity, but condenses all the information and data into your very own custom-designed nutritional guide.

Adding, adjusting and evaluating your acquisition of new habits and procedures will probably seem somewhat robotic, academic and maybe even awkward at first. This is the nature of

change. Do not be discouraged if you find yourself struggling somewhat with the details and implementation.

Recall the first time you did a squat, drove a car or used a new computer program. Chances are, it felt strange and awkward at first. But by paying attention to detail, you developed a habit where over time, the effort needed to perform that feat became less and less demanding. So it may be with adjusting your protein intake, rearranging your macros or heeding the contents of your peri workout meals. Little by little, a little becomes a lot.

You purchased this book to gain new insight that would help you add muscle and lose fat. As you work through the nuts and bolts of application, keep this goal in mind and remember that nothing can withstand the persistent and consistent application of a well designed plan. You now own that well designed plan! All that remains is the persistent consistency part.

Your first choice towards a new goal of body recomposition was to purchase this book. Each day forward will demand more choices, including adjustments to your diet and nutritional requirements to get to the next level. Make no mistake about it, those choices will determine success or failure. We are confident that each of your daily choices to start doing something different will start new behaviors that compounded over time will become a habit; a new habit yielding new goals.

Equipped with new information and a new resolve to apply what you have learned, new results are just around the corner. Please know, we will be here cheering for you every step of the way. We look forward to hearing YOUR success story!

MEAL PLAN #1

BASED ON MACRO GOALS:

TRAINING DAYS	NON-TRAINING DAYS
75G FAT	80G FAT
300G CARB	225G CARB
245G PRO	245G PRO
2846 CAL	2615 CAL

*This meal plan is ideal for an ~ 180-200 lbs male with ~12-15 % bodyfat. You should adjust the macros and food amounts to fit your specific targets. Because we endorse a flexible approach to nutrition, it is not required that you follow any set meal plan every day. These meal plans are provided as examples to give you ideas for how to structure your day. Granted, if following the same meals every day helps you stick to the plan better, then you are welcome to do so.

TRAINING DAY MEAL PLAN:

PRE-WORKOUT MEAL OPTION A:

MACROS: 10G FAT / 85G CARB /48G PRO

- **80G** Oats
- **140G** Blueberries
- **15G**Raisins
- **1 TEASPOON** Coconut Oil (5ml)
- **45G** Whey Protein

(OR) PRE-WORKOUT MEAL OPTION B

MACROS: 10G FAT / 85G CARB /48G PRO

- **4** slices Dave's Killer Bread
- **1** Whole Egg
- **265G** Egg Whites
- **130G** Banana

POST-WORKOUT SNACK:

MACROS: 2.5G FAT/ 54G CARB/ 48G PRO

- **1** Kirkland Soft & Chew Bar OR **1** Rice Krispy Treat
- **130G** Banana
- **60G** Whey Isolate

MEAL:

MACROS: 24G FAT/ 82G CARB/ 51G PRO

- **50G** Brown Rice
- **50G** Lentils
- **1.5** Salmon Burger Kirkland (6oz)
- **70G** Guacamole (Kirkland Single Serving Cup)
- **75G** Broccoli

MEAL:

MACROS: 20G FAT/ 58G CARB/ 36G PRO

- **250G** Sweet Potato
- **6OZ** 80/20 Ground Beef
- **75G** Asparagus
- **50G** Kiwi

MEAL: (EITHER BREAKFAST OR FINAL MEAL OF DAY)

16G FAT/ 19G CARB/ 61G PRO

- **4OZ** Bottom Round Steak
- **1** Whole Egg
- **150G** Brocolli
- **1** Dannon Light & Fit Greek Yogurt

DAILY TOTAL: 75G FAT/ 295G CARB/ 244G PRO = 2846KCAL

NON-TRAINING DAY MEAL PLAN:

*Although it is not required that you adjust carb intake on non-training days, it is suggested for specific circumstances as outlined in Chapter 5. Therefore, for sample meal plans we have provided examples of both training days and non-training days.

