

Iron Athenaeum

By Nick Tann

Version: Δ 1.1.1

Disclaimer

This article is an opinion piece. The information included may be outdated or wrong. At the time of writing I believe this to be the most accurate knowledge available. As opinions, take everything you read with a grain of salt. I encourage personal research and verification of all sources. Feel free to read as little or as much as you desire. The purpose of this document is to lay out my entire wealth of knowledge for others to learn. Don't get bogged down with the advanced details if you're just starting out. There are a few really simple actions you need to do to get 90% of the progress. Training optimization is where I nerd out but it can be daunting for others. Most of what I write about are general guidelines. You may find yourself several standards of deviation outside the average for a specific topic. Experiment and find what works for you. The most effective methods tend to be whatever produces results, is enjoyable, and can be consistently adhered to. Be aware your body has many fluctuating variables so identifying cause from an effect can be challenging.

The Basics

Change Takes Time

Often beginners have the misconception they can achieve their goals quickly and thus become discouraged when they don't see results as quickly as they anticipated. Keep in mind:

Sustainable weight loss is ~1% bodyweight (lbs) per week. Rapid weight loss is a recipe for relapse. Losing weight at a slow steady pace increases your likelihood of keeping it off long term. Muscle is built slowly over time. Beginners can expect to gain at most 20lbs in 12 months. After successive years of lifting the rate will slow logarithmically.

Focus On:

- **Appropriate amount of exercise at an appropriate intensity**
- **Progression over time**
- **Consistency**

You Belong In The Gym

No one cares about you or what you're doing. They're there to do their own thing and they aren't going to judge you unless it's potentially dangerous. Though intimidating, you'd be surprised the biggest guys in the gym are normally the most supportive, non judgmental and friendly gym goers around. For many, the gym is their greatest passion. As such they are excited for the chance to help a newbie learn why they love the sport so much. Even the elite guys were beginners at some point. There will always be someone who can lift more than you or who looks better. Focus on your craft. Try to learn from those more experienced. Make sure to verify their advice on your own.

Diet: 50 - 80% of The Battle

Your nutrition will depend on your goals. In every scenario diet is just as important if not more than the training itself. It isn't necessary to track macros or count calories all the time or ever but it is the most accurate method of achieving your goals. There are many diet methods to choose from. Find what works for your goals that you can stick to the best.

Get Your Protein

The modern American diet is far beneath the suggested protein intake. A simple guideline is ~1g per body weight (lbs) daily. I highly recommend everyone try writing down what they eat for a week. By doing so you will learn a lot more than you thought about your eating habits and how you're over/under consuming. Keep an especially close look at protein and vegetable consumption. Most likely you're not getting enough.

Find A Community

Seek like minded people who enjoy what you do and you will enjoy it with them. Personal connection will be a major contributor to the longevity of your life in fitness. The people you train with will keep you accountable and motivated. This is one of the few things that I truly commend Crossfit for accomplishing. The main reason the sport is so successful is because of the bonding that goes on between the training group. A positive team atmosphere will help you push yourself harder and stay consistent with your goals and makes training fun and repeatable.

Stay Safe

You can't reach your goal if you're injured or sick. Above all else strive to maintain a base level health. When it comes to fitness it's easy to overdo things. Always be aware of your body and its capabilities and limitations. Every few weeks it's a good idea to schedule a few days or even a week to deload. Any type of training that makes you better over time also accumulates fatigue over time. You must take it easy every now and then or the fatigue will halt your progress. See [deloads](#)

Goals Must Be S.M.A.R.T.

Specific: clarify your goal. Be ultra specific so you know exactly what it is you're pursuing

Measurable: Break the goal into measurable pieces so you can analyze your progress

Attainable: investigate whether the goal really is acceptable to you. Weigh the effort, time and other costs your goal will take against the profits and the other obligations and priorities you have in life.

Relevant: What is the objective behind the goal, and will this goal really achieve that?

Timely: Make a tentative plan for everything you do. Everybody knows that deadlines are what makes most people switch to action. Install deadlines for yourself and go after them. Keep the timeline realistic and flexible, that way you can keep morale high.

Goals

If you have no goal you have no plan.

Without a plan you are destined to underachieve. To guarantee success, it's a necessity that you plan out how to get where you intend to be.

General Physical Health

Physical fitness is a composition of 5 measurable components.

1. cardiorespiratory fitness

- How well our body can supply fuel during physical activity via the body's circulatory and respiratory systems.

2. muscular strength

- The ability of muscle to exert force during an activity.

3. muscular endurance

- The ability of a muscle to continue exerting force without tiring.

4. Body Composition

- Body composition measures the relative amounts of muscle, bone, water, and fat. For men a healthy body fat range is between 8 - 20% and women 23 - 35%.

5. Flexibility

- The range of movement across a joint. Flexibility is important because it improves the ability to link movements together smoothly and can help prevent injuries.

You can tell if someone is physically fit by determining how well they perform in each attribute.

“Tone” aka Recomposition

Recomposition is the process of building muscle and losing fat simultaneously.

Most people can do this. Those more advanced who have been training with proper nutrition for several years may want to defer to a different goal. The longer you undergo recomposition, the

slower the process becomes. Recomposition is the combination of a proper diet in a moderate deficit and resistance training

Lose Weight

Losing weight is a matter of calories in minus calories out. If you burn more calories than you eat your weight will go down over time. Something everyone can do. I'd recommend considering recomposition first. To lose weight you must follow a proper diet with a moderate deficit.

Gain Muscle

Muscle gain is also known as [hypertrophy](#). Everyone can gain muscle. Some more quickly than others. Gaining muscle is the combination of a proper diet and resistance training.

No Longer Want To Look "Skinny Fat"

See [Recomposition](#)

Strength

Acquiring [strength](#) is done in at least 4 ways:

- 1. Adding muscle**
 - A larger muscle is a stronger muscle
- 2. Neurally training the brain's ability to recruit more motor units quickly**
 - Achieved through repeated experience under heavy loads
- 3. Improving stability**
 - Stability removes any potential energy leaks
- 4. More efficient movement**
 - Performing a task with maximum efficiency doesn't improve your actual strength but reduces any energy leaks resulting in all the force produced being utilized for the desired effect.

Endurance

Endurance is a broad term that could mean a few different things depending on the length of an exercise. All types of endurance fall under a single training principle. Progressively overload the duration of exercise.

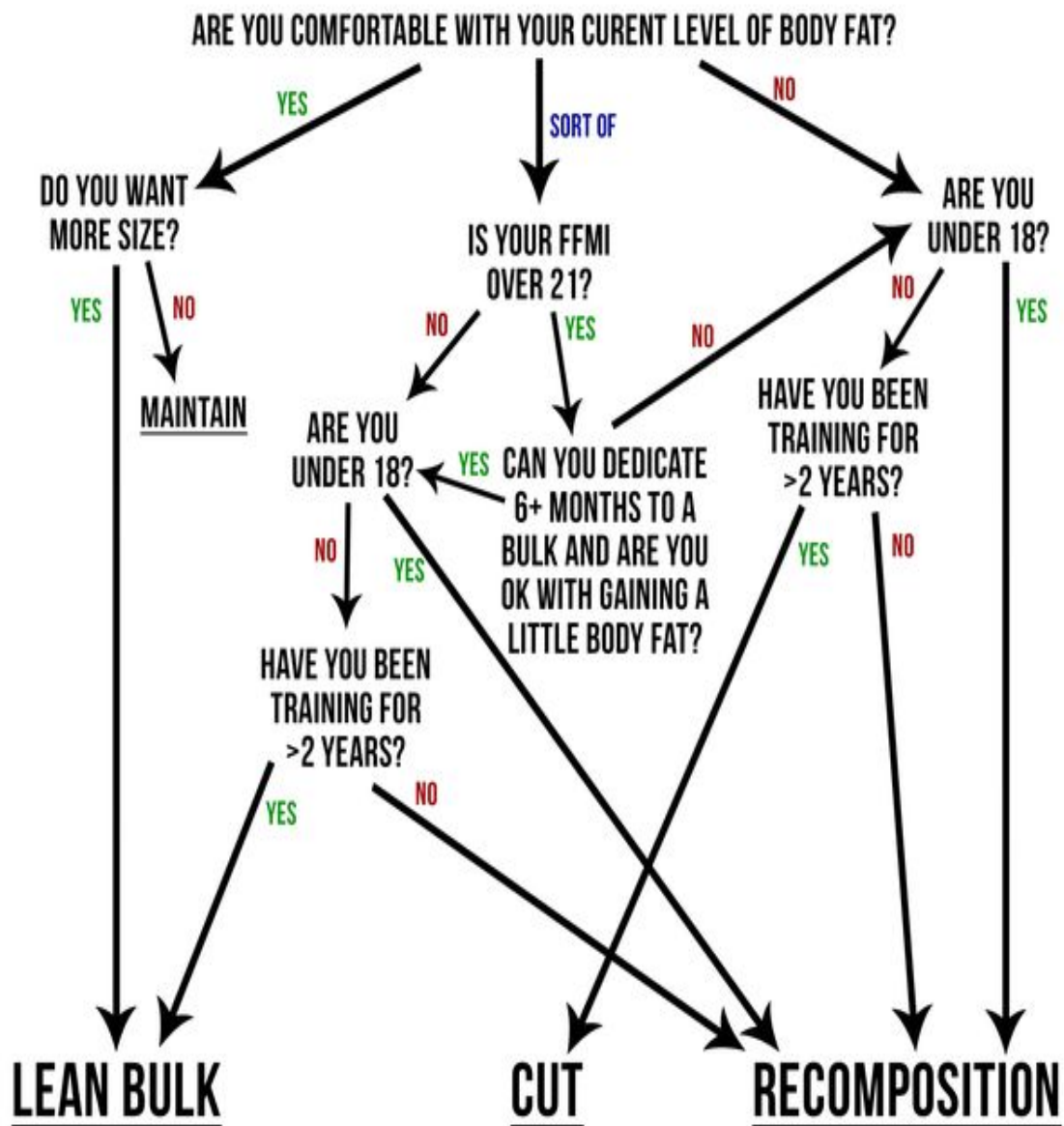
BodyBuilding Competition

Assuming you have already achieved an adequate amount of lean mass to present your physique on stage see [Contest Prep](#)

IDK

If you aren't sure about your goals, the flowchart below may come in handy.

SHOULD YOU BULK OR CUT?



Weight Lifting

A definitive exercise library is outside the scope of this document. ExRx has already done the work for us. Click the link below to discover new exercises, execution instructions, and other detailed information about almost every exercise that exists. [Exercise Directory](#)

For Beginners

So you stepped into the gym for the first time. Good news is you are primed now more than ever to lose fat and build muscle. Mark a few times in the week to go and make sure to make it part of your weekly routine. You don't need to go every day and you don't need to overdo your first few weeks. Because resistance training is such a novel stimulus you are almost guaranteed to overdo it the first few sessions. Expect your body to be sore in the days to follow and don't stress out because your body will adapt if you're training responsibly.

Stick to the compounds

A compound is an exercise that moves across more than one joint thus recruiting multiple muscle groups. You should focus on these for two reasons:

1. **Simplicity**
 - You can do 3 or 4 compounds and have a complete workout for the day.
2. **Foundation**
 - These movements should become your bread and butter for the rest of your life and you need to become proficient with them if you want to progress.

Avoid These Mistakes

Using too much weight

- Always start lower than your expected ability and work your way up that first workout. If your form suffers, you are swinging the weight, or using momentum, you may be using too much weight.

Not using enough weight

- Always play it safe, but if you can perform 30 reps with a certain weight, it's likely time to increase it a bit.

Going too fast

- There is nothing gained by lifting weights fast. A joint is only as strong as the muscles that cross it. Be careful what you ask of your joints.

Not resting long enough

- Rest time for higher rep sets (12+ reps) should be around 1 minute while moderate work (5-12) should be within 2 or 3 minutes. Very heavy work (4 reps & below) may necessitate upwards of 5-6 minutes of rest.

Etiquette

- Bring a towel to wipe your sweat off the equipment you use. Whatever you use, remember to put it back. Don't hog the equipment. If someone is waiting for the machine you're using don't rest too long or work in with them between sets if possible. Most people are more than willing to share when asked nicely.

Beginner Split

Monday - A

Tuesday - rest

Wednesday - B

Thursday - rest

Friday - rest

Saturday - A

Sunday - rest

(The next week would start with workout B)

Workout A

Deadlift - 2 sets warmup + 3 sets x 6 reps.

Chinup - 3 x 10

Lunges - 3 x 12

Overhead Press - 3 x 8

Pull-ups are recommended for the vertical pull, but if you can't do them yet, lat pull-downs or some form of assisted pull-up would be a suitable replacement. For the overhead press and lunges, either barbell or dumbbells are fine.

Workout B

Bench press - 2 sets warmup + 3 x 6

Squat - 3 x 8

Row - 3 x 12

Hip Thrust - 3 x 10

Squats are definitely recommended, but leg presses could be used in their place if necessary. For the bench press, a flat barbell bench press is recommended, but a flat dumbbell bench press can work too. Use a spotter whenever possible/necessary. For the row, pick any one you want. Bent over barbell or dumbbell rows, seated cable rows, chest supported machine rows. It's all fine.

Focus on proper form first

Beginners should spend their first few weeks on a weight training workout routine primarily on learning proper form. Don't worry about anything else during those first few weeks. Pick a weight for each exercise that is definitely a little too light and focus on learning and using perfect form. Getting exercise technique right at this beginner stage is extremely important, so make sure you do. Once those few weeks are up and you feel like your form is what it needs to be on every exercise, it's then time to focus on consistent progression while keeping that form intact.

Ego Lifting

Lifting with your ego is the act of lifting or pushing too much weight with disregard for form or safety. Come to the gym to build strength, not to demonstrate it. Lift heavy, but not maximal. Train hard, but leave a rep or two in the tank each set.

Warmup

The goal is to raise core temperature and the temperature of specific muscles used in the workout. This is beneficial because the enzymes used to produce energy have an optimal temperature at which it functions best. For the enzymes that produce ATP the optimal temperature is around 100 degrees Fahrenheit (Normal core temperature 98.6). Your muscles also have visco-elastic properties which operate better when a few degrees above base core temperature.

Beyond general activity to break a sweat, you should be focused on movement preparation. If you're a team sport athlete this may be rather elaborate involving running, cutting, jumping, pivoting and moving in different planes. As a lifter warm up may be as simple as moving light weight for a few non working sets. The amount of warm up you need depends on the individual and depends on feel.

Static vs. Dynamic Stretching

People who support dynamic stretching warm-ups like to point to particular studies where participants show decreased power output from static stretching routines. Many of these studies involve methods that are very irregular and very unlikely to be used by someone willingly. While dynamic stretching may help save the time needed to negate the slight, immediate but transient effects of static stretching, the use of static stretching before training won't necessarily decrease performance. The benefit of the warm-up is due mostly to a reduction in muscular stiffness by increasing heat, rather than increasing or restoring range of motion in joints from baseline. Don't get me wrong, an athlete should definitely strive to improve range of motion of joint capsules and address tissue and motor qualities, but a warm-up that addresses all of these concerns doesn't guarantee better performance. If dynamic stretching is used to reduce muscular stiffness, there's of course no harm in it. However, if the purpose in using it is to address mobility concerns right before training, time may be better spent elsewhere. If you or an athlete has a psychological dependency on performing a certain static stretch before training, there's no good reason to remove it.

Post-Activation Potentiation (PAP)

PAP involves performing an activity before a performance that will cause a positive effect on the performance. This can mean higher power output or sustained increases in strength. PAP usually causes this increase in performance through some means of contracting muscles at or near maximal intensity. The theory is that a PAP will involve a contraction that calls for a greater volume of motor unit activity that can be used in the subsequent activity. The PAP would supposedly provide a short-term memory of greater activity for the contractile properties of the muscle that could be used immediately for the task that follows. The first problem in using PAP is that both researchers and coaches are unsure as to what methods truly increase performance. Some researchers have observed elevated performance in sprinting and jumping abilities when participants used heavy barbell loaded movements that mimicked these activities. The second problem in using PAP is in how long the positive effects actually last. Studies show that any positive effect dissipates over 5-7 minutes. So to truly see benefits from PAP, you'd have to almost immediately follow the PAP contraction with the activity you're looking to improve. This is not what most people who claim to use PAP do. Coaches and lifters will go through some PAP protocol but take far too long on their ramp-up sets to hit their heavy set or max attempt. By the time they attempt the lift they've intended to influence through PAP, the short window of time has already passed.

Warmdown

Most of the cool-down routines in programs attempt to reduce the soreness and stiffness seen the next day, and while the intent is great, the research usually doesn't show anything worth noting. We don't see any changes in delayed onset muscle soreness (DOMS), as most of the benefits come from a good warm-up, proper load, and sound rest later. Cooling down mirrors warming

up, and while it doesn't provide as many of the benefits, it does have value. Less-intense training is just part of programming, and adding some training under fatigue will be valuable, not in facilitating actual recovery but psychologically. It's about leaving the workout in the right frame of mind and body. Right after intense training is a good time to reflect on the workout, as well as see how the body is operating after an intense session. Sometimes the feedback after the adrenaline wears off is a better story than just the numbers alone.

Gym Gear

Equipment	Use	Pros	Cons
Weight Lifting Belt	By bracing against the belt intra abdominal pressure is created around the midsection thus creating a stable rigid column from waist to neck.	Performance Enhancer	Choosing the wrong belt Wearing it incorrectly Using it as a garter belt rather than for function
Knee Wraps	Elastic fabric that is wrapped tightly around the knees during squats.	External compression Elastic energy Relieves tension/stress on patella tendon Helps exceed raw lifting numbers	Could mask underlying problems Improper use Excessive use
Wrist Wraps	Supports the wrist joint during heavy lifts.	Stabilizes movements	Overuse
Knee Sleeves	Compression garment for your knees.	Heat and compression around thighs and calves warms connective tissue. Helpful for those recovering from	Overuse crutch

		injury or with bad joints.	
Elbow Sleeves	Compression garment for your elbows	Heat and compression around biceps and forearms warms connective tissue. Helpful for those recovering from injury or with bad joints.	Overuse crutch
Wrist Straps	Straps your wrists into the weight you are moving. Overcomes the obstacle of grip strength as a limiting factor when lifting heavy.	Allowing to pull more weight	Using straps on wrong exercises Forearms do less work
Weighted Belt	Belt with a chain. Add weight to the chain to increase the load for exercises like pull ups and dips		
Weight Lifting Shoes	made specifically with stiff, rigid heels that does not allow for compression of the sole of the shoe as a lifter drives into the floor. The elevated heel decreases the strain placed upon the ankle, and in turn allows for greater knee and hip flexion	Improved mechanical angles at the bottom of a squat position. Stable base	weightlifting shoes are heavier than others, making them bulky to wear during jump training, circuits, etc. \$100+ tendency to mask a lifter's mobility flaws

Many non-weightlifting shoes provide added comfort, often with plush foamy platforms and softer shoe construction. While having supportive, cushioned footwear can be helpful during some activities, heavy and explosive lifting (squats, presses, deadlifts, snatches, cleans, etc) should be done with sturdy shoes that do not allow for excessive movement of one's foot within the shoe. If you plan to work your legs the least you can do is wear shoes with a flat sole.

Men vs Women

Practical training differences between men and women comes down to slight variations to an already sound fundamental training philosophy embedded in basic human physiology not necessarily predicated on sex differences.

Women who lift weights will not end up thick, bulky, or masculine because while they do have an impressive potential to build muscle doing so results in the toned look most women are seeking. The monstrous physique is usually only attained through steroids or an advanced and rigorous training and nutrition plan specifically dedicated to attain that masculine look.

The natural potential to build proportional muscle between men and women is pretty much the same. Although men tend to be stronger on an absolute basis 97% of this difference is muscle mass and nothing else. Usually the differences in men and women comes down to the differences in muscle mass and body fat.

The main difference is hormones. Because women have 9x more estrogen than men they reap the benefit of that hormone not only on metabolic health and glucose handling but muscular repair and preventing catabolism. The main training implication is that women can recover from more work which means they can do more sets and reps per workout and more workouts per week. It also appears that women are less fatigable because they have better blood flow, muscle perfusion and slow type I endurance fibers. Women can do more reps at a given intensity and can probably get away with shorter rest intervals.

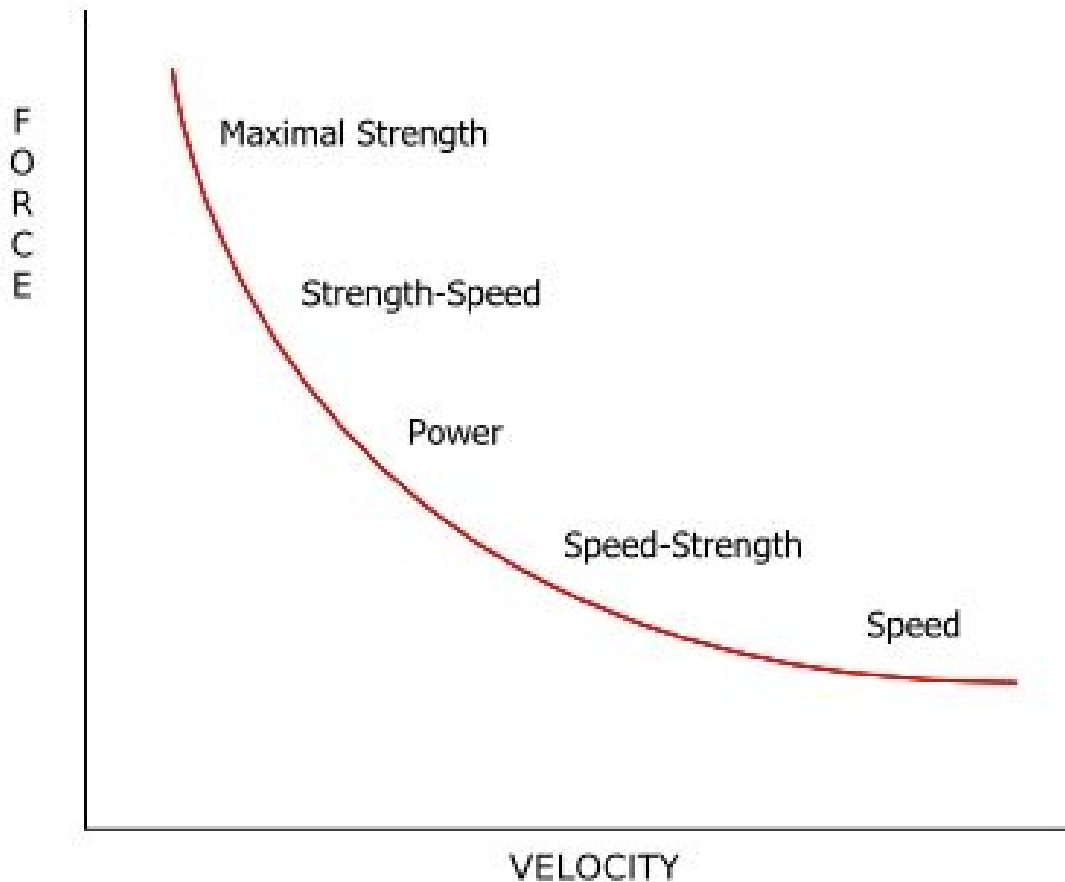
The flip side of this is that women are less suited for explosive training compared to men. Men can benefit with a faster tempo with more forceful positives. It isn't smart to think in black in white terms so including all types of work for most individuals is good advice.

There also is a notable difference in upper to lower body ratios between men and women. Women have about 50% the strength in the upper body and 66% for the lower body. This might explain why women tend to enjoy training legs more than men. They're better at it.

