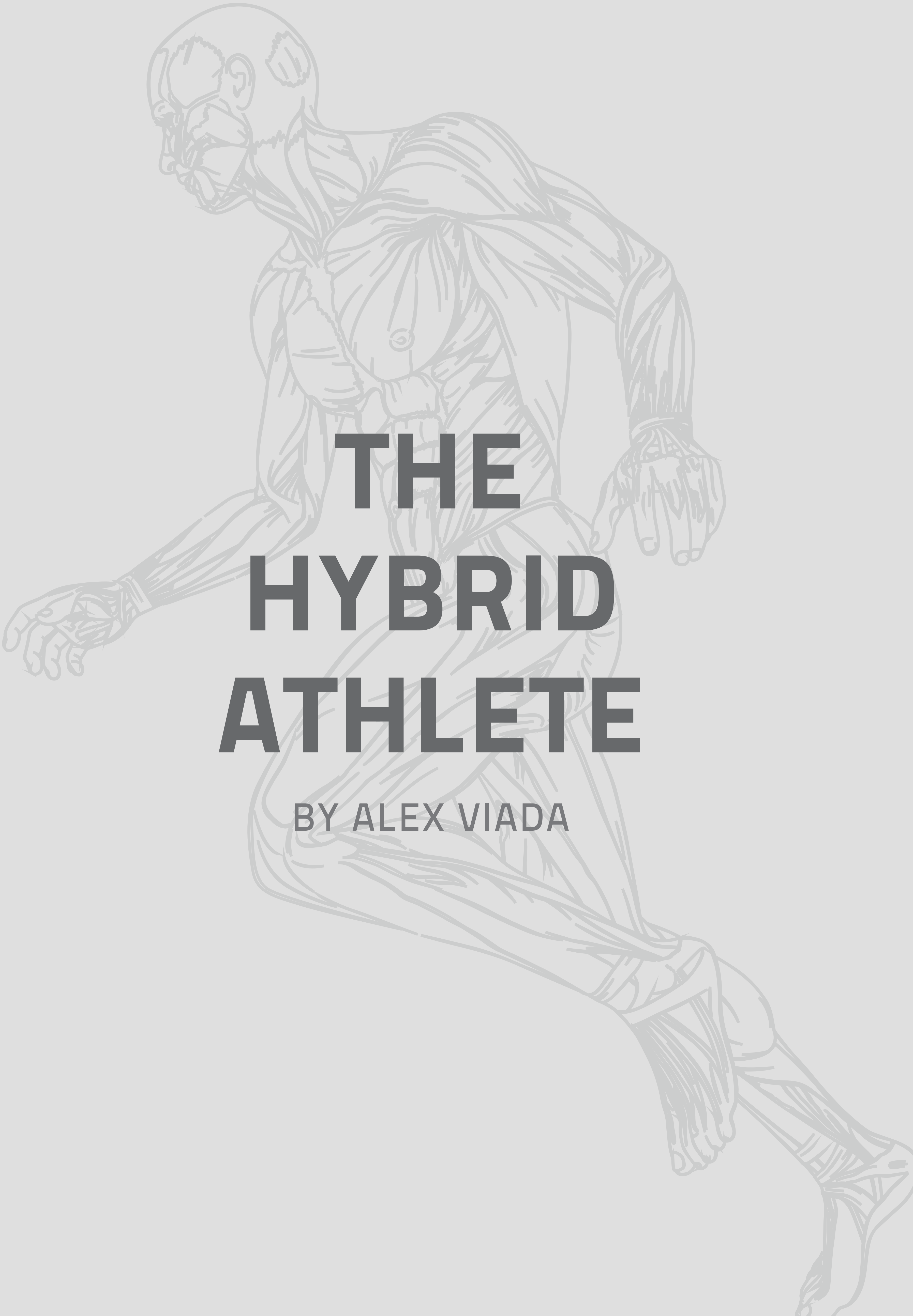
ALEX VIADA

THE HYBRID ATHLETE



THE HYBRID ATHLETE

BY ALEX VIADA

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FOREWARD

For many years it has been widely accepted in the athletic and fitness communities that strength and endurance are physiologically opposed to one another and therefore, cannot be simultaneously trained and developed. Strength athletes and bodybuilders believe endurance work weakens them and strips them of their precious muscle mass. Endurance athletes believe strength work will add unnecessary weight from increased muscle and slow them down.

I did not grow up in the athletic or fitness communities.

I came up in the special operations community where Army SOF, SEALs, Marines and Controllers have been doing both, to some extent, out of necessity for decades. It was intuitive and without an in-depth knowledge of exercise physiology. Endurance is ingrained in our operational mindset. There is no endurance event quite like a 4,000m swim and dive that transitions into a two day tactical, cross-terrain ruck march with over 100lbs of gear. Strength is something on which we pride ourselves. Once on target, we still need to have the strength to physically handle enemy personnel. For decades, we trained with the combination of strength and endurance programs we could piece together. Too often the greatest limiting factor to our success was the ever-present injury due to overtraining.

CrossFit hit the stage in the mid-2000s. It initially appeared to be a complete fix for SOF's physical training. It was close, especially in the early days when the workouts were typically a well-balanced blend of three categories: strength, lactate, and conditioning workouts. It wasn't perfect, but it fit. SOF needed strength, short intense workouts, and longer work for conditioning to cover the physical requirements of the highly variable physical requirements of the job. We also needed shorter training sessions. At that time, SOF was spending most of its days in either Afghanistan or Iraq. Training while deployed was challenging. We did not have time for an hour of weights and an hour or more of running each day.

In 2008 I opened CrossFit Wilmington. By that time I had been doing CrossFit-style training for three years and CrossFit was changing rapidly. Olympic weightlifting was becoming the favorite in CrossFit gyms. The weights in most workouts were getting heavier. It was a logical path. Heavier was the only direction for CrossFit to grow and evolve. As we all know, the heavier we lift, the less volume we can do. The workouts in CrossFit got much shorter. It was at this time that endurance and cardio work was being greatly demonized by all strength disciplines. The "do you want to look like a skinny runner" pics and advertisements were all over the internet. Additionally, some coaches were perpetuating a minimalist approach to endurance. They were making popular the idea that sprint work could be translated into endurance. Time would prove there were too many mistakes in their assumptions, and even more in their application. High intensity interval training (HIIT) training was also gaining popularity at this time. It further added to the misconceptions. The strength world had seemingly bought completely into the hype.

In retrospect, it seems more that laziness is mostly to blame for the acceptance of this myth, not fact or science. True endurance work requires a lot of time and effort. It takes fortitude… the word's very definition is to resist or withstand discomfort or pain for long periods of time. Of all exercise, endurance is certainly the easiest to wish removed from a program. My own distances had dwindled from three, five and 10 miles to 400m, 800m and 1 mile sprints. I did a few triathlons during this time… sprint triathlons that is. Since they only take 50-80 minutes to complete, sprint races are not truly endurance events. My program's link to true endurance was almost completely severed.

Fast forward to 2013. A shoulder injury required I cut out all overhead movements. By default, I began to work on my deadlift and squat. I'd always favored and competed in Olympic weightlifting, so I had never tried to develop my 1 rep max deadlift and back squat. My boredom spawned a new goal. I decided to work towards a 1 to 1 ratio between my deadlift and 1 mile run time. I quantified the goal and set it at 550lbs and 5:30. The mention of this goal led to my introduction to Alex. He had, in fact, matched his deadlift and 1.5 mile. Not only that, he was also doing the so called "impossible"; completing long distance, or true endurance events, while developing max strength. He was doing something right, and I wanted to know what it was.

In the weeks following our introduction, Alex shared with me the lessons he'd learned. Through both trial and error, and by applying his formal education and knowledge of physiology, Alex had realized, not just that strength and endurance could be developed concurrently, but actually how to train them. What he shared with me changed the way I programmed my training… and more importantly, how I programmed my athletes' training.

Since applying what Alex shared with me, I was able to nail my 1:1 deadlift mile goal. I began at a 485lbs deadlift and a 5:52 mile at 215lbs bodyweight. Four months later I pulled 550 and ran the mile in 5:08 at 220lbs bodyweight. The run went better than planned and presented the option of pursuing the ratio with my squat and mile also. A 515lbs squat gave me that 1:1 ratio as icing on the cake.

I made that DL and 1 mile run ratio the "CrossFit Wilmington Challenge." If a member completes it, they get a lifetime membership to my gym. So far, only one has... Kimberly Lawrence, with a 350lbs pull and 6:08 mile (the female ratio is slightly scaled per a conversion factor).

Since then, I have applied Alex's methods to bigger endeavors, completing a powerlifting meet and an Iron Distance Triathlon with only two week's separation. I hit a 515 squat, 320 bench, and a 525 pull. My race time was 14 hours, 11 minutes. The most important thing to take away is that I trained for 7 months for an Ironman and a Powerlifting meet concurrently and did not sustain a single injury. My race time was compromised because I fractured the second metatarsal in my left foot at the swim / run transition. It had little effect on my bike time, but slowed my run by about two hours. Completing the race with a broken foot I partially attribute to the preparation and training Alex's methods provided me... and partially to being harder than I am smart on that type of thing.

As a further testament to the methods Alex has pioneered, my athletes have also pushed the endurance and strength envelop. Melissa Hoff (2013 CrossFit Games competitor) also lifted in the powerlifting meet and completed the Iron distance race. I have applied, with great success, these methods to my CrossFit athletes' successes. Not only do my athletes enjoy a reputation of strength, but any running event is now almost a guaranteed win. Their recovery between workouts has also improved greatly because of the additional aerobic training.

Timing the workouts properly has reduced the risk of injury.

My relationship with SOF has taken a different role. I train a large number of military personnel in preparation for selection/indoc courses for SOF units. The changes I have made to that training has increased the recovery times and improved the overall efficacy of the programming. They enter their respective selection course more resilient, stronger, faster, and without nagging injury. The operational troopers I train enjoy a reduced training volume but increased strength and endurance built solely for their mission requirements. Alex's methods that I apply to their training keep them healthy and in a high state of readiness.

I hope you are able to apply what you learn from Alex to the same extent I have. This book will undoubtedly further human performance more than any other in recent years... maybe decades. Enjoy.

TONY COWDEN

Owner CrossFit Wilmington / Wilmington Strength & Conditioning / Competitive EDGE Performance

01

INTRODUCTION & HISTORY

INTRODUCTION & HISTORY

First of all, I'd like to extend a genuine thank you to you, the reader, for picking up this book. I hope you're even a tenth as excited as I am to finally have all this information down in one place, and I am thankful for the opportunity to pass along what I've learned over the years.

As someone who's deeply passionate about all aspects of fitness and athleticism, but who also recognizes the importance of being well-rounded (both in athletics and in life), I hope you may find something in this text that changes your approach to training for the better. From the first pieces published on AtLarge Nutrition and initial seminars at CrossFit Wilmington to the various presentations given over the last year, including JTS' Become Unstoppable 3 seminar in California and the joint CHP/TZ Strength series in the fall, it's been great to be able to reach out to such a variety of athletes, and your feedback (both positive and negative) has shaped my training and coaching more than you may realize - so please accept my additional thanks for that.

The Hybrid Training methodology is the product of years and years of trial and error, with a very large emphasis on the error. Given the dearth of literature on (successfully) programming for both strength and endurance concurrently, it is safe to say that nearly every purported negative of the combination has been directly experienced by the author. Hybrid

Training has now been around, in its current form as we practice it, for approximately three years, with several hundred athletes having utilized it in their sport training, yet it continues to evolve daily.

If there is one flat admission to make regarding this methodology, it is that this programming "borrows" shamelessly and frequently from some of the finest programs out there, utilizing components from various "conjugate" programs, block periodization, daily undulating periodization... combining the most relevant components of each to create a style of programming that develops strength, strength-endurance, sport skill, and aerobic conditioning simultaneously.

The goal of this book is to summarize this entire system - to give an overview of how the methodology was developed, understand the relevant physiology involved, and allow the reader to design his or her own program specific to his/her needs.

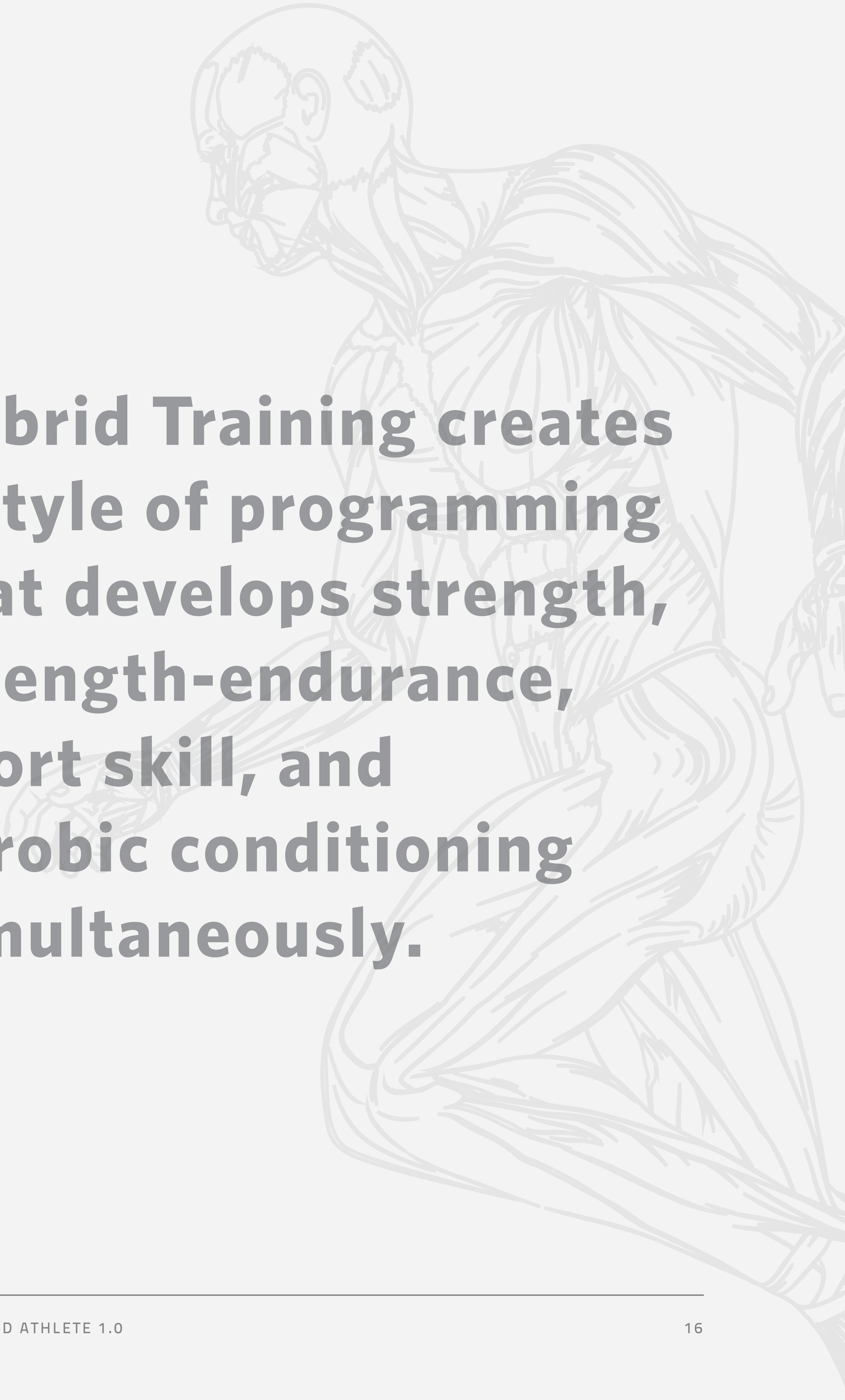
I'd like to take a (self indulgent) moment, though, and offer a bit on my background and how this came about. Though originally from an endurance background (in high school), I got into strength training at the end of college, and made fairly good progress in a short period of time, working up to a top bodyweight of 245 pounds with a 745 pound deadlift. There were still several things I was extremely challenged by, however, including stairs and parking spots too far from the gym. And skipping dessert. Also tying my shoes.

Around the time that I was just starting to get accustomed to finding good spots to rest on the three flights of stairs up to my loft apartment, and had mastered the whole "two stage two breath shoelace tie" (inhale, exhale, lean down, cross laces, sit up, inhale, exhale, inhale, exhale, lean down, double loop, wrap and tighten, sit up and gasp for air) , I was somehow cajoled into signing up for a 5k - my first real run over 400 meters since I was 18. Needless to say, some training was needed, so I gamely attempted to accompany runners on their training runs and developed an incredible aptitude for feigning calf cramps and suddenly remembering important conference calls that I had to go back home to take. Fast forward to the race, and I turned in a mediocre performance, though the post race beer was outstanding. The beer was too outstanding, actually, since in that slightly inebriated state I decided to commit to my first marathon - the logical next step after a 5k.

When I started marathon training, I watched my 700 pound deadlift plummet - my recovery just wasn't there. I lost muscle, I was sore 24/7, I got stress fractures and shin splints, muscle strains, knee pain... and I still wasn't a very good runner. Needless to say, mistakes were clearly made, yet the variables seemed to line up - I had a great running program and a great lifting program, yet nothing came together.   A second attempt a year later gave me the same results - or lack thereof.

The problem was simple - any good program in any sport is designed to push the body to near the limits of its recovery - doing enough solid work to maximize the adaptive response, then allowing just enough recovery to attack the next workout.

Combining two programs that push the athlete to 90% and expecting to not regress may seem to be an obvious no-no, yet it is done all the time, because most athletes still assume there is some dividing line between "strength" training and "endurance" training. The fact is, there is not. Work is work, the principles of physical fatigue, trauma, energy substrate exhaustion, mental fatigue, and adaptive response are absolute, regardless of the exercise modality, and recognizing this was the first step in creating successful programming. Being able to break these stimuli and adaptations down into discrete components, and train each component in a well-designed microcycle is where the "magic" came in.



Hybrid Training creates a style of programming that develops strength, strength-endurance, sport skill, and aerobic conditioning simultaneously.

The magic, of course, is that there IS no magic, just very simple programming principles that are too-often ignored. But perhaps the most important take home message: Work hard, but be lazy. In other words, do as little as possible to attain the necessary result. Lift less often than a powerlifter, run less than a runner, bike less than a cyclist, swim less than a swimmer... the body has limited recovery, and will quickly become overwhelmed. Isolate what is truly important in each type of training, focus on those areas, and do them well. Cut out the junk miles, cut out the gym pissing contests, be draconian in how you approach routines - take those articles with the "ten exercises you should be doing" and toss them in the trash. The more you want to do, the less you should be doing. That is what Hybrid Training, and this book, is all about.

What this book is not is a scientific review of the various literature revolving around concurrent strength and endurance training. While useful as a starting point, very little of the literature has provided any useful conclusions that the author has found regarding this style of programming - as will be discussed later, reductionist/mechanistic approaches have their place, but in the arena of complicated, novel programming of a complex organism in a complex environment, it has its limitations. This is not an "evidence based" book.

Quite frankly the lack of evidence-based literature on concurrent training for experienced athletes led to the development of this entire methodology.

Research exists, to be sure, but it is still in an early phase.

This book is also not a manuscript being submitted to a peer reviewed journal. The majority of the information contained can be found in either basic biology texts, or extrapolated from these texts through common sense. If the reader wishes to view a hundred citations per chapter (which in most cases you will find, go completely unread even by the author), he or she may wish to look elsewhere - the majority of the statements made on physiology contained herein can be found in nearly any textbook - which is where every individual should start their education in the field of exercise science. Not on PubMed, not from eBooks (this one excluded - it is fantastic), not from articles, but from the basics.

It is remarkable how many questions are answered in the process of obtaining a basic biology and biomechanics education, and alarming how often a review of peripherally related, mechanistic/reductionist primary literature is being substituted for a basic education in biology. Forgetting the basics or ignoring the basics is the cardinal sin of exercise science - it is attempting to fine tune a sculpture with a scalpel or nail file while it is still a solid block of wood.

02

HYBRID TRAINING DEFINED

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Hybrid Training is still not easily defined, even though the author technically helped popularize the label - the closest definition, wordy as it may be, is that Hybrid Training is "The concurrent training of different athletic disciplines that do not explicitly support one another, and whose disparate components are not essential to success at any one sport".

Recognizing the fact that this is a horrible definition, a bit more detail is needed. There are a number of sports which combine strength and endurance- indeed the combination itself is nothing new or novel. Most any sport falls somewhere in the middle of the pure endurance/pure strength spectrum, though degree varies wildly. Strongman and OL positions in football are high strength roles that require a certain base level of endurance and conditioning, while rugby backs or pursuit cyclists require excellent endurance, but still need strength and power to win. (Bear in mind, hybrid training principles apply very well to the training of these athletes, but this is not what makes the principles nor approach unique.)