MEAL OPTION A

MACROS: 9G FAT/ 55G CARB/ 42G PRO

- **40G** Oats
- **140G** Blueberries
- **15G** Raisin
- **1** Teaspoon Coconut Oil (5ml)
- **45G** Whey Protein

OR MEAL OPTION B

MACROS: 8G FAT/ 56G CARB/ 42G PRO

- **2** slices Dave's Killer Bread
- **1** Whole Egg
- **265G** Egg Whites
- **130G** Banana

SNACK

MACROS: 14G FAT/ 11G CARB/ 52G PRO

- **60G** Whey Isolate (0g Fat/ 6g Carb/ 46g Pro)
- **28G** Almonds (14g Fat/ 5g Carb/ 6g Pro)

MEAL

MACROS: 24G FAT/ 82G CARB/ 51G PRO

- **50G** Brown Rice
- **50G** Lentils
- **1.5** Salmon Burger Kirkland (6oz)
- **70G** Guacamole (Kirkland Single Serving Cup Cup)
- **75G** Broccoli

MEAL:

MACROS: 20G FAT/ 58G CARB/ 36G PRO

- **250G** Sweet Potato
- **6OZ** 80/20 Ground Beef
- **75G** Asparagus
- **50G** Kiwi

MEAL:

MACROS: 16G FAT/ 19G CARB/ 61G PRO

- **4OZ** Bottom Round Steak
- **1** Whole Egg
- **150G** Broccoli
- **1** Dannon Light & Fit Greek Yogurt

DAILY TOTAL: 83G FAT/ 225G CARB/ 242G PRO = 2615KCAL

MEAL PLAN #2

BASED ON MACRO GOALS:

55G FAT/ 180G CARB/ 150G PRO

*This meal plan is ideal for an ~ 160-180lbs female with ~30-40% bodyfat. You should adjust the macros and food amounts to fit your specific targets. Because we endorse a flexible approach to nutrition, it is not required that you follow any set meal plan every day. These meal plans are provided as examples to give you ideas for how to structure your day. Granted, if following the same meals every day helps you stick to the plan better, then you are welcome to do so.

TRAINING DAY MEAL PLAN:

MEAL #1 - PRE-WORKOUT SMOOTHIE OR OATMEAL BOWL

MACROS: 12G FAT/ 57G CARBS/ 31G PRO

- **40G** Raw Old Fashion Oats
- **100G** Banana
- **5G** Raw Cacao Powder
- **5G** (1tsp) Liquid Coconut Oil
- **8G** Almond Butter
- **1** Scoop Whey
- Himalayan Pink Salt or Sea Salt
- Dash of Cinnamon

MEAL #2: POST WORKOUT

MACROS: 2.5G FAT/ 20G CARBS/ 23G PRO

- **1** Rice Krispie Treat Mini or 120g Apple
- **1** Scoop Whey Protein

MEAL #3:

MACROS: 10G FAT/ 47G CARB/ 35G PRO

- **25G** Dry Rice
- **25G** Dry Beans
- **4OZ** Raw Weight Chicken Breast ~3oz Cooked Weight
- **150G** Mixed Bell Pepper - Fajitas
- **60G** Guacamole
- Himalayan Pink Salt or Sea Salt

MEAL #4:

MACROS: 8G FAT/ 27G CARB/ 30G PRO

- **100G** Raw Weight Sweet Potato
- **100G** Broccoli
- **4OZ** Salmon
- Himalayan Pink Salt or Sea Salt
- Dash of Cinnamon

MEAL #5:

MACROS: 23G FAT/ 27G CARB/ 34G PRO

- **3** Whole Eggs
- **18G** Bacon (2 slices)
- **100G** Mixed Veggie of Choice
- **1 slice** David's Killer Bread

DAILY TOTALS: 55.5G FAT / 178G CARBS / 153G PRO

NON-TRAINING DAY MEAL PLAN:

*Although it is not required that you adjust carb intake on non-training days, it is suggested for specific circumstances as outlined in Chapter 5. Therefore, for sample meal plans we have provided examples of both training days and non-training days.