Don't forget basic training principles do not discriminate based on gender.

Strength Training

Force Velocity



The force-velocity curve is a relationship between force and velocity. The x-axis indicates velocity while the y-axis indicates force. The curve itself shows an inverse relationship between force and velocity, meaning that an increase in force would cause a decrease in velocity and vice versa. Giving an example, a one repetition maximum back squat would produce high levels of force but would be lifted at a slow velocity. While a countermovement jump would produce a high movement velocity, it would also only produce low-levels of force. This indicates that there is a trade-off between force and velocity.

As power is a key determinant in the performances of many sports, optimising an athlete's power production is of great importance. Because $\text{Power} = \text{Force} \times \text{Velocity}$, improving either of these can increase power production. In most circumstances, the primary objective of strength and power training is to shift the force-velocity curve to the right resulting in the athlete being able to move larger loads at higher velocities and therefore becoming more explosive. Shifting the force-velocity curve to the right represents an improved rate of force development (RFD). The RFD simply reflects how fast an athlete can develop force. An athlete with greater RFD capabilities will be more explosive as they can develop larger forces in a shorter period of time.

Although most athletes should typically train at each section along the force-velocity curve, the time spent at each zone is dependent on many factors. Considerations include:

- Training age
- Individuals strengths and weaknesses
- Training objectives
- The sport and position of the athlete
- Time of year/ season/ stage of the macrocycle

All parts of the force-velocity curve should typically be trained in order to maximise the explosiveness of the athlete. With that being said, there is often great debate between training multiple components of the force-velocity curve during one microcycle, or whether it is more effective to segregate it into separate blocks.

Maximal Strength

Maximal strength is the maximum amount of force someone is able to produce through a specific movement. For example, a 1RM Back Squat would represent the maximum amount of force an athlete can produce during that particular exercise. Therefore, this training zone is typically classified by using intensities of approximately >90% of 1RM.

Strength-Speed

This is a classification for exercises that are not deemed to deliver peak power output, nor peak force, so it sits between maximal strength and peak power. As relatively high intensities are used within this zone (80-90% of 1RM), it leans more towards strength rather than speed. The strength-speed zone requires an athlete to produce optimal force in a shorter timeframe than the maximal strength zone, and as discussed earlier, this reduces the amount of force that can be produced.

Peak Power

This is a classification zone for exercises deemed to deliver peak power output. These exercises typically produce the greatest amount of force in the least amount of time. Essentially, power sits in the middle of strength-speed and speed-strength producing the optimal amount of force in the shortest time frame possible (30-80% of 1RM).

Speed-Strength

Similar to strength-speed, this zone does not deliver peak power, nor peak velocity, so it sits between maximal velocity and peak power. Peak force would be expected to be even lower here compared to strength-speed due to the greater restriction on time available; however, movement velocities will be higher.

Maximal Velocity

Maximal velocity is the maximum movement velocity an athlete is able to produce through a movement. For example, a 100m Sprint may represent the maximum movement velocity an athlete can produce during that particular exercise. Whereas, assisted sprinting, otherwise known as 'supramaximal sprinting' can produce $\geq 100\%$ movement velocities. Therefore, this training zone is typically classified by using intensities of approximately $< 30\%$ of 1RM.

Different training zones are merely guidelines to various intensities and can be manipulated to fit the athlete. They have been developed by exercise professionals for educational purposes in order to demonstrate the effects of different exercises and intensities on athletic performance. However, each training zone, or section of the force-velocity curve, will provide different physiological adaptations, and therefore may have its own benefit for the athlete. For example, if an athlete is very strong (i.e. has a high 1RM), but performs poorly during speed tests (e.g. 20m sprint test), then spending time at the maximal velocity and speed-strength zones may be of great benefit for the athlete.

CNS

Central nervous system (CNS) fatigue is defined as a reduction in our ability to voluntarily activate a muscle in a maximal effort. This reduction in voluntary force necessarily requires either a decrease in motor unit recruitment levels, a reduction in motor unit firing rates, or both.

CNS fatigue likely occurs as a result of three mechanisms:

1. A decrease in the size of the excitatory input to the motor neuron.
2. An increase in cortical inhibitory input to the motor neuron.
3. A decrease in the responsiveness of the motor neuron itself.

CNS fatigue can occur during both submaximal and maximal contractions, and the underlying mechanisms are quite similar in each case. Contrary to popular belief, it is unnecessary to exert high forces or achieve high levels of muscle activation to produce CNS fatigue.

CNS fatigue occurs immediately after a workout of fatiguing contractions. Such reductions in voluntary activation can last for up to 30 minutes. This prolonged suppression of motor unit recruitment levels may explain why short rest periods are less effective for muscle growth than longer rest periods, as taking a short rest period involves training while still experiencing CNS fatigue from the previous set.

Isometric contractions cause more CNS fatigue than dynamic contractions, perhaps due to the continual compression of the vascular structures, which prevents metabolites from leaving the muscle, thereby increasing afferent signaling.

There is a diminishing effect of adding extra volume for a muscle group to a workout. Each incremental set will have a progressively smaller and smaller effect, due to the increasing level of CNS fatigue. Exercises that are performed later in a workout will produce smaller effects than those performed earlier in the same workout. When training to muscular failure, the level of mechanical tension experienced by the working muscle fibers is the same regardless of the weight on the bar.

To mitigate the effects of CNS fatigue, we can use longer rest periods between sets and prioritize the most important exercises by placing them first in a workout, because CNS fatigue will occur after each set in the workout, and it will accumulate gradually with each additional set. We can use moderate and heavy loads, since these involve performing fewer total reps to achieve the same hypertrophic stimulus as light loads. Finally, be aware that simply adding extra volume to a single workout may not necessarily produce incrementally superior effects, and dividing a single workout into more frequent workouts over the week may lead to better results.

Plyometrics

Plyometrics is a training program that teaches and conditions the body to produce fast, powerful and even explosive movements that wouldn't be possible with traditional exercise programs. Plyometrics incorporates a series of challenging stretches, muscle-contracting drills, and rapid exercises focused on a part of the body vital to performance in a particular sport. Plyometrics is aimed at making muscles work better and more efficiently rather than making them bigger.

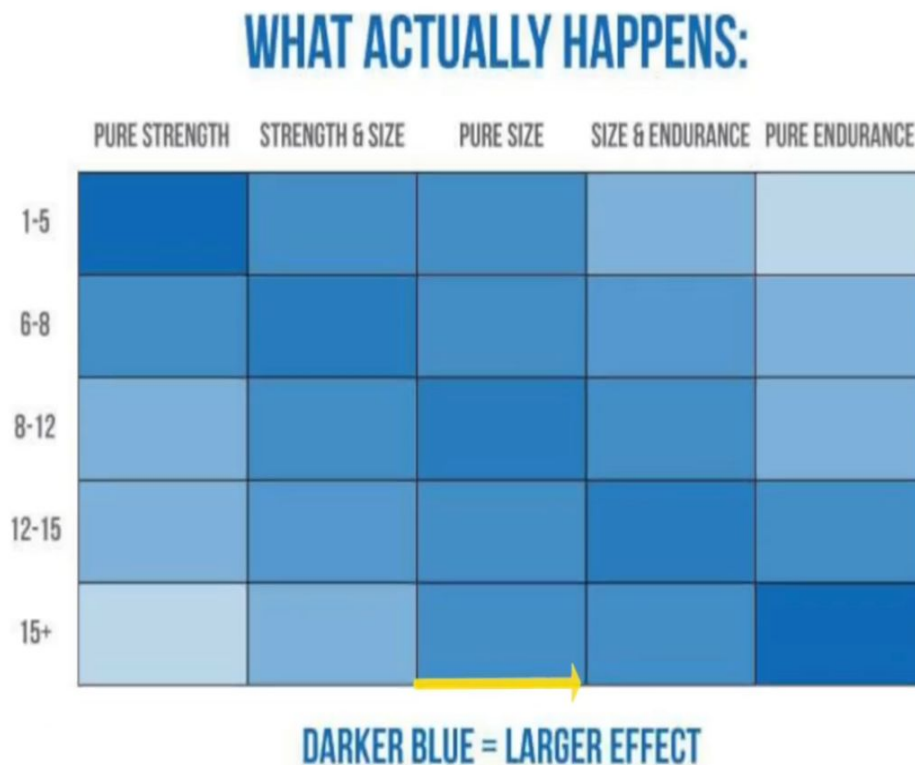
The basis of plyometric exercises is that they toughen muscles and condition nerve cells, which trigger a pattern of muscle contractions. Specifically, the exercises engage the myotatic reflex when muscles are stretched to their maximum. This reflex in turn stimulates neurons called stretch sensory receptors. The ultimate goal is achieving as strong a muscle contraction as possible in the shortest amount of time possible.

There are three phases of the plyometric muscle contraction. The first is the eccentric phase, the rapid muscle-lengthening movement. Next is the amortization phase, the very brief, power-building period of muscle rest or holding period. Finally comes the concentric phase, in which muscles are released to create the explosive muscle shortening movement. Plyometrics are primarily for use by athletes who are in training and are already strong, fit and flexible.

Rep Ranges

Rep Range Selection will be determined by your goals. Generally knowledge follows: heavier weights with lower reps will produce a stronger strength stimulus. Moderate ranges will favor hypertrophy. High ranges stimulates muscle endurance

As the chart below will illustrate, strength hypertrophy and endurance responses all rest on a continuum. You can still build strength using moderate reps and vice versa.



There's not a big difference in muscle growth when comparing different rep ranges. You should probably do most of your training in the rep range that allows you to get in the most hard sets per training session and per week for each exercise. This generally will be a moderate intensity and rep range for most exercises and people. Since different rep ranges go about triggering a growth response in slightly different ways, you're probably better off training with a full spectrum of rep ranges instead of rigidly staying in a single rep range and intensity zone. The main reason moderate reps is favored is for the advantage in recoverability and reduction in time spent in the gym.

Progressive Overload

In order for a muscle to grow, strength to be gained, performance to increase, or for any improvement to occur, the body must be forced to adapt to a stimulus that is above and beyond what it has previously experienced. If you lift the same weights, for the same number of reps, the same way for the next 20 years. nothing will ever happen.

Progressive overload comes in many forms. Over the long term aim to:

- Add an extra set or rep
- Increase the weight
- Increase training frequency
- Reduce rest time
- Perfect form

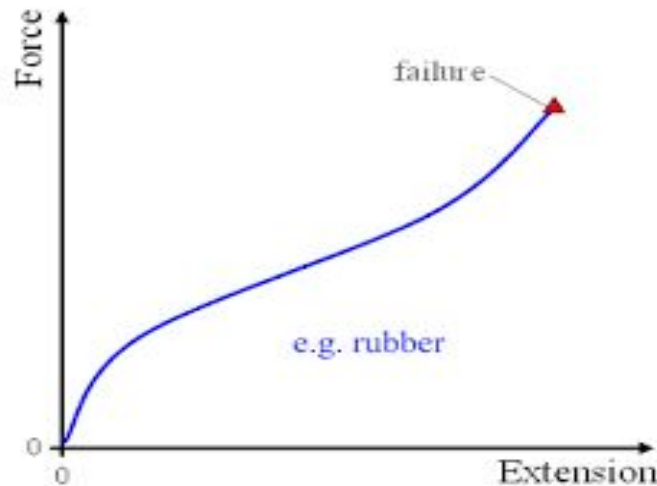
Your body only knows and cares about 1 thing: keeping you alive and functioning as efficiently as possible. The trick is to provide an ample stimulus to generate adaptation that isn't too heavy that you can't recover or execute safely. Don't expect to make progress every day. Your recovery plays a big factor in performance. It's unrealistic to expect to progress in a linear fashion.

Bands, machines, cables, dumbbells, kettlebells, barbells and chains

Each piece of equipment accomplishes the same goal in a different way - resistance. No single mode is better than another in a general sense. But some may be better than others depending on the context.

Bands

The strength curve for bands is quite unique. As the band is stretched it gets exponentially more difficult.



Bands are also unique in that they are light, portable, and easy to set up, it's possible to combine with another resistance mode. By adding bands to another mode the strength curves combine to create a whole new experience. For example the bench press which is typically hardest at the bottom and easiest at the top becomes evenly difficult throughout when you add two bands to the ends of the barbell. Whether you buy them individually or as a set, resistance bands are an inexpensive addition to your home gym equipment.

Machines

Machines are the king of isolation. They are built with a specific purpose and are flawless at said function. The fact that machines work on a fixed path makes it easier for individuals to learn and execute the movement with correct form, even when fatigue starts to set in. This can be a big safety plus, especially for those who are new to strength training. The strength curve will vary per machine. The fixed movement of most machines makes it difficult to work the stabilizer muscles and work the body in different planes of motion. Weight is quickly and easily adjustable.

Cables

The strength curve for a cable is entirely constant throughout the movement. The origin point is adjustable, allowing you to work muscles from different angles. Not a lot of potential for overload here. Typically cables are used for isolating the arms, chest and back. Load is easily adjusted.

Dumbbells

These have a high potential for overload but aren't the king like the barbell is. You sacrifice load for greater freedom. With a barbell you must hold onto a rigid bar. With dumbbells your wrists are free to pronate and supinate as you please. Since they allow for unilateral movements, they

can help improve your form and correct muscle imbalances. Dumbbell training is easier on the joints and allows for a more natural movement with a greater range of motion when compared to barbells. Weight goes up in large 5lb increments. This makes progression a bit more difficult than with a barbell. Strength curves depend on the movement relative to gravity.

Kettlebells

The retarded cousin of the barbell. Don't get me wrong I use these from time to time, they indeed have their time and purpose but are in reality a less versatile dumbbell. If you're looking to swing 50 kilograms around the gym floor for a half hour these are your go tos. The kettlebell allows the addition of a few dynamic exercises you cannot do with traditional weights. Additionally, some dumbbell movements can be interchanged with a kettlebell. Strength curve is also dependent on the movement relative to gravity.

Barbells

The uncontested king of strength and resistance training. Nothing else even comes close to the effectiveness of barbell squats, presses, deadlifts, and the Olympic lifts for the development of strength, power, and muscular size. The reason barbells are so valuable is that they are the most ergonomically-friendly load-handling tool in existence. They allow very heavy weights to be gripped in the hands and moved directly over the center of the foot. Their extremely adjustable nature allows small increases in stress to be applied to the whole body over the full range of motion of all your major leverage systems; these small increases accumulate into amazing gains in size and strength for many uninterrupted years of progress. Strength curve is the same as dumbbells.

Chains

Chains are typically added on top of barbells making the weight heavier when lifted high above the ground and lighter when lowered as some of the weight from the chains are resting on the ground. A good tool for creating more variety in strength curves.

Exercise Selection

An exercise is most effective for a body part if that body part is a limiting factor in the execution of the exercise. For any selection of body parts, a compound exercise is superior to more isolated exercises, because of the potential for overload. The more an exercise moves joints through their full range of motion, the better it is. The more precisely an exercise's resistance can be determined, the better the exercise.

Splits

Splits are your weekly lifting plans. What muscles are you going to focus on each day? Volume and recovery should be the main factors when considering a split. Working a muscle group 2-3 times per week seems to be optimal.

Full Body

Everytime you're in the gym you do some exercise for your legs and some for the upper body. Exercise selection will vary every day. Simple for beginners. Advanced guys also implement this training style in the hopes of spreading volume across every day in order to manage recovery.

Upper / Lower

If one day you focus on your legs, the next session will have an emphasis on the upper body. Still simple enough for a beginner to follow. Often advanced guys will use this to bring up their legs. The problem I have with this split is the recovery demands on the legs becomes difficult with working legs 3 days a week.

Push / Pull / Legs

One of my favorite splits. Each session you rotate pushing movements (triceps, chest, shoulders), pulling (back, biceps, rear deltoids) and legs. The goal of this split is to work muscles that do similar things within the same day. That way you're not sore in the areas you intend to work for the next two workouts.

Bench / Deadlift / Squat / Accessory

This is a very basic powerlifting split. Train the big 3 lifts and add an extra day for improving often neglected muscles. Then spread 3 days of rest within the week. Bench is a pressing day, Deadlift is mostly legs with some back and squat is almost entirely legs. The accessory day is added to confront weak points and keep the volume between the upper and lower body similar.

Bro Split

A bro split is when you dedicate a specific muscle group to a day of the week. For example: every monday is chest, tuesday is back, and wednesday is bi's and tri's. Keep in mind you only work each muscle once a week. We know muscle protein synthesis will cease within 48 hours. Meaning you can go four days of the week without an MPS response in that region. The idea

behind the bro split is that by focusing on only one or two muscle groups per session, you're able to work them really hard. Some of the biggest dudes seem to use this split. See PED's

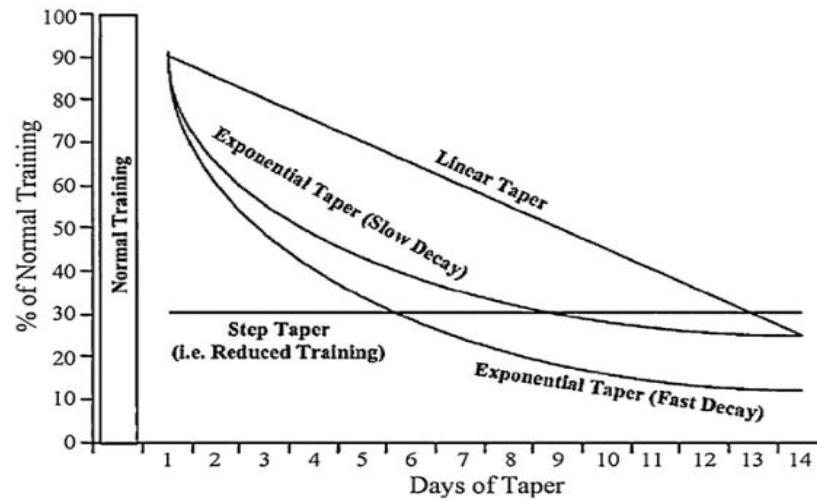
Muscle Anatomy

Muscles are able to contract from a lengthened position to a shorter one. Thus moving two joints closer to each other. The fibers of a specific muscle determine the direction of contraction forces. Fibers run in the direction of origin to insertion points. A detailed list muscle groups can be found here: [Muscle Directory](#)

Deloads & Tapers

A deload is a temporary reduction in weekly training stress to give your body and mind a break from hard training. To deload properly, use the same weights as your hard training but do half as many sets for the week. With a deload, your goal is to do as little as you can to maintain performance while diminishing fatigue, meaning minimizing muscle loss and likely increasing in strength. I suggest a deload about every two months.

The main purpose of a taper is to decrease training to improve performance. The strategy is similar to a deload in that work load is lowered for a longer period of time. By the time you start a taper, you should need it as a taper typically follows a 12-16 week training cycle. Maintaining training intensity while keeping frequency the same and lowering the volume seems to be the key factors in order to retain performance during a taper. The obvious limitation with tapering is that it can lead to detraining. 8-14 days seems to be the ideal taper length but it can be longer depending on the individual, their style of training and sport. Women particularly recover quicker than men. This might mean women don't have to taper as much, or as often. There's a few approaches to taper.



1. Linear Taper

- Volume is reduced by a constant amount each day. This method is what gives the taper its name. Volume is literally tapered off from 100% to ~30% over the course of ~2 weeks.

2. Exponential Taper

- Similar to the linear taper in approach but the volume is reduced either more rapidly in the first or last few days.

3. Step (Drop) Taper

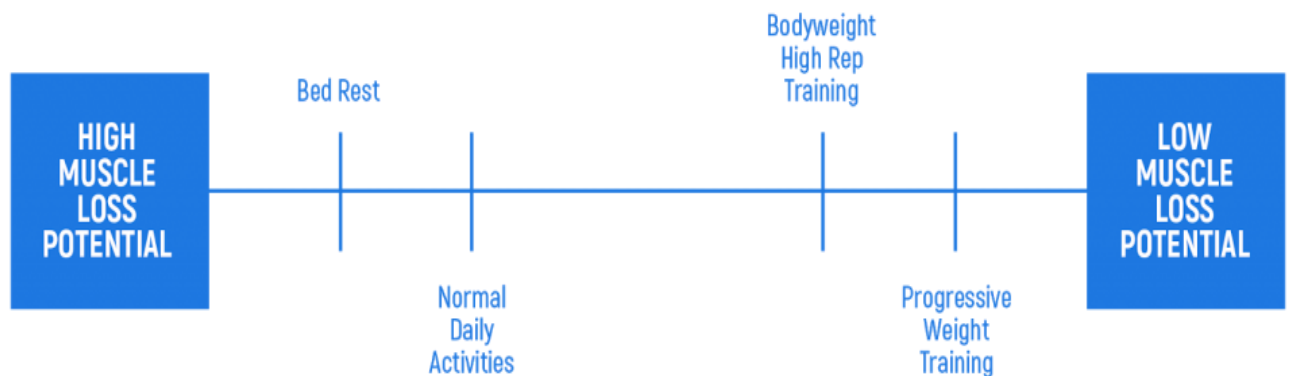
- During a step-taper, immediately reduce training volume 30-60%. This type of taper seems to be the most consistent in producing benefits for the athlete.

Detraining

What happens to your body when you stop lifting weights? It's important to first understand there is an ongoing tug of war between muscle protein synthesis and muscle protein breakdown. What really matters for muscle gain and muscle loss is the long term balance between these two opposing processes. This balance determines whether we gain, lose, or maintain muscle mass. While we know that muscle protein breakdown must exceed muscle protein synthesis for us to lose muscle, there are actually several different ways this can occur: 1) decrease in muscle protein synthesis, 2) muscle protein breakdown can increase, or 3) A combination of the two simultaneously. A decrease in muscle protein synthesis seems to be the most variable and thus can be more easily modified. How much muscle you actually lose will depend on 3 main factors: physical activity, caloric intake and protein intake.

Physical Activity

How quickly you lose muscle largely depends on exactly how little you're doing physically. Scientific evidence tells us that if you don't do any physical activity at all, unfortunately, you can lose a lot of muscle depressingly fast. Even if you're not training at all, chances are, most of you will still be getting out of bed and doing some sort of normal everyday activity. And, as it turns out, just walking around is actually quite a lot better at preventing muscle loss than lying in bed all day. You probably won't see noticeable muscle loss within two weeks of detraining, as long as you're bothering to get up and get dressed. Sometime shortly after two or three weeks, most people will begin to notice some muscle shrinkage. What if you're forced to cancel your gym membership for, say, two months? Even after two months of no lifting AT ALL for participants in a study conducted by Léger and colleagues, they still kept half the muscle they had built by just continuing everyday activities. It's important to keep in mind, however, that these subjects were untrained from the start. People with more lifting experience might see less relative muscle loss in that same time frame.



Based on a 2011 study from Bickel and colleagues, reducing training volume all the way down to 1/9th of what you were doing before was enough to maintain muscle mass over 7 months. One 2017 review by Schoenfeld & Grgic suggested that for well-trained lifters, a ~65% reduction in training volume should be enough to maintain muscle mass. Of course, because of individual differences in responses to different training volumes, it's impossible to say exactly how much any given lifter will be able to reduce their volume and expect to maintain gains. It seems that muscle maintenance is a whole lot easier than muscle building.