The primary differentiator is that these sports all require this combination - it is not optional. Indeed, peak performance is all about the balance, with each sport having its "ideal" athlete - looking at top decathletes, rugby players, NFL position player, CrossFit games athletes, there's not a tremendous amount of variety in the builds and "performance envelopes" of the top performers.

Hybrid athleticism makes no such concessions to "ideal" build - the objective behind this training is simple - to allow specialists to train all components of athleticism, even ones which they do not appear well physically-suited for, without compromising performance in their primary sport. Make no mistake- it is unlikely that a 275 pound pro-totaling Powerlifter will qualify for Boston or run a sub -10 hour Ironman, but this methodology would still allow this individual to train for and successfully complete an Ironman (with performance improvements comparable to most tri-dedicated programs) while maintaining or improving their total.

Hybrid Training is “The concurrent training of different athletic disciplines that do not explicitly support one another, and whose disparate components are not essential to success at any one sport”.

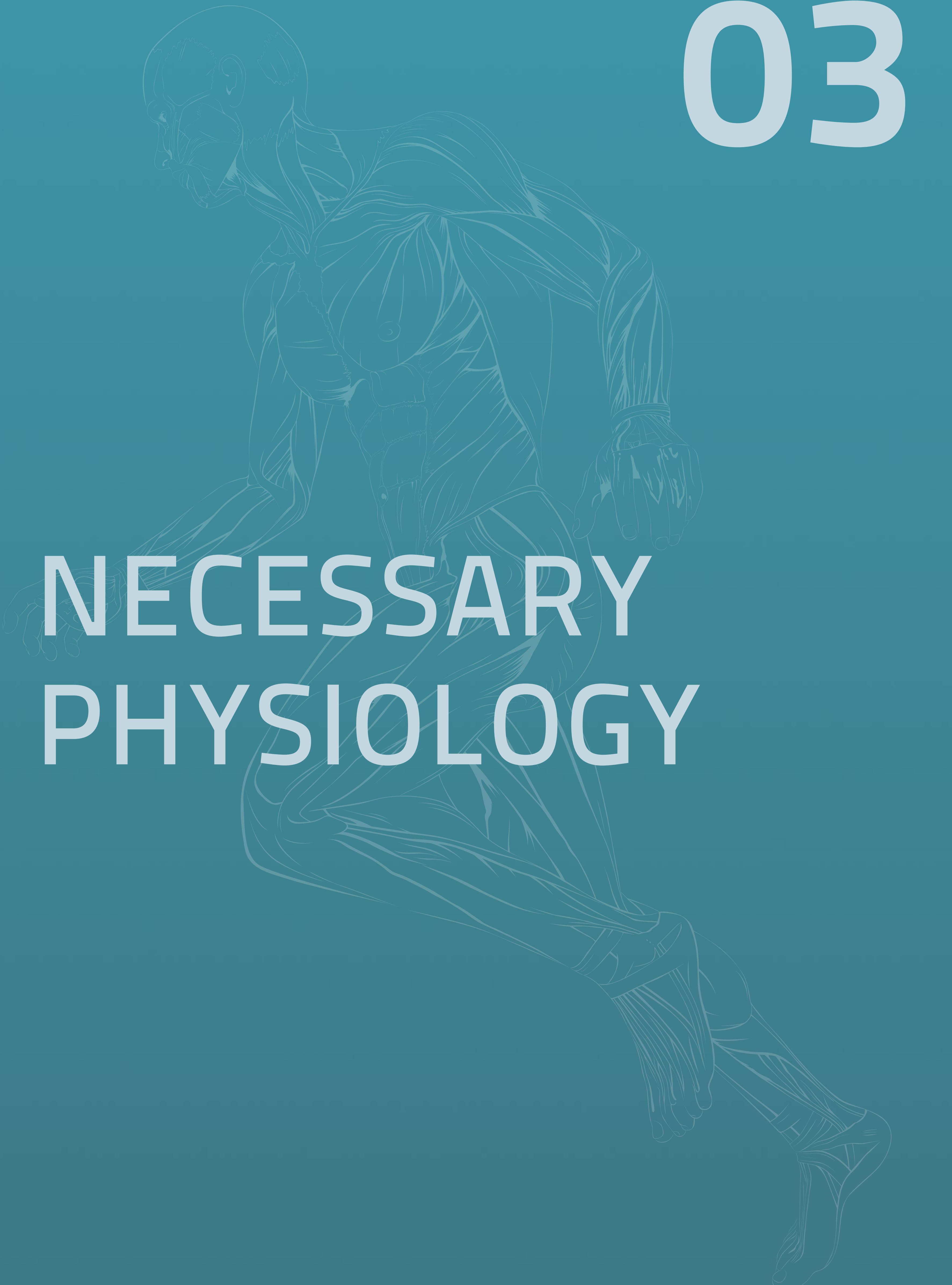
There is, of course, appeal to this methodology beyond the not-so-massive populations of Ironman Powerlifters and ultra runners who want to clean and jerk 1.5 times their bodyweight - these training principles can be applied to nearly any athlete - there are very few athletes who would not benefit from a performance increase in their non-primary energy systems. Indeed, improving one's aerobic capacity can improve recovery for pure strength athletes, and improving limit strength can aid in injury prevention, fix postural/strength imbalances, and improve threshold performance in endurance athletes, not to mention the overall health benefits of being well-rounded.

What this approach offers is the "without compromise" component - getting a SHW powerlifter to run or a cat 1 climbing specialist to lift heavy weights is a challenge - conventional wisdom dictates that they are wasting their time with cross training of this sort, and potentially eliciting negative adaptations, and spending time on cross training is a poor use of both time and recovery. As we'll see in both the physiology and practical segments of this text, however, this is not the case.

So what is Hybrid Training about? It is about analyzing the different stressors involved in various forms of strength and endurance training, and designing programs based around consolidating these stressors to minimize interference and maximize recovery- this text should be read with this basic concept in mind.

03

NECESSARY PHYSIOLOGY



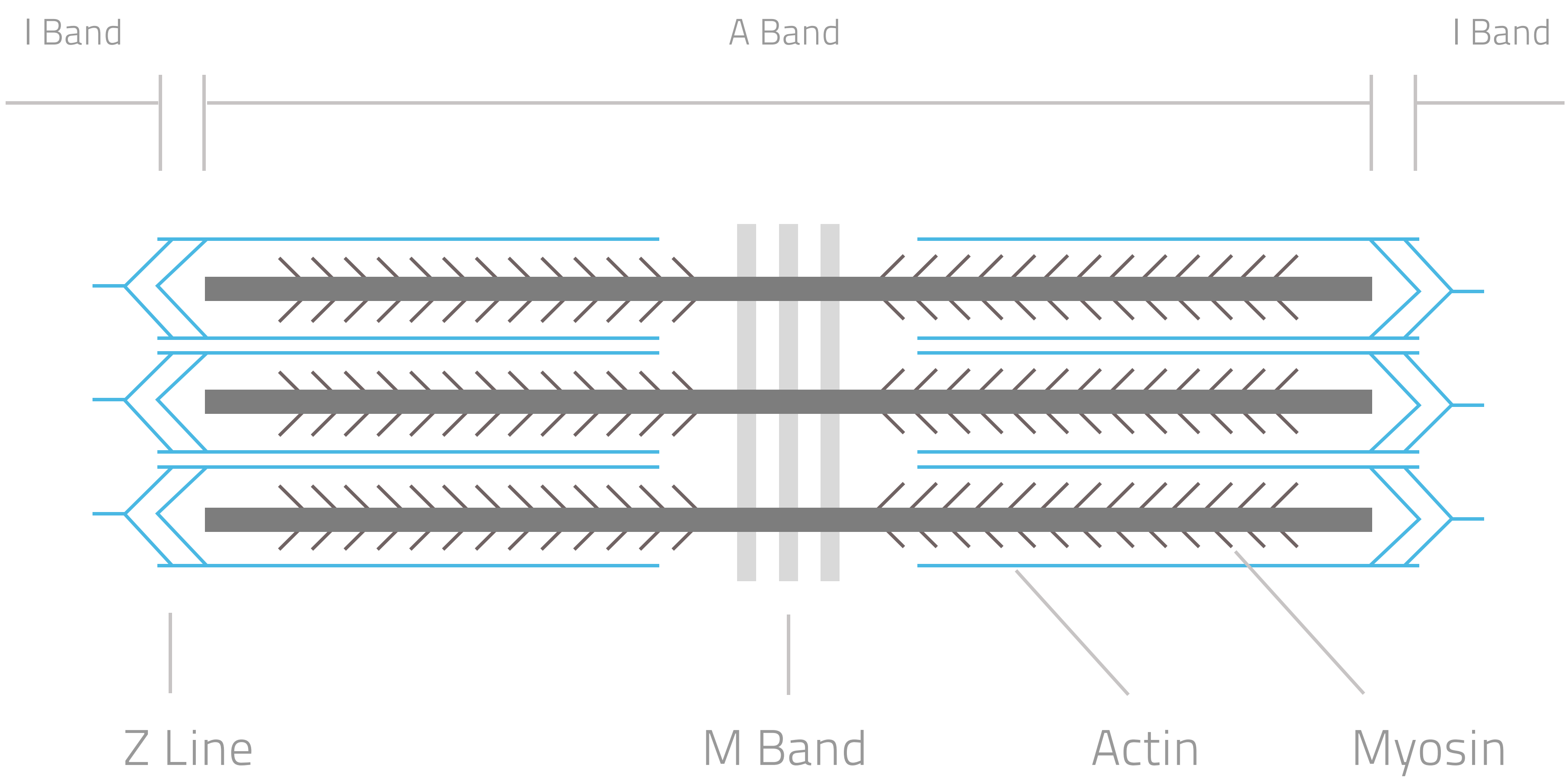
BASIC PHYSIOLOGY OF SKELETAL MUSCLE AND STRENGTH

Obtaining a full understanding of strength production and skeletal muscle function could certainly be an entire book in and of itself. In fact, the author highly encourages the reader to further their understanding through any number of free online courses or through picking up a basic physiology textbook - what will be covered here are just the relevant basics as they apply to training design and adaptation.

MUSCLE STRUCTURE

Skeletal muscle tissue is a type of striated muscle (as opposed to smooth muscle, such as the muscle surrounding your arteries or trachea) that is comprised of multiple muscle cells (myocytes, or muscle fibers), further grouped into motor units, which, combined, comprise a single muscle.

Sarcomere



A myocyte, or muscle fiber itself, is actually comprised of a number of contractile proteins that are responsible for muscle contraction. These proteins, actin and myosin, are arranged in repeat units called sarcomeres. Multiple muscle fibers are arranged into motor units - which are groupings of fibers that all share common innervation - in other words, they all contract simultaneously when the nerve fires.

Note that the number of motor units contracting at once determines the degree of contractile force.

A very fine, delicate movement may only stimulate a handful of motor units, while a large powerful movement may stimulate nearly all motor units - it is the number of motor units contracted that determines voluntary force output by any muscle. Worth noting is that the number of muscle fibers per motor unit is highly dependent on the muscle's function - the eye muscles may have a handful of muscle fibers per motor unit (since the average motion is very fine against minimal load), whereas the calf muscles may have a large number of fibers per motor unit (since the need for fine motor control is far less).

Motor units are largely comprised of similar "fiber types" - most readers may be familiar with type I and type IIa/b/x fibers, the former being "slow twitch," high endurance, low output fibers, the latter being various types of "fast twitch," higher power fibers. These categories are largely simplistic - fiber type is truly more of a continuum than a set of categories, there being a number of variable characteristics that are winnowed down into a handful of types. These will not be discussed, other than to state that motor units will typically have a certain similar set of characteristics.

When the nerves receive an impulse from the brain to contract, however, the type of fibers that fire is not relevant - it is the size of the motor unit (number of fibers per unit) that determines the order in which they are recruited - smaller motor units first, larger motor units as the strength of the impulse increases (though generally speaking, the smaller motor units are indeed comprised primarily of fibers that have the "type I" characteristics). Note that increasing the number of motor units that can be recruited simultaneously/rapidly is a learned component of strength that occurs over time with both repetition and heavy loading.

All these motor units comprise a single muscle - every muscle has its own origin (attachment closer to the middle of the body) and insertion (attachment further to the periphery).

Muscles are relatively simple in their contraction- when they contract, all they do is exert a single force vector, which becomes a single rotational force around the joint - this is why every complex movement is the result of the relative contributions of dozens of muscles operating in unison, fine tuning the joint movement to achieve the desired effect.

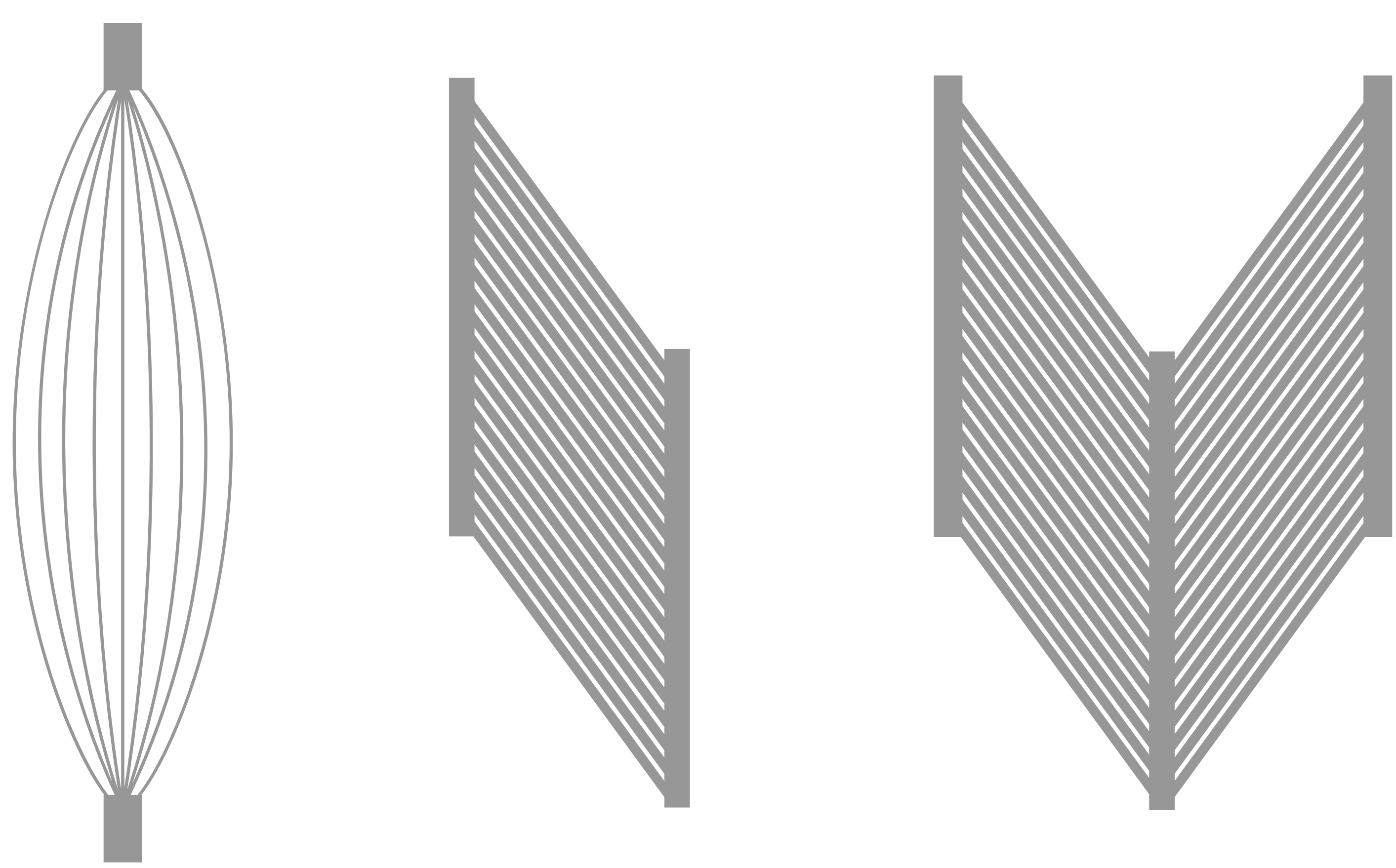
The simple act of raising your arm in front of you requires dozens of muscles, hundreds or thousands of individually contracting motor units, firing, relaxing, and firing again.

There is simply no such thing as muscle isolation in the human body!

MUSCLE STRENGTH

Absolute muscle strength is a function of total muscle fiber cross sectional area - fiber type has some impact here, but truthfully is less important than overall size. What is important to note, though, is that muscle fiber cross sectional area is absolute potential, but muscle shape and attachments can make a significant difference.

For muscle shape, fiber arrangement can make a significant difference in contraction- longitudinally or unipennate arranged fibers are the "standard" arrangement typically pictured for muscle structure.



Fusiform, unipennate, and bipennate structure- thin lines are muscle fibers, thick lines are fascia.

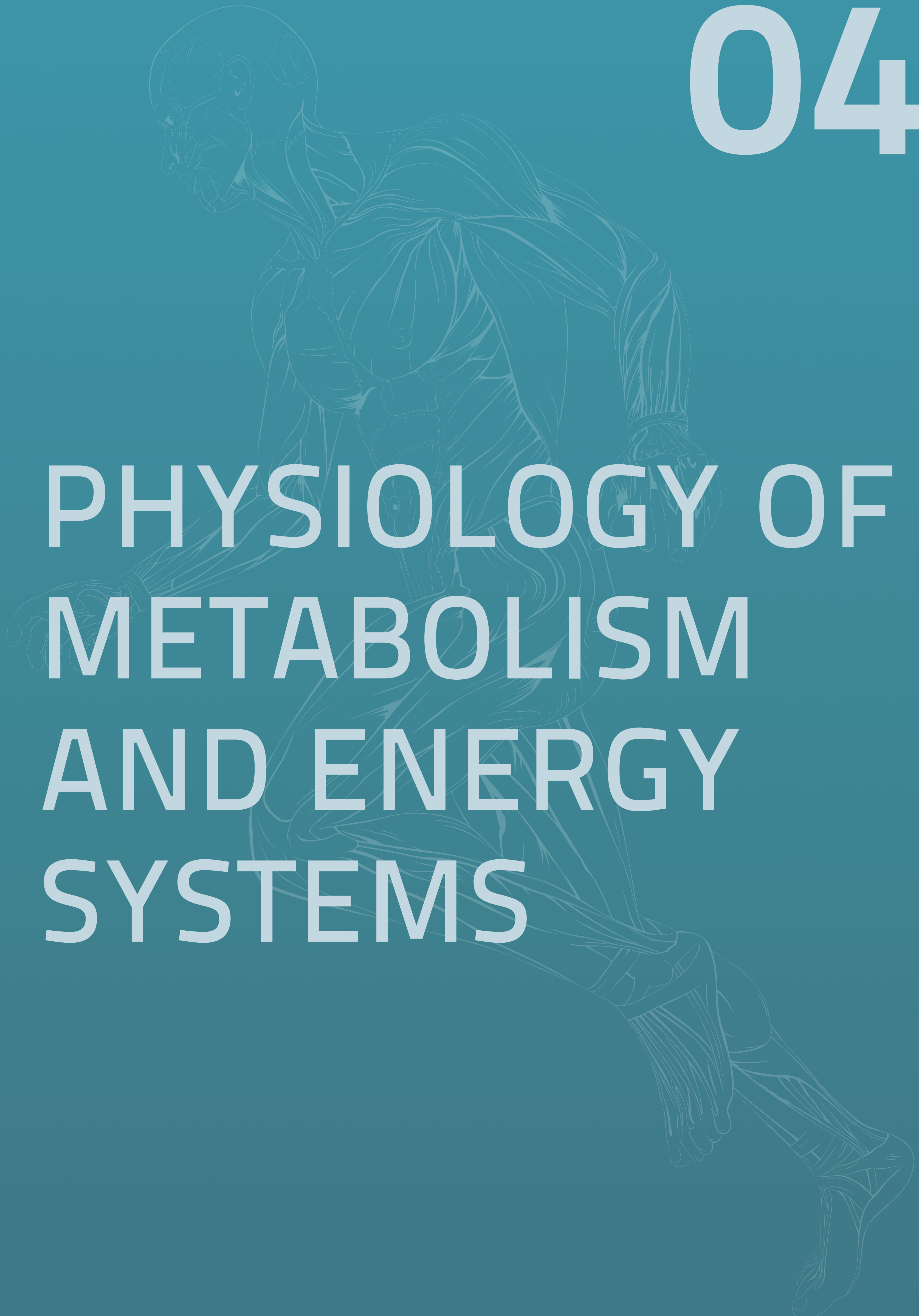
Bipennate muscles (and unipennate, to a lesser extent), sacrifice range of motion and speed of contraction for force generation. Pennate structure is essentially identical for all human beings, however, and this is not a variable that really needs to be studied for the athlete.