MACRO GOALS: 60G FAT/ 140G CARB/ 140G PRO

MEAL #1 SMOOTHIE OR OATMEAL BOWL

MACROS: 12G FAT/ 57G CARBS/ 31G PRO

- **40G** Raw Old Fashion Oats
- **100G** Banana t
- **5G** Raw Cacao Powder
- **5G (1TSP)** Liquid Coconut Oil
- **8G** Almond Butter
- **1** Scoop Whey
- Himalayan Pink Salt or Sea Salt
- Dash of Cinnamon

MEAL #2:

MACROS: 10G FAT/ 47G CARB/ 35G PRO

- **25G** Dry Rice
- **25G** Dry Beans
- **4OZ** Raw Weight Chicken Breast ~3oz Cooked Weight
- **150G** Mixed Bell Pepper - Fajitas

- **60G** Guacamole
- Himalayan Pink Salt

MEAL #3:

TOTAL: 8G FAT/ 7G CARB/ 27G PRO

- **100G** Broccoli
- **4OZ** Salmon
- Himalayan Pink Salt
- Dash of Cinnamon

MEAL #4:

MACROS: 29G FAT/ 27G CARB/ 34G PRO

- **3** Whole Eggs
- **36G** Bacon (4 slices)
- **100G** Mixed Veggie of Choice
- **1** slice David's Killer Bread

DAILY TOTALS: 59G FAT / 138G CARBS / 133G PRO

CIRCUMFERENCE MEASUREMENTS:

(MEASURE 1X PER MONTH)

DATE												
SHOULDERS												
WAIST												
CHEST												
GLUTES												
L ARM												
R ARM												
L ARM FLEXED												
R ARM FLEXED												
L LEG												
R LEG												
L CALF												
R CALF												

SKINFOLD MEASUREMENTS:

DATE											
1. CHEST											
2. ABDOMEN											
3. THIGH											
4. TRICEPS											
5. BICEPS											
6. SUBSCAPULAR											
7. SUPRAILIAC											
8. AXILLA											
9. CALF											
BODY FAT %											

ABOUT THE AUTHORS

JEFF NIPPARD:

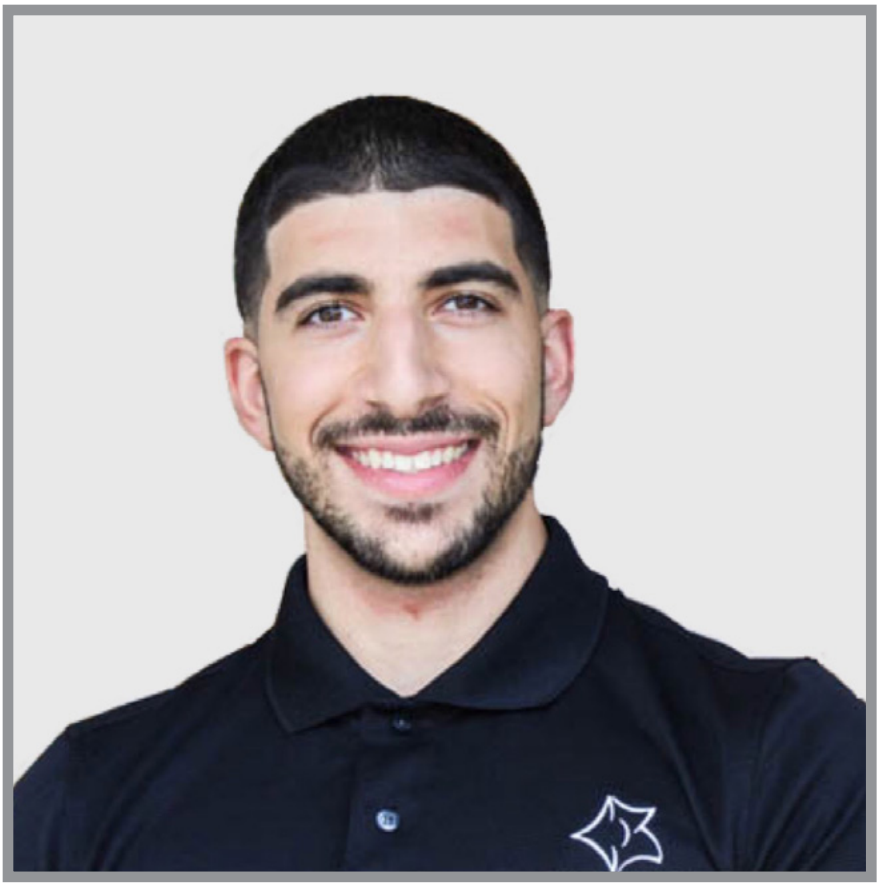
Jeff is a professional natural bodybuilder and powerlifter. Through his informative and entertaining **Youtube** channel which has gathered a fan-base of over 1 million subscribers, Jeff aims to share the knowledge he has gathered through university education and field experience with others who are passionate about the science behind building muscle, losing