Caloric Intake

Unsurprisingly, how much muscle you lose depends on your daily total caloric intake. A sustained energy deficit compromises muscular potential by inhibiting muscle protein synthesis

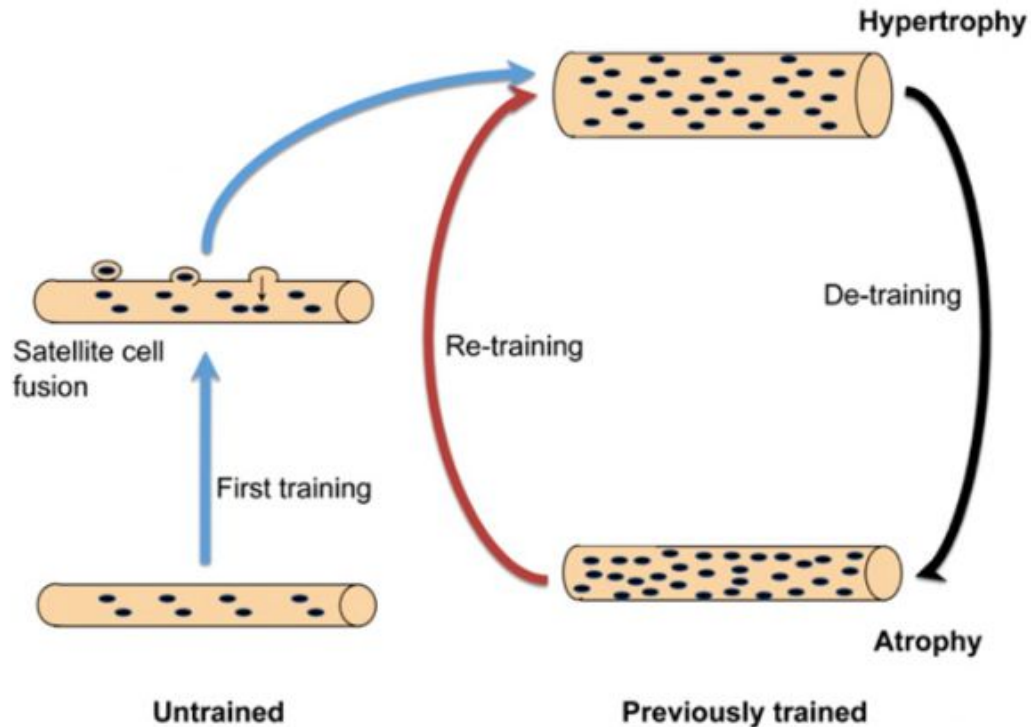
and molecular anabolic signaling, whereas being in a caloric surplus provides the ideal milieu for promoting muscle growth. You should eat at caloric maintenance or in a slight caloric surplus, if your main goal is to avoid muscle loss.

Protein Intake

Sufficient protein intake is crucial when it comes to preserving muscle mass. 0.7 to 1g per lb of bodyweight is a good range for drug-free, non-dieting trainees. However, you may want to err on the high end or slightly higher if you aren't training.

Muscle Memory

Even if you ignore all of my advice and decide to do absolutely nothing for the next two months, or even two years, not all is lost. It's much easier to rebuild lost muscle than to build new muscle from scratch. As soon as you start training again, muscle nuclei - which is originally built in training and remain active even after detraining - can start pumping out new muscle proteins and thus rebuilding all your lost muscle.



Advanced Intensity

These techniques add diversity to a workout and allow a lifter in some cases to train past failure.

Supersets (SS)

Good if you're short on time. Doing two or more exercises without rest. There are a few types:

Compound to Isolation SS

- Execute a compound exercise like bench then follow with an isolation movement like a chest flye.

Antagonistic SS

- Execute a set for one part then an exercise for the antagonistic body part. For example curls followed with tricep push downs.

Upper-body to Lower-body SS

- Execute an upper body exercise followed by a leg exercise. For example curls followed by leg extension

Same Body Part SS

- Execute two movements in a row that target the same muscle but in a different way. For example: tricep rope pushdown followed by tricep overhead extension.

Cheat Reps

- Using a bit of momentum to lift weights you wouldn't normally be able to lift using proper form. High potential for overload but also for injury. Cheat only to push yourself harder not to make the exercise easier.

Partial

- Moving weight with a less than full range of motion. Higher potential for overload. Partial can be done at the end of a set to extend it.

Pre-Exhaust

- Execute an isolation movement to exhaust a muscle group before starting a compound exercise. In theory the other muscles participating in the compound movement should take over because the isolation work fatigued the muscles you want to eliminate from taking over.

Forced Reps

- A spotter provides just enough resistance for the lifter to complete their rep. High potential risk. Can be very demanding on recovery as every rep is to failure.

Drop Sets

- Doing a set to failure then immediately doing another set with lighter weight.

Run-The-Rack

- Drop set variation in which the lifter continually drops the weight in small increments. Until they have traversed the entire stack of weight or as the name suggests they use every dumbbell on the rack.

Variant Drop Reps

- Doing a set to failure then immediately switching to a technique tweak that makes the movement slightly easier by either manipulating range of motion or body position in order to extend the set.

Rest Pause

- Do a set to failure. Rest for a couple seconds then squeeze in a few more reps.

Negatives

- Focuses on the eccentric lowering phase of the lift. Spend a little extra time lengthening the muscle. You are about 30% stronger in the eccentric when compared to concentric tensile strength. This means you can overload the weight more than normal if you have some help on the concentric

Strip Sets

- Variation on the drop set but with a barbell. Start with a heavy weight on the bar and go to failure. Once there strip off some of the weight from the bar and continue.

Isometric Holds

- Resisting the force of gravity for some amount of time. Usually the lifter will hold the weight in the mid range of the exercise and hold it there for as long as necessary either doing reps or one long hold.

Overcoming Isometric

- Attempting to move an immovable object with maximum effort. These isometric muscle contractions allow you to put every ounce of effort and energy into the movement, which recruits as many motor units and muscle fibers as possible.

Blood Flow Restriction (BFR)

- Cutting off venous blood flow out of a limb, but still allowing arterial blood flow into a limb. The biggest benefit of BFR training seems to be notable increases in strength when it's added to heavy training. It causes a high degree of muscle activation and causes virtually no muscle damage, making it essentially "free" volume to help you get stronger without compromising recovery. This is especially good news for those that are injured. Under this type of training athletes are able to continue to train hard under very light loads. BFR is mostly used to enhance recovery or reduce atrophy when you're injured.

Hypertrophy

The growth and increase of the size of muscle cells. There are 2 types that are not mutually exclusive.

Myofibrillar Hypertrophy

Accomplished via the growth and multiplication of the myofibrils inside each muscle fiber. The myofibrils are the actual “motors” of the muscle fiber, made up of contractile proteins that make the muscle fiber contract.

Sarcoplasmic hypertrophy

In theory, accomplished by the expansion of the sarcoplasm inside the muscle fiber. We don't know a lot about this phenomenon other than it happens and may contribute to the discrepancy between a bodybuilder's rather low muscle size to strength ratios. Whether you can train for either type of hypertrophy is unclear. Also unclear is whether [steroids](#) contributes in any major way to sarcoplasmic hypertrophy.

The two major mechanisms of hypertrophy in a constant tug of war are mechanical tension and metabolic stress. More of one generally means less of the other. When you add weight to the bar, you induce more tension but you can't do as many reps, so metabolic stress is lower. When you take weight off the bar, you can cause more metabolic stress but muscle tension is lower.

Some may claim a third mechanism: muscle damage. However, there is little evidence that this damage causes subsequent muscle hypertrophy. Since it seems that damage only plays a minimal role in muscle hypertrophy, when training for hypertrophy, I'd recommend you focus on the other mechanisms.

Volume

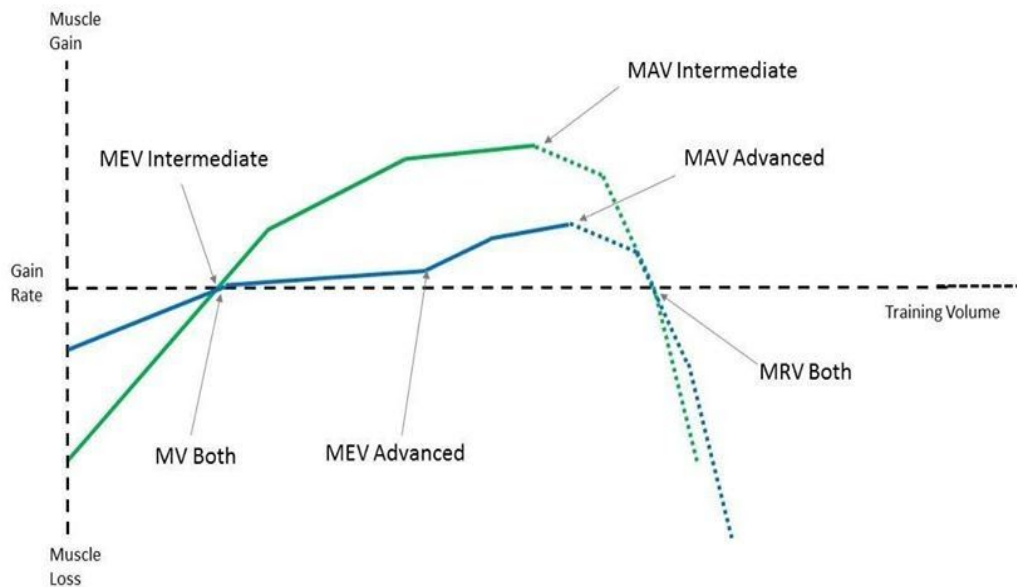
Volume = Sets x Reps x Weight or

Volume = # Hard Sets

Volume is the main stimulus for hypertrophy. MEV is the minimum amount of volume a lifter needs in order to induce any substantial hypertrophic effect. For the average lifter the minimum effective volume hovers around 10 sets per week.

MRV or maximum recoverable volume is the most a lifter should work before long term fatigue begins to inhibit recovery and soreness affects future sessions. MRV is somewhere around 20 working sets a week for most people

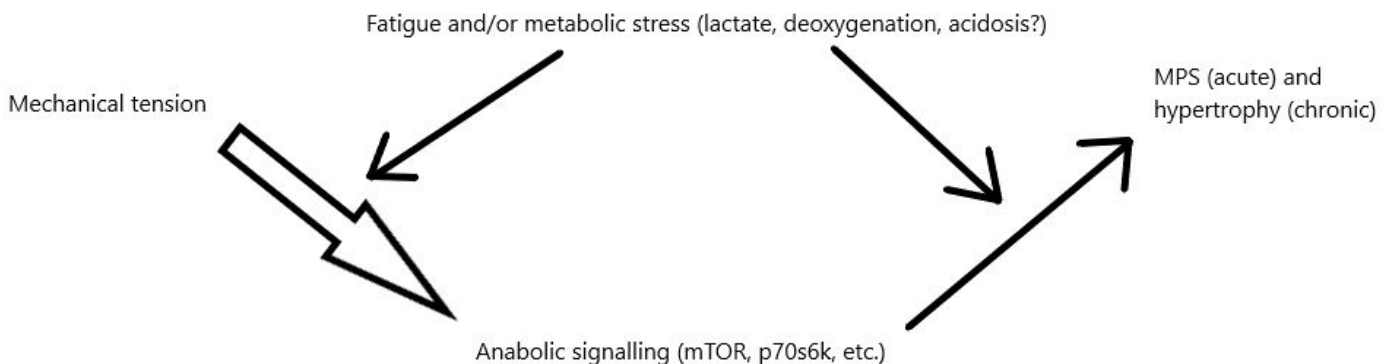
MV vs. MEV Intermediate to Advanced



Effective Reps

Not all reps are created equal. The last few reps before you fail are more effective for hypertrophy than the first few reps when you are “fresh”. Tension is the initiator of hypertrophy, and some aspect of fatigue amplifies that signal. Effective reps in a way debunks the mathematical definition of volume as described above. Rather than reps x sets x weight volume more accurately can be defined as the quantity of sets taken near failure.

More tension promotes more hypertrophy up to a certain level, but you don't need maximal tension on each fiber to maximize hypertrophy, and more fatigue promotes more hypertrophy up to a certain level, but you don't need maximal fatigue to maximize hypertrophy.



Thick arrow = causal relationship. Thin arrow = influence or enhancement.

To maximize hypertrophy on a per-set basis, you have to get somewhat close to failure.
Sorry to my pump chasing bodybuilder friends. The truth of the matter is effort does play a role in dictating hypertrophy. You cannot accumulate garbage volume and expect to grow naturally.

Diet

Weekly rather than daily

If you're tracking what you eat, it's most important to look at the big picture. A single day says nothing about a person's diet. weekly or even monthly intake is more important than daily fluctuations.

General Diet Advice

Good dietary advice includes:

Eat a whole bunch of

- fruits and vegetables with fiber
- good fibrous grains
- dairy
- seafood
- legumes
- nuts & seeds
- lean meats

Avoid excessive intakes of:

- saturated fats
- added sugars
- refined starches
- processed meats.

That doesn't mean you can't have some. But the totality of the literature indicates we should keep these items on a low to moderate limit. Avoid extended periods of overeating or you will get fat.

Macronutrients

Protein ~4 Cal/g

- Arguably the most important macro for those concerned with body composition. Above all else make sure you are getting enough. Slightly higher thermal effect compared to the other macros. Your body has to burn more energy to process protein.

Carbohydrates ~4 Cal/g.

- Very easy to overconsume. Carbs are the primary fuel source for exercise. Glycogen refers to the state that carbohydrates take when they are in storage within your body. When you consume carbohydrates, your body will use the amount that it needs. Your body will store the surplus carbohydrates in your muscles and liver. The amount of glycogen stored in your muscles is enough to provide energy for an entire day.

Fats ~9 Cal/g

- Fats are essential for regulating all the hormones within the body. De novo lipogenesis (new fat production) is extremely rare in humans. Nearly all the fat we store comes directly from the food we consume. If you have a surplus of calories your body will store the dietary fat into fat cells.

Metabolism

Total daily energy expenditure (TDEE) is the amount of calories you burn on the average day. TDEE is determined by an individual's metabolism. It is the sum of 4 components:

1. Thermic Effect of Food (TEF) ~10% TDEE

- Energy required to process the food you consume. Protein has the highest effect but it's not that noticeable. Aside from the most advanced of competitors, TEF isn't something people should be concerned with

2. Non Exercise Activity Thermogenesis (NEAT) ~15% TDEE.

- The energy expended for everything we do that is not sleeping, eating or sports-like exercise. It ranges from the energy expended walking to work, typing, performing yard work, undertaking agricultural tasks and fidgeting. Can vary drastically from person to person. This is the aspect that people are referencing when they claim they have either a high or low metabolism

3. Exercise Activity Thermogenesis (EAT) ~5% TDEE

- Calories burned during explicit exercise. Can vary depending on the type and duration of exercise

4. Basal Metabolic Rate (BMR) ~70% TDEE

- Energy needed to keep your organs running properly. Bodyweight and body composition are the only thing that really affect this. The bigger you are the more energy you need to keep yourself going.

Deficit, Surplus, Maintenance

Deficit

- You are eating less calories than you are burning. The opposite is true in a surplus. As a general rule of thumb every 500 calories above/below your TDEE is 1 pound gained/loss per week.
- The rate of weight loss is wholly determinant on your goals. More often than not the slower the better. Rapid changes in body weight is a recipe for disaster. For weight loss: $\text{Body fat \%} \div 20 = \%$ of current body weight you should aim to lose per week. Most likely you will gain little to no muscle when in a deficit
- If you're currently at 20% body fat, you should aim to lose about 1% of your bodyweight per week. If you're 10%, you should only aim to lose about 0.5% of your body weight per week. Now, you can certainly aim to lose weight faster than that, but you'll almost certainly lose muscle in the process.

Surplus

- You are eating more calories than you are burning.
- The rate of weight gain is wholly determinant on your goals. More often than not the slower the better. For weight gain: $-(\text{Body fat \%} - 30) \div 40 = \%$ of current body weight you should aim to gain per week. Most likely you will lose little to no fat when in a surplus.
- If you're currently at 20% body fat, you should aim to gain about .25% of your bodyweight per week. If you're 10%, you should only aim to gain about 0.5% of your body weight per week. Now, you can certainly aim to gain weight faster than that, but you'll almost certainly add more fat in the process.

Maintenance

- When at maintenance you are neither above nor below your TDEE. You know this is the case if you are neither gaining nor losing weight long over the term.

- You absolutely can build muscle and lose muscle in maintenance through body recomposition

Insulin

Insulin is a hormone that regulates the levels of sugar in your blood. When you eat a meal, the carbohydrate in the meal is broken down into glucose. The glucose enters your blood. Your pancreas senses the rising glucose and releases insulin. Insulin allows the glucose to enter your liver, muscle, and fat cells. Once your blood glucose starts to come back down, insulin levels come back down too. This cycle happens throughout the day. You eat a meal, glucose goes up, insulin goes up, glucose goes down, and insulin goes down. Insulin has other effects as well. It stimulates muscles to build new protein and inhibits lipolysis and stimulates lipogenesis. It is the latter effect by which insulin has gotten its bad reputation. Because carbohydrate stimulates your body to release insulin, it has caused some people to argue that a diet high in carbohydrate will cause you to gain fat. Their reasoning goes like this:

High Carbohydrate Diet -> High Insulin -> Increased Lipogenesis/Decreased Lipolysis -> Increased Body Fat -> Obesity

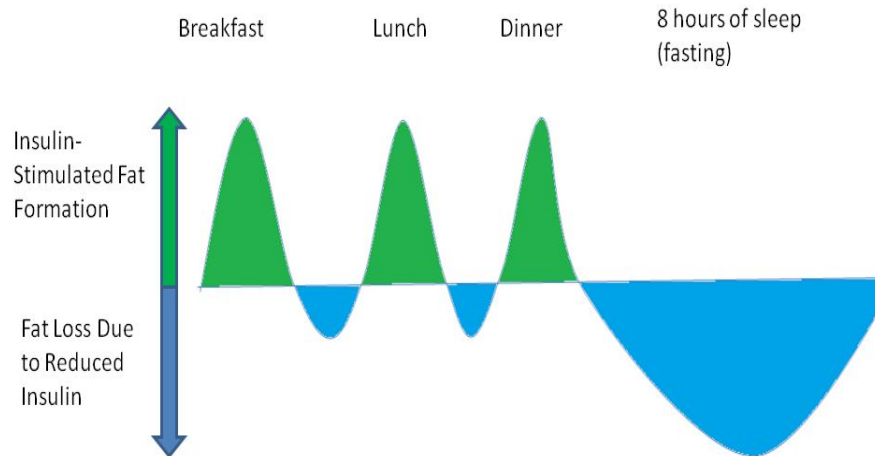
Low Carbohydrate Diet -> Low Insulin -> Decreased Lipogenesis/Increased Lipolysis -> Decreased Body Fat

However, this logic is based on many myths.

Myth: A High Carbohydrate Diet Leads to Chronically High Insulin Levels

Truth: Insulin Is Only Elevated During the Time After a Meal In Healthy Individuals

- In healthy people, insulin only goes up in response to meals. This means that lipogenesis will only exceed lipolysis during the hours after a meal. Over a 24-hour period, it will all balance out meaning you do not gain weight. A high carbohydrate diet will result in weight loss just as any other diet.



Myth: Carbohydrate Drives Insulin, Which Drives Fat Storage

Truth: Your Body Can Synthesize and Store Fat Even When Insulin Is Low

- Your body has ways to store and retain fat even when insulin is low. For example, there is an enzyme in your fat cells called hormone-sensitive lipase (HSL). HSL helps break down fat. Insulin suppresses the activity of HSL, and thus suppresses the breakdown of fat. Fat will also suppress HSL even when insulin levels are low. This means you will be unable to lose fat even when carbohydrate intake is low, if you are overeating on calories. If you ate no carbohydrate but 5,000 calories of fat, you would still be unable to lose fat even though insulin would not be elevated. This would be because the high fat intake would suppress HSL. This also means that, if you're on a low carbohydrate diet, you still need to eat less calories than you expend to lose weight.

Myth: Insulin Makes You Hungry

Truth: Insulin Suppresses Appetite

- Insulin acutely suppresses appetite. This will be important when we talk about the next misconception

Myth: Carbohydrate Is Singularly Responsible for Driving Insulin

Truth: Protein Is a Potent Stimulator of Insulin Too

- Carbohydrates get a bad rap because of their effect on insulin, but protein stimulates insulin secretion as well. In fact, it can be just as potent of a stimulus for insulin as

carbohydrate. Whey protein, which has the highest insulin response, causes the greatest suppression of appetite.

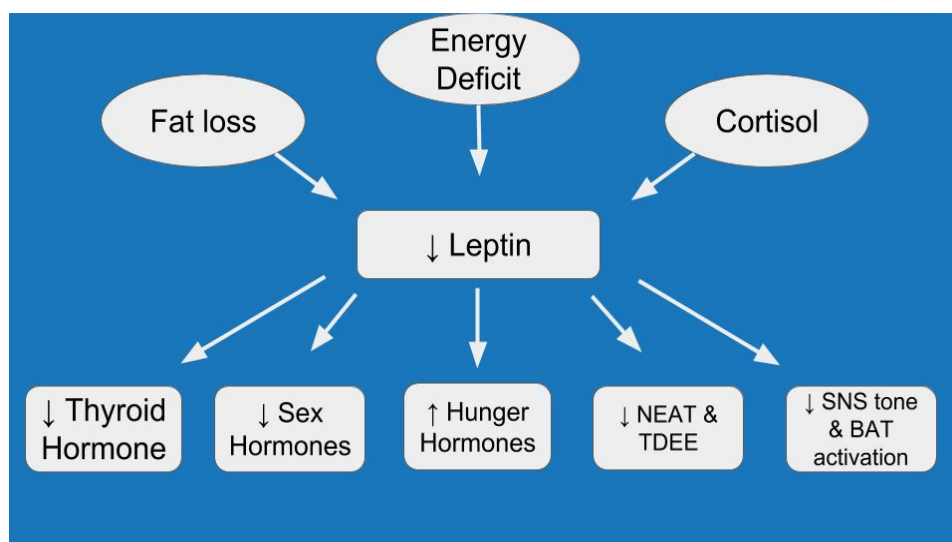
insulin is not this terrible, fat-producing hormone that must be kept as low as possible. It is an important hormone for appetite and blood sugar regulation. The problem with refined carbohydrates is a problem of energy density. With refined carbohydrates, it is easier to pack a lot of calories into a small package. Not only that, but foods with high energy density are often not as satiating as foods with low energy density.

Metabolic Adaptation

When people are underfed their body has an affinity for reducing calorie output. The same is true to a lesser degree for overfeeding and increased activity.

The latter is explained by small increases in NEAT when feeding above caloric maintenance. For this reason maintenance isn't a number so much as it's a range in which energy balance is even. It's possible that those who have trouble gaining weight may experience a 500 calorie increase in activity when eating 500 calories over their perceived maintenance. Thus resulting in no weight gain.

The former makes sense from an evolutionary perspective. In a time when meals were not guaranteed, starving was a major concern. The body will slow itself down when starved of calories over the long term. A male that diets from 23% body fat to 18% body fat over a reasonable time frame is not coming face to face with his impending starvation, so the magnitude of adaptation is typically mild. When weight loss attempts become more extreme – either by losing vast amounts of weight, losing weight very rapidly, or pushing body fat storage close to the minimum amount required for survival – the adaptations become much more pronounced.



Effects of Weight Loss on Hormones		
Hormone	Direction	Primary Effect
Thyroid Hormone	↓	Reduce metabolic rate
Leptin	↓	Reduce metabolic rate Increase hunger Affect numerous hormones
Ghrelin	↑	Increase hunger
Insulin	↓	Increase hunger Threaten muscle retention
Testosterone	↓	Threaten muscle retention Reproductive side effects in males
Estradiol	↓	Threaten bone health Reproductive side effects in females
Cortisol	↑	Blunted leptin activity Water retention Effects on appetite and lean retention (possibly)

Hormones are not the only obstacle those who are dieting face. In weight loss diets, the thermic effect of feeding will be reduced for a very straightforward reason, if you eat less food, you won't burn as many calories in the process of eating, digesting, metabolizing, and storing it.