Muscle attachments are far more relevant and important. If the reader will examine his or her pectoralis major muscle for a moment, and observe where on the upper arm it attaches, then picture the lever action that moves the humerus forward, he or she may understand how moving that upper arm attachment a half inch closer to or farther away from the shoulder joint could make a tremendous impact in torque generation around the joint. These attachment points are highly variable by individual, with more favorable leverages for force generation allowing for more power to be generated across that joint with a smaller muscle. There are many world class powerlifters and Weightlifters who may seem deceptively “small” in terms of muscle mass- chances are, their leverages are phenomenal!

The trade-off, however, is in efficiency and speed - less favorable leverages for maximum power tend to be superior for economy of motion and turnover - indeed, many talented distance runners may find that a portion of their economy is due to favorable leverages for running, which may be less than ideal for squatting. These leverages are not absolute from a biomechanical standpoint, incidentally, as closer attachments do not necessarily improve running economy (depending on the joint). There are certain joints where the argument could be made that superior torque benefits both strength and endurance athletes, and "inferior" torque would only benefit the individual at a slow walking pace, for example. Generally speaking, however, closer attachment points mean higher potential velocity of the bones around the joint, which would be favorable to, say, a cyclist looking to maintain a high cadence, or marathon runner who needs a fast, efficient cadence over time.

Once limb length is considered as well, it begins to become clear why two individuals with similar overall stats (height, weight, body composition) can have such dramatically different strengths and weaknesses.

Practical muscle strength has a number of more important characteristics, however - beyond leverages, the rate and coordination of motor unit recruitment is a major determining factor in force production, which can be increased via repetition and mastery of a given movement - note that this form of optimization is highly movement specific, with minimal translation to other movements... in other words, even improving specific strength in the low bar wide stance squat may not necessarily translate to improving specific strength to the narrow stance front squat or overhead squat. There will be some carryover, but it is nevertheless important to note that these non-mechanical, CNS/coordination-related adaptations must be practiced frequently in the specific movements that the athlete wishes to improve.



04

PHYSIOLOGY OF METABOLISM AND ENERGY SYSTEMS

PHYSIOLOGY OF METABOLISM AND ENERGY SYSTEMS

When a nerve impulse stimulates a muscle, a rather complex multi-step process takes place in and around each muscle fiber. Without spending time on a lengthy discussion of the various steps, noteworthy are two things:

1. The proteins within a muscle cell are named actin and myosin - actin can be thought of as the fixed "ladder" that the myosin pulls itself along. ATP essentially powers the detachment and re-attachment of the "heads" or "fists" on the myosin protein that are responsible for contracting the muscle fibers. This ATP action, and in fact, the entire process, is dependent on creating and maintaining an electrochemical gradient inside and outside the muscle cell. When a nerve fires, this "electrical" impulse essentially sends ions flooding across the cell membranes, and after a series of steps, causes the unbinding/shifting/rebinding that makes the myosin "pull" itself along the actin.

2. Muscle fibers do not care where their ATP comes from, whether it be from CP (creatine phosphate- a phosphate

donor that quickly replenishes ATP), lactate metabolism, or aerobic metabolism. The order of operations here - activity lasting less than 10 seconds or so in duration (alactic) is replenished by the phosphagen system (creatine phosphate). For 0:30-1:00 high-intensity activity, the anaerobic glycolytic system is the primary energy source. Past this point, oxidative/aerobic lipolysis takes over as the most significant. Please note, these general guidelines are for activities that are limited to these durations by intensity - 10 seconds of easy jogging is hardly alactic! Also note, the reader may find a dozen different sources that may state different durations here- the reader would be best served not spending hours attempting to determine a specific "switch" point for each, since energy system usage is a continuum, not an on/off switch.

When ATP is *completely* exhausted, what actually happens within the muscle fiber is that the myosin heads no longer *detach* from the actin - they remain locked in their current configuration (this is the reason behind rigor mortis found in dead bodies - the complete lack of ATP results in the body's muscles being "locked" in position).

This is *not* the reason for failure during lifting, or for extreme fatigue during endurance activities - indeed, failure during a resistance training set is actually fairly poorly understood, and theories that range from heat buildup to "neural fatigue" to byproduct/metabolite accumulation have all been floated. What distinguishes this form of failure is the body's rapid recovery

- even after full muscular failure has been reached, a few minutes of rest and recovery can typically allow the individual to return to a near-maximal level of performance.

Failure or fatigue experienced in endurance activities, however, are quite different - these are much better understood, as they are a direct result of two factors - acid buildup as a byproduct of fermentation (colloquially and incorrectly terms “lactate buildup” or “lactic acid buildup”), and absolute substrate depletion (where rate of ATP re-synthesis does not match need).

"LACTIC ACID BUILDUP"

This is perhaps one of those misnomers that newly-minted Doctors of Wikipedia enjoy tearing down - the old theory used to be that lactate, or lactic acid, is created as a result of anaerobic glucose metabolism. In other words, if there isn't enough oxygen present, the body converts glucose to lactic acid, and in the process converts ADP back to ATP.

The lactate causes the burning sensation you feel in your muscles when you're pushing hard, but once it's cleared and returned to the liver, it's converted back to glucose.

We now know that lactate itself is not an acid (it's a conjugate base - though the author would recommend the reader avoid making this distinction at parties lest he never be invited to another one), nor is any acid directly produced in the process. Lactate itself is actually rather inert. What we do know is that fermentation is associated with acid buildup around the muscle, or more specifically, the proliferation of H+ ions around the muscle. (The release of H+ ions, of course, is what defines an acid and makes it harmful to tissue - those protons break down other molecules fairly quickly, hence the destructive effect of acid.)

If you recall, muscle action requires an electrochemical gradient to operate - positive ions kept on one side of the cell are released, then the gradient re-established in order for contraction to take place. In simple terms, imagine what happens to a circuit if you were to introduce a bunch of positively charged ions around a carefully calibrated electrical system? The system would malfunction, then short circuit. Effectively, as acid builds up around the muscle cells, the muscles lose their ability to contract fully and efficiently. Cyclists especially may be familiar with this phenomenon, as they watch their power outputs drop precipitously during hard climbs once that acid builds up, and they simply cannot push through it - this gradient is wrecked, and their muscles are short circuiting. Once the blood manages to clear out that acid, the gradient can re-establish properly, returning the muscle to proper function.

This clearance occurs at a fairly set rate, which depends a great deal on local perfusion (blood flow), as well as the presence of oxygen (which results in less acid buildup, as fermentation is less needed if there is sufficient oxygen present).

This is why lactate clearance and lactate threshold (two statistics tracked by endurance athletes) are such a great indicator of general aerobic conditioning - oxygen and bloodflow.

THE "BONK"

Fatigue due to extended duration activity, however, is something less easily reversible. Simply put, the muscles have a limited supply of glucose (glycogen), and if it is exhausted (note that fermentation exhausts it the fastest, as less energy is produced per gram of glucose than any other type of energy production), only the liver (which stores glycogen) or food intake can resupply it (muscles cannot "send" their glycogen to other muscles that need it, though there is a hypothesized mechanism known as the lactate shuttle that allows this energy substrate to be transferred between cells as needed). If the liver supply is exhausted, and digestion/absorption is slowed (food intake can rarely keep up with activity, and given that exercise diminishes nutrient absorption due to shunting bloodflow away from the gut towards working muscles, this is even more problematic at moderate to high intensity), the body is reliant purely on fat stores for energy.

The issue with this is that even in the most "fat adapted" athletes, aerobic lipolysis alone can simply not provide the energy required to fuel activity beyond what is likely a moderate paced walk (even the slowest run will still use some glycogen- even if lipolysis is providing 85% of energy, that 15% is the difference between a slow shuffle and a moderate jog). When this wall is hit, muscle contraction rate is slowed to the point where they will only contract when ATP is resynthesized aerobically. Sprint and speed performance disappears, mental faculties are impaired, and overall the athlete may feel like he is running through molasses with legs made of bricks.

This is the famous "bonk" that marathon runners and cyclists talk about frequently, and it is easy to see even from an onlooker - that glassy-eyed stare and slow shuffle, slumping of the shoulders, confusion, and overall lack of interest in the rest of the race. Once an individual hits this point, there is little he or she can do beyond attempt to take in calories (if food intake has been low), and hope that the food being taken in gives him or her enough energy to complete the event without faceplanting a mile from the finish. Often a 10-15 minute pause with some food and water may provide temporary relief, but truthfully the best way to avoid this form of muscular failure is simply to never get to this point in the first place! Pacing and movement efficiency, a well-established nutrition plan, and avoiding "redlining" (or pushing into that lactate system too far) are all factors in avoiding the bonk.

Now that the basics of strength, energetics and fatigue have been reviewed, how does the body adapt to various forms of training?

MUSCULAR/PHYSIOLOGICAL ADAPTATIONS TO TRAINING

The body strives for efficiency above all other priorities - as an organism adapted for survival, the adaptations to strength and endurance training only occur, and only remain, when demonstrably necessary. Extra muscle mass is costly to build and costly to maintain, a large vascular network and extra cell organelles are wasteful if not absolutely necessary. The sedentary obese individual perfectly demonstrates our body's ideal shape when challenges are minimal and it seeks to prepare for future hardship, whereas the lean, muscular high performing strength and endurance athlete represents precisely the opposite.

This is important to remember overall, as it reinforces the point that the body will quickly undo any positive adaptations to exercise the moment it deems said adaptations no longer necessary. But what, specifically, are these adaptations, and how are they achieved?

STRENGTH ADAPTATIONS

The human body has a potential for muscular hypertrophy that is truly remarkable - as mentioned above, an increase in muscular cross sectional area is the first and perhaps most fundamental ways in which the body gets stronger - progressively imposed overload pushes the existing muscle tissue to its limit, and in the recovery process the body will temporarily increase muscle mass above baseline to prepare for future heavy loading. This muscle mass, practically speaking, consists of an increased number of contractile proteins and the cellular network required to anchor them and fuel them.

There are numerous debates currently about the relative contribution of fibers and structures (myofibrillar) versus cell volume (sarcoplasmic) hypertrophy (many argue the latter does not exist as a contributing factor), the scope of which is beyond this book - and completely irrelevant.

Increasing the number of contractile proteins is simply a function of, as mentioned, progressive overload - pushing a muscle to severe fatigue or failure which begins a cascade of both mechanical and hormonal responses which lead eventually to new tissue growth.

Momentary failure against a single maximal load is rarely beneficial for hypertrophy.

The stimulus from the acute inability to move a load rarely causes enough systemic fatigue or a sufficient response to elicit the development of new muscle tissue - failure against a 1 rep max simply does not often recruit enough muscle tissue for a long enough period of time to cause fatigue in all fibers. Certain bodybuilding techniques, including slow, controlled repetitions focusing on time under tension or heavy eccentrics, seem to be anecdotally extremely effective, as they succeed in ensuring it is actual failure of contractile tissue that results in the termination of the effort, not form failure or mental/psychological defeat.

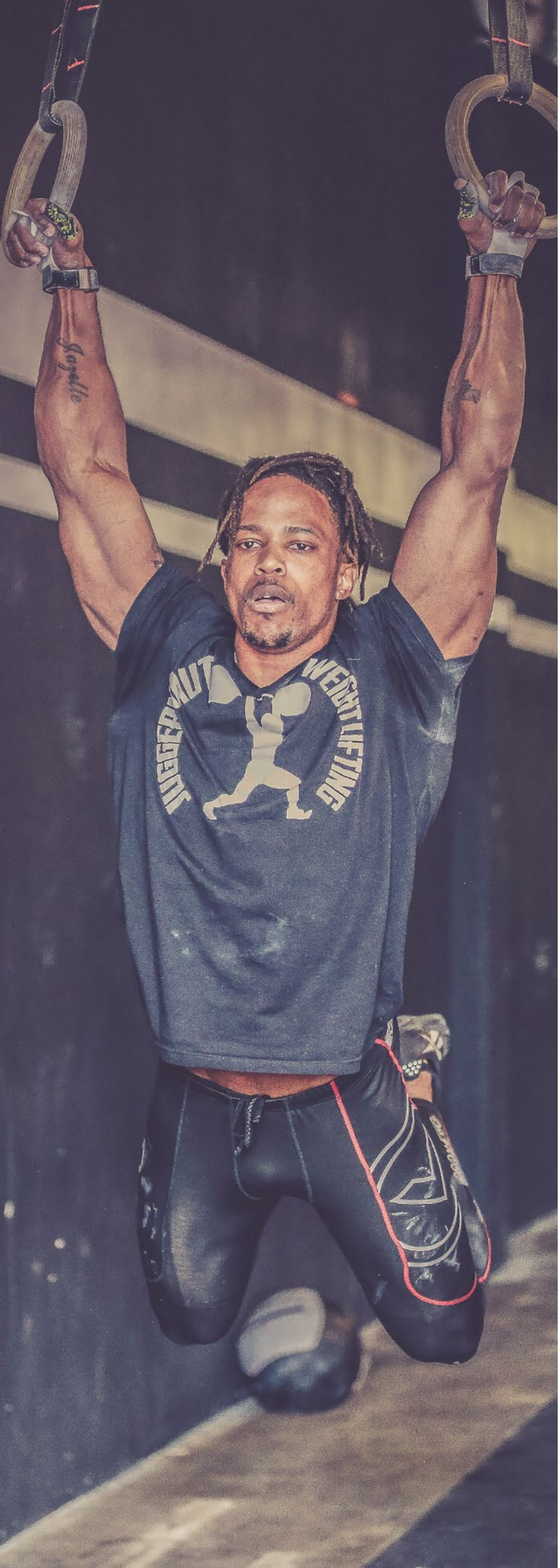
Worth noting - this increase in muscular cross section does not necessarily come with an increase in the relevant support network - new muscle tissue will not necessarily develop the same vascularity as existing muscle tissue, which can, in fact, reduce aerobic performance of this new muscle, as will be detailed later.

In addition to the enlargement of skeletal muscle, the connective tissue surrounding the muscle is similarly enhanced/built up. Tendons strengthen as muscles come under stress (though at a slower rate), and bone attachment points become more robust. On top of this, the bone itself responds to imposed load (both compression load and warping forces, such as a muscle causing the bone to bow out under load) by layering down new bone tissue, a process that is similarly slow but far more permanent than other adaptations.

As mentioned earlier, there is also a learned component to strength training - the improvement of motor unit coordination is key to both early-phase strength gains (for the newbie) and late-phase strength gains (for the elite athlete) - neither of whom experiences significant hypertrophy. This is a fairly sticky adaptation - once learned, this improved coordination seems to remain for quite some time, and can return quickly even after a layoff.

On the cardiovascular/respiratory side, adaptations are minimal. There is a slight increase in left ventricular hypertrophy associated with resistance training, but ejection fraction and stroke volume are largely unchanged - in other words, this enlargement of the heart is not associated with any increase in bloodflow, cardiovascular strength or improved “aerobic” ability.

Note that this is an important point: Many individuals seem to believe that resistance training, as it can elevate heart rate, can result in beneficial cardiovascular adaptations equivalent to those found through endurance training. This is false. The body adapts to imposed demand, and the most significant cardiovascular adaptations are a result of extended-duration activity and energy utilization, not short-duration exertion.



Glucose utilization and insulin sensitivity also increase with weight training - this can be a positive adaptation for overall health and body composition, but may also have a positive impact on glucose uptake during activity- in other words, resistance trained muscles are superior and taking in glucose from the bloodstream during activity, which can be important during any extended-duration effort.

ENDURANCE ADAPTATIONS

While resistance training has significant impacts on muscle, connective tissue, and bone, endurance training has a major impact on the heart, lungs, vascular system, and inside the muscle cells as well.

The cardiovascular adaptations of endurance training are typically the first that come to mind - these are the adaptations typically touted as being the most directly correlated with good health.

In response to endurance training and repeated demands on the heart and circulatory system, the heart itself must become stronger and more efficient. Unlike resistance training, which simply enlarges part of the wall of the heart (left ventricle) in response to brief and acute increases in cardiac load, cardiovascular training strengthens the entire heart, and most importantly, increases the vascular network that delivers blood to the heart itself (the heart itself doesn't just get blood from what it pumps - it, of course, has to pump blood to its own arteries as well, and this vascular network that fuels it is critical to allowing it to sustain stronger, faster contractions for an extended period of time).

Along with the improved vascular network, the heart's stroke volume (blood pumped per contraction) is increased - this adaptation requires extended full ventricular filling (Frank-Starling mechanism), which as mentioned tends to occur in the moderate aerobic range (70-85% of MHR) - high intensity training, including weight training, does not seem to trigger this same increase in contractility, and therefore may not result in the same adaptation.

The primary reason that these stressors are different: During resistance training/HIIT, a combination of muscle occlusion and the valsava maneuver (straining) actually increase blood pressure but occludes venous return; in other words, since everything is tensed during every repetition or short interval, no blood is flowing during muscular contraction, and less is flowing into the heart. When an individual is running or biking, this isn't the case, venous return is actually increased. In essence, with weight training, though the heart rate is increasing, it's not necessarily pumping more blood. With cardiovascular training, it is.

There is, however, some evidence to suggest that a well-adapted heart (i.e., in a trained endurance athlete) does not suffer this same limitation - as the heart strengthens and remodels, it can still fill and pump completely at higher intensities. Keep this in mind when assessing training status and relative high versus low intensity components! Many novice endurance athletes traditionally begin with lower intensity training, which gives their hearts time to adapt. The recent wave of "HIIT is king" is forcing these relatively untrained hearts well past the moderate aerobic range, where they are likely unable to benefit from the greater intensity (when it comes to eliciting adaptation).

Lung capacity is largely unchanged- there is little difference between the respiratory volume of trained athletes versus non-trained athletes. This may be unsettling to hear for many individuals who believe it is their "lungs" that are holding them back when they push hard on a run, but rarely is it carbon dioxide buildup that is causing this shortness of breath (this is an unfortunate myth that is easily debunked via blood analysis). There are a few potential factors that could be increasing respiratory rate and causing this sensation of shortness of breath, which could include temperature increase, blood pH changes (from anaerobic glycolysis), or even a generalized stress response (all of which can trigger the "must breathe harder" response).

Either way, "increasing lung capacity" is not an endurance adaptation, and "getting enough air in the lungs" is not ever a limiting factor for endurance exercise- it is the downstream factors that matter more, like getting inhaled oxygen to the working muscles and clearing metabolites, that truly matter. Therefore, it is the circulatory system causing shortness of breath, not insufficient lung capacity.

To this end, the vascular system also adapts - beyond increased heart vascularity, working muscle perfusion increases as well - the capillary network to all working muscles is dramatically increased, improving oxygen transfer capability as well as metabolite clearance.

Muscle tissue itself, however, does not enlarge as a positive adaptation - in fact, one adaptation to endurance training is that muscle fibers (particularly the slower twitch variety) can decrease in cross section.

The reason for this is simple - a large amount of contractile fibers is simply not needed for low intensity activity - far more important is easy availability of sufficient oxygen and ease of waste disposal - the smaller the cross section of the muscle, the better the capillary to muscle fiber ratio becomes (in volume). Note that this is the definitive "loss of gains" that many lifters worry about, though bear in mind that this is a highly specific adaptation, and resistance training can nearly completely eliminate this adaptation (even moderate resistance training will prevent this decrease in size from taking place.) Note that obviously higher intensity endurance disciplines that require more force (such as track cycling, sprinting, and others) will not typically elicit this adaptation, as there is no net benefit in performance (i.e., the demands of the sport will not reward it).

On a cellular level, one of the most significant adaptations is an increase in the number of mitochondria. These organelles are the portion of the cell responsible for energy generation - they produce ATP from both glucose and fatty acids. Note that they do not produce ATP related to anaerobic glycolysis. In other words, lactate production occurs independent of the mitochondria. This is important - endurance exercise can increase the number of mitochondria in a cell, which can improve cellular respiration. More aerobic ATP production means less glucose lost to lactate production - lactate production is a VERY fast method of restoring ATP and powering muscle cells, but is limited for a number of reasons, particularly because:

1. It is associated with a local rise in H+ concentration (acidity, which can shut down muscle contraction) and
2. Only about 8-9% of the ATP is produced per gram of glucose, which means that the body will blast through glucose stores much faster for the same overall amount of work being done.

Simply putting these adaptations together account for a great deal of the positive response that the body has to endurance exercise; first and foremost is improved energy substrate utilization - being able to more efficiently mobilize and burn fat and glucose will of course improve performance over time (due to more economical usage of glucose and a greater amount of essentially unlimited fat stores to burn). In addition, improved perfusion not only aids in getting oxygen to the cells, but also improves the body's ability to both buffer acid buildup from lactate metabolism (maintaining proper muscle function) as well as return lactate to the liver, where it is converted back to glucose (in the presence of oxygen). This is referred to as lactate clearance - a term referenced quite often in endurance training.

In sum - stronger heart with better endurance, better blood flow, more efficient muscles, better capacity to use fat and glucose for fuel.