fat and getting healthier.

He earned the title of Mr. Junior Canada for natural bodybuilding in 2012 and as a powerlifter, Jeff held the Canadian national record for the bench press in 2014. As a powerlifter, Jeff has claimed a 502 lb squat, 336 lb bench press and a 518 lb deadlift with an all time best Wilks score of 446.

With a Bachelor of Science degree in biochemistry, Jeff has gathered the requisite scientific knowledge to compliment his practical experience acquired through training and coaching. Jeff has coached women's bikini and men's bodybuilding national and provincial champions, professional natural bodybuilders and nationally and IPF Worlds qualified raw powerlifters. He has presented seminars on Block Periodization, concurrent training and nutrition and training for natural bodybuilding in academic settings including the 2019 Ultimate Evidence-Based Conference, and at Lehman College and the University of Iowa. He has aspirations of completing a PhD in exercise science or a related field.

Jeff currently lives in Kelowna, Canada where he is producing informative YouTube videos and **podcasts.**



CHRISTOPHER BARAKAT, MS, ATC, CISSN

Christopher is a researcher in the Human Performance Lab at the University of Tampa where he teaches courses in Exercise & Nutritional Sciences.

In 2007, he began his bodybuilding journey in his high-school weight room where he would train before basketball practice. As time passed, he started to enjoy weight training more than anything else, and although he was training hard, he will admit to not training smart. More importantly, he was not eating appropriately to support his goals. Spinning his wheels for the first three years (when he could have made the greatest progress) he barely gained any weight, therefore, hindering his ability to maximize muscle growth. At that time, he didn't understand the most fundamental principles such as energy balance, and actually restricted his calorie intake by avoiding calorically dense, processed foods because of the conventional wisdom of his time that convinced him he should "eat clean and healthy." The lack of progress, despite the time and effort he was putting into developing his physique,

ironically is what led him to study and learn about exercise and nutritional sciences.

During his undergraduate studies in Athletic Training, he became heavily involved with natural bodybuilding. As a 140 pound teenager, he started competing in 2011. In just 15 months, he gained 14 pounds of muscle mass and carried those gains to the stage for his second competition in 2013.

At that time, with four years of weight training experience, he finally started implementing a sound nutritional approach to support his training and build muscle tissue. With newfound knowledge and resolve, he was most intentional to be in a calorie surplus, eat plenty of protein and distributed these protein feedings in five-six meals per day.

While finishing up his bachelor of science degree, he started coaching others who sought to improve their body composition. So, invested and interested in this field, he committed to furthering his education and study exercise and nutritional science at the graduate level.

While in graduate school, his passion for research grew with each scientific study he conducted and published. Being directly involved with research completely changed how he interpreted and valued scientific data. He truly grasped the strengths of exercise and nutritional science studies, but more importantly, realized the flaws and shortcomings of science as well. This realization dramatically enhanced his abilities to critically think, improve his coaching modalities, and rekindle an artistic perspective within.

After graduating with top honors and earning the Outstanding Student Award, he began to teach at the University as an adjunct professor and continued working on research projects. Today, you will find him still working in the lab, teaching in the Health Science & Human Performance department, and coaching his clients. Chris has coached physique competitors in all categories earn professional status and works with many athletes competing at the world championship level of natural bodybuilding.

He is delighted to have collaborated with Jeff Nippard on this project to give enthusiasts the best nutritional information that you can immediately apply to improve their performance, overall health, build muscle and lose fat!

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