Weight loss also involves the loss of both fat mass and fat-free mass; fat mass is a metabolically active tissue, and fat-free mass is the primary determinant of energy expenditure at rest. As a result, resting metabolic rate will drop as we lose weight.

For any kind of locomotive cardio, such as walking, running, or cycling, the task itself involves generating enough force to transport the mass of your body. As you lose weight, the mass is reduced, and you naturally require less energy to transport your body a given distance.

When a person loses 10% or more of their body weight, their total daily energy expenditure drops by around 20-25%. Some of this drop relates to the loss of body mass, but there is also an adaptive component, as TDEE ends up about 10-15% below what we would expect based on body mass alone. Of that adaptive component, up to 85-90% can be explained by alterations in non-resting energy expenditure, and NEAT is by far the biggest contributor.

Solutions

If the goal is to maintain lean mass and attenuate metabolic adaptation, avoid excessively rapid weight loss. There are two main drivers pushing metabolic adaptation: short-term energy availability, and long-term depletion of energy stores. When actively dieting to become very lean, both stimuli are encountered; some degree of energy restriction is unavoidable for active weight loss, and depletion of fat stores is the entire goal of the process.

It has long been understood that weight loss is induced by an energy deficit, but an energy deficit doesn't necessarily need to be applied in a linear fashion.

Refeeds offer an option for manipulating energy intake throughout the week. either through structured refeeds or unstructured cheat meals. The purported benefits of refeeds are multifaceted; by acutely increasing carbohydrate intake, one could potentially boost leptin and thyroid hormone levels, acutely increase energy expenditure, enhance muscle and liver glycogen content, and provide a welcome reprieve from the low-carb food menu that often accompanies contest preparation, particularly in the later stages. Often this increase in energy expenditure is nowhere near enough to compensate for the increase in calorie intake required to induce it.

An alternative to refeeds has been discovered by considering the larger scope. A diet break is essentially a more modest long term refeed. Diet breaks are caloric play at the monthly level by alternating between two weeks of dieting and two weeks of eating at maintenance. This approach appears to have the capacity to attenuate metabolic adaptation to some extent, but also dramatically extends the timeline of the diet. As a result, there is a cost-to-benefit ratio that must be considered when determining the frequency and duration of refeeds or diet breaks.

- **Daily protein should be no less than 2 g/kg body mass, and as high as 2.3-3.1 g/kg of fat-free mass.**
- **Fat intake shouldn't go below 0.6-0.7g/kg of total body mass as a bare minimum**
- **Prioritize carbohydrates with whatever calories left.**

In the interest of lean mass retention, recovery, and maintenance of sanity, reasonable volumes and frequencies of cardio training should be used to promote an energy deficit.

Life after the diet

For short-term dieting, just about everything works. For long-term dieting, almost nothing works. Some aspects of metabolic adaptation can even persist for years after active weight loss. In the time period immediately following weight loss, we have a body with less metabolically active tissue, emptier adipocytes, more energetically efficient tissues, less leptin, lower levels of thermogenic, anorexigenic, and anabolic hormones, and higher levels of orexigenic and catabolic hormones. It is a body primed for ravenous eating and precipitous fat gain.

Reverse And Recovery Dieting

With reverse dieting calories mainly from carbohydrate and fat, are incrementally added back to the diet after the weight loss goal has been achieved. As the calories slowly increase, the dieter transitions from a deficit to maintenance to a surplus in a methodical manner. As calories are increased in a gradual fashion, metabolic adaptations are reversed over the course of this process. As a result, energy expenditure increases as caloric intake is increased, which prevents rapid fat accumulation out of the gate. Theoretically, this would allow the dieter to begin their offseason with substantially higher caloric intake than during their weight loss phase, but with a fairly low level of body fat.

Recovery dieting is quite similar. Recovery diets often include a very deliberate jump to a small caloric surplus immediately after the weight loss phase ends, and the approach generally allows a quicker rise in caloric intake and more directly embraces reasonable levels of fat regained early in the process.

An attempt to stay too lean during the offseason would likely inhibit an individual's ability to fully restore normal hormone levels, reverse the hyperphagia induced from dieting, and make strength and hypertrophy gains in the offseason. It's also relevant to note that a very slow, strict reverse diet is unequivocally more challenging and psychologically draining than the most brutal of contest preps. How do you reasonably convince yourself to exercise that level of dietary restraint when it defies all of your physiological cues?

If your diet is over, get the hell out of a deficit, immediately. Beyond that point, any time spent in a deficit is wasted recovery time. Conversely, if you're planning to rapidly overfeed to capitalize on a quick rebound of muscle gain, don't bother. Recovery is likely to be accelerated in the context of a larger energy surplus, more expeditious restoration of fat mass and lean mass, more complete restoration of fat mass and lean mass, more conservative management of training loads, and more effective management of sleep and life stressors. As such, more rapid increases in caloric intake after dieting favor more rapid and complete recovery, but must be weighed against the increased likelihood of body fat overshooting.

Increasing Calories: Fast Versus Slow

Favors Faster

Favors Slower

Persistent side effects from dieting

No persistent side effects from dieting

Not near genetic limit for muscularity

Near genetic limit for muscularity

Intend to eventually restore pre-diet fat mass in its entirety

Intend to permanently maintain some degree of fat loss

Planning to bulk before next cut

No offseason bulking phase intended

Leanness is not primary goal or area for improvement

Leanness is primary goal or area for improvement

Anticipated compliance issues

No anticipated compliance issues

Eager for psychological break

Would prefer to continue routine

If you've dieted to a reasonably sustainable body fat percentage, maintenance is certainly achievable. If you've dieted to a physique competition-level body fat percentage, weight regain is an important part of recovering from the unfavorable metabolic and hormonal effects of metabolic adaptation. However, if there's no plan in place for transitioning from weight loss to either maintenance or a controlled weight regain process, the likelihood of excessive fat regain and body fat overshooting is increased. When the weight loss phase ends, calories should promptly be raised to maintenance levels, at minimum.

Body Fat

Body fat is notoriously difficult to measure. Even the best equipment such as DXA, bod pod, and hydrostatic weighing can be upwards of 7% off a person's real body fat. The only way to know for sure is to dissect your body and put all of someone's fat on a scale. Body fat is still a good measurement for progress. If a machine says you're at 20% one year and the next it reads 10% you probably have a better body composition than before.

The general population's notion of body fat percentages is actually skewed a few points lower than reality.



Chrononutrition

Nutritional factors like meal timing, length of the feeding window, and the distribution of calories/nutrients across the day aren't worth worrying about... for most. The cornerstone for many of the underlying mechanisms relates to the circadian rhythmicity of many processes in the body. A few examples of biological processes that occur with a circadian rhythmicity:

Hormones

- melatonin, cortisol, leptin, etc.

Sleep-wake cycle

- sleep anticipation in the brain default mode network (DMN)

Core body temperature

- reaches peak during the day and minimum point at night

Immune system activity

- pro-inflammatory cytokines like TNF

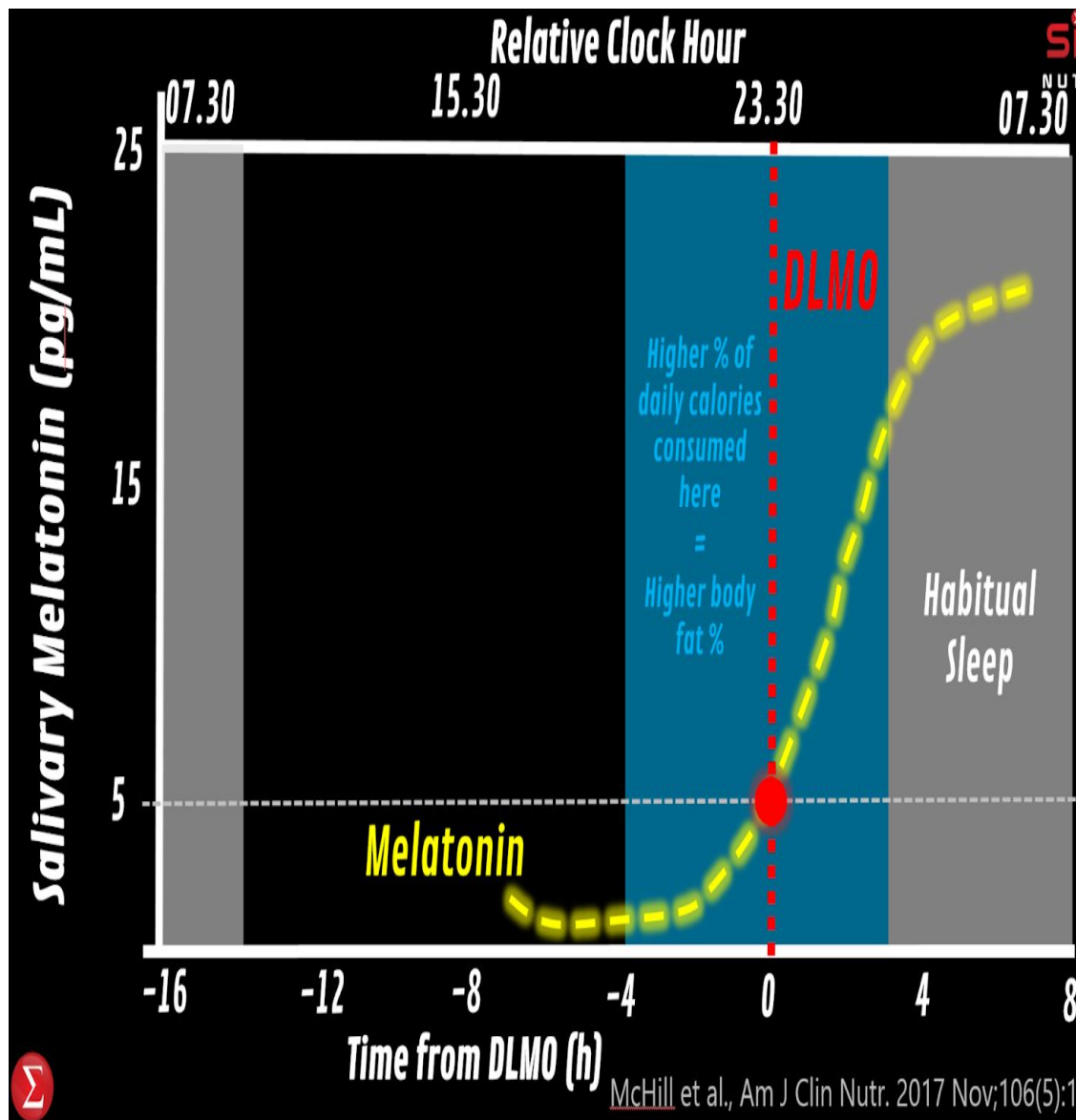
The body has peripheral circadian clocks in tissues of the gut, liver, pancreas, adipose tissue, and skeletal muscle. This opens up the potential for peripheral clocks to control the timing of digestion, nutrient metabolism, hormones, appetite and physical activity. Adverse health effects can be driven by a misalignment between the master and peripheral clocks, relative to the external environment and behaviors. This desynchronization is defined as chronodisruption. So to maintain health, we want to have a synchronization between our: master clock, peripheral clocks, and external environment that influences these clocks.

There is a bi-directional relationship between diet and circadian biology

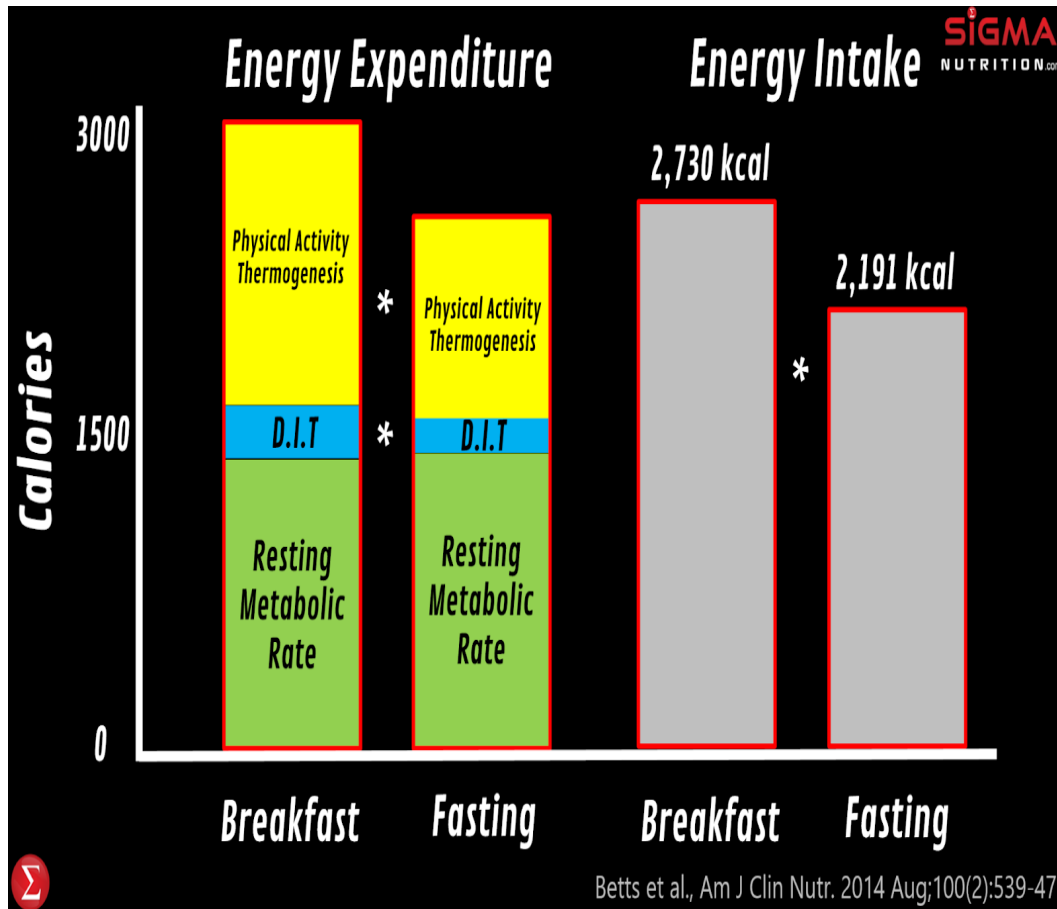
One of the potential external factors that can entrain the peripheral clocks is nutrient ingestion. Therefore, when and how we eat has the potential to synchronize or desynchronize our circadian rhythms, causing circadian alignment or misalignment. Several biological processes related to metabolism, digestion, and hormone secretion have a circadian rhythmicity. Therefore, there may be better ways to eat based on diurnal variation.

Are there better times to eat and avoid eating?

Eating at biological night is a bad idea. Postprandial metabolism is much worse when a meal is eaten during the night than day. Individuals consuming more of their daily calories between 4 hours before DLMO and the onset of sleep have a higher percentage of body fat.



There are benefits to eating early in the day. However, that should be synonymous with “eat as soon as you wake.” Think of it more like “eat something in the early part of the day.” In one of James Betts et al studies, they found that eating a large meal early in the day leads to much greater energy expenditure over the day compared to fasting until 12pm. Most of this is explained by greater physical activity thermogenesis, specifically of light movement through the day.



The majority of people have highly variable eating patterns in regards to the times their meals are consumed and frequencies of meals from day to day. Most people eat later on the weekend, likely owing to later sleep and wake times on the weekend in those who work a typical work week. Gill and Panda (2015) refer to this change in eating time potentially causing “metabolic jetlag”; i.e., having a detrimental impact via shifting circadian clock phase.

Best Practices

- Avoid eating during biological night.
- Have a restricted feeding window.
- Get daylight exposure early in the biological day.
- Avoid artificial light at night.
- Bias towards a “front-heavy” calorie distribution.
- Avoid meals, particularly those high in fat and/or carbohydrates, close to sleep time.

- Avoid erratic eating: have consistent meal times and meal frequency from - day-to-day.

Caveats

In order to maximize athletic performance, there are several nutrition strategies that may be different from those applied to maximize human health. There are several cases where they may not apply or be counter to evidence-based sports nutrition practices. Here are a few examples.

- If an athlete is struggling to consume enough calories is it wise to use a time-restricted eating model? Or avoid large meals in the evening?
- If an MMA athlete trains twice per day at high intensity, after their evening training session, is it conducive to their recovery to tell them “let’s avoid eating carbs at night”?

There is a reason to suggest that we can mitigate the glycemic concerns of later carbohydrate feedings through the inclusion of evening training sessions. I can think of few things worse than missing out on a meal out with a spouse, drinks with friends, a family party, or any other valuable social occasion because you’re deathly afraid of any disturbance to your body’s circadian clocks. There is value to thinking about circadian biology and how your usual eating may influence it, but also realize there are tremendous health benefits to being socially connected, enjoying oneself, and having happy memories with people you care about. A commonly voiced concern with some of these heuristics is that they will make things unnecessarily difficult for people. If trying to implement some of these circadian strategies undermines an individual’s ability to adhere to the fundamental pieces of healthy nutrition then of course don’t bother.

Types of diets

Keto

Keto is a low carb high fat diet. The theory goes that because you are consuming very few carbs your body will go into a state of ketosis in which the main energy source becomes ketone bodies a derivative of triglycerides from within fat cells.

Studies have shown that power output is decreased when in said state. This is because of the lack of available glycogen stores. Another possible downside is the keto flu. Adverse health effects such as headache fatigue nausea and upset stomach may occur when transitioning from carbs to ketone bodies for energy which lasts for less than a week. These symptoms mirror symptoms of sodium depletion. This happens because lower levels of insulin increase the secretion of sodium. You can avoid this by replacing the sodium you lose with more salt.

The keto diet is very restrictive on the foods that you are allowed to eat because the macro ratio is somewhere around 70% fat, 25% protein, 5% carbs. Low carb diets seem to have better

participant retention rates when compared to low fat diets. This is because those who follow keto will eat more fat and protein dense foods that are more satiating than carbs. At the end of the day it still comes down to calories in versus calories out.

Low Fat

The opposite of a keto diet. This was a big trend in the 90's when fat was demonized for its potential risk of heart disease. We know now that the real risk is the combination of high carbs and fats and a caloric surplus that is truly dangerous for heart health. We also know that fats shouldn't go lower than 15% of caloric intake else hormone regulation will be adversely influenced. Typical low fat diets are about 55% carbs, 25% protein and 20% fat.

If It Fits Your Macros (IIFYM)

The least restrictive diet but it requires calculations. The point here is to hit target macro ratios and you're golden for the day. Typically protein is somewhere between 20 - 30%, fats between 20 - 60%, and carbs between 20 - 60% depending on the person and their goals. The problem with IIFYM is that the diet is so unrestrictive that participants can decide to get their macros from micronutrient scarce foods like pop-tarts. I subscribe to a variation of this method but with an emphasis on eating plenty of micronutrient dense foods, fruits, vegetables and a target for protein and calories. I don't worry about the ratio between carbs and fats.

Paleo

Short for paleolithic. A time before agriculture became widely practiced, humans ate only what was readily available in the environment. Advocates argue there hasn't been enough time between the paleolithic and now for the human body to adapt to the western diet. Foods on this diet include: grass fed protein, caught fish, eggs, nuts, plant based oils, fibrous vegetables, and fruits. The diet black lists grains, legumes, refined sugar, dairy, and salt. Here's where the diet goes wrong. The food choices are expensive, calories are completely ignored, and isn't practical due to its restrictive nature. As you may notice, restriction will be a common theme as it often determines whether someone can adhere to the diet or not.

Pescatarian

- does not eat meat but does eat fish.

Lacto-ovo vegetarians

- avoid all animal flesh, but do consume dairy and egg products.

Lacto vegetarians

- avoid animal flesh and eggs, but do consume dairy products.

Ovo vegetarians

- avoid all animal products except eggs.

Vegans

- avoid all animal and animal-derived products.

Many people choose to eat this way for ethical, environmental or health reasons.

This is perceived as healthy because included in the restrictions is processed meats and most saturated fats. These diets do not account for calories. In fact you could be entirely vegan if all you ate was brownie mix and potato chips. If you are vegan you will probably be deficient in some micronutrients so supplementation is necessary. These micronutrients include: B12, D, omega 3, Iodine, Iron, Calcium, and Zinc. You certainly can have great performance and gains as a vegan but you will have to put in extra work than those who have a less restrictive diet.

Carnivore

The carnivore diet only includes meat, fish, and other animal foods like eggs and certain dairy products, excluding all other foods. The diet is extremely restrictive and likely unhealthy in the long term. Plus, no research backs its purported benefits. The Carnivore Diet stems from the controversial belief that human ancestral populations ate mostly meat and fish and that high-carb diets are to blame for today's high rates of chronic disease. Other popular low-carb diets, like the keto and paleo diets, limit but don't exclude carb intake. However, the Carnivore Diet aims for zero carbs. It provides no guidelines on calorie intake, serving size, or meal timing. Testimonials from those who follow the diet claim that it can help treat several health issues, but no research supports these claims. Carnivore is the logical extreme of the elimination diet.

Elimination Diet

Food intolerances and sensitivities are extremely common. In fact, it's estimated that between 2–20% of people worldwide may suffer from food intolerance. Elimination diets are the gold standard for identifying food intolerances, sensitivities and allergies through diet. They remove certain foods known to cause uncomfortable symptoms and reintroduce them at a later time while testing for symptoms. Allergists and registered dietitians have been using elimination diets for decades to help people rule out foods that are not tolerated well.

Cardio

You do not need to do cardio to get lean. A caloric deficit is what will burn fat. Cardio in relation to dieting serves one purpose: negative calories. The calories burned during a cardio session can either push you into a caloric deficit or deepen an already existing deficit. If you are already in a proper deficit and burn 500 calories with cardio that's an extra 500 calories worth of food you

are then able to eat for the day. Cardio will not kill your gains unless you do it for several hours nonstop or you let it push you into an extreme deficit. Additionally be wary of the values you read from machines they are often inflated to make you feel better about using them. It also might be worth considering the basal metabolic calories you would have burnt during the exercise period. It takes a lot of energy to keep you alive so that plus the inflated numbers may mean for any given cardio session you are burning half as much as you think.

HIIT

- High Intensity Interval Training is a short burst of high effort followed by low intensity recovery work at intervals. In this method carbs are used more than fats as fuel however, due to the Calorie Afterburn Effect, you will consume more oxygen post workout thus the amount of fat burned between HIIT and LISS are equal. HIIT does appear to reduce appetite a measurable amount. A score for HIIT is that it can be more time effective if you do it right and often is less boring.

LISS

- Low Intensity Steady State is exertion at a steady pace over a long period of time. LISS is much easier to recover from when compared to HIIT.

Fasted Cardio

- The idea behind fasted cardio is: If you want to burn as much fat as possible you should avoid eating before and during a cardio session. The truth is: Just because you burn more fat during the cardio session itself, doesn't imply that you will lose more fat overall. If you burn more of one energy substrate in a session you will burn less of it over the next 24 hours. Fasted exercise will not increase the amount of fat burned when compared to fed exercise.

Fat Free Mass Index

FFMI is an index that assesses your body mass while also taking into account muscle and fat mass. There are three factors that are being used in the calculations and these are the weight, body fat percentage and height. It addresses one of the criticisms of BMIs which is that two persons with different weights and heights can have the same BMI but different fat/ muscle amounts. This value is highly dependent on genetics and can vary widely person to person. It's not the most accurate nor scientific value so take all of this with a heavy grain of salt, especially in regards to the figure below.