It is important to note, however, that many of these adaptations seem to occur at the local level. While cardiopulmonary function is a general adaptation, other adaptations are far more local/tissue-specific.

GENERAL VERSUS SPECIFIC WORK CAPACITY

Work capacity is a term that is throw around with tremendous frequency, yet is often poorly defined. Nearly every circuit or more-than-one-repetition set that many athletes do is said to improve "work capacity," yet what does this mean? For the purposes of this text, work capacity is divided into two forms - general/systemic work capacity, and specific/local work capacity.

General/systemic work capacity is simply the ability of the organism to produce work over time. The modality itself is irrelevant. What is important here is general recovery - durability, energy stores, cardiac output and cardiac perfusion, and other general components of overall endurance that essentially provide the foundation for an athlete to train and compete for longer while recovering better.

Specific/local work capacity is different - this is the athlete's ability to perform specific movements at a given frequency/repetition (without unacceptable performance decrease). This, rather than being systemic, is tissue-specific and movement-specific.

Improving general work capacity is one potential side benefit of Hybrid Training- general cardiovascular fitness helps improve fat utilization for energy, spares glucose during recovery, ensures a higher percentage of glycogen is metabolized aerobically versus anaerobically, and generally helps maintain athlete alertness/mitigate fatigue. Every athlete can benefit from an increase in general work capacity: GPP (general physical preparedness) as an off-season emphasis is a mainstay of many high level sporting programs, yet it is often misunderstood by the general populace - many strength athletes seem to believe GPP is an in-season activity that involves high intensity training such as weighted carries, tire flips, and other physically taxing forms of high intensity interval training. GPP at its core, however, is ideally an off-season activity that is intentionally as different as possible from the primary sport- GPP is an attempt to “round out” the athlete, not further tax recovery.

Low intensity steady state cardiovascular activity fits this bill perfectly for both off-season and in-season general work capacity improvement - by improving general, “background” measures of fitness without taxing the same muscles in the same manner as the primary sport.

Steady state cardiovascular activity can increase general work capacity at little cost.

Specific work capacity is much more... well... specific. Specific work capacity is defined on the tissue level or movement level - it is the ability of the organism to perform a sport-specific or task-specific movement over and over again with minimal performance detriment. For example, for a Powerlifter, specific work capacity may in part be defined as the number of high quality squats that can be performed in a given period of time. This number can be improved almost exclusively by squatting more - improving movement efficiency, optimizing motor unit recruitment for the movement, refining form, improving local vascularity and further increasing mitochondrial density (for example) - these are adaptations that require the individual to perform the sport movement over and over again - as the repetitive movement deviates further from the sport-specific form, the carryover to specific work capacity is decreased, but is still retained to a certain extent. For example, to improve work capacity in the deadlift, volume deadlifts are at the top of the food chain. Romanian deadlifts for high repetitions may be further down, with tire flips further down the line, kettlebell swings even further (due to low load), and hill sprints even further down the line. These latter movements may improve specific work capacity in the glutes and hamstrings (and lower back), but have less translation to the deadlift than simply deadlifting.

In sum, both general work capacity and specific work capacity are of use to the athlete - when constructing a routine or considering accessory movements, it is important to incorporate both.

VO2MAX, PERIPHERAL VASCULARITY, AND NEW MASS

A final point worth mentioning - and a simple truism that the author has found in this type of training - new muscle mass without concurrent conditioning can decrease general work capacity significantly.

Those familiar with VO2max may recall that it is essentially a measure of the body's maximum oxygen utilization - the true absolute peak of oxygen uptake, and therefore, aerobic performance. Many may further know that VO2Max is typically expressed in ml/kg/min, or oxygen used per unit of bodyweight per unit of time (and is, therefore, relative to body mass). Typically there is the assumption that this is a function of lean body mass - in other words, given two equal weight athletes, the one with the lower body fat percentage will have a higher VO2 max, but this couldn't be further from the truth. Muscle mass is not all created equal in this regard - an endurance athlete's leg muscles are well perfused, and per kilogram of muscle can utilize a significant amount of oxygen. A powerlifter's legs are generally far less well perfused - their oxygen utilization is likely significantly less (simply compare the VO2 max of these individuals while running or cycling).

What would happen to a multi-sport athlete if he or she engaged in an off season strength and mass gaining phase, and added new muscle without maintaining cardiovascular fitness? This new muscle mass would be poorly perfused - the body will simply not maintain the same level of intramuscular vascularity that it developed in response to previous endurance training.

This individual will therefore notice a decrease in not only general work capacity (VO2Max will decrease, as kg is increasing, but amount of oxygen utilized per unit of mass is not), but also specific work capacity (as local vascularity is not up to par).

It is therefore critical that any athlete who requires any degree of endurance maintain cardiovascular training during any strength or mass gaining phase!

05

CRITICAL COMPONENTS OF STRENGTH TRAINING

CRITICAL COMPONENTS OF STRENGTH TRAINING

As with every aspect of training, the various physiological adaptations that occur on a micro level cannot be viewed from a reductionist perspective - in other words, focusing on individual signaling pathways or attempting to, say, maximize the expression of certain enzymes or hormones is typically a waste of time. As can be clearly seen in the field of clinical research, too many well-understood pathways in the body are remarkably resistant to manipulation, particularly the sort of gross manipulation that is often done with diet and training stimuli.

What we must then do is loosely define the various components of "strength" that can be trained independently - in other words, every different kind of strength training protocol is designed to increase "strength" of some sort - further dividing these up, we like to use the following individual components:

1. Maximum Force – the level of peak force that can be exerted to move the heaviest possible load
2. Rate of Force Development – the speed at which a muscle can go from rest to maximum force production.
3. Strength-endurance – the ability to repeatedly produce

sub-maximal force with minimal drop in performance

4. Hypertrophy – an overarching indicator of strength, as contractile force is absolutely limited by muscular cross sectional area.

Why is it so critical that these be independently defined? Each one of these items requires a specific sort of training - a specific loading protocol, cadence, work volume, level of intensity... which must all be understood and then matched with similar workouts on the endurance side of the spectrum, the details of which will be in the routines section. In addition, none of these factors are explicitly reliant on the others - each can theoretically be developed in isolation, and in some cases, even in spite of a reduction in the others.

In fact, perhaps the best way to summarize the different stressors here would be according to the following chart:

SYSTEM COMPONENT	MAXIMUM FORCE	RATE OF FORCE DEVELOPMENT	STRENGTH ENDURANCE	HYPERTROPHY
Neurological	High	Moderate	Low	Low
Mental Focus	High	High	Moderate	Moderate
Energy Substrates	Low	Low	High	High
Trauma	High	Moderate	Moderate	High

CHARACTERISTICS OF EACH TYPE OF TRAINING

MAXIMUM FORCE

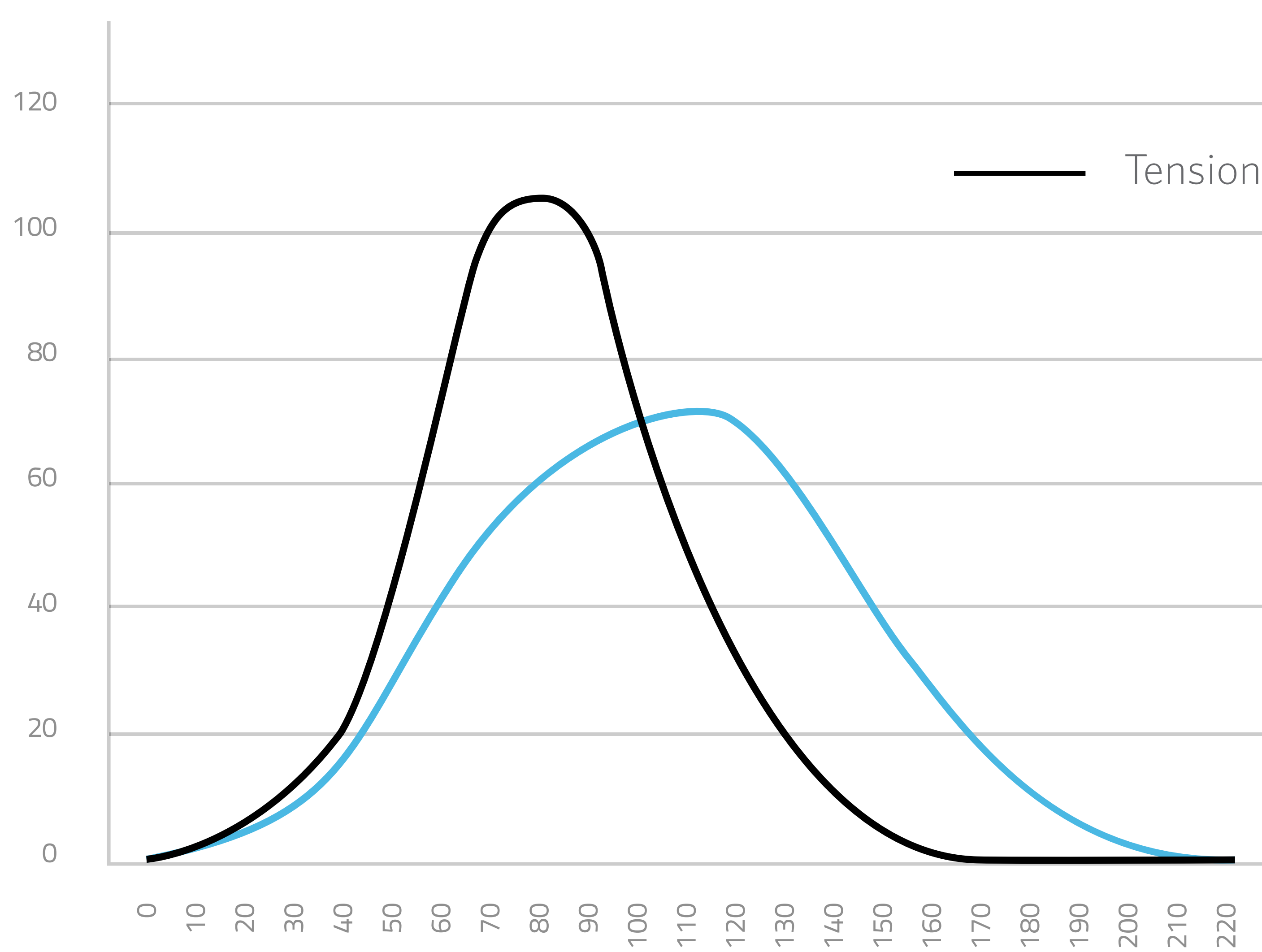
What people typically envision as representative of strength - lifting a heavy weight for low repetitions - maximum effort “1 rep max” type efforts, or any sort of heavy, high intensity, low volume loading. Note that “power”, or lifting with a velocity component, is not necessarily being discussed here - just maximum force.

Training for this is perhaps the most straightforward of all strength training - producing maximum force is highly movement specific. In other words, if you want to get stronger at a particular movement, then practice that particular movement with a heavy load. Of course, in practice this can be challenging - as can be seen on the stressor chart, the very act of near-maximal effort lifting is extremely taxing on the body - though the metabolic cost as far as energy substrates go is minimal, lifting heavy loads has the potential to cause significant stress to ligaments and other joint connective tissue (unless flawlessly executed, which is rare), and requires significant mental focus.

One can rarely “zone out” before a heavy lift - even though I recommend against getting excessively “amped up” before heavy lifting, a high degree of focus is still required. Training of this sort tends to rotate in the author’s programming between heavy (but not maximal) singles, triples, and sets of five. Note that the author does not recommend true 1 rep maxes in training, as the risk/benefit is often simply not there. True maxes simply test strength and form, they do not develop it. 95% “daily maxes” are still light enough that they can be performed with correct form (e.g. depth on the squat) with little chance of failure, reinforcing positive movements and confidence.

RATE OF FORCE DEVELOPMENT/ PRODUCTION (RFD/RFP)

Rate of force development training is frequently misunderstood- very often, “RFP” training is seen as “speed work” or dynamic effort work, where maximum force is applied against submaximal loads to improve the speed at which the body performs a given movement. Rate of force development is both a function of movement practice/economy and motor unit recruitment.



Two curves, representing the total tension that a given muscle can exert with the sum of its fibers- one curve showing a faster rate of force development, the second, a slower. For pure strength and power athletes, it would make sense to maximize the rate of power production as long as the area under the peak is usable, but note that a high peak may not necessarily be advantageous to an athlete who is looking to economize movement over time, or to maximize strength-endurance - the peak tension is not needed to move the load, but the useful tension over time may be reduced. Nevertheless, improving rate of force production is useful to nearly every athlete, as all but elite level athletes typically lack pure movement proficiency.

"Speed work," then, is seen as a major method of training for rate of force production - again, exerting peak force to move a light load at maximum velocity.

The issue with this concept is that it is next to impossible to reach maximum force with a submaximal load- the body can simply not exert 100% force against a 50% load, or 60% load, or 70% load. Rate of force development is therefore a relative quality - RFD training for a shot putter would be very different than RFD training for a Weightlifter, both in terms of load used and in terms of overall volume/recovery needs. It is important when analyzing RFD needs that the load being used is comparable to the sport-specific load, too low and the practical force application is nearly zero.

RFD training is also highly movement specific - much like maximum effort training, it focuses on neurological qualities as much as structural, so inter-muscular coordination is critical - RFD training should typically be restricted to the exact movements that the athlete is trying to improve in - as close to the competition movement as possible to maximize benefits (i.e., explosive push pressing will not improve the shot put as much as jammer extensions or the shot put itself).

The structural load placed on the body by RFD training is lower than max effort training, and while mentally/neurologically taxing, it is often seen as less "intimidating" or stressful to the athlete, which makes it an incredibly useful adjunct to max effort training for the strength and power athlete, allowing greater overall volume of the competition movement with less stress.

RFD training typically focuses on lower repetitions as well - though the load used can be tolerated for multiple repetitions, once the movement itself starts to slow, the objective of the training is lost.

STRENGTH-ENDURANCE TRAINING

Strength-endurance, like RFD, is highly relative to the needs of the athlete. Good strength-endurance for a Strongman would be exemplified by a stone load or car deadlift for reps, while strength-endurance for a track cyclist would be maintaining peak sustained wattage over time. As such, the specifics of such training vary wildly, but a few things remain consistent - strength-endurance is less specific to movements than RFD/ME training, as it is more a product of substrate utilization than it is muscular coordination (though there is certainly a "practiced efficiency" component to it). As such, the modalities used for said training can vary significantly, though in general such training tends to remain higher volume and moderate to low intensity. Essentially, this training should mimic the longest high-output portion of sport training- for Strongman this could be core/upper back/hip training lasting around 1:00 in duration (anything from push presses to frame deadlifts), whereas for a Keirin cyclist this could consist of no-rest moderate weight squat sessions lasting upwards of 2:00 to build work tolerance in the legs (the two minutes of positioning before the motorcycle pulls off). The more specific the movements the better, of course, but minor variations here can build endurance while preventing overuse.

HYPERTROPHY

Arguably the single most important factor in determining strength.

As muscular cross section is directly related to maximum potential contractile strength (this is a fairly absolute figure, regardless of gender or age), a larger muscle will nearly always be a stronger muscle.

Training for hypertrophy is still considered a bit of a black art - there are several frequent hypotheses regarding the factors that contribute to hypertrophy, and certainly several chapters could be devoted to this topic. This would be a tremendous waste of time, however, since although the biochemistry of muscular hypertrophy may be a complicated science, the practical means by which it is achieved is not.   Generally speaking, moderate load through a full range of motion with increased time under tension, performed to near-muscular failure is ideal for muscle growth. This book will pause for a moment while many readers take to online discussion boards to pick this statement apart, despite the fact that these seem to be consistent characteristics of the majority of bodybuilding programs. Overall volume need not be excessively high - once fatigue is reached in two to three consecutive sets, generally there are diminishing returns. Repetition ranges tend to range in the 8-12 repetition category, with the author recommending 303x cadences (3 second eccentric, 3 second concentric) as good guidelines, with the load being as tolerated.

WHY THESE MATTER

The purpose of isolating and differentiating these components is simple - every concurrent routine that seeks to build a more well-rounded athlete will simply need to focus on every component of these. This is even more important in hybrid training, as training on the endurance end of the strength/endurance spectrum can and will cause the deterioration of various components of strength if these are not specifically trained! It is critical to note that speed and explosiveness will diminish if an athlete consistently spends the majority of their training time (strength + endurance) training at low intensity with movement patterns focused on efficiency. Muscular cross section will decrease if the budding endurance athlete does not devote a portion of his or her training to hypertrophy.

Therefore, solid strength programming for the hybrid athlete must incorporate some form or variation of all of these types of strength training, or the individual's strength and power output will suffer.

06

CRITICAL COMPONENTS OF ENDURANCE TRAINING

CRITICAL COMPONENTS OF ENDURANCE TRAINING

For many non-runners, (and by this, I mean individuals who have not had formal running training), the quest to improve one's running ability simply consists of running more. Just ask the military or any police academy. Want to be a better runner? Go out and run. Then do it again tomorrow. And the day after. And the day after.

This works, to an extent, but this is nearly as silly as telling an individual who wants to get stronger to simply lift more, and go into the gym to pick up the exact same weight for the exact same rep range every day and hope for improvement. The individual can and will improve through this method - many individuals do improve their running ability simply by putting a few miles on the road every day, but not only is it not ideal for progress, it is absolutely abysmal for injury incidence and maintaining strength while running. An effective endurance program, much like an effective resistance training program, addresses each component of fitness individually and incorporates them all intelligently into the training cycle.

While systems such as Westside have popularized the notion of Max Effort and Dynamic Effort as components of concurrent training in strength sports, endurance training still often falls under more conventional periodization models, with different training components less well defined - indeed “speed training” versus “base building” and so forth are frequently seen as discrete phases that occur at separate times in the training macrocycle. To a certain extent, this makes sense - while many strength events can be held year round, many endurance events are weather-dependent and are typically held seasonally, which allows for the establishment of a true “off season”.

Hybrid programming, however, does not typically give the athlete the same luxury. Though technically an individual can use this programming method to have a “strength season,” where endurance work would be limited to, say, easy base building, and an “endurance season”, where strength work would be maintenance only, this is not ideal (as discussed during the previous physiology segment).

Therefore, this programming will always attempt to improve all aspects of endurance fitness simultaneously, with base building work, threshold work, form work, and all other components trained in the same microcycle.

The critical components of endurance training can be summed up (for the purposes of this text) on the high-volume-to-high-intensity spectrum:

1. Aerobic base building – long, slow, relaxed pace training that is done at a lower heart rate and for a longer distance than the athlete would target for competition.
2. Tempo work – moderate intensity, moderate distance work that is done primarily for practicing and improving on competition distance and competition pacing.
3. High intensity threshold/interval training – short distance bursts of 1-4 minutes that improve speed, power, and recovery from high efforts

4. Alactic/power training – extremely short distance work lasting less than a minute- primarily work for sprinters, or endurance athletes who wish to improve sport-specific muscular strength (in conjunction with resistance training)

There are two absolutely key takeaways from this section - if you remember nothing else, remember that:

1. aerobic base building needs to stay aerobic, and
2. alactic/power training is far less necessary for a hybrid athlete than a specialist.

These are distinct levels of training with discrete purposes, and overlap should be minimized - many endurance athletes go entirely too hard on their “aerobic” or “low intensity” days, and end up gaining neither the discrete training benefits of higher intensity work nor recovery benefits of the lower intensity work.

WHY THESE ARE ALL IMPORTANT

Historically speaking, there are periods of time where the “high intensity is king” philosophy comes to the forefront and remains there for endurance training - there are a few well known programs that endorse this particular method, many pointing to research as backup. The Tabata study, for instance, gave rise to the whole notion that doing any exercise for 8 rounds of 0:20 on, 0:10 off would improve aerobic conditioning.

SIDEBAR

Tabata: What is Tabata, and how is it done?

1) If you're not doing it on a bike or other steady, high output machine, you're not doing the Tabata protocol. It is very difficult and requires good technique to achieve this even on a rower (low stroke rate), though a treadmill is an option.

2) The true protocol is 4 days a week of intermittent moderate to high intensity exhaustive training (0:20/0:10 for 7-8 sets), then one day with a 30 minute set of steady state at 70% of VO2 max with 0:20/0:10 x 4 (not exhaustive) to finish.

3) Therefore, 0:20/0:10 x 8 is not Tabata. Anything other than the above protocol is not Tabata. In fact, Tabata is a guy's name, so your 0:20/0:10 pushup/KB circuit may as well be called "Charles". Or "Skip". Or "Frank".

4) The study's conclusions were meant more to demonstrate the specificity of exercise adaptations, not create a whole new wave of people who thought that 4 minutes of intervals would somehow magically improve both their aerobic and anaerobic capacity.

Certainly high intensity intervals work - going back to endurance adaptations, they are excellent for improving lactate clearance/tolerance, local vascularity, oxygen utilization, and lowering insulin resistance. The issue, however, is that they simply cannot be done at a particularly high volume (certainly not enough to be considered "sport practice" for most endurance athletes, where there is simply no substitute for putting miles on the road), and they absolutely do compromise strength performance (due to being a similar stressor).

Low intensity aerobic activity conveys certain similar benefits (though more systemic; overall adaptations such as improved stroke volume, improved fat utilization for fuel, etc. are more marked than lactate clearance, for example), yet without the same cost. The primary reason that low intensity work is often reviled is because of time: These are long sessions that consume training time that could be better spent on sport. The secondary reason is caloric expenditure/catabolism from extended activity. We will see in later sections how both these challenges can be mitigated, as the heavy incorporation of low intensity conditioning is what makes hybrid training even possible - to repeat - without low intensity cardiovascular activity, prospective hybrid athletes will never realize their potential.

A good program will strategically incorporate all four kinds of training outlined above, as each has their own particular costs and benefits - as you will see in the routine section, the particular stressors of each can be managed, and combined with different forms of resistance training to minimize interference/maximize benefit.

In general, in the author's experience, high intensity work should represent

5-10% of the athlete's total cardiovascular conditioning, tempo work 15-20%, and low intensity long duration the balance. Alactic work should be considered as a "resistance" component and tracked/programmed as such.

A final note- many strength athletes or less experienced runners believe that "low intensity" running will simply make them better at running slow. This is akin to stating that higher repetition lower sets simply make an individual better at lifting light weight. If done exclusively, in the absence of serious tempo/threshold work, a prospective runner will get slower, but this is why well constructed tempo work is so critical - when doing intervals, remember that the goal is to have these intervals gradually translate to steady state improvements in speed. If the rest periods aren't getting shorter or the intervals aren't getting longer or faster, then they are serving no purpose. The author recommends that intervals gradually increase in distance and duration until the near 30% of tempo distance work, then drop back down to shorter distances and increase in pace.

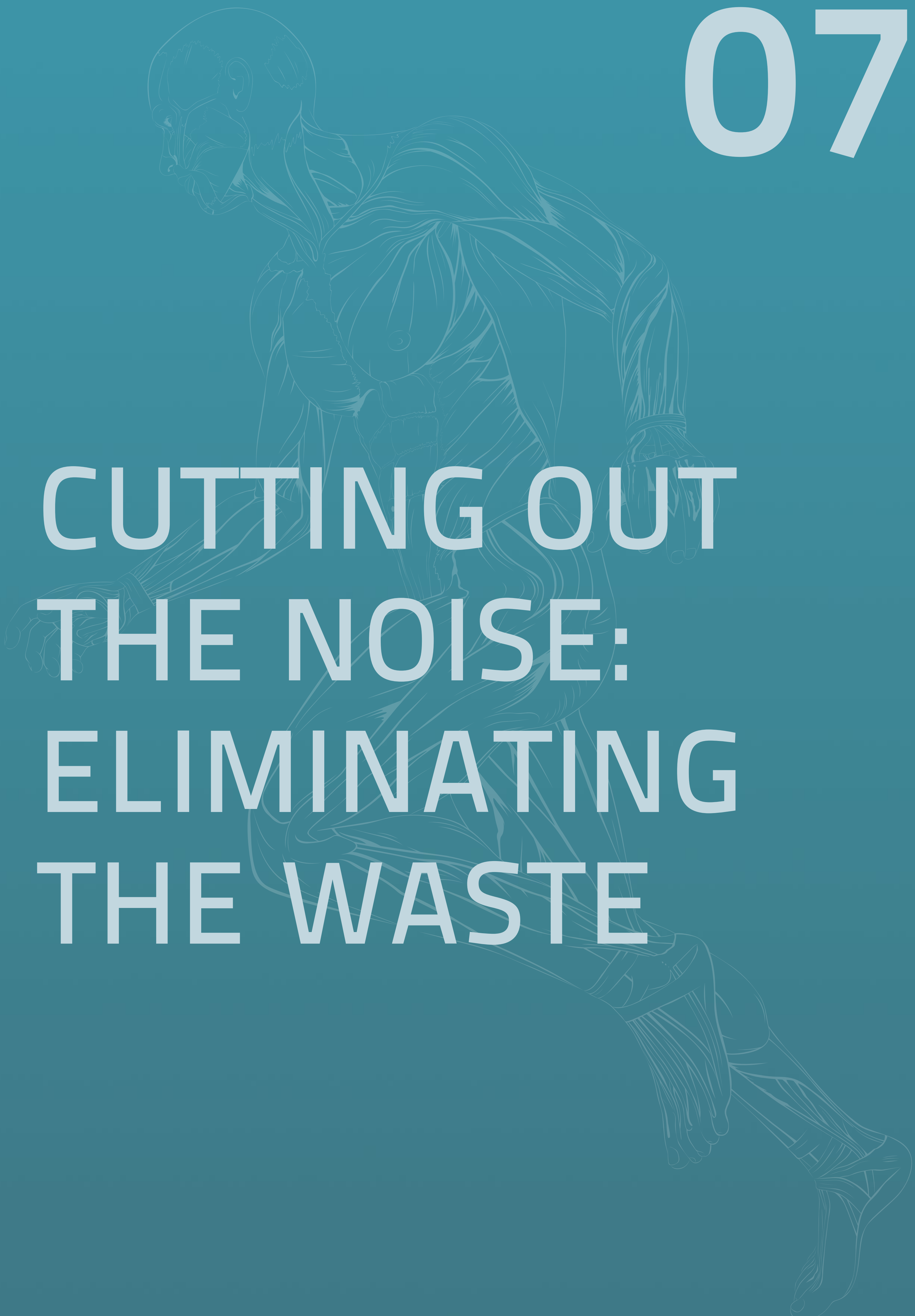
If the tempo work is not gradually increasing in speed or getting closer to race distance, no improvement is being made. Continuous progress in all components is critical, but overlap must be avoided!

SIDEBAR

The author's single biggest mistake early on was getting bored with tempo work and attempting to turn it into threshold work. Hybrid athletes especially may get frustrated with occasional slow workouts or high RPE for a rather slow speed - this is normal - volume and fatigue are masking fitness. Threshold work and speed work is akin to maxing out - it is metabolically and mentally costly, and tests fitness more than it builds it (very often).

There is a great benefit, of course, to running quickly, but rare is the sprinter or even marathoner who spends more than a small percentage of time training at race pace. A runner does not need to do his or her runs at 100% to improve! Cardiovascular conditioning, like weight training, is about pushing the body to adapt, then allowing recovery, not annihilating the system whenever possible.   When the author hired a coach to help him improve his mile years and years ago, the hardest thing to do was accept how little time he was spending running at his potential speed. Recognizing that adaptation, not demonstration, was the goal was a major breakthrough in training. The second hardest thing was realizing that, years down the line, when he relayed this story, he'd be speaking about it in the third person.

07



CUTTING OUT THE NOISE: ELIMINATING THE WASTE

CUTTING OUT THE NOISE: ELIMINATING THE WASTE

At the beginning of this text, the concept of "doing less to do more" was introduced. Given the number of different "critical components" outlined above, this may seem an impossible task - with multiple types of training to incorporate concurrently, how does one determine what "waste" is?

For waste, there is a simple way of determining whether or not something should stay in the routine or be discarded: Simple ask the question - "Will performing this particular part of my workout routine improve my final performance more than any other potential component?". If the answer is yes, include it then move on to the next. The answer will go from a firm "yes" to a more general "yeeeeeees" to, eventually, the dreaded "I think so", or "the internet said so". Any primary component of training should be both necessary and sufficient to improve sport performance in one particular component of a given sport. For a powerlifter, the squat, bench, and deadlift are all primary. For the triathlete, the tempo run or time trial. For the ultra runner, the long slow trail run. For the Weightlifter, the Snatch and C&J.

This is one major area in which hybrid training may break from several more common training methodologies - there are numerous programs out there that train around the sport specific movements or activities, building the various components of a lift or attacking, say, the swim via multiple drills and varying distance intervals. This is of course feasible for the specialist, but for the hybrid athlete. There is a major problem - recovery is of course finite, but learning is finite as well. A triathlete needs to optimize his swim stroke, his bike handling and pedal stroke, and his running gait. A powerlifter needs to optimize three lifts. Accessory work in either case may introduce new motor learning patterns, but on the balance there is both sufficient sport-specific volume to maintain proper "competition patterns", and fewer distractions.

For the hybrid athlete, there are simply too many types of learning that are being done to afford distractions - for a powerlifter triathlete, for example, the individual must learn how to, without exception, squat most efficiently, bench with proper form, deadlift properly (all these are fairly complex, individualized movements that take years of practice to perform properly at a high level)... then take those same arms and focus on mobility and even power delivery in the swim (also a form-intensive movement), cycle efficiently and master bike handling skills, and optimize running form at their race pace - all these are complicated movements requiring different muscle firing patterns, different levels of coordination, and frequent practice.

Practicing all of these in a single week does not allow much room for, say, working on the clean and jerk, pushing a sled, or working on sprint form. Why? Because all these movements mentioned require practice and focus to be performed at a level where they return an athletic benefit, and they are not the best possible option for improving both fitness and form in the sports movements.

SIDEBAR

Decathlon is considered by many to be one of the most challenging of all sports to master - the variety of strength, speed, skill, and endurance components have always kept it near the top of various polls when coaches are asked "who are the greatest athletes in the world." The author happens to agree - these individuals are absolutely magnificent athletes both in terms of capabilities and talents. Yet breaking down performance by event, individual event performance is actually fairly middling. A few of Ashton Eaton's all time best performances in individual events are as follows, compared to national (US) high school records:

- 100 meters: 10.21 / 10.01
- Shot put: 15.40m / 20.65m
- 1500m: 4:14 / 3:38
- Pole vault: 5.05m / 5.57m

So why can arguably one of the greatest athletes on earth get absolutely embarrassed by a talented 17 or 18 year old at any given event (and given that a ten second loss in the 1500 is embarrassing- nearly a full length of the track- a 36 second loss is abysmal)? Certainly body type is one factor- (shot put particularly), but even for running events: Alan Webb, at 5'9", 145, with a 3:38 1500m is certainly more suited to mid distance running than Ashton at 6’1”, 185, and Ashton and other decathletes need to maintain a body type that suits them for all events, yet this is not the whole story.

A visit to Fort Bragg will turn up a few dozen men weighing north of 200 pounds who can turn in sub 5:00 miles, yet these individuals have the luxury of focus. A decathlete must not only train to improve his aerobic endurance and strength for his events, but must practice technique in multiple different sports- the discus, pole vault, high jump, hurdles- these are all highly technical movements with different movement patterns, and a decathlete does not have the luxury of devoting half his training time (as many soldiers do) or all his training time (as milers do) towards running mid distance - in fact, Ashton does nearly zero mid distance training whatsoever - his runs are focused on the greatest overall utility for all events- i.e. short distance repeats. He may also train certain events (like the hurdles) once per week, whereas a hurdler... well, you get the idea. So this exceptional athlete, considered one of the greatest all around athletes in the world, is so hampered by the sheer number of events he must train for that he must do the bare minimum to maintain competency at each one. To put this another way, you will not catch a decathlete doing anything superfluous!

CARRYOVER CHART FOR POWERLIFTING

	SQUAT	BENCH	DEADLIFT
HIGHLY SPECIFIC	Back squat	Moderate	Low
	Paused back squat	High	Moderate
MODERATELY SPECIFIC	Front squat	Incline bench press	Romanian Deadlift
	Jump squat	Close grip bench	Deficit Deadlift
	Box squat	Floor press	Deadlift (secondary style)
	Good morning	1/2/3 board press	Rack pull
ACCESSORY	Split squat	JM press	Pendlay row
	Bulgarian split squat	Dead bench	Seated good morning
	Lunge	Overhead press	Zercher squat (sumo deadlift)
MINIMUM CARRY OVER	Thruster	Jerk	Full clean
	Overhead squat	Dumbbell fly	Snatch
	Box jump	Pushups	KB swings
	Yoke walk	Log press	Tire flip

Many complex but seemingly related movements can, in fact, be counterproductive to improving performance, simply because they are taking too high a percentage of the (more limited) time the athlete has to practice sport movements to learn new patterns.

For example, the initial pull on the clean is very different than the initial pull on the deadlift, and for an individual who'd be interested in working on even the power clean to improve "explosiveness" may find that this time is simply better spent on the deadlift itself. So what are these "high carryover" movements?

This chart may seem exceedingly obvious, but it is highly recommended that every individual generate a similar chart for every sport they are engaged in. Generally speaking, with all these charts, select movements near the top of the list and work your way down. Minimum carryover movements should be discarded, accessory movements utilized sparingly (as mentioned below), and moderately specific exercises used to bolster the highly specific. You may notice that the resulting routines you will end up building may be rather... boring. However, we are of the opinion that success is more entertaining than lift variations.

A common question at this point is often, "What accessories are useful?" The answer - only those ones that definitively impact a specific weakness.

This does not mean including good mornings because these are a typical squat accessory movement - for a hip/hamstring dominant squatter, these may simply exacerbate movement issues (including premature hip lift and forward lean), while close grip benching for a presser who has weak pecs (Yes! Benching uses the pecs) may be a complete waste of time. Answering this question requires assessment of the athlete's lifts - video analysis and/or a coach's trained eye are best. Generally, pick the competition movement, 1-2 accessories that absolutely assist the movement, and 1-2 additional movements that can provide structural stability/indirectly assist with the lifts. Period, full stop.

If there is a single way to sum up this segment, it is this: Avoid distraction. The more sports or movements an athlete wishes to excel at, the less room there is for deviation. One of the biggest pitfalls is the thinking “well, this could help”. There is no room for could- a given exercise at a given prescribed intensity and frequency either definitely improves performance to a level that exceeds its recovery and opportunity cost, or it does not. If it does not, scratch it.

SIDEBAR

Tire flipping, for a Strongman competitor, is tremendously applicable to the sport. There are numerous events that involve exactly this sort of movement (including, yes, the tire flip),

For a CrossFit competitor, hell, there might be a tire flip at the next Games, so why the heck not?

For a fighter, repeated engagement of the hips and posterior chain in this fashion may indeed be useful for competition- shooting then taking down an opponent engages precisely these sorts of muscles, and improving the athlete's ability to perform this movement repeatedly can certainly improve one's chances in a match, so tire flipping is actually a fairly good accessory exercise, and certainly incorporates the "imbalanced load" concept, which an opponent certainly would be. This should still be incorporated sparingly, though, as an accessory to resistance training, not a primary form of conditioning.

For a Powerlifter, this movement is all but useless. If it is to be aerobically taxing, the loads used would be insufficient for any strength increases in the posterior chain or chest/triceps. If it is not aerobically taxing, then it is simply introducing a complex high load movement that is not being tested in competition, and is inferior to, say, the deadlift, stiff legged deadlift, rack pull, or incline bench at improving the athlete's ability to squat, bench press, or deadlift.

If the Powerlifter is looking for an improvement in aerobic capacity, he or she should engage in aerobic activity that overlaps the least with the muscles and energy systems they require in sport specific training and competition. In other words, a slow jog or extended elliptical workout will not heavily recruit type II fibers, over-stress tendons and ligaments, and otherwise hinder the body's attempts to recover and adapt to heavy lifting. Not to mention that this complex movement introduces absolutely unnecessary risk into the training program! Torn biceps are a big enough problem in the deadlift. No need to add to the issue.

For a runner, the movement is equally useless. Clearly it will not be aerobically taxing. If he or she wishes to improve local muscular endurance or power in the legs for running purposes, uphill sprinting is far more specific. If he or she wishes to improve bone density, back strength, or improve weak hamstrings, he or she is far better served engaging in a carefully designed weight training program incorporating a deadlift variation or two - there is less chance for injury, a much shorter learning curve, and quite frankly he or she will be less physically devastated after a few sets of deadlifts than after moving a tractor tire back and forth across a parking lot. Tire flips are fun, trying new things are fun, but getting injured and wasting time is not. The author has ample experience with both.

08

SPORT SPECIFIC TRAINING

SPORT SPECIFIC TRAINING

Moving on from the background, this section will get into more analysis and practical application of these concepts. Generally speaking, it is worth bearing in mind that the content contained herein is within the context of hybrid programming - entire volumes could be written on the specific training for each discipline, and attempting to duplicate it here would be extraordinarily cruel to the editors. Two realms of athletics will be discussed initially because of how they exemplify the Hybrid concept, followed by more general considerations for individuals on either extreme.

THE MILITARY ATHLETE

Training for Law Enforcement, Fire, and Military personnel has come a long way in the last twenty years. That is to say, in twenty years, it has... successfully aged 20 years without much change at all. Though PT can occasionally be somewhat innovative and interesting (with certain units running through the occasional metcon or high intensity circuit or complex, and incorporating intelligent cardiovascular training protocols), this is far from the standard. The APFT still measures basic bodyweight strength and basic short to mid distance running speed, two important measures of fitness, but far from comprehensive, and far from predictive of actual operational efficiency.

The reasoning here is simple, of course - these are all basic tests of bodyweight strength and speed, they can be done with relatively little practice and next to no equipment, and they are easily scored. What this does not measure, however, is durability, strength, mental fortitude, general aerobic capacity, or any other measure of overall physical capability that would be critically important to a police officer or SWAT officer involved in a high stress extended engagement, a firefighter team engaging in an offensive attack (breaching, hose operation, etc) in a live structure fire, or any military personnel out in the field who may face multiple high stress engagements requiring both mental and physical alertness after extended durations of steady effort (patrols with full gear). For this reason, many of these individuals have multiple priorities in their training:

1. Meet or exceed testing standards
2. Maintain favorable body composition
3. Build and maintain excellent aerobic capacity
4. Build and maintain greater than average strength and strength-endurance

These goals are arguably a solid summary of hybrid training goals in general. There is one major confounding factor, however- many individuals in these professions rarely have complete schedule autonomy, which further complicates and restricts the training that can be done. Because of this, training needs to be even more targeted toward improving the specific components of strength and fitness that will improve relevant performance.

This last sentence is key - what is “relevant performance” to a soldier? Is a big bench press critical? Likely not. How about the squat, the cornerstone of most weight training programs? Not really.

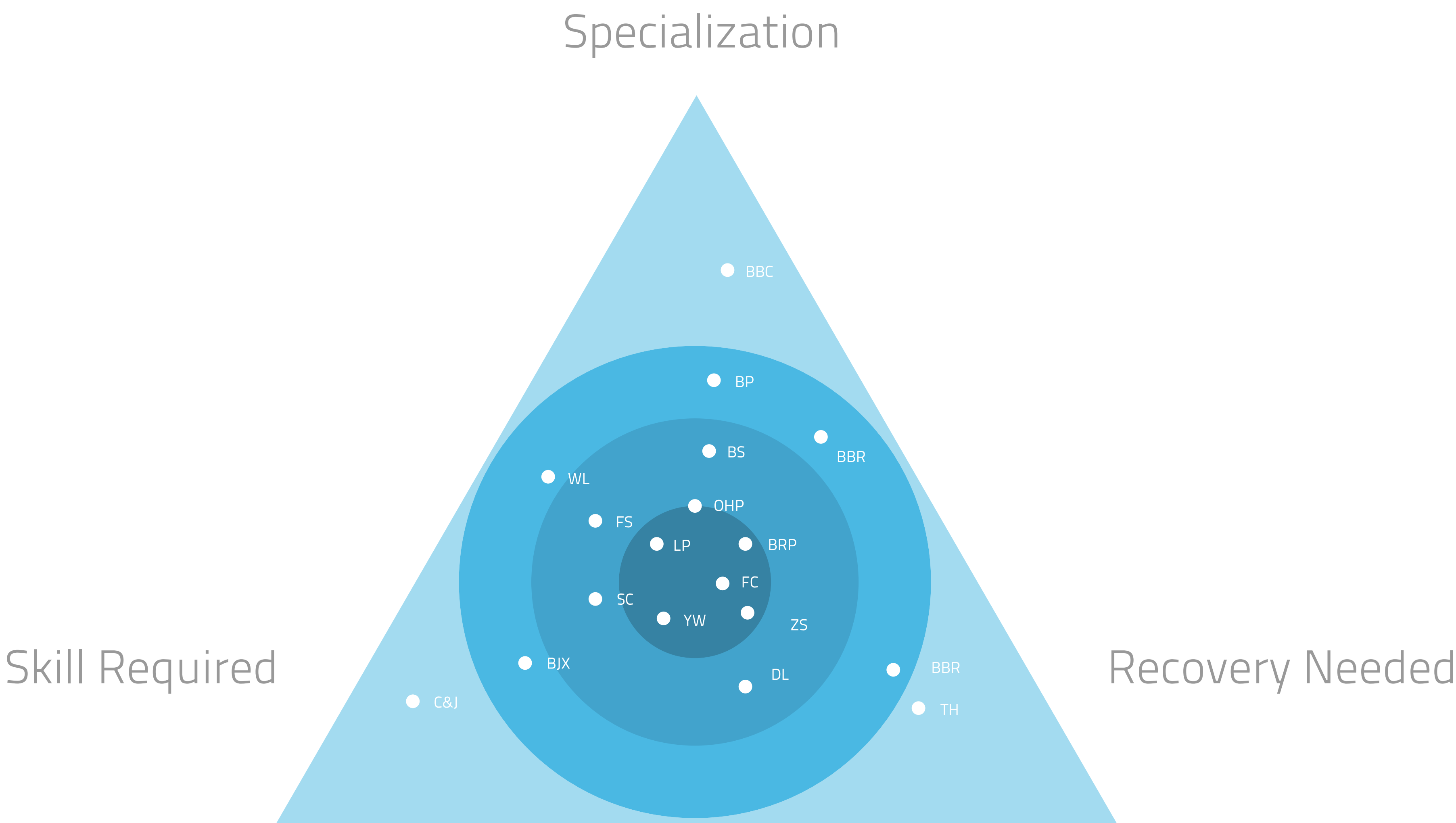
Relevant performance is pure operational performance - rarely will a police officer find himself assaulted by a heavy barbell which he is forced to squat for a few repetitions before returning to a rack.