FFMI SCALE	
AVERAGE	18.0
	20.0
YOU LIFT	20.0
	22.0
EXCELLENT	22.0
	23.0
GENETICALLY EXCELLENT	23.0
	24.0
NATURAL LIMIT	24.0
	25.0
99% UNNATURAL	25.0
	26.0
STERIODS	26+

Intermittent Fasting (IF)

Fasting for a short period of time. Typically implemented by limiting the feeding window from 7am-11pm down to 12pm-8pm. The easiest way to do this is by skipping breakfast and refraining from late night snacks. IF is useful because instead of eating 3 small meals of breakfast, lunch, dinner, one can consume a large lunch and a large supper. If you're worried about being hungry after skipping breakfast don't be. You can easily train your body to expect food less often (see [Ghrelin & Leptin](#)). IF isn't anything special. For most people it just means postponing breakfast until noon. You can't overeat if you aren't eating

Carb Cycling

On some days - typically rest days - keep your carb intake low and on others - typically before a hard training session - increase the carbs. Protein and fat stays relatively the same. The acute cycle of carbs does not benefit metabolism in the long term. For most the added work isn't worth the small potential benefit. If you are a professional bodybuilder you may want to consider cycling your carbs as there is a slim chance it may help prevent muscle protein breakdown.

Breaking Through Weight Loss Plateaus

1. Reduce calories

- At a certain point your body will adapt and metabolism will slow down. If dieting long enough, you will come to a point where you are no longer losing on the same amount of calories that you used to. You might just have to begin either eating even less or increase the amount of cardio. The more aggressive the diet is however, the more risk you run of losing muscle along the way.

2. Track what you eat more carefully

- You may be over eating and not even know it if you aren't tracking carefully enough. To the best of your abilities use an app like Myfitnesspal to record everything you put in your mouth. Use this in conjunction with a food scale to properly portion each meal.

3. Change up your food sources

- Swap some of the foods that you typically use to diet for different foods. Maybe change up the carb to fat ratio if what you are currently doing isn't working.

4. Take a Diet Break

- See [Diet Break](#)

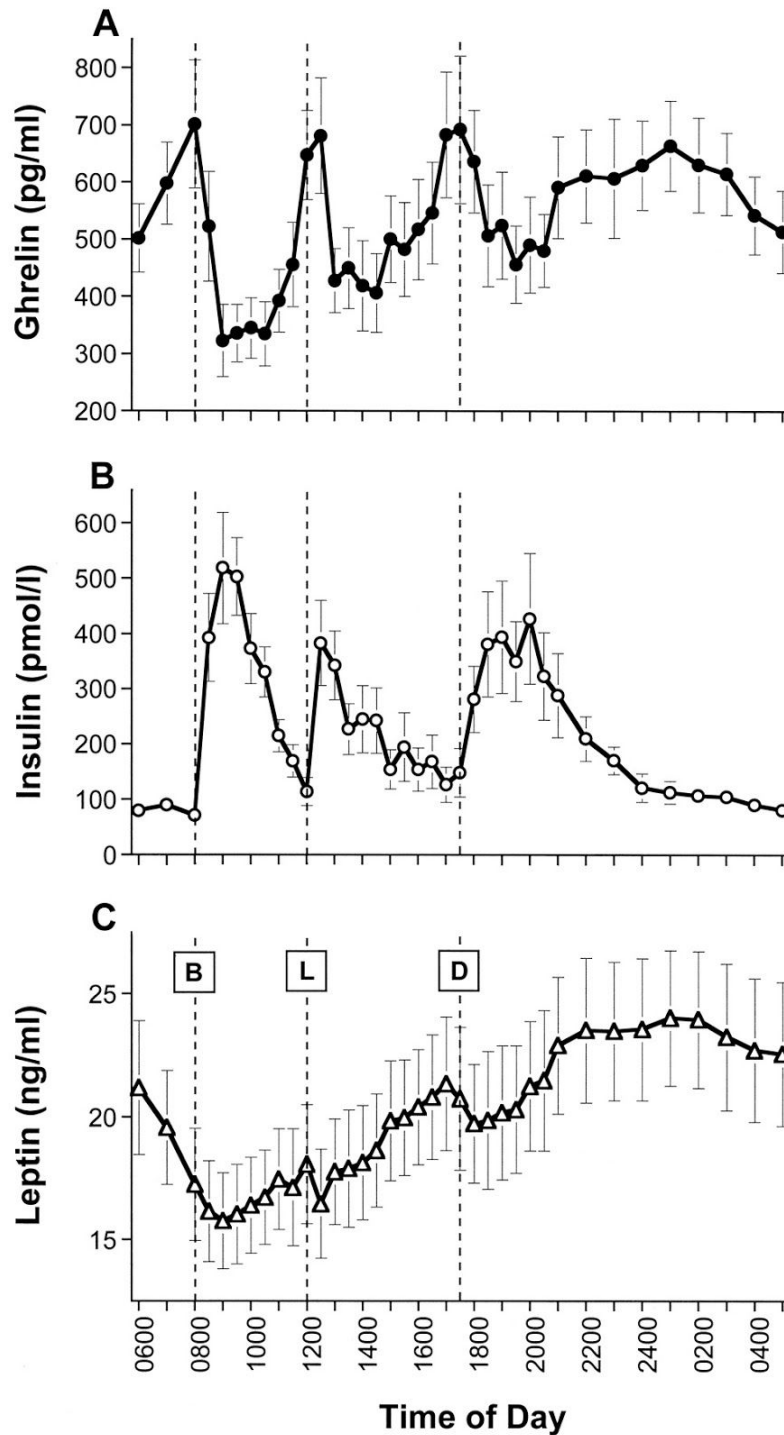
Ghrelin & Leptin

Ghrelin

- Known as the hunger hormone. It stimulates appetite by telling your nervous system that your body needs to eat.

Leptin

- The satiety hormone. Its role is opposite of Ghrelin. It tells your body that you are full.



Ghrelin and Insulin tend to increase when you expect to eat. If you have a routine of eating at specific times like breakfast, lunch, and dinner, your hormones will spike around those times telling you to eat. The good news is you can train these spikes. If you consistently don't eat breakfast like is commonly practiced in intermittent fasting, ghrelin will no longer spike around that breakfast time. This brings us back to chrononutrition and meals as described earlier.

Mini Cut

A mini cut is simply a short 1 to 2 month diet. The goal here is to improve body composition by losing any accumulated body fat from bulking and return your body to a more stable weight. From there you can maintain a healthy weight with the newly acquired muscle mass, dive deeper into a full blown cut or start the cycle over again with another surplus to bulk back up. If you find during your bulk that you have lost your appetite from force feeding yourself this may help reset your appreciation for food.

Diet Break, Refeeds, & Cheat Meals

Diet Break

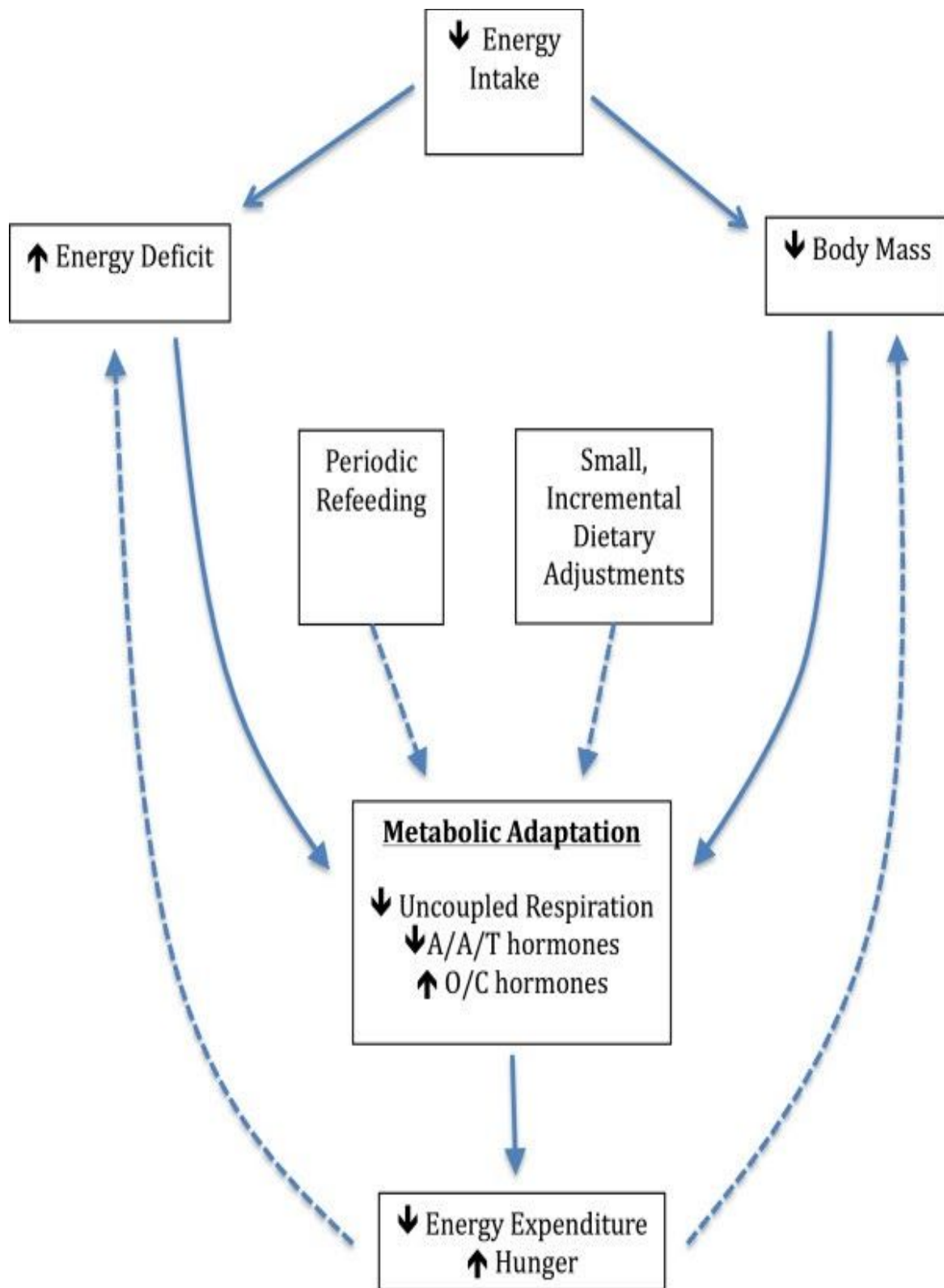
- Typically a diet break means returning to TDEE rather than staying in a deficit for the entire process. The theory behind this is that the detrimental effects of dieting on metabolism accumulates slower than it recovers after dieting is finished. By taking two weeks or so at maintenance, metabolism will rebound and you can resume the diet without the metabolic reduction.

Refeed

- Similar to a cheat meal but more structured. Refeeds are calculated additions of carbs and fats for a brief period of time.

Cheat Meal

- The least scientific of the three. A cheat meal or cheat day means eating whatever you want in the hopes of relieving cravings and restimulating the metabolism. Besides the acute spike in the thermic effect of food, metabolism will not recover after a single meal. Unless used scarcely and with caution cheat meals can be very detrimental to progress. An extra 1,500 calories on saturday could eliminate an entire week's worth of a 250 Calorie deficit. This strategy when used sparingly may help psychologically with food cravings. Expect every once in a while to screw up on your diet but don't make it a habit.



Sugar

Sugar is a dose dependent chronic poison. Chronic exposure of high doses of refined sugars will result in illnesses like Hypertension, heart disease, pancreatitis, obesity, fatty liver disease, and addiction.

The 7 criteria for an addiction are: Binging, desire to quit, craving, affecting life, irrational use, tolerance, withdrawal. If a substance checks at least 3 of these then it is considered addictive. Binging and cravings are obvious symptoms of sugar addiction. Humans also have a tolerance for sugar and experience symptoms of withdrawal when sugar is removed completely. With at least 4 of the 7 checked, yes sugar is an addictive substance.

A lot of people are overdosing on sugar and not even realizing it. Ever since the low fat craze of the 90s our food supply has become overrun with added sugars. 80% of our food has sugar added to it. I recommend tracking how much sugar you have every day. On most days try to keep sugar below 10% of your caloric intake. So for an athlete on 2500 calories a day 250 calories or 62g or 5 tablespoons directly from sugar should be the absolute limit.

Sodium

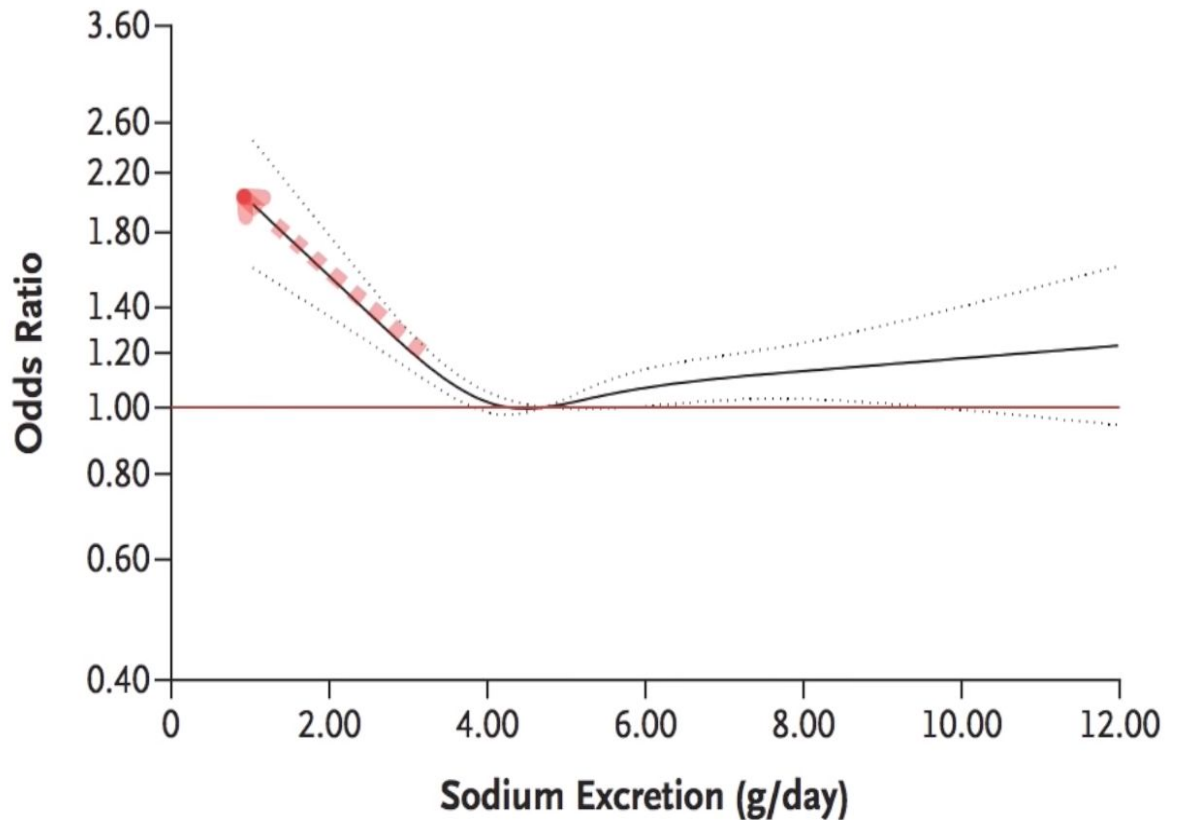
Not much is usually said about salt except eat less of it. But is that always the best advice? It's been estimated that by reducing American's intake of salt by half a teaspoon a day would prevent 92,000 heart attacks. The logic is as follows: in large amounts sodium pulls fluids from the body's tissues into blood which raises the blood volume and the heart has to pump harder resulting in high blood pressure. Chronic high blood pressure stresses the heart and leads to heart disease. Is salt to blame?

No. Salt intake used to be higher than it is now. Before the industrial era salt was the most common way of preserving food. After WWII when refrigeration became practical and widely used salt consumption dropped by about half. Despite the drop in salt, since WWII heart disease has more than tripled.

Sodium is absolutely necessary to sustain life. Those who do not get enough will suffer from headaches, muscular weakness, lethargy, ataxia, cerebral edema, seizures, and coma. On the other hand consuming large quantities of salt has its side effects. If consumed quickly enough salt will kill you. If the high amount is consumed at a steady pace, however it will be processed by the kidneys. Through osmoregulation the balance between salt and water is constantly balanced out. The human body is well adapted to handle salt overload but not deficit.

A daily intake of 3 - 6g per day was associated with lower risk of death and cardiovascular events.

A Estimated Sodium Excretion and Risk of Death or Cardiovascular Events



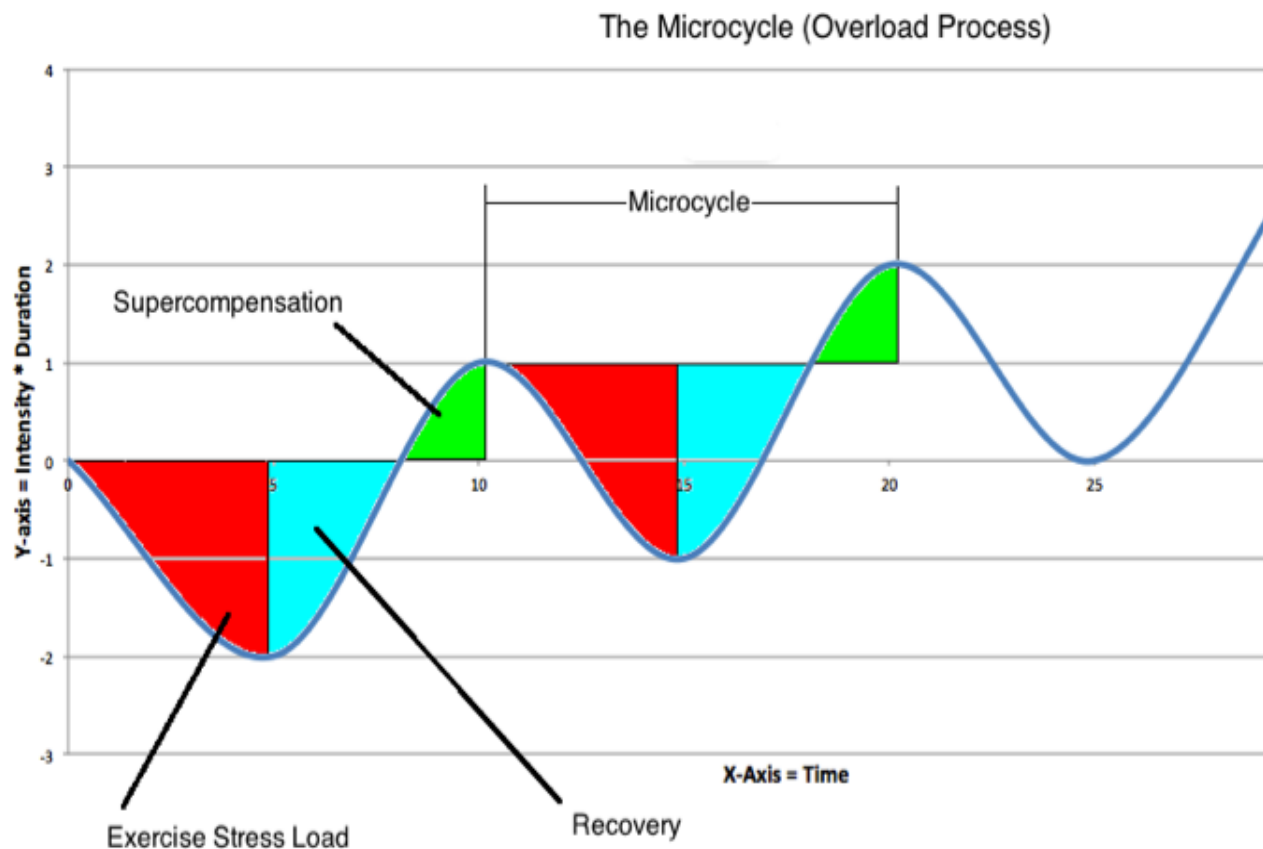
No. of Events	101	1,023	1,437	597	126	25
No. at Risk	1817	30,124	46,663	18,395	3885	756

What's interesting here is that lower intakes result in adverse health much quicker than overconsumption. Eating 6 times more salt than the WHO guideline of 2g/day poses less of a risk to health than what the organization recommends. In the US the average salt intake is about 3.6/day. Data suggests that the body will push people to acquire salt in accordance to their requirements for the mineral.

Programming

Supercompensation

The body is always seeking to maintain a state of homeostasis so it will constantly adapt to the stress from its environment. In training the desired adaptive response is called supercompensation. Supercompensation is a four-step process. The first step is the application of a training or loading stress and the body's subsequent reaction to this training stress which is fatigue. Step 2 is the recovery phase. This can be a lighter training session, a recovery session, or active rest. As a result of the recovery period, the energy stores and performance will return to the baseline. Step 3 is the supercompensation phase. This is the adaptive rebound above the baseline. This supercompensation effect is not only a physiological response but also a psychological and technical response. The final step is the loss of the supercompensation effect. If no training stress is applied, there will be a decline. This is the detraining phenomenon.



Autoregulation

Your readiness to train, recovery status, and performance is affected by a multitude of factors independent of your current training session that you may not have full control over such as:

- **Nutrition**
- **Sleep**
- **Mood state**
- **Prior training**
- **Menstrual cycle phase**
- **Emotional stressors etc...**

Lifters themselves can become a reliable source of information regarding their own readiness to train and recovery-status if they are given the proper tools and training. Simply “training by feel” is something most people don’t do well. Crazy bodybuilders end up with injuries and an unproductive ratio of fatigue to fitness, and those prone toward being overly cautious, or even lazy, tend not to do enough. It takes a unique combination of self-awareness, aggression, self-control, drive, patience, experience, and humility to be successful “training by feel” autoregulation using subjective rating is a more accurate method than simply training by feel. The primary rating tool for athletes is RPE which will be covered in the next subchapter.