The thing to remember here is that the weights are a tool, the means to an end. The thought process that dictates a certain lift or movement needs to stay in the rotation needs to vanish.

So what movements do work best? Each movement needs to be evaluated on three metrics:

1. Specialization versus carryover
2. Recovery requirement
3. Skill requirement

The ideal movements have high carryover, a low recovery requirement, and a minimal skill requirement.



Note- see Appendix A for exercise abbreviations

If you think the resultant lifts look remarkably like a combination of Strongman and "the sport of fitness", you'd be correct. Carrying heavy loads, picking up odd objects, moving the body through space, and repeatedly moving sub-maximal loads through a wide range of motion are all movement patterns that are highly translatable to this particular population.

The military athlete - training considerations and priority movements:

Most of the center circle items, you will notice, address the basic physical "needs" of the job, which are as follows:

1. Lower back / core strength

If there is one thing that is absolutely crucial to durability, both during training and for career purposes, it is a strong back and midsection. Though ruck marches may fatigue the upper back and shoulders significantly, this discomfort is often a result of compromised posture as the lower back fatigues and weight begins to shift forward.

A major training priority, both for durability during extended movement under load, as well as for performance and speed out in the field while in full gear is precisely this core strength and endurance, which both directly supports improved performance. Infantry, depending on mission, can carry from 40 pounds of gear (very minimum) up to well over 90-100 pounds of equipment. Firefighter turnout gear can weigh 45 pounds for just the protective gear, plus any other equipment along with heavy hoses... in all these cases, the entire body is under extremely heavy load yet the individual must still be able to quickly respond to physical threats and changing environmental conditions.

Strong legs and a strong upper body are absolutely meaningless without a strong core to transfer this power. This is why weighted carries, plank variations, and deadlifts remain so close to the center of the triangle.

2. Ankle Lower Extremity Strength, Health and Bone Density

Carrying all this gear, surviving Selection, avoiding stress fractures - the feet, ankles, and knees of this entire population can take a tremendous pounding both in training and in the field. Stress fractures and the like can be managed via simply taking time off, but avoiding them is obviously far better than treating them. To build up the necessary strength and bone density, these individuals need to be consistently subjecting their lower extremities to progressively greater loads and time under load, as well as mechanical stress.

Clearly the act of running (or rucking) alone is enough to elicit the necessary adaptations, but carefully programmed plyometric activity and, again, weighted carries can certainly both speed the process and allow for a slightly lower training volume to get the same response.

Rucking, LISS running, and weighted carries all address these needs, and are therefore close to the center of the triangle.

3. Upper Body Strength-Endurance

Overhead carries, supporting a load on shoulders, pullups, or even simply carrying a moderately heavy load in the hands for extended periods of time - these are important both in testing standards as well as for mission/call requirements.

These all require a powerful shoulder girdle, well balanced/supported shoulder joints, good grip strength, and excellent deltoid/tricep strength-endurance. Overhead presses to overhead static holds, thrusters (particularly as part of an overall metcon), crucifix holds, sandbag carries, farmer's carries, and light weight yoke walks (focusing on stabilization of the yoke at speed) are all excellent options, as are standard push/pull barbell movements, particularly snatch grip rows, rear delt flyes, and muscle snatches/cuban rotations to assist with shoulder balance. Weighted pullups, towel pullups (for grip), and burpee pullups are all excellent ways to grease the groove for the APFT as well.

4. Aerobic capacity

Running, rucking, and occasionally rowing are all viable methods of increasing aerobic capacity. No magic here, but programming must take into account the routine as a whole (outlined in the routines section). Please note, the author is tremendously in favor of low intensity running with higher intensity “surges” interspersed - a bit of fartlek training, but with a lower average intensity.

Being able to recover while still moving at moderate intensity is absolutely crucial for performance for all these individuals, and training oneself to continue to push at 60-70% while waiting for breathing and heart rate to return to zone 2 is a learned skill.

The majority of the movements above may look familiar, as mentioned - a number of them are traditionally Strongman lifts, which makes sense. These individuals essentially train to carry heavy loads, lift odd objects, and have tremendous core and shoulder/upper back strength. Combine these traits with additional aerobic conditioning, and you have an incredibly functional athlete - indeed, a lightweight strongman with a conditioning background would fit the author’s profile for a nearly ideal SOF candidate.

Does this mean there is no room in these routines for the basic strength movements? Absolutely not - these exercises on the outside circles are very useful “off-season” exercises.

WHAT IS THE OFFSEASON?

Like any other group of people with physical standards and physical goals, the first step in designing a routine is to assess/compare the individual compared to the ideal candidate/athlete. This requires brutal honesty, and it also requires plenty of insight into the profile of a successful candidate. What the individual must then do is break down their current performance envelope and focus initial development on those arenas that fall short. Though the squat is not, as mentioned particularly "functional" to this population, a certain level of strength here indicates a certain level of overall fitness and robustness that needs to be addressed.

If the typical successful SFA candidate has a squat north of 355 (which we have found to be the case), an individual with a 315 squat likely has a number of physical weaknesses/deficiencies, which a focus on the squat could address (lower back strength, hip strength, knee stability, etc.)

These "outer ring" movements are therefore movements to focus on initially if they are needed, at which point they should gradually be phased out in favor of more specific movements with higher carryover- movements that address the specific needs of these individuals. This off season is also the time to make body size/composition changes if needed- once the push becomes pure performance, the individual cannot afford to have diet come first (as it would if size gain or loss is the goal) - diet must strictly support activity. The off season, or the 4-8-months-out time frame (before any kind of selection or academy tryout) is the time to make the necessary changes in body size/shape, shore up weaknesses, work on strength and conditioning fundamentals, and otherwise prepare the individual for the 3-4 month specific prep (and later, ongoing conditioning).

09

FUNCTIONAL FITNESS COMPETITION

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Functional fitness competitions, including the CrossFit games, are perhaps some of the most complex, multi-dimensional sports currently practiced in significant numbers - the combination of strength, sport specific skill, endurance, and bodyweight strength-endurance makes CrossFit competition a logical choice when many people are discussing applications of Hybrid methodology. Note that many readers may not necessarily be interested in competing in this sport, but there are still many lessons to be learned here for OCR competitors, military athletes, and even strongmen.

As the sport has progressed, there are multiple theories (often poorly researched) on how the elite athletes train for competition, with some individuals firmly stating that the majority of the off season is spent focusing on strength training, with an endurance focus in the ultimate 6 weeks before competition. Given the segment on endurance adaptations above, it is easy to see why this is wrongheaded from a physiological standpoint - the majority of these individuals should use variants of concurrent training, incorporating strength work, metcons, and conventional cardiovascular conditioning to improve all components of fitness during their sport training.

For individuals looking to improve every component of their sport performance here (and indeed, to even non-functional fitness athletes who appreciate the variety of abilities that these individuals possess), Hybrid methodology is nearly perfectly suited.

THE COMPETITOR

For the competitor, the first stage in program development is, of course, athlete analysis - what complicates things, however, is that absolute performance parameters can be deceiving - conventional tests of strength and aerobic fitness (for example, the 1RM back squat and 5k) are not necessarily associated with superior results in competition. This is because, in functional fitness, it is sustained performance over time which is important - rarely is it thresholds or limits that determine the victor, but rather it is practiced efficiency and repeat performance at a high percentage of maximum intensity. The successful competitor is fairly strong, but has excellent strength-endurance and has the ability to operate at close to threshold without exceeding it.

THE ROLE OF STRENGTH

The role of strength in functional fitness obviously cannot be dismissed - with any repeated effort workout, of course, if the athlete cannot complete a single repetition with a given load, or if a given load is such a high percentage of maximum that he or she is fatigued after a single repetition, the individual will perform poorly or simply have to scratch that particular workout, which is devastating for a competitor.

There is one thing that is important to remember, however - maximum strength does not necessarily translate to improved strength-endurance.

In other words, if an individual were to increase his or her squat by 50 pounds, from say 300 to 350, the individual may improve his or her ability to squat 250 for maximum repetitions, but may or may not improve this ability significantly, perhaps not even as much as an athlete who had focused more specifically on improving strength-endurance in the squat (with lesser increase in maximum power). In fact, this athlete may not improve it at all- there are many CrossFit Games top athletes with back squats that may seem “mediocre” by Powerlifting standards (usually in the 450 to 500 range), yet their ability to rep out 315 may exceed that of individuals with 600+ pound squats. Strength-endurance is not dictated solely by percentage of maximum force exerted!

This is a simple issue of cost-benefit and training economy- certainly increasing maximum strength can lead to increases in strength-endurance at a given level, but for multi-sport athletes, it may be far more economical for them to focus on incorporating strength-endurance work than multiple max effort cycles. Remember the opportunity cost- maximum effort training is costly to program in (in terms of time and recovery needed), and has lesser translation to the sport. Increasing limit strength rapidly becomes a case of diminishing returns, where the training time required to attain minor increases in peak force output (which may not translate to improved strength-endurance) becomes disproportionately high compared to other, perhaps more important components of training.

For a Games level CrossFitter, increasing his squat to 550/600 pounds would require entirely too much effort and dedicated squat programming to be acceptable.

Strength-endurance work, however, can be incorporated as part of a metcon, done as a finisher, or otherwise programmed in filling multiple roles. Also bear in mind that any increase in maximum power may require not only time and recovery, but changes to his or her physical shape and size that may be unfavorable.

For this reason, strength is more of a barrier to entry into, for example, the CrossFit games than it is a winning trait - in other words, the athlete needs to evaluate the strength levels needed to compete at the level he or she wishes to, and not get caught up in increasing strength numbers for their own sake past that point. There are many prospective CrossFit games athletes who are chasing high numbers in the squat, deadlift, or other power lifts with little regard given to the opportunity cost of this training - hours spent increasing a lift that does not need to be increased could be far better spent on skills practice or conditioning practice.

Finally, a common question is the role of various intensities and types of strength development. Should the prospective Games athlete be doing max effort work? What about speed work? Volume work? For max effort, the answer is yes, but only in the pre-season - if the individual is not yet at that base level of strength to compete once increasing sport focus becomes the emphasis, then he should look to the following year to compete. For speed work, the answer is always no - metcon performance is about efficiency- utilizing just enough energy to move a given load quickly but without using more force than is necessary. Speed work, as it is usually prescribed, is maximal force applied to a sub-maximal load, precisely what these athletes should not be practicing! While useful for an athlete looking to maximize force output in a single repetition, if one watches a CrossFit Games athlete compete, it's easy to see that each repetition is performed quickly and powerfully, but not with tremendous additional force or momentum.

Finally, volume work - this is an absolute yes - volume work builds specific work capacity and strength-endurance, which are musts. In fact, bodybuilding-style workouts can have tremendous translation to strength-endurance, which can greatly assist in functional fitness competition.

THE ROLE OF ENDURANCE

Functional fitness is an endurance sport, period. Any sport that has a timed component involving multiple repetitions, which punishes a lack of conditioning, can be termed an endurance sport. Though Strongman is rarely considered an endurance sport, it also fits these same criteria, and indeed Strongmen are endurance athletes to a great extent. The primary difference here is the balance of performance parameters - Strongmen can get away with short alactic bursts of energy, requiring far less actual aerobic capacity to perform at a high level (though in the next section, we'll discuss how aerobic training can still benefit them), while functional fitness athletes must indeed train those aerobic systems both to fuel the individual workouts and to sustain energy throughout a long day of competition.

As discussed earlier in the segment on aerobic adaptations, low intensity cardiovascular conditioning has a place in nearly any routine - the metabolic cost is comparatively low, the skill component is relatively low, and it can easily be performed as the second workout of the day with minimal stress. The positive adaptations from aerobic training translate to nearly every component of the sport - improved lactate threshold allows for a higher consistent power output and more consistent high effort work, better overall aerobic capacity helps maintain energy levels both over longer duration WODs and over the course of day long and multi-day competitions - the benefits are enough to be nearly self-evident.

SIDEBAR

Functional Fitness is not a high intensity sport

Though many workouts are seen as opportunities to absolutely exhaust oneself, a great deal can be learned from watching top level competitors perform in competition. One need only watch Froning to understand the importance of pacing - his strategy has long been to maximize performance over time, not come out of the gate with guns blazing, but operate just under threshold long after other competitors have gassed out, either due to acute exhaustion or exhaustion over the course of multi-day competition.

Critical to success in, for example, the CrossFit Games, like any other endurance based sport, is managing energy levels and operating under one's threshold. As CrossFit has multiple modalities, and it is significantly harder for an individual to maintain a truly consistent power output (as you could, say, on a bike), it is even more important that the athlete pay attention to when he or she may be "redlining" - tapping into the lactate energy system too much and not only temporarily exhausting glycogen levels, but putting him or herself in an energetic hole that cannot be recovered from - once the muscles are bathed in H+ ions, performance deteriorates rapidly and the athlete hits the wall. Often the inexperienced athlete looks to push to threshold on more "pure cardiovascular" components of a given workout, such as a rowing or running component, without realizing that this is absolutely destroying their ability to perform the skill portions with any degree of competence.

SKILL WORK AND TYING IT TOGETHER

With functional fitness training, given the dual emphasis on strength training and endurance training, with a further emphasis on training multiple skills and movements (far more than any other sport), putting these components together without suffering from massive burn out would seem to be insurmountable.

The key, however, is the often-neglected "moderation" component of training - the notion that productive work, even metabolic conditioning work, does not have to be high intensity or high volume to be effective. Indeed, given the various types of stimuli required for the sport, the majority of workouts should not be high intensity - instead, the training priorities should be focused on when volume and intensity are being prescribed. So what are these training priorities?

THE SPECIFIC NEEDS

1. Performance while fatigued - the athlete must be able to perform to the peak of his or her abilities while both acutely and chronically fatigued - volume and proper workout construction aimed at consolidating fatiguing stimuli are crucial here

2. Gymnastic and Weightlifting skill - these complex movements need to be practiced regularly, with high frequency.

3. Strength-endurance - improving repetition performance at 70-80% of maximum load

4. Focus and pacing - the athlete must build and maintain the ability to operate just under his or her fatigue threshold, and practice proper pacing throughout a workout.

5. Overall aerobic conditioning - the quality of the athlete overall deteriorates quickly if aerobic conditioning is not maintained.

6. Mental preparation and discipline - the athlete must learn how to deal with frustration. Given the wide variety of movements required, it is highly likely that an athlete will encounter a movement or three in competition that is one that she traditionally performs poorly in. Frequent programming of these "pain point" movements, particularly in timed workouts, is important as this builds the individual's ability to manage a poor component without derailing the entire WOD. It is also critical that the athlete partake in random WODs - it has become fashionable in some circles to focus on careful programming exclusively in the off season. This is a mistake, however, as an athlete who has done nothing but focus on carefully planned programs that address specific needs/weaknesses may be ill-prepared for the occasionally random and/or "poorly constructed" workouts encountered in competition. Mentally speaking, the individual needs to be prepared to handle workouts that may over-target certain muscle groups or energy systems, or ones that may, in fact, be insurmountable. This is like determining if ball drills, running plays, and

> weight training versus scrimmaging is a better way to develop ball players. You need both - neither one on its own has any hope of developing the best competitor.

It is important to understand the six above points before sitting down to analyze a program. Most important is understanding that at no point in the training cycle can any of these priorities be allowed to slip.

10

CONDITIONING FOR THE STRENGTH ATHLETE

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For the strength athlete, cardio is often considered a dirty word. The numerous jokes that run along the lines of "cardio is more than five reps" and "powerlifting- a triathlon for real men" would be significantly more humorous if they didn't speak to more than a bit of laziness. The statement before from an admitted cardio lover who also out-lifts the vast majority of strength athletes should kill the argument that it's an activity for a "lower" tier of athletes. But hey, cardio - it kills your gains, right?

Truthfully, it can, but this takes a concerted effort. Poor programming, insufficient calories, or insufficient recovery can negatively impact strength and muscle size, but this is easy to avoid. The best way to serve these two masters is to keep their needs as separate as possible (just leave that statement alone, please) by understanding your recovery and energy systems.

Remember from the earlier discussion the order in which energy substrates are used by the body: ATP and creatine phosphate during short, intense bursts of activity (5-15 seconds of actual activity), glucose for medium duration activity (20 seconds to a minute or two), and fat stores once effort is extended out beyond that. Important to recall is that this is a continuum- technically, all of these systems are being used at all times, the degree of each is all that changes.

More relevant is that glucose levels are not a limiting factor during heavy lifting. Maximum effort work is rarely restricted by low levels of glycogen - this energy system is simply not relied upon to a tremendously great extent. If you are glycogen depleted, you can still lift quite heavy - you will just need to take longer breaks to allow your body to resynthesize short term energy substrates at a slower rate than a well-carbed athlete. This is an important fact to remember if you're contemplating how you can do a long run one day and lift heavy the next. It's not really the lack of energy that will hinder your lifting the next day so much as actual muscle and mental fatigue, which has more to do with microtrauma/extended time under tension than energy substrates.

Structure your routine to allow for maximum recovery, which is the key behind this entire concept. More on this in the sample routine below, but long story short, you need to understand what types of running hinder your lifting the most (hint: mostly sprints and hill climbs - those runs that heavily engage your type II muscle fibers), and plan accordingly. Which also means, yes, do not sprint unless you have to. If you are a serious strength athlete, sprinting will not build leg strength. Period, full stop.

The forces exerted by all but an Olympic level 100 meter sprinter during acceleration, though significant, do not remotely compare to the forces exerted during heavy squats or snatches. You may see articles telling people to do "speed work" to improve your explosiveness. If you're a lifter who already incorporates dynamic effort work of any sort, you are getting plenty of this.

The real benefit to this sort of work would be in improving overall speed and pace during the run, but as a strength athlete, you need to approach this with care, since being too aggressive here will not help you. For the most part, the less you are demanding of your type II muscle fibers during your running, the more they'll be in top shape for your lifting.

Therefore, it is critical for the strength athlete to stop thinking about conditioning as a high intensity activity - while high intensity and interval work certainly has its role, this should not make up the majority of a strength athlete's cardiovascular training. Instead, the major thought should be "What will interfere with my strength training the least?" - and bear in mind, this does not have to be running. Yes, if a powerlifter wishes to complete a 5k or marathon, running should certainly be the cornerstone of his/her training, but it does not have to be the entirety. In fact, the generalized lower intensity work, with its systemic adaptations, can in fact be everything but running - the minor loss in running fitness due to lack of specificity will be outweighed by the overall lighter load on joints, connective tissue, and eccentric loading that can be detrimental to strength.

So why would a powerlifter look to improve aerobic conditioning? Can it help sport performance? The answer is (provided that deleterious effects can be minimized) an absolute yes. Health benefits aside, though powerlifting competition is a pure ATP/CP sport, recovery even over the course of a workout taps into aerobic systems heavily (for substrate replenishment and recovery between higher volume sets). Improved aerobic capacity can lead towards greater overall work capacity and training volume, as well as faster recovery between sets.

Improvement in muscle glycogen stores and increased mitochondrial density would also greatly improve training quality (by allowing higher workout volume), and though event day sport performance will not be directly impacted, more (and longer) quality training sessions are a major benefit. Is aerobic training necessary for the powerlifter? No. But all else being equal, these positive effects are decidedly worthwhile for the majority of lifters, and the author is of the opinion that a lifter with superior aerobic capacity will have more productive training sessions than one who is absolutely exhausted after walking to the monolift.

SIDEBAR

Distance running, or any type endurance sport for that matter, becomes more challenging for the larger, more muscular athlete and not simply because you weigh more. In running and biking, the added weight not only acts as resistance but also forces a change in body mechanics - the larger you become the more pronounced this is. If you're a triathlete, added muscle mass also makes the swim portion much more difficult because your density increases, making you less buoyant - thus making you work harder to not only swim quickly and efficiently, but also to just stay afloat. However, this isn't to say the two seemingly opposites of endurance sports and strength training cannot be effectively combined.