Rate of Perceived Exertion (RPE)

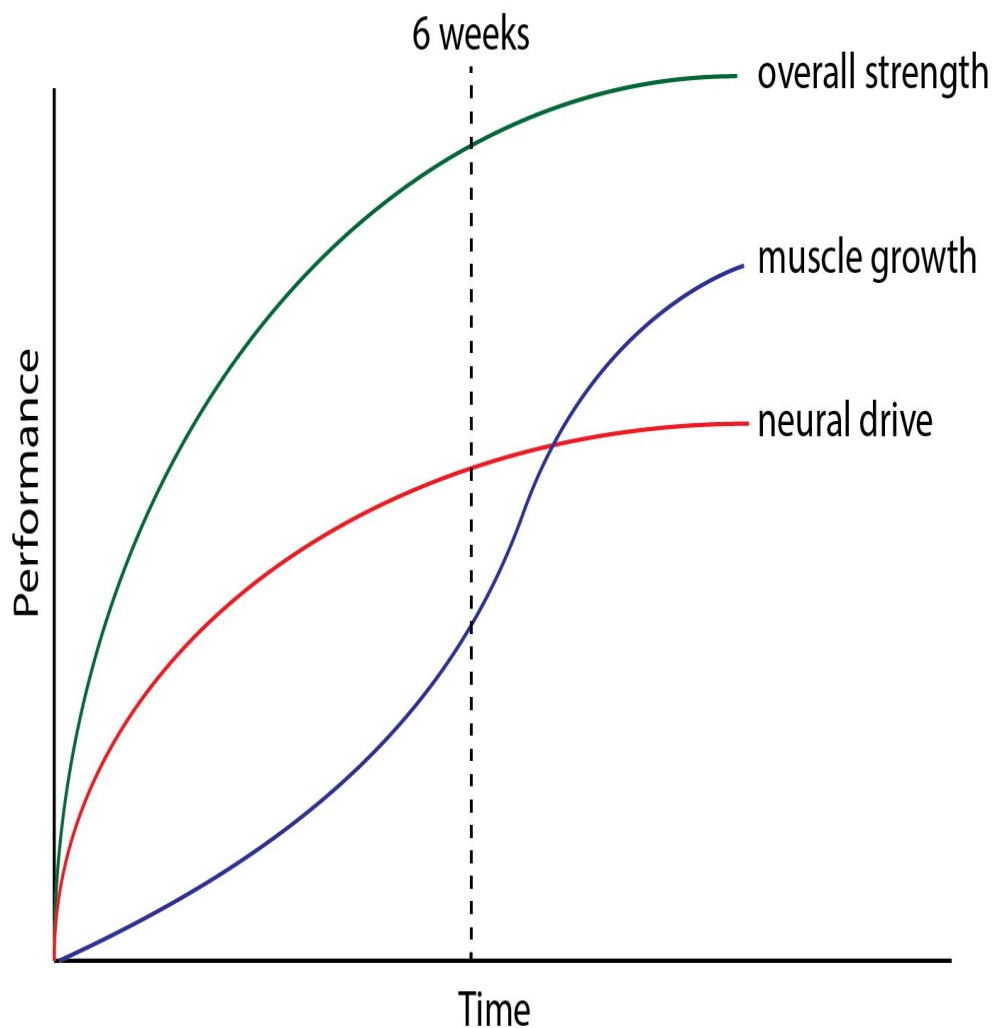
RPE scores are specifically determined based on how many more repetitions you believe you could perform before reaching failure within that set.

RPE SCALE BASED ON REPETITIONS IN RESERVE	
10	Could not do more reps or load
9.5	Could not do more reps, could do slightly more load
9	Could do 1 more repetition
8.5	Could definitely do 1 more repetition, chance at 2
8	Could do 2 more repetitions
7.5	Could definitely do more 2 more repetitions, chance at 3
7	Could do 3 more repetitions
5-6	Could do 4 to 6 more repetitions
1-4	Very light to light effort

The beauty of this simple scale is that it embeds anchoring into the scale that anyone experienced with training near failure understands. Also, it allows load to be individualized for the desired stress level.

Neural Adaptation

Early strength gains induced by resistance training are primarily the result of modifications of the nervous system. Modifications can be both at the local level and at the central nervous system level. One paper recommended incorporating motor learning theory and imagined contractions with strength training. Strength performance depends not only on the quantity and quality of the involved muscles, but also upon the ability of the nervous system to appropriately activate the muscles. Strength training may cause adaptive changes within the nervous system that allow a trainee to more fully activate prime movers in specific movements and to better coordinate the activation of all relevant muscles, thereby effecting a greater net force in the intended direction of movement.



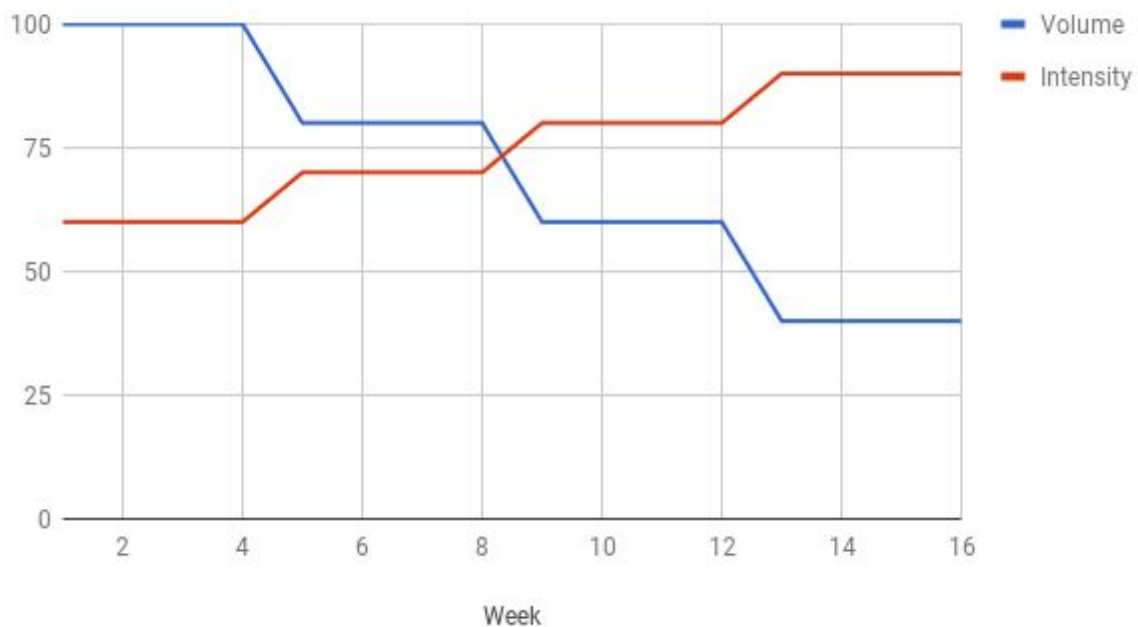
Periodization

Periodization is a method for employing alterations in the workload, and training focus within the microcycle, mesocycle, and annual training plan. Every plan provides a framework for sequencing training so that training tasks, content, and workloads are varied at a multitude of levels in order to ensure the development of specific outcomes at predetermined time points.

Linear Periodization

Training volume progressively decreases over time, and training intensity progressively increases over time, with a taper before a major competition.

Linear Periodization Example



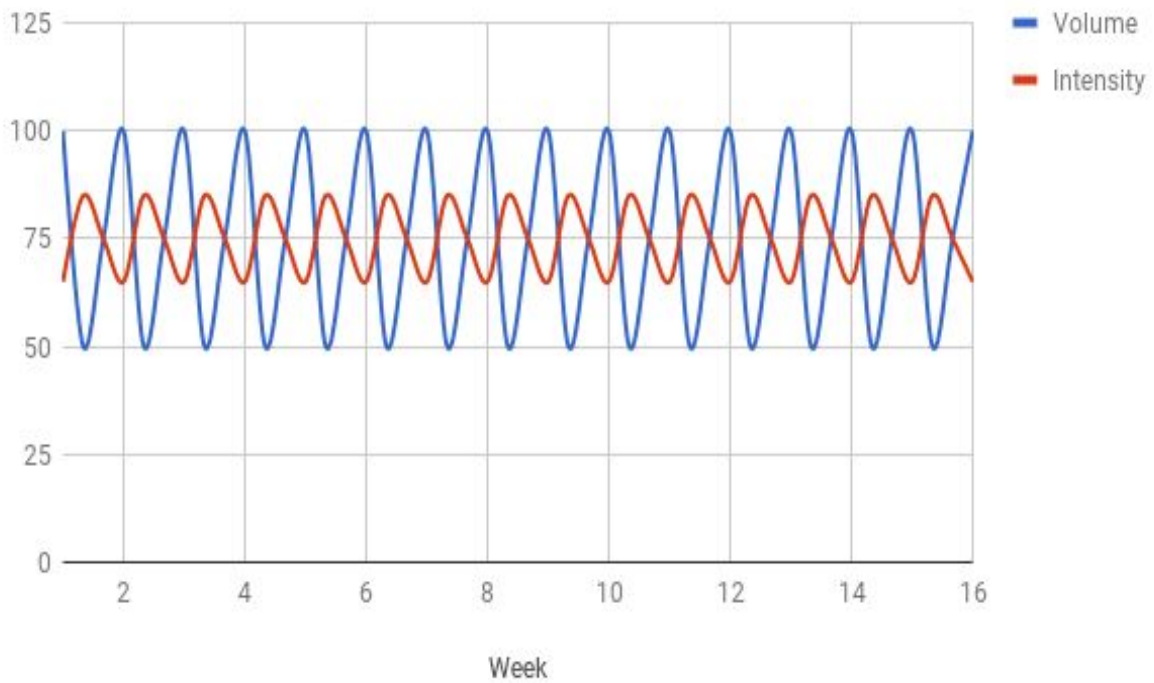
Undulating Periodization

- Volume and intensity both go up and down repeatedly over time.

Daily Undulating Periodization (DUP)

- Fluctuations in volume and intensity take place within a single training week

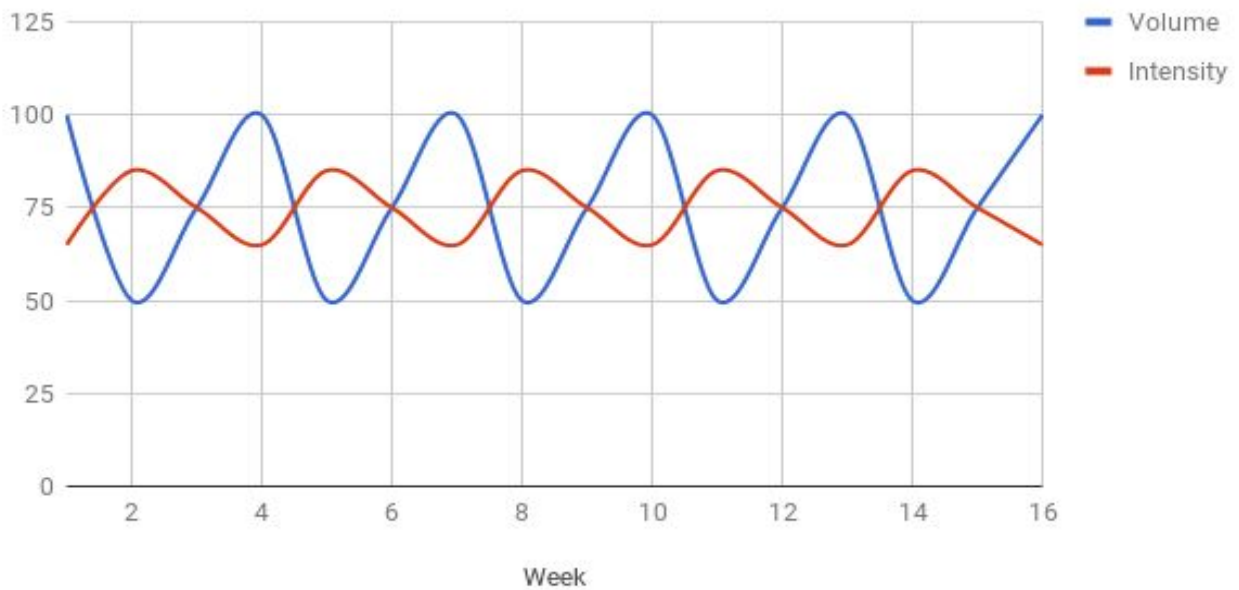
Daily Undulating Periodization Example



Weekly Undulating Periodization (WUP)

- Fluctuations in volume and intensity take place week to week

Weekly Undulating Periodization Example

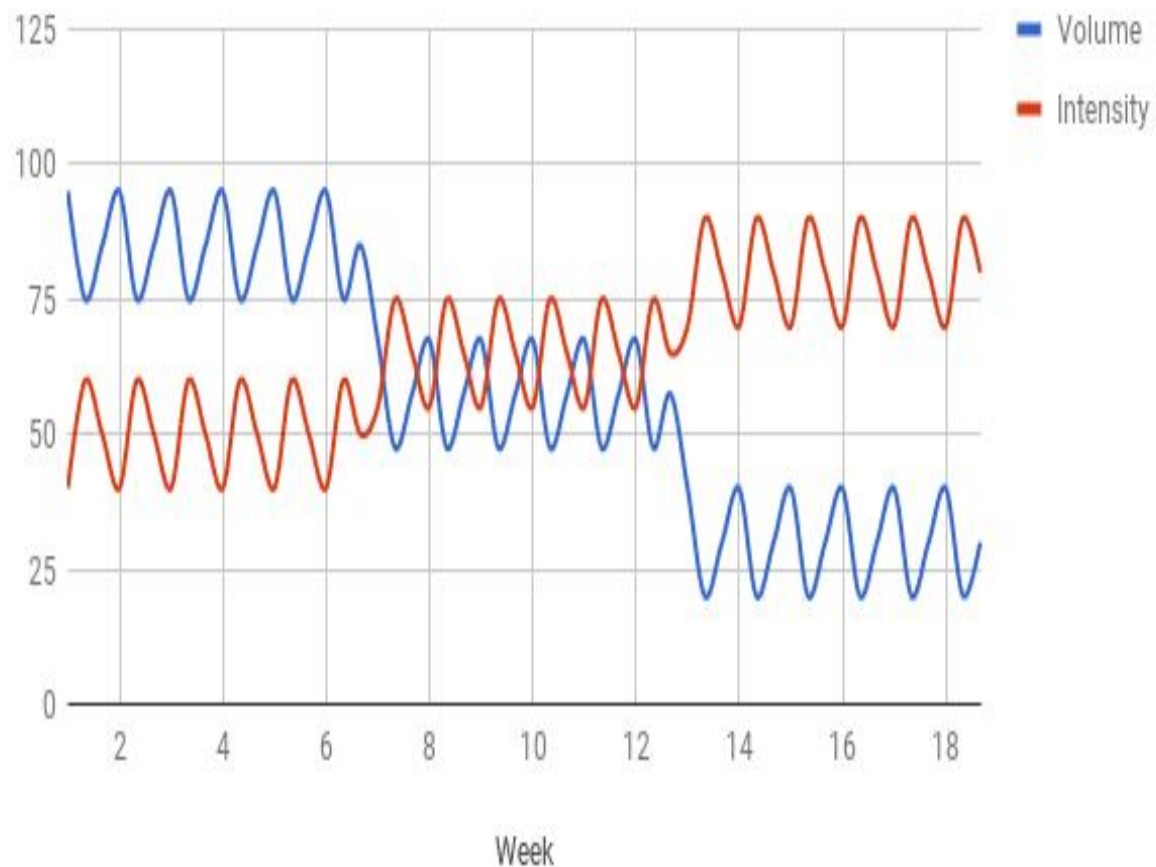


Block Periodization

Training that starts with a block focused on strength endurance, followed by a block focused on hypertrophy, followed by a block focused on maximal strength, followed by a block focused on power and velocity followed by a competitive block.

None of these methods are mutually exclusive.

Integrated Model; DUP within weeks, organized into blocks, blocks progress linearly



Overall, periodized training tends to produce larger strength gains than non-periodized training, though the effect is pretty small.

Specific Adaptation Imposed Demands (SAID) and Specificity

If you want to get better at something the principle of specificity is king. When the body is placed under some form of stress, it starts to make adaptations that will allow the body to get better at withstanding that specific form of stress in the future. The best way to get better is to practice doing what you desire to get better at. For a musician that's playing the composition they intend to perform with. For powerlifters it's lifting heavy, for swimmers it's swimming their event. In the analogy of the musician there is very little stopping them from playing for hours on end. In fact the best musicians do so. Athletes only have so much training they can do before they become fatigued. Powerlifters cannot max out every day or they will destroy their bodies and become weaker. Training has to take both fatigue and specificity into account. The bulk of your work should always be recoverable and as close as possible to what plan to do in competition.

Training stress must be the right amount. If there isn't sufficient stress, there will be no adaptation, and if there is too much stress, you will cause injury or burnout. The basic rule about getting better at anything is to keep progressing the level of difficulty of the training without getting hurt or overtired. Performance tends to plateau when the difference between too much and too little is so small that we can't find it. Stress must be sufficiently specific to ensure "carryover" to your sport. The body only makes adaptations to withstand the specific stress it encounters. It has no interest wasting time making changes that don't directly address the issue. Be very skeptical of the carryover or transferability of "functional training" or even training that purports to be "sport specific." Chances are, it's not. Keep training simple. If you want to get better at X, train what looks like X as close as possible as often as you can without getting hurt or overtrained.

Training To Failure

- Safe
- Not necessary to maximize growth
- A helpful indicator that you're definitely working hard enough for your muscles to grow
- A large decrement to recovery when compared to RPE 9 efforts.

Overtraining

Get comfortable being uncomfortable. You have to redline yourself every once in a while to determine where your limits are. This is a decidedly non-evidence based recommendation but one that I believe in heavily. When you've pushed way too hard, either in a session or over a longer period of time, you know what "too much" feels like. With this knowledge, you can push yourself to the brink without tipping over, and you can be a little more comfortable with discomfort.

Stress kills gains. You are a psychosomatic being. Psycho = mind. Soma = body You can't divorce the two. Mental stress can manifest itself as physical stress, and physical stress can manifest itself as mental stress. You can't take your exercise performance in the gym today as an indicator of how hard you should be training. Having a difficult time recovering from a single session may not seem like a big deal, but it adds up over time when you're dealing with chronic stress. Chronic overtraining will lead to drops in performance and increased risk of injury. If you're getting stronger, don't fix what isn't broken. If you're not, assuming you aren't feeling worn down all the time, do more.



Specific Overreaching / Strategic Overtraining

Periodize sessions or weeks or training blocks in which you train more than you are capable of. The following week or session or training block you give your body extra time to recover from the additional stress.

Another use of the specific over-reaching term is used to describe a method of targeting a specific muscle group or movement and working it harder than the rest of your training. Up the volume in an area you want to improve. You should be able to manage the additional stress of overreaching in one small area of your training.

Recovery & DOMS

For a non enhanced athlete recovery is the limiting factor to training. Recovery can be harshly inhibited by cortisol, the stress hormone. To reduce stress:

- **Get plenty of sleep**
- **practice mindfulness**
- **improve your overall work-life balance**

Delayed onset muscle soreness (DOMS) is correlated with exercise-induced muscle damage. You do NOT need to experience DOMS to experience muscle hypertrophy or strength gains. Unfortunately nothing decisively helps.

Marginal but somewhat promising treatments:

- Ibuprofen
- Massage
- vitamin D
- Antioxidants like Circumen and Fish Oils
- Heat
- Foam rolling

Popular but ineffective treatments:

- Ultrasound
- Warmup
- Light exercise
- Glutamine or arginine
- Stretching
- Icing
- Electrical nerve stimulation
- Epsom salt
- Drinking extra water
- Compression garments

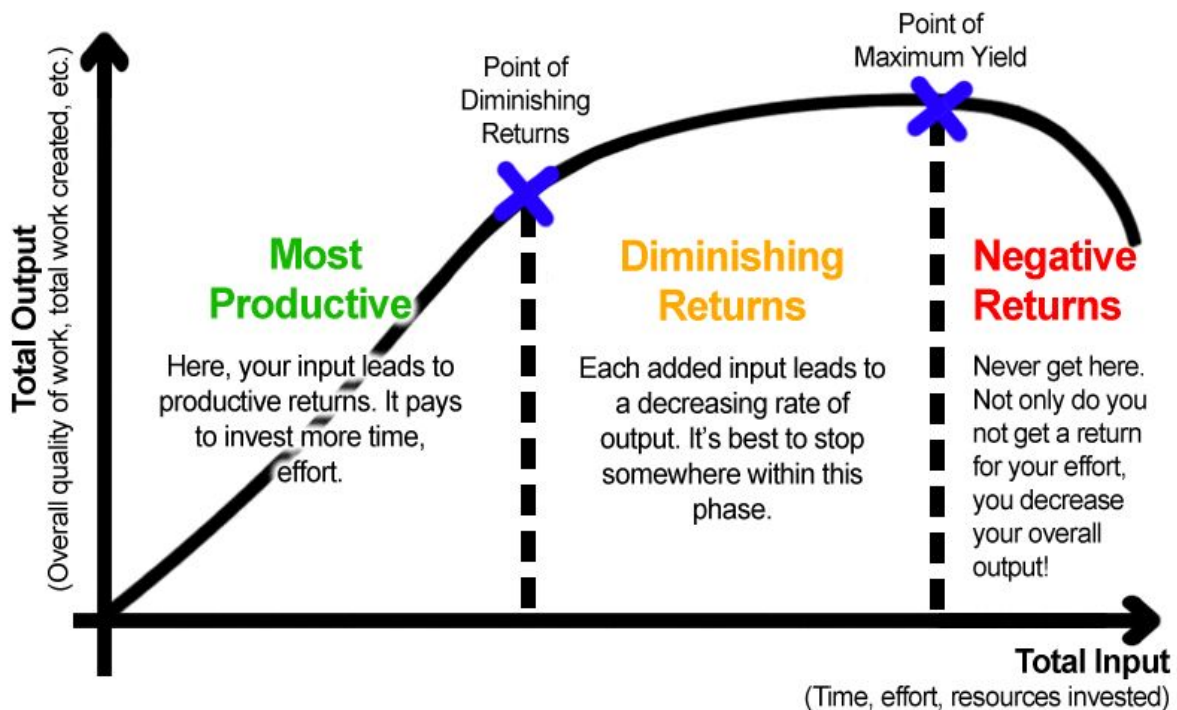
DOMS is not restricted to any particular muscle group, but some people tend to experience it more in certain muscles. As muscles get familiar with a specific stress, they quickly adapt and react much less strongly. Contrary to popular opinion, lactic acid is not a contributor of muscle soreness. A day of delay is typical. There seems to be a large natural range for how delayed DOMS can be. It may start as quickly as right away or within the next two days. DOMS is at least partially suppressed by the 4th day in most cases.

An important note for recovering is that doing anything at all will help some. The power of placebo is powerful here. The simple act of feeling like something works may actually make it effective.

Law of Diminishing Returns

The longer you put effort into something the slower the results become. It may take you 2 years to squat 400lbs from 315lbs but another 5 years to hit 420lbs. The law of diminishing returns is a common phenomenon in many aspects of fitness including but not limited to

- **Muscle gain**
- **Fat loss**
- **Strength Numbers**
- **Track / Swim / Cycling times**



Supplements

Protein Powder - A+

While I wouldn't technically classify protein powder as a supplement in the colloquial sense, it does fall in this category because it is supplemental (not necessary). Protein powder is a convenient alternative source of dietary protein. If you eat enough daily protein you will not benefit from the powdered form. The reason the label of supplement doesn't fit protein well is because it's food. You wouldn't call milk a supplement but as soon as it's processed into a powder the story changes somewhat.

Benefits

- High protein diets are better at building muscle and losing fat. Twice the calories must be burned when digesting protein and it is much more satiating when compared to carbs or fats. Gains in body fat are unlikely to occur when overfeeding.

Safety

- A High protein diet can worsen kidney function in people who already have kidney disease. High protein intakes in fact do not adversely influence kidney function in healthy adults. The same goes for bone health. The body of evidence suggests protein on bone health to be favorable.

Dosage

- There is no upper daily limit of protein consumption. As far as we know, there is no way to consume too much. We do know however there is a limit somewhere around 40g of protein per meal in which additional protein may not be utilized as effectively. In light of this data it would be wise to space your protein consumption evenly throughout the day for the most optimal protein synthetic response. The most important factor to keep in mind is hitting your total daily protein. For untrained individuals in a caloric surplus the recommendation was .7g/lb. This number might not be optimal for those seeking body recomposition. The leaner you are and the more experience you have the more you may benefit from higher daily levels of protein. A range between .7 - 1.1g/lb seems to be proper for most athletes. Some exceptions an obese person at 350lbs would have to consume 245 - 385g definitely overkill. For those seeking body recomposition or are in a heavy deficit or very lean the ultimate recommendation is somewhere between 1.1 - 1.4 g/lb of fat free mass.

Types

- Concentrate: typically 60–80% protein. The remaining 20–40% are fat and carbs.
- Isolates: An additional filtering process removes more fat and carbs. 90–95% protein.

Sources

- Whey: Derived from milk. It is the liquid that separates from the curds during the cheesemaking process. It's high in protein but also harbors lactose, a milk sugar that many people have difficulty digesting. The isolate version contains very little because most of this milk sugar is lost during processing. Whey digests quickly
- Casein: Also from milk. Casein is absorbed much more slowly. It may be beneficial to consume a combination of whey and casein for the most optimal protein absorption curve.
- Egg: Could be a good choice for people with dairy allergies who prefer a supplement based on animal protein. egg-white protein hasn't been studied as much as whey or casein.
- Pea: Especially popular among vegetarians, vegans and people with allergies or sensitivities to dairy or eggs.
- Hemp: Another plant-based supplement that is gaining popularity. Although hemp is related to marijuana, it only contains trace amounts of the psychoactive component THC

Although all protein powders provide a concentrated source of protein, certain types may be more effective at giving your body what it needs. Research has consistently confirmed whey protein's ability to promote muscle mass and recovery.

Caffeine - A

Caffeine is one of the most commonly used stimulants among athletes. Taking caffeine, within limits, is allowed by the NCAA. Urine concentrations over 15 mcg/mL are prohibited. Caffeine works by stimulating the central nervous system (CNS), heart, muscles, and the centers that control blood pressure.

Benefits

- Research suggests that drinking caffeinated beverages throughout the day keeps the mind alert and might improve reaction times. Combining caffeine with glucose as an "energy drink" seems to improve mental performance better than either caffeine or glucose alone. Taking caffeine seems to increase physical strength and endurance and might delay exhaustion. It might also reduce feelings of exertion and improve performance during activities such as cycling, running, playing soccer, and golfing. However, caffeine does not seem to improve performance during short-term, high-intensity exercise such as

sprinting and lifting. Taking caffeine daily for up to 4 weeks might also lead to tolerance. This might decrease or eliminate any performance enhancing effects.

Side Effects

- Likely safe for most healthy adults when used in doses up to 400 mg per day. unsafe when taken by mouth in very high doses as it can cause irregular heartbeats and even death.

Dosage

- For sports performance 1-4mg/lb. For a 150lb individual an effective dose can be anywhere between 150-600mg

Creatine Monohydrate - A+

Creatine is a chemical that is found in the body. It is found mostly in muscles but also in the brain. It is also found in foods such as red meat and seafood. Creatine is most commonly used for improving exercise performance and increasing muscle mass in athletes and older adults. There is some science supporting the use of creatine in improving the athletic performance of young, healthy people during brief high-intensity activity such as sprinting. Creatine use is allowed by the International Olympic Committee, NCAA, and professional sports. Creatine is involved in making the energy muscles need to work.

Benefits

- Research shows that creatine seems to modestly improve upper body strength and lower body strength in both younger and older adults.

Side Effects

- Likely safe when taken by mouth at doses up to 25 grams daily for up to 14 days. Lower doses up to 4-5 grams taken daily for up to 18 months are also likely safe. Many people who use creatine gain weight. This is because creatine causes the muscles to hold water, not because it actually builds muscle. Creatine can cause stomach pain, nausea, diarrhea, and muscle cramping.

Dosing

- The most effective use is a short-term loading dose followed by a long-term maintenance dose. Loading doses are typically 20 grams daily for the first week. Maintenance doses are typically 2-10 grams daily.

L-Arginine - C+

An amino acid necessary for the body to make proteins. L-arginine is found in red meat, poultry, fish, and dairy products. It can also be made in a laboratory and used as medicine. L-arginine is converted in the body into a chemical called nitric oxide. Nitric oxide causes blood vessels to open wider for improved blood flow. L-arginine also stimulates the release of growth hormone, insulin, and other substances in the body.

Benefits

- There is inconsistent evidence about the effects of L-arginine on athletic performance. L-arginine might help people exercise longer, but it does not seem to help make people stronger. Some evidence shows that taking L-arginine increases the time a person can exercise before becoming tired and helps the lungs work more efficiently.

Side Effects

- Possibly safe for most people when taken appropriately by mouth short-term. It can cause some side effects such as abdominal pain, and bloating.

Dosing

- 5 grams per day. Taking lower doses might not be effective.

Beta Alanine - C+

Non-essential amino acids made by the body. Most amino acids are the building blocks of proteins. However, some like beta-alanine are used to make other chemicals in the body. Beta-alanine is commonly used for improving athletic performance and exercise capacity, building lean muscle mass, and improving physical functioning in the elderly.

Benefits

- Can modestly improve some measures of athletic performance. However, not all research shows positive effects with beta-alanine on athletic performance. Scientists are trying to determine why beta-alanine might work better for some types of exercise than others. Some scientists think that beta-alanine might help to improve the amount of exercise done but not how well it is done.

Side Effects

- Possibly safe when taken by mouth appropriately for a short time. Side effects have not been reported with moderate doses of beta-alanine. High doses can cause flushing and tingling.

Dosing

- 2.4 - 6.4 grams of beta-alanine daily has been used for up to 10 weeks.

L-Citrulline - C+

A naturally occurring amino acid. It is found in some foods like watermelons and is also produced naturally by the body. L-citrulline is used by mouth for heart failure and improving athletic performance. The body changes L-citrulline into another amino acid called L-arginine and also to a chemical called nitric oxide. L-citrulline might help increase the supply of ingredients the body needs to make certain proteins. It might also help open up veins and arteries to improve blood flow and reduce blood pressure.

Benefits

- Might be effective for improving some types of exercise performance when taken for up to 7 days. L-citrulline may help some athletes work harder, lift weights longer, and go faster on an exercise bike. But it does not seem to help people run for longer distances. Also, taking L-citrulline for up to 8 weeks does not seem to increase muscle size or strength.

Side Effects

- Possibly safe for adults when taken by mouth in appropriate amounts.

Dosing

- 2.4 grams or 5 grams daily for 7 days. A single dose of 8 grams just before exercise has also been used.

Taurine - C

An amino sulfonic acid. Taurine is found in large amounts in the brain, retina, heart, and blood cells called platelets. The best food sources are meat and fish.

Benefits

- The effects of taurine on measures of exercise performance is mixed. Taurine might improve endurance by a small amount. But it's unclear if taurine improves power during sprint exercises. It's also unclear if taurine improves muscle power during weight-lifting exercises. The effects of taurine used in combination with other supplements is also mixed. In most cases, it's unclear if the effects of taurine combination supplements are due to taurine, other ingredients, or the combination.

Side Effects

- Possibly safe for adults and children when taken by mouth in appropriate amounts.

Dosing

- 1.5-6 grams of taurine per day

Baking Soda (Sodium Bicarbonate) - B-

Metabolic byproducts like lactic acid and hydrogen form in the muscle cells. While most of the byproducts are buffered, some remain in the muscle cells and create an acidic environment. Acidity is directly related to pH levels in our body. Increased acidity alters pH levels causing our muscles to burn and feel fatigued. Sodium bicarbonate helps flush metabolic byproducts from the muscle tissue.

Benefits

- When acid levels are maintained at neutral levels, our muscles operate more efficiently. Energy metabolism is increased and studies indicate our muscles can sustain longer workouts. According to the American College of Sports Medicine, baking soda is an effective buffering agent to maintain healthy pH and improve athletic performance. Baking soda supplementation may reduce lactic acid during interval training and improve short-term endurance performance.

Side Effects

- Some adverse gastrointestinal effects have been noted when taking baking soda. It's important to start any new supplement regimen in small doses.

Dosing

- 0.3 g/kg BM of NaHCO₃ 2 hours before working out.

Collagen - C

Accounts for about 25% of the total protein within our body. Collagen provides the structure for connective tissues like ligaments, tendons, bones and cartilage. Our rate of Collagen production is not always sufficient for our needs.

Benefits

- Some research shows that taking collagen type II by mouth for 3 months reduces joint pain, and swelling.

Side Effects

- Possibly safe when taken by mouth in doses up to 2.5 mg daily for up to 24 weeks. Some people might have stomach problems after taking collagen type II. Headache, difficulty sleeping, dizziness, and liver problems have also occurred. But these events are uncommon.

Dosing

- There is not enough scientific information to determine an appropriate range of doses for collagen type II.

Testosterone Boosters - C-

It's unlikely increasing testosterone between the natural ranges of 250 - 900 ng/dL will affect muscle mass. We do know however that increasing testosterone above 900 through exogenous methods (steroids) affects muscle mass better than training alone. Steroids will put your body's testosterone into super physiological ranges around 3000 or higher chronically which is 3 fold what you can get from an acute increase via supplement. It seems likely that increasing a low testosterone level like 300 to a more average range like 600 may help. Whether going from a mid range to high like 600 to 900 will do much remains to be seen. Neither soy foods nor isoflavone supplements alter measures of bioavailable testosterone. Vitamin and mineral composition matters but more so in the case of deficiencies. Natural supplementations either have no evidence, no human evidence or conflicting evidence for testosterone benefits. I would not focus on supplementation for boosting testosterone.

Omega 3 - B

Omega-3 fatty acids are thought to help reduce the risk of heart disease and also to promote healthy skin. They are also used along with diet and exercise to help lower levels of a certain blood fat (triglyceride) and to raise levels of "good" cholesterol (HDL). This product may also be used to help treat high blood pressure or rheumatoid arthritis.

Side Effects

- Fishy aftertaste, nausea, bloating, or burping may occur.

Dosing

- Follow all directions on the package label.

Circumen - C-

Curcumin, a substance in turmeric, may help to reduce inflammation. Turmeric is an unproven treatment, though it has years of traditional use and some preliminary convincing research. There is no standard dosage.

Ashwagandha - C+

Ashwagandha is a plant. The root and berries are used to make medicine.

Benefits

- Taking a specific ashwagandha root extract 300 mg twice daily after food for 60 days appears to improve symptoms of stress.

Side Effects

- Possibly safe when taken by mouth short-term. The long-term safety of ashwagandha is not known. Large doses of ashwagandha might cause stomach upset, diarrhea, and vomiting.

Dosing

- 2.5g daily

BCAAs - C+

Branched-chain amino acids stimulate the building of protein in muscle and possibly reduce muscle breakdown. Branched-chain amino acids seem to prevent faulty message transmission in the brain cells of people with advanced liver disease, mania, tardive dyskinesia, and anorexia.

Benefits

- Early research shows that taking branched chain amino acids before exercising might reduce muscle soreness after exercise.

Side Effects

- Possibly safe when taken by mouth appropriately for up to 2 years. Some side effects are known to occur, such as fatigue and loss of coordination.

Dosing

- 10-20 grams daily

Daily Vitamins - B

One should always aim to max out their whole food options first before turning to supplements. It's important to recognize that food alone doesn't always get the job done in practice especially for athletes. My recommendation: take 1 multivitamin per day especially if you are in a caloric deficit.

CBD - F

The non-intoxicating marijuana extract is being credited with helping treat a host of medical problems - everything from epileptic seizures to anxiety to inflammation to sleeplessness. But experts say the evidence is scant for most of these touted benefits. Worse, CBD is being produced without any regulation, resulting in products that vary widely in quality. Only one purported use for cannabidiol, to treat epilepsy, has significant scientific evidence supporting it. Last month the FDA unanimously recommended approval of the CBD medication Epidiolex to treat two rare forms of childhood epilepsy. The rest of the potential uses - as an antipsychotic, antidepressant or sleep aid have all been studied in animals, with only one or two examples of studies in humans. My recommendation: Be under the care of a health care provider who understands CBD. do not buy random CBD oils thinking it's going to be the answer.

Selective Androgen Receptor Modulators (SARMS)

See [PEDs](#)

Contest Prep

Prep Time

The first step in deciding to do a show is determining how much time you need to get into peak condition. The more competitions you do the better grasp you'll have on your individual diet process. Plan for about -1% body weight each week. This is a good conservative estimate because there may be a case where you plateau or progress slows down for any reason and you should be fine. Let's assume you are 200 pounds at 20% body fat. You want to get down to 7% for the show. You therefore have 160lbs of lean mass. Assuming you retain 97% of your lean muscle mass your goal weight should be around 167lbs. Using -1%/week lands you at about 18 weeks

If you're lazy you can use this equation here

$$\text{weeks} = (\text{weight} - (\text{weight} * (1 - \text{current bf\%})) * .97 / (1 - \text{goal bf\%})) * 4/7$$

Organization

There are three prominent federations in the US: OCB, NPC, and WNBFF. you may be able to find additional local organizations depending where you live. Each federation has its own strengths and weaknesses.

Organization Of Competitive Bodybuilders (OCB)

These are all natural shows. Every competitor must submit to a drug test and polygraph before the start of the competition. During the finals, each competitor has an individual T-Walk in, which gives them creative freedom. Joining the OCB is a safe choice for those who like smaller shows.

National Physique Committee (NPC)

The NPC is one of the most recognized federations in the world of bodybuilding. Most of the shows have a large number of participants and the atmosphere is competitive. To participate at the highest level, competitors must place in the top five of a regional show and win a national show. Competitors who prefer simple, specific poses may enjoy the NPC. They divide all open classes by height and make them available to any age group. The NPC directly feeds into the largest professional bodybuilding federation in the world IFBB and is not tested whatsoever.

World Natural Bodybuilding Federation (WNBF)

Similar to OCB these shows are stringently drug tested. This span of natural events is the strongest internationally. Still the competitor pool pales in comparison to the numbers the NPC pulls per show.

Class

Most organizations have up to 3 classes for men. Class selection depends on your goal physique and the amount of muscle you're able or willing to pack onto your frame.

Judges from every class score competitor based on size, definition, proportion, symmetry, and stage presence.

Men's Physique

The easiest class for new people to participate. Size is important but not to the same degree as the other two. Judges are basically looking for what the general public would consider a perfect jacked guy body. Any guy who's been lifting a few years can do well at a local show.

Competitors wear board shorts that hide their leg development.



Mandatory poses:

- Front relaxed
- Back relaxed

Classic Physique

The newest category has been skyrocketing in popularity. This is a return to the “golden era” of bodybuilding (70s & 80s) when open bodybuilding had more emphasis on beautiful flow and proportions. The biggest guy doesn’t always win but it sure helps. Judges seek someone that looks like Arnold or Frank Zane. (They may also prefer more developed legs than in the old days) Competitors wear spandex or medium speedos on stage. Partially concealing their glute development.



Mandatory poses

- Front relaxed
- Back lat spread
- Front double bicep
- Side chest
- Back double bicep
- Abs & thighs
- Classic pose of your choice

Open Bodybuilding

Open bodybuilding is considered where the huge mass monster freaks of nature go to compete. Exclusive to the men who are juiced with steroids to the gills. The men who eat clen, tren hard, anavar give up. If you're an IFBB pro this is most definitely the case but in other orgs and weight classes this isn't necessarily true. As an example, I have attached a photo of 2019 Mr. Olympia Brandon Curry alongside a photo of Niang Babacar 2019 WNBFF Worlds champion.



Mandatory poses

- Quarter Turns
- Front Double Biceps
- Rear Double Biceps
- Front Lat Spread
- Rear Lat Spread
- Side Triceps
- Side Chest
- Front Abdominal & Thigh

Based on the organization you affiliate with there may be more or less classes than the ones listed. Each organization creates its own class with their rules and judging criteria.

Coaching

You may want to pay a coach to guide you through posing, nutrition, training, drug cycles, and show day preparation. Coaches can be expensive but they might be worth it if either competing is unknown territory or you plan to be the best on stage and win the show.

Tanning

The last thing you want to do is be under the bright stage lights and look washed out. A darker body reflects more shadows and gives the illusion of increased detail.

Ideally on stage you look chocolate brown. Yes if you're white it feels wrong basically going black face but it's the best way to have competitors mostly the same shade and have a fair playing field.

Make sure to do 2-3 layers over 2-3 days. When it comes to competition tans you can get professional spray tans or use a product called Dream Tan if your organization allows you to. It has posing oils built in but it smears very easily with perspiration.

Posing

Understand the rules and poses for your division and make sure to practice a lot. Perfect posers are able to hide weak points and highlight the parts of their body that are the strongest. Judges will score you higher if you exhibit a strong stage presence. If you're going to pay a coach for anything it should be this. Don't be the guy that steps on stage in a speedo and doesn't know what to do.

Cardio

As you progress deeper into your competition prep your cardio should progress as well. What worked well for me was around 0 - 20 minutes of medium intensity steady state cardio per day for the first month followed by 20-40 the next and 40 daily the final month. Days before your competition it's a good idea to back off. As stated in the cardio section of the dieting chapter, cardio is simply a tool to create negative calories so we can eat more. If it's hindering your recovery, try lowering the intensity or backing off on the duration.

Peak Week

So you've put in the work and gotten down to a very low body fat percentage. What minor nutrient manipulations can we use to put your best body forward for the very short time you're on stage?

	Significance	7+ days out	6 days	5 days	4 days	3 days	2 days	1 day	Show day
Carbs	*****	low	low	low	low	medium	high	HIGH	HIGH
Fats	*	normal	normal	normal	normal	normal	normal	normal	normal
Protein	*	normal	normal	normal	normal	normal	normal	normal	low
Water	***	high	HIGH	HIGH	HIGH	normal	low	low	LOW
Sodium	***	normal	high	high	high	normal	low	LOW	HIGH
Creatine	*	normal	normal	normal	normal	normal	normal	normal	normal
Citrulline Malate	**	normal	normal	normal	normal	NONE	NONE	NONE	8g 30mins before
Shave	*****	normal	normal	normal	normal	normal	normal	SHAVE	N/A
Tan	*****	normal	normal	normal	normal	Base 1	Base 2	Dark	Stage Shine
Cardio	*	medium	low	low	low	low	low	LOW	NONE
Training	**	normal	normal	normal	normal	pump	pump	pump	pump

Post Show

Have a plan and goal for after your show. If you don't I guarantee you will end up binge eating more than you'd like and feel demotivated. Consider implementing a lenient diet strategy for the postseason and find a goal that will keep you continuing to train after you come back from your post show training break.

PEDs

Pros & Cons

The effects of PEDs are not only dose dependent but also depend heavily on an athlete's genetics. Some people respond tremendously to drugs while others will only experience minor enhancements. It's important to remember that "enhanced" athletes lie on a spectrum. Besides asking for the truth there is no reliable way to tell for sure if some is natural or not. The performance benefits are undeniable and numerous:

Muscle Mass

- Anabolic steroids are synthetic derivatives of testosterone. They promote the growth of muscle (anabolic) and the typical male characteristics of puberty (androgenic). The best derivatives aim to reduce androgenic properties and maximize the anabolic. Once ingested, it travels through the bloodstream to the muscle tissue. It is drawn into the muscle cell's androgen receptor.
- The shoulders and traps have a high concentration of androgen receptors which is why overdeveloped traps and shoulders is a good indicator of steroid abuse.
- Once delivered to the muscle cell, the steroid can interact with the cell's DNA and stimulate the protein synthesis process that promotes cell growth. Different variants and amounts of AAS can cause different reactions producing different results. Athletes experiment with different combinations (stacking) in an attempt to fine-tune the final result.

Increased Strength

- A larger muscle is a stronger muscle

Recovery

- While the focus in the media is on the bulked-up mass monsters, anabolic steroids can also benefit athletes who need a faster turnaround from sore, overused muscles. Intense exercise releases the stress hormone cortisol, which breaks down muscle tissue, producing sore muscles. AAS can block cortisol from binding to the muscle cell's receptor sites, which diminishes the breakdown process. Less muscle breakdown means less muscle fatigue which would allow faster recovery.

Endurance

- Some drugs can stimulate the production of red blood cells, thus improving delivery of oxygen from the lungs to the working muscles, which in turn allows you to exert oneself harder over a longer period of time.

Body Composition

- While steroids may not melt the fat off your body it does make you nearly always anabolic. Meaning almost 365 days of the year while on gear you will be building muscle even when dieting. Dieting for a natural means losing fat and as little muscle as possible. For an enhanced competitor it means gaining muscle slower than normal while losing fat. Maintaining one's weight while on steroids necessitates that the muscle they gain replaces its weight in fat.

Enhanced mental performance

- Athletes can use a combination of stimulants and beta blockers to increase performance. The stimulants directly affect the central nervous system. They work to speed up parts of the brain and body, increasing the heart rate, blood pressure, metabolism and body temperature of the user. They are used by athletes to reduce tiredness and fatigue, and to increase alertness, competitiveness and aggressiveness. Beta blockers can cause a slowed heart rate. This makes the heart work more efficiently and causes less anxiety. This is particularly effective in athletes who require intense focus and precision.

For the average person running a low dose cycle of anabolics for 4 weeks once will have very little if any adverse health effects long term. If you begin taking a moderate 500mg weekly for distinct cycles there is quite a bit more risk but if you're intelligent about it you can get close to full longevity for your life. If you're eating like a bodybuilder and growing as big as the anabolics allow you to then the size will kill you before the drugs. Being 250+ lbs is way worse than the synthetic hormones. If however you begin taking 1g+ weekly of gear there are serious consequences long term. You have to be satisfied with chopping off a decade of your life in the pursuit of putting on a ridiculous amount of muscle. You can choose quality of life, which is subjective over longevity but it should be a calculated risk you're willing to take. Effects both long term and short term depend on what you take and how much for how long. They include but are not limited to:

Cons

- Severe cardiovascular complication
- Mania
- Depression
- Dependence
- Liver Failure
- Gynecomastia
- Hormone imbalance
- Acne
- Infertility
- Cardiomyopathy
- Heart arrhythmias
- Kidney damage
- Stroke
- Nausea
- Joint Pain

It is possible to minimize risk with proper dosages and a stack of other drugs that mitigate potential side effects. A lot of the dosing and effects on humans of these drugs have yet to be tested because of ethical concerns. I can say for certain everyone has some side effects. The type and degree is heavily dependent on the individual and the specific stack they use during their cycle.

A lot of people in the public spotlight like celebrities and influencers on social media are on steroids. Their entire livelihood after all is based on their appearance. The fitness industry particularly is a highly saturated market. Taking steroids can help your physique stand out among the crowd. Given PED's have a profound effect on performance and the fact that marginal improvements at the world class level can be rewarded with millions of dollars it is a calculated risk more athletes than you realize (upwards of 60%) are willing to take. If you're not willing to do it, someone else will. Take football or UFC for example. Those athletes destroy their brains and body for their sport. Drug use is no different. Champions are willing to sacrifice everything to become the best. For the recreational user it may make them look and feel better both physically and psychologically, which can go a long way.

As a libertarian minded individual I really don't care whether an athlete takes them or not. As a sports spectator I condone drug use. I want to see records broken and new awe inspiring feats of athleticism never before seen. I want to see the human body pushed to the physical limit. The athletes certainly should understand the risks they are taking but who is to say what a consenting

adult does to their own body? The only point of contention I have is if said individual deceives others by claiming drug free, is a child and therefore cannot consent to drastic chemical alterations to their body, and in sports where these substances are banned. I'm mostly on the fence about whether to denounce "cheating" in sports. On one hand the best are all doing it, everyone knows it, and a part of the game is not getting caught. Is it cheating if you don't get caught? On the other it specifically goes against the ethics of sportsmanship.

Bodybuilding has a good solution to this delima. They have the mainstream untested organizations where competition is open to anyone regardless of natural or enhanced status and organizations that require testing. There is less incentive to participate and cheat in the smaller tested organizations if organizations exist that don't require such testing. This way the drug free competitors are better filtered from the unnatural crowd. That's not to say there aren't cheaters at the natural competitions but the majority of the ones who would cheat would rather compete in the untested stream. In the untested stream nothing is banned and the cheating problem is eliminated. Whether natural or not you can draw inspiration from any athlete.