Let me share some of my personal experience with you. While admittedly being more of a recreational endurance athlete, I have nonetheless enjoyed running and biking throughout my entire life. Even though I have chosen to focus on powerlifting and more recently bodybuilding for the majority of the last twenty years, I have continued to dabble in running and biking and have competed in a handful of middle distance events. In my late teens and early twenties I ran a number of 5K and 10K races in addition to many three mile races that we were required to run in the Marines. My personal record was an 18:00 minute three mile weighing 185lbs at age 19 to go along with a sub 5 minute mile. I was able to keep my three mile time in the 18's and 19's until my body weight exceeded 200lbs. At this point I slowed to over 20 minutes and by the time I had pushed my body weight up to 225lbs my run times entered the 21s.

Over the years as I focused on powerlifting and began competing professionally, my body weight continued to climb as I added muscle mass to aid my strength gains. As I grew, running became increasingly difficult, but I was still able to post mid 6 minute miles while weighing 250lbs with very little training for many years even as I entered my middle and late thirties. This time period was also while I was chasing the all-time world record in my weight class in powerlifting which I eventually achieved posting a 1003lb squat, 738lb bench press, and 810lb deadlift for a 2551lb total in the 220lb class. As a side note, even though I competed at 220lbs I generally walked around at 250-255lbs and was known for my drastic weight cuts for competitions.

With all of that being said I do still firmly believe with properly programmed training combing both aspects of endurance work and strength training, any hard working athlete can post very respectable numbers in both disciplines.   I will be working with Alex in the upcoming months to help restore my endurance capacity, improve my overall health and well-being and hopefully break a PR or two.

-Matt Kroczaleski is a former Marine, a cancer survivor, world champion and world record holding powerlifter and an NPC bodybuilder. He is the 2006 Arnold Schwarzenegger Classic WPO Powerlifting Middle Weight Champion and in 2009 became the all-time world record holder in the 220 lb class posting a 2551 lb total via 1003lb squat, 738lb bench press and an 810lb deadlift. Check out his book "Insane Training" (it can be purchased on Amazon, Barnes & Noble and at pretty much any major book retailer) and his web site www.mattkroc.com for more on this athlete.

WORK CAPACITY VS AEROBIC CONDITIONING

Note that these benefits are independent from specific work capacity - discussed earlier. Specific work capacity directly results in more repetitions and a higher movement-specific training volume (i.e., improves the duration of specific efforts, and potentially can increase total poundage lifted over the course of a given training week). General work capacity/aerobic conditioning indirectly results in higher volume due to improved recovery (particularly between efforts) and greater overall training load (poundage in all movements cumulatively).

Work capacity training for the Powerlifter primarily consists of more sport-specific movements - there is significant overlap between work capacity training and strength-endurance training in this case. Work capacity training may involve something as simple as high repetition work or multiple partial repetitions, but can also mean the use of odd implements or non-movement specific loads to improve the individual's work capacity in general movement patterns if these patterns are weak (e.g. kettlebell swings to improve hip/posterior chain work capacity, or basic weighted carries to improve upper back/core stability and endurance).

Note that this kind of training will certainly elevate the heart rate and is physically highly taxing, which mistakenly leads many individuals to believe that it is aerobic activity or "cardio" - this is simply not true. The stresses on the system associated with this kind of training do not result in the physiological adaptations that make aerobic training good for recovery and general health. On the same token, aerobic conditioning is not a substitute for this kind of work capacity training - it is a distinct entity with unique challenges.

SIDEBAR

Bear in mind, there is still little peer-reviewed data to argue that aerobic capacity definitively produces a superior Powerlifter. As with the majority of this text, this is based on observation and trends - though there are many powerlifters who do not do aerobic conditioning of any sort, the author would also like to point out that there are many athletes out there who can match or exceed the majority of Powerlifters in terms of sheer strength, yet perform regular aerobic conditioning (one need look no further than the NFL, Rugby League, or even track cyclists).

Certainly there is a genetic component to their strength, yet the training programs for these individuals can be extremely high volume, with high frequency, yet they manage to recover and thrive. Causality or correlation?

I'd be willing to assert that their exceptional conditioning facilitates greater training volumes.

SPECIAL ENDURANCE FOR LARGER ATHLETES

Endurance sports are not particularly kind to larger individuals. Given that endurance sports typically consist of moving the body through space for a great distance in the shortest period of time, there is generally an ideal size and shape for this activity - light and streamlined. Strength athletes can be light, but rarely as light as endurance athletes, and they are often anything but streamlined. In fact, the author has been know to pull two pace lines in group rides due to his rather wide draft (and receive numerous accolades and appreciative pats on the back when he is promptly dropped on the next climb). This short section will examine three basic endurance sports and discuss the unique challenges faced by larger athletes.

RUNNING

Humanity has spent thousands of years finding alternatives to running, and now that we have automobiles, trains, sea travel, air travel, and space flight, we now have the luxury of indulging in something that we've finally made completely obsolete. Perhaps it is the runner's high that makes us enjoy it - that rush of endorphins that the body releases during a run (usually the body's response as it prepares the organism for impending death) or the human urge to pretend we're not the slowest, weakest apex predators on earth. Whatever the reason, it is still the most fundamental form of aerobic conditioning - it is simple, takes nearly zero equipment, and is relatively easy to learn. On top of this, for many professions and sports it is highly functional, so running is often the modality of choice when it comes to conditioning.

Larger individuals have several issues that must be taken into account, however. Strength athletes tend to be heavier, of course, which increases the loads being borne, but they also tend to be larger up top, their upper bodies adding a heap of (at that moment) useless weight that needs to be managed. They tend to be poorly practiced- though not all of them have avoided running, they do tend to view it with some distaste- meaning less time has been spent practicing our stride than even most casual exercisers. They tend to have some interesting pre-existing injuries- torn muscles, damaged knees, bad hips... that are unrelated to running, and cause changes to our running mechanics. But quite frankly, most individuals just don't know how to run properly - those that argue it is a "natural" movement are rarely those who have spent significant time developing decidedly unnatural levels of strength and muscle, with the unique physiques to match.

AVOIDING INJURY FOR LARGER RUNNERS

1. Change your shoes, often. Even minimalist shoes will break down and provide less support over time. Larger runners will tear shoes to pieces in a far shorter time than lighter runners. Look for signs of uneven wear in the soles, creases or wrinkles on the sides of the sole (in the foam), small tears in the stitching- I do not necessarily agree that shoes need to be changed every 200-300 miles, but they do certainly need to be changed (or better yet, rotated) more often than the majority of us do.

2. Get a running store to look at your gait - if you have a reputable running store nearby, many of them will let you try on shoes and watch you run in them. They can often make some general recommendations on certain types of shoes to support pronation/supination while running, though I tend to find this less critical than many other factors. If they have a good return policy, you can probably trust their advice, since it's in their interest to have you love the shoe you buy.

3. Do not run on the sidewalk. Concrete is the worst surface to run on. Asphalt is superior, being somewhat softer due to the rubber in the compound, so running on the side of the road (please watch for traffic, and run towards traffic not away from it - you are not a vehicle) can be easier on your joints. Grassy medians between the sidewalk and the road are also an option, though they are often slightly uneven terrain. Trails are by far and away the best - undulating grades and soft surfaces force you to pick up your knees, take short steps, vary your pace, and pay attention to your stride - the best ways to ensure healthy joints.

   Increase your volume slowly. Very slowly. There is no fixed percentage here per week- some runners recommend 10% weekly volume increase, but listen to your body. Running aches and pains do not go away- unlike some lifting pains, you cannot train through them. Do not do "deload" weeks where you simply run shorter distances if you're experiencing pain. It is far better to skip 3-4 days of running entirely than run shorter distances for a few weeks - the former will let the body heal, the latter will simply maintain the status quo. And vary your pace, vary your terrain, your types of runs, and your distance. Do not just run the same loop three times a week- if you're running three times a week, do three different types of runs (interval, tempo, long slow distance, etc.) on three different surfaces or routes- variation helps prevent overuse.

4. Jammer shorts are your friend. To prevent inner thigh chafing, compression shorts or jammer shorts (tight fitting swimming trunks) are an absolute must.

   Determining intensity and understanding unique considerations for larger runners.

   There are several physiological oddities that must be understood for larger, most muscular runners as well. The majority of running research for trained runners is done on, well, trained runners- generally slighter of build, with just enough muscle mass to optimize performance. Strength athletes need to take several things into account when designing a running program and looking at progression.

5. Speed drop-off is not linear, and prediction charts are

terrible. Strength athletes may find that their 800 meter to mile time, their mile time to 5k time, and their 5k time to marathon time do not follow the standard pace prediction charts designed for runners. The reasons are varied but fairly straightforward, and have to do with heat dissipation and energy substrate/oxygen utilization.

For the first, it is important to understand that heat buildup is a tremendous limiting factor in performance - cellular processes take place in a very narrow ideal range of temperatures for a reason - enzyme activity generally requires a specific temperature range, and exceeding this range can result in reduced power output and premature fatigue (among other things). As heat dissipation is primarily a function of skin surface area relative to volume, it stands to reason that a heavier, denser athlete (epitomized by a lean but muscular strength athlete) would have a higher volume of metabolically active tissue per square inch of skin than both a smaller, lighter runner and a larger, less muscular runner (who may have more surface area for a similar metabolically active mass due to a less dense body composition). Heat buildup can be a tremendous issue, and this is why larger individuals may find that they are frequently better off training indoors during the summer (where heat buildup does not limit the workout before the training effect is achieved), or competing in colder weather.

For energy substrate utilization, it is also worth looking at maximum caloric burn per hour- a 125-130 pound elite Kenyan marathon runner will burn around 900-1000 calories per hour at a sub-5:00/mile pace, which is a significant rate of burn. A 230 pound Powerlifter chugging along at a 10:00/mile pace will actually burn 1100+ per hour. If he attempts a 5:00/mile pace, this ramps up to well over 2200 per hour. This is not even taking running economy into account. Though obviously the powerlifter's greater muscle mass could theoretically hold more glycogen, the other aerobic adaptations are not linear with bodyweight - in other words, it is highly unlikely that this larger individual could utilize twice the fat for fuel as the hyper-specialized runner, and therefore, even though there are a number of very strong individuals with exceptionally fast mile times (the author trains a number of military personnel who weigh north of 200 pounds with 5:00 miles), these individuals fall well short of predicted marathon times with that mile, and even well short of predicted 5k times. (Jason Khalipa, at 225+ pounds, is a wonderful example - there is a training video which shows him running Yasso 800s at a 2:50 per interval pace, yet his best 5k is over 23:00).

Finally, once local muscular glycogen is exhausted, liver glycogen and nutrients in the GI tract are the only source for further glucose. For a smaller individual, ~400 calories of liver glycogen can provide energy for quite a few more miles than those same 400 calories for the larger individual (weight training does not make the liver grow, ordinarily). In addition, rate of glucose absorption across the intestine does not increase linearly with body size or muscle mass, so a smaller runner taking in glucose during a race can, over the same time period, take in a greater number of calories per kilogram of bodyweight than the larger individual, further extending performance.

Why is this relevant? Many runners, when constructing their programs, will use similar charts to determine target pacing not only for future races (and may be interested in attempting to predict performance), but will use these charts to determine target speeds for various workouts.

Recovery times are extended. Though more muscular individuals may recover more quickly between bouts of resistance training, bones, ligaments, and other structures are subject to significantly greater stresses without any commensurate increase in recovery capabilities - larger runners simply cannot handle the frequency of running that lighter individuals can, and in fact, will have to take more days between runs, and run fewer miles per week than lighter runners. In addition, as noted in the injury management section, heavier runners will need to take many more steps (shorter strides) to avoid fractures and strains.

6. Sprinting is one of the easiest ways for an untrained individual to pull a hamstring, and the obligate tightness in the posterior chain that most strength athletes have

make this an even more likely occurrence. Sprinting itself is rarely recommended as general conditioning, and if it must be done, it should be done uphill to minimize the possibility of overextension. Truly efficient running gaits, including the "ultra shuffle" actually pose minimal risk to joints and muscles, and are highly encouraged for larger individuals.

CYCLING

Far less complicated for the larger strength athlete is the bike - gone is the heavy ground impact (unless you happen to go over the handlebars), and suddenly strong legs give the temporary illusion of superior performance over the dedicated endurance athlete - until the would-be cyclist hits the first hill.. Cycling is still a far kinder activity to the larger athlete, however, and one which many strength athletes may find themselves gravitating towards as they gain experience.

There are still a number of special considerations regarding both equipment and training specifics, however, as well as a number of common misconceptions.

EQUIPMENT CONSIDERATIONS

Though road bikes may appear rather fragile and easily broken, they are often more than robust enough to handle all but the largest riders. Most framesets are designed to handle riders up to 275 pounds, and truth be told even past that point it is highly unlikely that a larger rider will damage the frame through daily riding. More important is selecting higher spoke count wheels, which can survive small divots and minor bumps without allowing too much wheel flexion, along with paying special attention to brake pad condition. It is certainly worthwhile for larger individuals to frequently check their chain condition to look for excessive stretch, and regularly true their wheels (especially the front wheel) to catch minor rim flexion before it becomes an issue.

Also important is to ensure tires are inflated near the high end of the range (~110+ for road bikes, ~40-45+ for MTB), as heavier riders are more likely to incur pinch flats from underinflated tires.

Saddle recommendations - larger riders not only have more absolute bodyweight, but strength athletes also carry a larger percentage of their bodyweight in their upper body, making the actual weight placed on the perineum significantly greater than for the average cyclist. Finding a comfortable seat is very important. Note that more padding does not equal a better seat- the author recommends split-nose saddles for pressure release (the author does his long rides on the excellent ISM Adamo Peloton saddle- Cobb also makes an excellent line), though extra bodyglide will be needed on the inner thighs to prevent chafing.

Larger riders may also experience initial knee pain regardless of saddle height- large thighs tend to bow the knees out when riding unless special attention is paid to keeping the legs in line with the bike, which can result in some torsional strain on the legs during any “pedal mashing”. Saddle choice also matters here, but this is primarily an issue of training.

Finally, when it comes to fitting a bike, realize that larger thighs will make the aero or drop position very uncomfortable if the stem is too low, as larger thighs could absolutely smack the abdomen on every pedal stroke, which could interrupt breathing.

When fitting a bike, a more upright position may be needed for the larger rider. In addition, larger riders may wish to consider shorter cranks, opting for 165mm cranks rather than 175-180mm to reduce the frequency of thighs hitting the abdomen.

PERFORMANCE CONSIDERATIONS

Larger riders will have more absolute power, but (as noted in the running section), as aerobic capacity does not increase linearly with bodyweight) power to weight may decrease for a similarly fit rider even as their absolute power increases, one reason being additional upper body mass certainly does not aid in cycling. What this means is that larger riders may perform exceptionally well on the flats, but suffer tremendously on any sort of climb or incline. Very fit larger riders may find themselves being dropped by smaller, less fit riders on even moderate hills, and it is very important that larger riders recognize that this is inevitable. Many larger riders attempt to pour on the power to keep pace with smaller, lighter riders when the grade picks up, and find themselves redlining, passing their lactate threshold quickly, and fatiguing much sooner than expected. Accept that you will be dropped on hills, and use your superior flat land speed and descending speed to make up the difference.

In addition, larger legs also have more inertia- while smaller legs may benefit from higher cadences, larger riders may find that even moving their larger thighs at 100+ RPM is exhausting, even in an easy gear. Generally, adjust RPM recommendations down by 5-10 RPM if you have larger thighs, or 15+ RPM if you are a beginner.

The strength cost of cycling varies tremendously - while long slow distance cycling does little to build strength, intervals on the bike are both quite safe (as opposed to sprints while running), and can be outstanding for leg hypertrophy. It is critical to treat high intensity cycling intervals as "strength training," however, and give them the same consideration that would be given to, say, high repetition squats.

Overall, strength athletes should, in the author's opinion, learn to love the bike.

It is sustainable, it is a great deal of fun (particularly mountain biking/trail riding), and if the individual avoids falling off the bike, has a fairly low incidence of chronic injury.

SWIMMING

"Don't worry, you'll float" – The lie every swim coach tells you when you first get in the water. Sure, if you're built like an average human being, you'll float, but as density (muscle mass) increases, unless there is a commensurate increase in body fat, the body overall has a tendency to sink. Combine this with rather dense legs (for males, particularly, as they store less bodyfat here) which turns the legs into anchors, and you have the recipe for a very inefficient, slow form of locomotion. The benefits are massive, however, as the absolute lack of impact allows even the most broken strength athlete to engage in regular swimming with minimal chance of injury.

The challenges, other than having the buoyancy of a brick, can be significant. First and foremost, if the strength athlete in question is a bench press specialist or Strongman who relies heavily on their upper body strength, then keep swimming to an absolute minimum, particularly the crawl/freestyle. A certain level of shoulder stiffness is an absolute necessity for these individuals, and the freestyle stroke forces the individual to develop tremendous "looseness" (some would call it mobility) which the author has found over and over again to be quite detrimental to pressing strength and stability. Speed/interval work is likewise extremely taxing, and should be used sparingly if general fitness is the goal.

For the majority of beginner to intermediate swimmers, form and reducing drag in the water are a far superior use of time than working on "speed", both in terms of results and in terms of sparing recovery.

Secondly, to address the buoyancy issue, many beginning swimmers are highly advised to make use of a floatation device (the pull buoy, for example) or to wear a wetsuit, even in the pool. Without these aids, the beginning swimmer will quickly exhaust himself attempting to maintain a certain speed to keep his head out of the water, which can result in dramatically shortened workouts and extreme discouragement. While these aids will not always be present, they allow the would-be swimmer to get the majority of the benefits of swimming without the potential downsides, which include exhaustion, panic, drowning, and death.

Third, shoulder mobility can indeed be a major issue and result in necessary changes to conventional form. Larger, more robust lattisimus dorsi musculature can make the simple act of keeping one's elbows high in the catch a near- impossibility, which means the larger swimmer must take special effort to incorporate mild upper body rotation to facilitate a clean stroke- heresy to many swim coaches, but a necessary evil for the body type. In addition, as further heresy, it may behoove the larger swimmer to breathe unilaterally, as many lifters tend to be asymmetrical in terms of torso rigidity (due to inherent postural imbalances being exacerbated/ exaggerated by heavy weight training).

Finally, the larger lifter must be extremely cautious around lifeguards, since the initial "thrashing" that comes from extreme power and poor form may cause these well-meaning safety-minded individuals to panic and throw multiple floating implements that can cause minor head trauma and contusions if they hit the swimmer in the face. The author is uncertain how common this particular phenomenon is, but can assert to it happening at least twice, the details of which will remain confidential thank you very much.

11

STRENGTH FOR THE ENDURANCE ATHLETE

"Strength training is the most over looked component of triathlon training. Injury is caused by lack of durability and function. Tendons and ligaments need to be all day strong. Power increases on the bike and paces increase on the run can be easily achieved with proper strength training. Deep into an Ironman my bet is on the guy who did his work in the gym."

-JAMES LAWRENCE, THE "IRON COWBOY"

Guinness world record holder for most Ironmans
completed (30) in one year

STRENGTH FOR THE ENDURANCE ATHLETE

The field of endurance athletics has quite a wide variety of views on the value of resistance training. Certainly, many "endurance" sports, often of the short distance, high intensity variety (speed skating, track cycling, sprinting) view resistance training as a necessity for peak performance, while others (marathon running, ultra running, road cycling) view it as anything from a somewhat beneficial annoyance to an outright counterproductive waste of time.

Just as any strength athlete can benefit from the improved recovery and general work capacity benefits that endurance training offers, it is the author's opinion that any endurance athlete can benefit from the improved power production, structural/connective tissue strength, and postural/alignment benefits that strength training offers, not to mention the fact that older endurance athletes may find resistance training is critical to prevent generalized cachexia that running or swimming alone may not.

The primary issue with "strength training" for the endurance athlete as it is found in many endurance routines is, however, that it is abysmally awful, if not totally useless. Just as a few miles of easy walking a week will do very little to markedly improve conditioning, these low resistance, moderate

volume strength routines found in many triathlon or running magazines will do very little to actually improve strength, power, or body composition (further reaffirming the belief that strength training is a waste of time for endurance athletes).

It is first worth examining some of the more valid concerns that endurance focused athletes may have, however, when it comes to strength training.

UNWANTED BODY MASS CAN HURT PERFORMANCE

This is absolutely a possibility, though it would require a concerted effort on the part of the athlete. Additional body mass is not particularly easy to achieve, and certainly requires a caloric surplus.