Types

Stimulants

- Stimulants directly affect the central nervous system. They work to speed up parts of the brain and body, increasing the heart rate, blood pressure, metabolism and body temperature of the user. They are used by athletes to reduce tiredness and fatigue, and to increase alertness, competitiveness and aggressiveness.
- The most common stimulants detected in anti-doping tests include amphetamines, cocaine, ecstasy and methylphenidate (Ritalin). Nicotine and caffeine are also frequently used as stimulants but they are not banned in sports.

Anabolics

- Anabolics are derived from testosterone. Testosterone is involved in controlling the build-up and breakdown of the main biochemical components of all tissues, including muscle.

- There are two types of anabolic androgenic steroids. Exogenous steroids are synthetically created versions. Endogenous steroids are naturally occurring substances that are involved with the metabolic pathways of testosterone.
- Because testosterone affects muscle growth, raising its levels in the blood can help athletes increase muscle size and strength. Anabolic steroids can be taken in tablet form or injected directly into the muscle. Some of the most common types of anabolic steroids include: stanozolol, nandrolone, boldenone, trenbolone, androstenedione, tetrahydrogestrinone.
- Athletes who use anabolic steroids claim that as well as increasing muscle mass, they reduce body fat and recovery time after injury. But the androgenic (masculinising) side-effects such as increased body hair and a deepening of the voice are not always desirable, particularly in women. To counteract these side-effects, scientists developed steroids that retain their anabolic effects but have a lower androgenic effect.

Prohormones

- Pro hormones are precursors for specific hormones, which converts to anabolic hormones in the body. They are considered the less potent version of anabolics. Like anabolic steroids, pro hormones are androgen agonists. A strong androgen receptor agonist will present effects related to testosterone.
- Pro hormones also affect your estrogenic and progestogenic receptors. The effects on these receptors tend to be similar. Prohormones that convert to estrogen and progesterone can increase mass and strength. However, a lot of the mass gains are often lost after the cycle is over.

Selective Androgen Receptor Modulators (SARMs)

- SARMs are supplements that enhance the levels of androgens, or male hormones, in the user's body. They do this by binding to androgen receptors, which then signals your body to start building more muscle. The results and side effects of SARMs are similar to Prohormones. They are essentially a less potent alternative to anabolic steroids.
- SARMs are only legal under research purposes. The drug is still being investigated. This may call into question the reliability of production quality control. Products that have

SARMs on the label may either not contain that compound or contain an alternative or have a different dosage or a combination of the three.

Human growth hormone (HGH)

- HGH promotes physical development, particularly the growth of bone during adolescence. It stimulates the synthesis of collagen, which is necessary for strengthening cartilage, bones, tendons and ligaments, and also stimulates the liver to produce growth factors.
- In adults, HGH increases the number of red blood cells, boosts heart function and makes more energy available by stimulating the breakdown of fat. Other effects attributed to HGH include increase in muscle mass and strength as well as tissue-repairing. However as HGH is often used in conjunction with other PEDs its direct role in these benefits is unproven. Still, it is quite easy to see why athletes believe it will enhance their performance.

Blood doping

- Blood doping is the use of various methods and substances to increase a person's red blood cell mass. Higher levels of red blood cells in the blood result in more oxygen being transported to the muscles, resulting in increased stamina and performance. Blood doping includes Erythropoietin (EPO), blood transfusions, and Synthetic oxygen carriers (SOCs).
- Produced naturally by the kidneys, EPO is also available as a pharmaceutical. EPO stimulates the production of red blood cells in bone marrow and regulates the concentration of red blood cells and haemoglobin in the blood. This is useful for athletes, since red blood cells shuttle oxygen to the cells, including muscle cells, enabling them to operate more effectively. EPO is a peptide hormone and can be produced synthetically using recombinant DNA technology. By injecting EPO, athletes aim to increase their concentration of red blood cells and, consequently, their aerobic capacity. EPO can also work to increase the body's ability to buffer lactic acid.
- SOCs are purified proteins or chemicals that have that ability to carry oxygen. T SOCs were developed for use in crisis situations where blood transfusions are not possible or blood products are not available.

- There are several different types of SOC's available. Two of the most common types include haemoglobin based oxygen carriers (HBOCs) and perfluorocarbons (PFCs). Like red blood cells, they work to deliver this oxygen to the muscles, increasing aerobic capacity and endurance. However, they also have some additional benefits. HBOCs are not only great at tissue oxygenation, they can deliver increases in blood serum iron, ferritin and naturally occurring EPO. They can also increase CO₂ production and curb lactic acid production.
- PFCs, due to their size, are able to enter the body's tiny capillaries, providing very efficient local oxygen delivery to greater areas of the body, while the makeup of the drug also allows it to deliver oxygen to peripheral tissues.
- Blood transfusion is an effective and relatively simple method of allowing athletes to boost the number of red blood cells in their blood, improving their aerobic capacity and endurance.
- Blood transfusions can be classified as autologous, where the athlete receives pre-prepared doses of their own blood, or allogeneic, where the transfused blood comes from someone else. Athletes who choose to use this method generally begin undergoing blood withdrawals several weeks before a competition, building up a supply of blood between 450 millilitres and 1800 millilitres. The plasma is returned to the body during the withdrawal while the red blood cells are stored. These can then be re-infused in the patient directly before or during a high-endurance event.

Beta Blockers

- Beta Blockers work to block the effects of adrenaline. They work to slow the heart rate, thereby reducing blood pressure, anxiety and muscle tremors, and improving the ability to focus.
- There are more than 20 types of beta blockers available. They can be taken orally, via injection or as eye drops. Some common beta blockers include: propranolol, metoprolol, atenolol, bisoprolol, esmolol.

Diuretics

- Diuretics work to promote the production of urine. Athletes use diuretics to assist with weight-loss. An added benefit is that other drugs present in the system could also more quickly be 'flushed out' of the body. The increased urine volume also aids in the dilution of doping agents and their metabolites.
- There are more than 20 diuretics banned by the IOC and WADA. Some examples include: hydrochlorothiazide, desmopressin, probenecid, amiloride, metolazone.

Testing

Avoidance

Cheating methodology with PEDs is in a constant race with testing methodologies. Cheating is almost always ahead. Whenever the testing improves so too do the avoidance tactics.

A popular tactic is to hop on a drug cycle to gain strength and muscle years or months in advance and stop using long before any drug tests are planned. While much of the progress from the drugs will diminish but in most cases the athlete is far better off than if they had never cycled any drugs. If the athlete is still being tested during the offseason they can falsely report their whereabouts to the testing agency so they receive a missed test rather than a failed test. The truth is drug tests are expensive and less frequent than you'd think. The penalty for missed tests are far less severe than testing positive for a banned substance. If that isn't possible the athlete still has the option to take specific drugs that are undetectable after a week or a few days. If they have especially good connections they could alternatively take advantage of designer drugs fresh from a lab. Drugs coming out of these labs are typically unknown to anyone outside of the lab and its connections and are basically minor modifications to an already banned chemical. The advantage of these is that they are new. It's hard to detect something if you don't know it exists. In fact it's too expensive to test for all the drugs that we know exist. Even still if all of those options are not enough the athlete could under certain circumstances use different blood or urine and/or bribe the testing officials.

Carbon Isotope Ratio Test (CIR)

The idea behind this test is naturally we have a very high ratio of carbon 12 atoms compared to carbon 13. When introducing exogenous synthetic drugs into the body that ratio changes and we can detect that. This is one of the better methods around but it has a few shortcomings. Detection time is still being studied but it seems to be at least several weeks. As soon as an athlete quits the drugs the ratio begins to slowly rebalance itself. anabolics with endogenous profiles could theoretically pass this test.

Epitestosterone Ratio Test

A common test is the comparison between the hormone testosterone to epitestosterone. Normally this ratio is close to 1:1. When using anabolics however testosterone increases several fold while epitestosterone remains the same. The ratio then becomes something like 5:1.

Biological Passport

The most rigorous form of ongoing testing is when a testing body maintains records of baseline biomarkers from blood or urine. This is called a biological passport. The organization then monitors fluctuations in measurements after each additional test. Before biological passports the individual was compared to general levels which is more lenient because different people have different levels of hormones and metabolites in their system. So the levels at which an adverse analytical finding was set high to make sure there weren't people who were outliers with false positives. Biological passports are more sensitive for the individual.

Retrospective Analysis

Another profound breakthrough in the science of drug testing is retrospective analysis. The top testing bodies now will preserve samples for up to 10 years. This way when testing methodologies improve in the future they can retest a sample from several years ago and catch markers of drug use they wouldn't have been able to catch had the samples not been preserved.

Contamination Risk

Many legal supplements may be contaminated or spiked with illegal substances. The onus is on the individual to figure out what they are putting into their body. Most drug testing bodies will punish you if you have markers of banned substances in your system whether you are aware of it or not.

Myths

Consuming too much protein is unhealthy

Acid Ash Hypothesis (Bone Health)

- Myth: Amino acids in the body cause a state of acidosis. The body then attempts to buffer the acidity by releasing alkaline stores from the bones
- Fact: Current evidence shows no adverse effect of high protein intake. Moderate support for healthier bone mineral density for higher protein groups.

Kidney Damage

- Myth: High protein intakes damage the kidneys and leads to renal failure
- Fact: Kidney dysfunction with higher protein intake only applicable to those with pre-existing kidney dysfunction. Current evidence shows no adverse effect of high protein intake. Moderate support for increase in glomerular filtration rate for higher protein groups.

How much can you eat in a single meal?

- Myth: Only 30g of protein can be absorbed per meal
- Fact: All protein is absorbed. However there does exist a muscle full effect. Past a ceiling of around .2g/lb/meal the additional protein does not contribute to muscle protein synthesis. The ceiling depends on the amount of muscle and age of the individual. Older larger individuals could benefit with upwards of 50g per meal. To make your diet potentially more optimal space protein across 4-5 meals of 40g of protein per day.

Benefits of high protein intakes

- Decreased rate of age related Sarcopenia
- Body composition
- Weight management
- Appetite control

Anabolic Window

Is missing the 1 hour protein window after a workout devastating to gains?

- There is a small effect of protein timing on lean mass gains.
- Resistance exercise stimulates a prolonged elevation of muscle protein synthesis for up to 48 hours.
- For optimal results there is roughly 2 hours before and after a workout for which maximal anabolism is acquired
- Post workout anabolic signaling immediately but slowly tapers off after a workout. The longer you wait the weaker the signal. This decay is however very forgiving

Detox

Does eating exclusively clean foods or only drinking water help detoxify the body?

- The liver and kidneys do not need any help clearing out toxins. Our bodies have already evolved an efficient and complex detoxification system.
- A good diet has a variety of nutrient rich foods moderate deficit or maintenance of calories and adequate protein
- User thirst as a guide for hydration. Drinking too much can cause a fatal condition hyponatremia
- Detox diets as a tool for weight loss are rarely sustainable.

Cardio and Muscle Loss

Does cardio burn muscle or inhibit gains?

- Concurrent training and/or endurance training alone, so long as dosages are not egregious, does not seem to reduce muscle size and/or strength to the extent to which some have argued, if at all.
- evidence suggests greater improvements in muscle size in the short term when concurrently training, and greater reductions in body fat, compared to more isolated training methods.

- Separating bouts of moderate or low endurance exercise from bouts of resistance exercise by ~6 hours likely potentiates these effects.
- If only one single training session is necessary, conditioning should be completed after resistance training and not before.
- Placing conditioning modalities that stimulate different musculature than immediately adjacent resistance training sessions provides further assurance that interference won't occur.
- Cardiovascular training can improve your recovery between sets and workouts, and won't interfere with strength or muscle gains if you do it correctly.

BENEFITS OF AEROBIC TRAINING

Increased aerobic capacity.

Increased capillarization.

Increased parasympathetic/
decreased sympathetic nervous
system activity at rest.

Decreased risk of heart disease.

Improved mood and sense of well being.

CARRYOVER TO STRENGTH TRAINING

Decreased recovery time between sets.

Improved bloodflow to the muscles.

Improved recovery between sessions.

You can't get jacked if you're dead.

None directly, but it feels good to feel good.

Stunted Growth

Does excessive external loading cause damage to growth plates?

- Mechanical stress placed on developing growth plates from resistance exercise may be beneficial for bone formation and growth
- High loads have a critical role in bone mass acquisition during and before puberty

- Actions in sport that involve tensile compressive shear bending and torsion stresses on bones that can elicit mechanostat related mechanisms during growth have an osteogenic potential.
- Resistance training for children is safe provided they are given proper instruction on technique and progression and are lifting under adult supervision.
- Resistance training is beneficial for bone health, injury prevention, general strength, and self esteem

Starvation Mode

Can dieting slow the metabolism so much it's impossible to lose weight?

- Dieters can encounter temporary stalls or spikes in weight despite being low on calories .
- People who are legitimately starving look emaciated with a very low bodyweight.
- People are bad at estimating their caloric intake/expenditure.
- Weight may temporarily stall or spike due to water retention.
- With weight loss metabolic rate will slow. Bigger bodies burn more calories.
- Decreases in NEAT explains the metabolic differences of equally sized individuals. It also is downregulated subconsciously when dieting for extended periods of time. This effect is greater with more aggressive weight loss attempts.
- If you are in a caloric deficit you will lose weight over time.

Foam rolling, cryotherapy, theragun

Does foam rolling improve recovery?

- The research on foam rolling is mixed. Some show a small reduction in soreness while others show no benefit.
- Many studies show acute improvements in joint range of motion, however these effects may be negated when foam rolling is combined with a dynamic stretching routine
- A good warm up that includes dynamic stretching appears to be enough on its own to prevent injury and improve recovery

- There is no drawback from foam rolling other than the extra time spent.

Does cryotherapy improve recovery?

- Cold water immersion is more effective than cryotherapy for reducing muscle soreness
- Cold water immersion is not very effective at reducing muscle soreness
- Cryotherapy not only reduced anabolic signaling after training but also stunted muscle growth across a 12 week training program when compared to a simple 10 minutes cool down.

Do massage guns improve recovery?

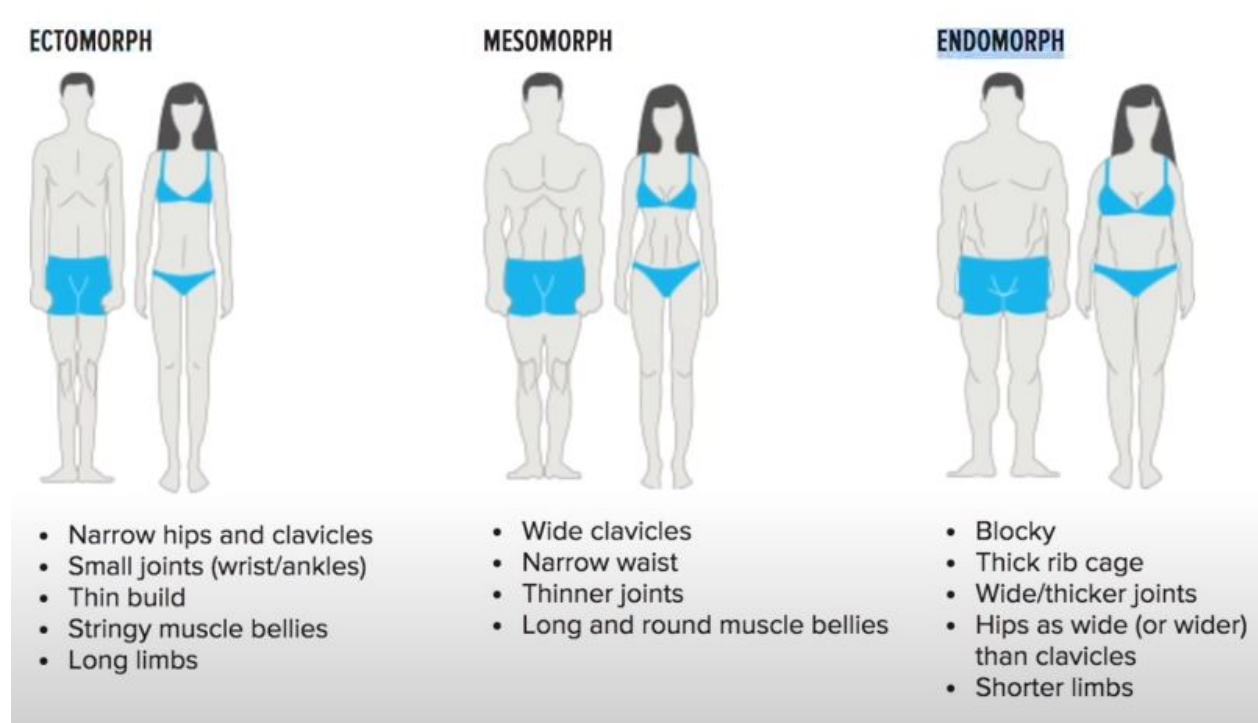
- A massage gun is basically a DIY deep tissue massage.
- Massages have been shown to reduce soreness if done immediately after workout. These conditions are quite limited.
- Massage guns can also work as localized warm ups. The vibrations can literally warm the tissues in the target area. Warm ups will reduce post workout muscle soreness.

Alcohol and Gains

Does consuming alcohol kill your gains?

- Alcohol reduces muscle protein synthesis by up to 30% for men. Fat oxidation is also blunted to some degree.
- If drinking heavily consider lowering fat intake or at least avoid high fat post drinking binges.
- When combined with empty calories, poor satiating ability and reduced inhibitions, alcohol isn't positive from a body composition perspective.
- It isn't likely to cause significant fat gain or muscle loss as long as caloric intake and protein are controlled.

Body Types



Does the body have a somatotype which cannot be changed?

- Changes in body composition are doable if you know what you are doing and are patient. The body will change when given a caloric surplus or deficit.
- Training remains the same for all bodies. If you are overweight, consider a caloric deficit. If you are an “ectomorph” consider putting on some muscle with a caloric surplus.
- Based on genetics and behavior some people have an affinity to be heavier or skinnier, more or less muscular and much more.

Fasted Cardio

Does fasted cardio burn more fat?

- Just because you burn more fat during a cardio session itself does not imply that you’ll lose more fat overall
- Fasting before exercise does not enhance lipid utilization
- Fasted compared to fed exercise does not increase the amount of fat or weight loss

- There is no specific harm to doing fasted cardio
- Do cardio when it best fits your schedule or when you have the best energy

Carbs before bed

Do carbs before bed make you fat?

- Your resting metabolic rate does not slow down when you are sleeping
- De novo lipogenesis (converting carbs to fat) is rare among humans
- Eat along a schedule that works best to your schedule and preferences while being mindful that snacking late at night can lead to overconsumption of calories

Soreness

Should you avoid working out while sore?

- Soreness is largely genetic
- Being sore should be viewed as a negative thing as it prevents getting back in the gym at full capacity
- Soreness is common when beginning a new program or entering the gym for the first time in a while.
- The answer depends on how sore you are. This decision will be largely subjective as it depends on the individual and their goals.
- Training through minor soreness is fine so long as you are properly warmed up and are able to execute proper technique.

Do you have to be sore to make progress?

- There is no evidence to suggest the more sore you are the more you stimulate muscle hypertrophy
- Soreness is a good indicator that you are training more than hard enough. But it is not absolutely necessary.

- Advanced trainees chase the repeated bout effect which is your body's response to a stimulus which decreases after each repeated bout.

Painkillers

Can painkillers enhance athletic performance?

- NSAIDs (non-steroidal anti-inflammatory drugs) attenuate muscle protein synthesis
- NSAIDs actually didn't lessen athletes' perception of pain during exercise or decrease muscle soreness after.
- They should be reserved for the short-term treatment of pain from an acute injury.

Lifting weights make you bulky

Can putting on muscle through resistance training make you look worse?

- Big muscular people only got that way through years of training and an extended period of caloric surplus and/or steroids.
- You need to be strong to be lean and toned. To do this, the recipe is simple: weight training and a proper diet with everything in moderation.

Should women use lighter weights to avoid the bulk look?

- The relative weight at which you train will only affect strength. Hypertrophy is based on the amount of work that you do.
- The purpose of lifting is to gain muscle and strength which means you should incorporate both heavy and light weights.
- Women will not bulk up like men, because they have a different hormones

Weights and Inflexibility

As you put on muscle mass do you become less flexible?

- If you are lifting with large ranges of motion and with good form, your body will adapt to just that. You can actually enhance flexibility this way.

- It's possible that you will lose some mobility from resistance training, but likely only in joints that were hypermobile to begin with.

fast metabolism

Is breakfast the most important meal of the day?

- For a working definition: breakfast is any meal above 50 calories within 2 hours of waking up.
- Eating breakfast may increase NEAT
- Skipping breakfast does cause you to over eat later in the day but not enough to offset the caloric deficit from skipping the meal.
- Breakfast skippers tend to consume and burn fewer calories. So there is not much of a difference. Eat in accordance with your hunger patterns.
- If you train in the morning it may be worth considering eating breakfast before, unless fasted cardio works well for you.
- From a hypertrophy perspective a very long gap between dinner and breakfast may not be ideal.

Six pack

Do you need to weight train to get abs?

- You need to be sufficiently lean in order for your abs to show visibly through the skin.
- If they are not developed to begin with diet alone will not allow the abs to pop.
- Abs are built with training and revealed in the kitchen.

Are heavy bracing exercises like the squat and deadlift enough?

- Squats and deadlifts don't activate the abs very well.
- Since they do not activate the obliques they won't make your abs look blocky either.
- I recommend moderate to high reps of isolation movements to grow the abs.

Fat Burn

Can you target areas to burn fat?

- Fat being used to fuel exercise can come from anywhere in the body, not just the more active areas
- It might be possible that local muscular work could increase blood flow to nearby fat tissue, increasing mobilization of those stores. One could then perform low intensity aerobic exercise after freeing the fatty acids from the area with increased blood flow to burn that specific fat.
- There is only one study with a small sample size that found this idea to work. There are several other studies which found the opposite conclusion. I'd remain hopeful but skeptical on this issue.
- Sustained caloric deficit, progressive resistance exercise and sufficient protein are the three pillars of quality fat loss.
- Practically speaking: keep dieting, continue to lean out and those stubborn fat spots will eventually lean out as well.

Do fat burners work?

- There is no evidence any legal supplement can effectively burn fat.
- They typically do contain ingredients that may minorly increase your metabolic rate. Fat burning is a matter of calories in vs out so the few extra calories expended may push someone into a caloric deficit and thus lose weight.

Useful Links

Stronger By Science
Reddit Fitness FAQ
How Strong Are You?
Max Muscle
Macro Calculator
ORM
Wilks
FFMI
Exercise Library
Muscle Index

[Stronger by Science • The online home for thinking lifters](#)
[Frequently Asked Questions](#)
[Weightlifting Strength Standards](#)
[Max Muscular Bodyweight and Measurements Calculator](#)
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Change Log

Version	Changes	Date
∆ 1.1.1	+myo reps	9/19/2020
∆ 1.1.1	*minor formatting *grammar	5/19/2020
∆ 1.1.0	+ testing *supplement grades	5/18/2020
□ 1.0.4	+ detraining under Weight Lifting - Methods	5/17/2020
□ 1.0.3	+ SARMs + Prohormones	5/16/2020
□ 1.0.2	+ To pros & cons under PEDs + To Types under PEDs	5/15/2020
□ 1.0.1	+ To cardio under Diet	5/13/2020
□ 1.0.0	+ Sub sections in myths * Formatting + Change Log + Media	5/11/2020

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