In addition, routines focused more on RFD and core strength/stability are unlikely to result in significant hypertrophy. It is still important that the endurance athlete carefully monitor bodyweight and adjust training volume appropriately if unwanted mass begins to adversely impact performance, however it is critical that the individual distinguish between a decrease in performance due to additional mass versus due to excessive fatigue masking improved fitness (as a result of more volume).

Do bear in mind that increased mass is primarily a result of diet, however, many endurance athletes do very much enjoy their post-workout feasts (and post-race beers), and adding weight training to the mix can result in the individual taking in even more calories simply due to hunger.

Any caloric surplus here will be targeted towards mass gain, which is potentially detrimental to performance, even if this is lean mass.

As a related point, weight training may temporarily (day to day) increase fatigue and soreness, which can potentially reduce the duration and intensity of endurance workouts. Generally, this would be insignificant, but if a long course triathlete finds that her long runs or rides are significantly off-pace or under-distance due to lingering fatigue from, say, squats, the net result may actually be a decrease in caloric expenditure. This is a major reason that the author has noted weight gain in endurance athletes who start a weight training program.

This is all academic, however. The majority of males are lucky to gain 1-1.5 pounds of muscle a month if on a dedicated mass-gaining plan, and the majority of women are lucky to gain that much in 3 months (despite stories to the contrary). In other words, a triathlete could stop all his conditioning work and focus on nothing but "bodybuilding" for a four month off season, and be lucky to gain 5 pounds of lean body mass in that time - hardly a detriment.

STRENGTH TRAINING DETRACTS FROM SPORT-SPECIFIC TRAINING

This is also a valid concern - time spent in the weight room is less time on the road, or on the track, or in the pool - similar to Powerlifters arguing that conditioning time detracts from lifting. As always mentioned, specificity and sport-training ranks above all else in priorities, and if a runner absolutely needs to get in 60 miles a week for his goals, and with family obligations, work, life, and the like, he barely has time to get those in, is carving out another two hours a week for weight training a good use of time?

First, what must be examined is: Is 60 miles really critical? Or to put it another way, what would be the incremental loss in performance if this were reduced to 58 miles? 55? 52? What is the critical distance that must be done per week to achieve the desired effect? If even 45-60 minutes a week can be opened up for resistance training, the argument then becomes, would 55 miles a week plus a targeted resistance training program that improved balance, robustness, power, and stability superior to 60 miles a week alone?

If properly constructed, yes, and by properly constructed, this means a routine meant to address these issues in particular, not attempt to (poorly) imitate sport specific movements (e.g. performing beltless heavy squats or weighted carries would be superior to high repetition quarter squats for a cyclist, as the former addresses core and overall power issues that cyclists cannot develop on the bike, whereas the latter attempts to imitate a sport specific movement while being inferior to the movement itself.)

THERE IS A LEARNING CURVE WITH LIFTING

One other point I hear echoed often - many suggested movements may be challenging to learn and perform, which further detracts from time spent out on the road.

To this, the author says – yes, you're right. Learning new things takes effort and requires you spend a little time outside the comfort zone. Not much that can be said about this beyond the fact that the majority of recommended movements are relatively straightforward, and that sinking in a few hours a year to learn the basics is probably worth the individual's time if they want to have a long, healthy career. In other words, suck it up, buttercup.

BENEFITS OF STRENGTH TRAINING FOR THE ENDURANCE ATHLETE

Some of these have already been alluded to above - endurance sports are, almost by definition, characterized by repeated movement, performed at a relatively similar intensity, over and over again, for potentially hours at a time, week after week, month after month, season after season. A running stride is no different from any other practiced sport movement - a good athlete has honed his or her form to provide the best balance of power and efficiency possible, which means that the repetitive, unchanging nature of this form is an adaptive benefit - i.e. this is a good thing for the sport.

What is good for performance in the sport is not necessarily good for longevity in the sport, however (or for health in general). Repetitive motion, by nature, causes the development of imbalances, and certainly restricting movement to a single plane of motion can result in underdevelopment (or atrophy) of many muscles. The core musculature responsible for torso rotation, back extension, and scapular retraction, for example, are often underdeveloped in cyclists and runners, which can certainly result in a “glass cannon” sort of athlete (excuse the blatant misuse of an RPG term) - an individual who seems extremely high performing, robust and durable while engaged in his or her chosen activity (on the offensive), but where even the slightest accident or miscue while training or racing could result in season-ending (or worse) injury - i.e. no true defense against injury.

Cyclists tend to have poorly developed shoulder joints and have lower upper body bone density, which may certainly contribute to a high incidence of AC separations, collarbone fractures, and other upper body injuries (even in the case of relatively mild crashes). Runners often have marked pelvic tilt (the nature of which depending on type of runner), which often leads to knee issues and ankle issues (due to eventual overstriding or understriding). Swimmers have a lower bone density than even many sedentary individuals.

Learning new things takes effort and requires you spend a little time outside the comfort zone. Sink a few hours a year to learn the basics is probably worth the individual's time if they want to have a long, healthy career. In other words, suck it up, buttercup.

Resistance training can help prevent these issues with minimal cost, and even if the athlete does not believe performance can be directly increased, longevity and less time spent in rehab in the event of injury can compensate for a session or two of weight training per week.

So what are the best movements to work for endurance athletes? As many "movement specialists" will be happy to tell you, running and cycling, especially, take place in the sagittal plane, which means your cross training and resistance training should take place in the frontal and transverse planes, so doing woodcutters and lateral raises are all you need. Right?

No, that's absolute misapplication - the body doesn't truly care that it is trained in all planes of movement, what it cares about are balanced mechanics.

Generally speaking, running and cycling (even in full aero tuck) are movements that are highly limited in their ranges of motion and muscles worked- typically deficits in lower back strength, upper back/shoulder girdle stability, and hip abductors are common. The author is a tremendous advocate for various pull variations, including the sumo deadlift, snatch grip deadlift, snatch grip row, basic back squat, Anderson squats, and push presses/thrusters.

Exact splits and exercises will be detailed in the routines appendix!

Critical to bear in mind, repetition range and intensity matters here.

Resistance training should not be a substitute for sport training, which means under no circumstances should resistance training seek to imitate the sport training- “high repetition low weight” resistance training for the endurance athlete is among the most ridiculous concepts that has ever been floated in sport, and does a tremendous disservice to the athlete. It is as ridiculous as a lifter stating that “lifting lighter weights quickly” improves one’s cardiovascular capacity.

Resistance training for the endurance athlete should fill in the gaps in athleticism, not poorly attempt to bolster existing strengths. Resistance training should be done with maximum power output and explosive strength in mind, which means relatively low repetitions and high intensity, with varying loads depending on relative RFD/Maximum power emphasis. Resistance training should also be simple - teaching a runner to do the clean and jerk is a tremendous waste of training resources if they do not already have this core competence - the movement would need to be practiced constantly in order to use a load (safely) that the athlete could benefit from. There are ways to train explosive power that do not require a complex movement.

SPECIAL STRENGTH SPORT CONSIDERATIONS FOR ENDURANCE ATHLETES

Luckily for endurance athletes, their lighter frames don’t necessarily cause problems when weight training (the way heavier strength athletes have inherent issues in endurance sports). There are certain movements that they may find far more challenging, or be puzzled as to why their strength may not be where it is expected on certain movements, however, and they may find that their performance envelopes are similarly skewed from what are expected.

1. Endurance athletes can throw their max calculators out the window. Much like pacing charts are useless to heavier runners, maximum weight calculators are useless to individuals who have exceptional tolerance for discomfort, exceptional vascularity and ability to clear waste metabolites, but little experience in half second to three second all out efforts. A runner or cyclist may squat 225 for a set of 10 and expect a maximum single of around 300, but find that more than 250 is a challenge (this is actually the case for many individuals that the author coaches). The reasons for this are multiple - some of which are positive adaptations to endurance training (pain tolerance, work capacity particularly in the lower body, improved "focus over time"), and some of which are "negative" (lesser ability to maximally recruit motor units over a short period of time, less comfort under heavy load). At the end of the day, the important thing to remember is that an endurance athlete's 1RM is best calculated by performing heavy "training" maxes - singles or doubles that are manageable but challenging, then estimating from that point.

2. Leaner, more lithe athletes have abysmal leverages for certain power movements. Any heavyweight lifter can tell you the value of a larger stomach or thicker thighs

at the bottom of a squat (they actually provide physical resistance and rebound), or the value of a thicker back and chest in the bench press (reducing range of motion). For the deadlift, larger glutes and a more robust shoulder girdle aid in keeping the bar from getting out in front, and assist with leverage as the bar gets past the hips. Understand that your streamlined frame is built for speed and endurance, not for brute force, and accept that certain movements may be initially uncomfortable, and you may find yourself struggling with weights that even the average Joe off the street can handle. Play with different squat stances, bench grip widths, deadlift styles, and realize that your proportions may mean you need a very different setup for these lifts than the guy next to you in the gym.

3. Endurance athletes may find that their strength over partial range of motions dramatically eclipse their full range of motion strength. Cyclists especially will build excellent strength in their legs through the ~100-180 degree (upper/lower leg angle) range of motion due to the power curve in their sport, but may find that their parallel squat is 50% of their "barely above parallel" squat. For the would-be powerlifter endurance athlete, it is critically important to be especially draconian with range of motion, not neglecting that extreme joint angle weakness even though it may mean truly humbling weight on the bar. This may also result in dismaying power losses over the full range of motion, with weights that

"feel" easy being a relative challenge to move through the lift.

4. Endurance athletes must resist the urge to "do more"- a lifting workout may feel physically taxing in some ways, but the "out of breath" exertion feeling may not be there. Run training, bike training, swim training - these sports typically leave the athlete with a feeling of mild exhaustion but accomplishment when finished - if a cyclist isn't slumped over her trainer surrounded by a pool of sweat she may think the session was a failure. Resistance training can be crushing, certainly. Watching a multi-ply powerlifter collapse after nearly blacking out on a heavy squat, nose bleeding and sweat pouring down his face, may give the impression that all serious lifting should leave the individual feeling exhausted. The other side of the spectrum is the circuit bunny routines that hop from station to station performing endless high repetitions of marginally worthless exercises that appeal to the "well I'm tired now" side of the endurance athlete's psyche. Both should be avoided for these athletes- resistance training should be about doing just what is needed to achieve the individual's goal - resistance adaptation, unlike cardiovascular adaptations, do not often involve systemic exhaustion.

So what should endurance athletes do? As mentioned, they should not try to have their weight training essentially be a watered down version of "speed work"; forget bouncing around with endless half squats and bodyweight step ups. Let us instead take the simple power lifts and discuss their application.

Starting with the deadlift: The standard deadlift (there are multiple variants of this lift, including the straight legged deadlift, Romanian deadlift, etc.) is a compound movement that primarily targets the hamstrings, glutes, and lower back. Obviously, increased strength in all of these muscle groups would be beneficial to running (more about this later). Less commonly discussed, however, are the benefits to smaller muscle groups and joints.

SPECIFIC ADAPTIONS FROM THE DEADLIFT

Improved ligament and tendon strength results in improved joint integrity. The forces exerted on the joints during compound lifts put strain on connective tissue, which effectively pulls the tendons and ligaments from the bone. This causes osteoblastic activity (osteoblasts are the cells within bone responsible for new bone growth), or in other words, the strain of the ligaments and tendons acting on the bone causes increased bone formation at those sites. The end result is improved strength at the point where the tendon or ligament attaches to the bone.

Stronger attachments to more robust bone mean lower risk of injuries at the joints stabilized by those attachments.

There is also the matter of mechanical loading on the bone itself - the long bones (of the legs, for example) bow ever so slightly under heavy loading, which results in adaptation (bone thickening across the entire length of the bone) to prevent possible damage in the future. This is very important for endurance athletes, as stronger bones are far less prone to stress fractures. Now imagine these processes taking place across the entire skeletal system, from neck to toes, while picking up a heavy load from the floor.

In addition to improved tendon and ligament attachments, there are the specific adaptations in the muscles surrounding the joint itself. The forces transmitted through joints while running are not always conducive to joint health - uneven running surfaces can cause unpredictable forces on the joint, which have to be countered by the body. A slip or stumble can result in strong sudden shear forces across a joint, or sudden twisting which pulls directly on the ligaments - one interesting fact is that ligaments are not meant to be used to any significant extent except in extraordinary circumstances!Ligaments are minimally activated in normal joint movement, it is the job of surrounding tendons and muscles to stabilize the joints, with ligaments only signficantly activated in extreme circumstances (such as knee twisting or at extreme joint angles, etc.)

Sudden sharp impacts or changes in force may also overwhelm the surrounding muscle's ability to tighten and stabilize the joint, which requires the ligaments to intervene. However, stronger muscles which are better trained (and therefore activate faster) are excellent protection against ligament and joint damage. Improved musculature surrounding a joint can provide increased stabilization (through stronger tissue and faster response) and therefore improved control when facing uneven ground, and can make the difference between slight embarrassment (after a stumble) or catastrophic ligament damage.

CORRECTING IMBALANCES

The repetitive motion of running can amplify structural and/or muscular imbalances. Many runners wonder how to adjust their running to correct these imbalances, but I would argue that you can't. You will only continue to exacerbate the imbalance by repeating the same repetitive motion over and over and over again. By incorporating a focused strength program that emphasizes full range of motion through multiple joints, these imbalances can be identified and corrected. You can spend 1-1.5 hours a week in the weight room now or 1-2 months off recovering from an injury later.

Let's consider the deadlift again - the simple act of picking a load up off the floor. An athlete with weak hamstrings will have difficulty pulling the bar off the ground, the first phase of the lift. An athlete with overly tight hamstrings will have difficulty reaching down for the bar. And an athlete with a weak back will have difficulty locking out, the final phase of the lift. You may be wondering why any of this matters - it matters because these same muscle groups are vital to the run - any imbalance that exists will be amplified significantly given the repetitive motion of endurance training. Once an imbalance is identified though, simple measures can be taken to restore balance and therefore allow for better form, and no runner will suffer from having stronger, more resilient hamstrings , or having a lower back that is too strong. No runner can afford to have disproportionately weak or tight hamstrings, or a functionally weak lower back (though many distance runners do have functionally tight hamstrings- the range of motion employed in a deadlift is unlikely to disrupt this adaptation). Running is rarely a controlled environment- every step represents an opportunity for the unexpected to happen, and if a runner is not a complete athlete, he or she increases the opportunity for injury every time he or she hits the trail, track, or road.

Worth reiterating here, of course, is that the goal of strength training should be to complement your endurance training, not to replace it. A benefit of compound lifts like the squat, deadlift, and bench press, which engage a variety of muscles groups throughout the body during each repetition, is that rather than working one muscle group in isolation, they target many opposing muscle groups in very practical ways. Think about it. Every time you squat down to pick something up off the floor or lean down to lift something up, or push something away from you, you are engaging the muscles groups targeted in one of the aforementioned lifts.

SPECIFIC ADAPTATIONS FROM THE SQUAT

The squat is another compound movement that efficiently targets many of the relevant muscle groups and cartilage attachments for good crossover from the weight room to the trail (or road, pool and so forth, depending on your event). The prime movers in this compound lift are the quadriceps, hamstrings, and gluteus group, with significant mechanical contributions from the spinal erectors, abdominal muscles, and calves. The flexion and extension of the ankles, knees, and hips during the course of this movement also contribute to stronger attachments of ligaments and tendons (from increased osteoblastic activity at the site of these attachments) as well as increased muscle mass around these joints for improved stability.

The squat is also a useful lift for developing a stronger "final kick" by improving muscle fiber recruitment. By training with higher loads for lower repetitions (singles, doubles, or triples), the body is forced to recruit more muscle fibers (through enhanced neuromuscular adaptation) in

order to move the heavier load. By training the body to fire more muscle fibers at one time, the net result is increased power and force production each time the neurons in the brain send a signal to the neurons in the muscles. Perhaps most importantly, however, training muscles to fire maximally, and fire quickly, improves efficiency - there is less energy wasted as the muscle fibers respond to nerve activation. This means that when you need to kick it into high gear, your body will be able to call upon more muscle fibers to contribute to power production to get you up that hill or to that finish line, and can do so with less wasted energy.

In addition to the traditional back squat, there are a number of variations of the squat exercise that emphasize different parts of the movement and include the following:

1. Front squats – this a more quadriceps-dominant lift with decreased emphasis on the spinal erectors, though increased emphasis on the hips given increased depth and position of the bar.

2. Zercher squats – requires increased involvement of the posterior chain including the glutes and hamstrings, as well as the anterior stabilizers to maintain balance, while also targeting the quadriceps and spinal erectors.

3. Bulgarian split squats – the primary movers are still the quadriceps, glutes and hip flexors, however there is more emphasis on the stabilizers at the core, hips, calves and ankles. Single leg movements are also excellent for addressing leg strength inequality and imbalances.

SPECIFIC ADAPTATIONS FROM THE BENCH PRESS (AND OTHER UPPER BODY EXERCISES)

Although the bench press offers less direct translation to running or cycling, it is still an important lift in your rotation and should not be discounted completely. We will discuss it here in terms of running (as was done for the squat and deadlift) and although the benefits may not seem as obvious as they were for the squat and deadlift, by stepping back and looking at the bigger picture, you will hopefully understand its value.

The bench press primarily targets the pectoralis major and the anterior and lateral deltoids, which are also the muscle groups that bring the arm and upper torso forward during the arm swing while running. This is important because the arm swing actually works in a synergistic manner with the opposite leg creating a reciprocal and opposite arm-leg swing pattern.

When your left arm swings forward and elongates, the right leg comes off the ground through the swing phase of the running gait. The speed of your feet can actually be dictated by the speed of your arm swing (often practiced with arm swing drills on the track). This becomes important when trying to maintain the most efficient running form. A lean upper body with slightly increased muscle mass will allow for a powerful arm swing that proportionately improves leg drive. The effects of increased strength and power in the upper

body will likely be most noticeable when pushing up a hill or powering through your final kick to the finish line when your body is otherwise fatigued and depleted. There is also, again, the fact that improved muscle coordination improves torso stability and movement efficiency, and a trained upper body will not be subject to the same “flop” that one will often see in fatigued distance runners.

An upper body workout is not complete without some exercises that focus on the antagonists of the pectoralis major and deltoids, namely the rhomboids, trapezius, and latismuss dorsi. Working only the chest will set you up for developing an imbalance that would be more detrimental than beneficial to your running form in the long run. A comprehensive, but not exhaustive list of exercises that target these muscles groups include barbell rows, Pendlay rows, seated cable row, lat pulldown and face pulls. These can be incorporated into your routine after your primary lifts.

The value of these lifts are in developing strong shoulder and upper back muscles that will help you maintain an upright posture as you start to fatigue.

If you watch a tired runner, you will notice that the upper torso tends to lean forward and the shoulders begin to round.

This position prevents full flexion at the hips and leads to a shortened, contracted arm swing that translates to an inefficient stride. The head down position also tremendously increases the load on the lower back (as the head, being one of the densest parts of the body, is no longer balanced above the spine but rather pulling down the front of it), which can serve to cause premature lower back and glute/hamstring fatigue while running. Targeting your upper back and shoulders will help you avoid this issue.

Thus, even the basic “power lifts” have application to the endurance athlete - simply put, again, provided interference is kept to a minimum, these lifts can and will definitively benefit the endurance athlete in his chosen sport.

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DESIGNING A PROGRAM

DESIGNING A PROGRAM

As there will be a number of routines laid out in the appendix, delving into the specifics of a routine will not be the subject of this section. Rather, what will be discussed here is the general process that the coach or athlete should go through when designing a routine.

BASELINING AND ASSESSMENTS

The first step is in assessing the athlete physically - stature, body composition, absolute body size. Regardless of the type of hybrid routine that is being created, body size is the most important single determining factor when it comes to selecting initial endurance modalities, as it will play a major role in initial volume tolerance.

Larger individuals who are relatively new to (or just coming back to) running, cycling, etc. have the dual factors of higher challenge plus lower fitness than a regularly trained endurance athlete- for a 300+ pound powerlifter, even a 14:00/mile fast walk/slow jog burns as many calories per hour as a 150 pound marathoner running a 6 minute mile, and the powerlifter has additional problems associated with heat dissipation, joint impact, and far less perfusion per cubic inch of muscle tissue than the runner, making this an extremely challenging proposition.

For this reason, the first step is determining what low intensity means to the individual - as much as determining working maxes is important for weight training progression, determining what an actual “zone 2” workout is for a hybrid athlete is equally important.

A simple 30 minute run/walk assessment with a heart rate monitor where the individual is told to maximize distance while maintaining a heart rate in zone 2 can easily help determine standard low intensity pace.

What is zone 2? While individual heart rates may differ, (and the author has noted that larger strength athletes often exhibit a more narrow range of heart rates between resting and maximum), the author recommends that maximum heart rate is established first. For an endurance athlete, the 30 minute time trial (10 minute fast warmup, then peak heart rate attained during a 20 minute all out effort) is recommended as a good guide. For the strength athlete, the standard Tanaka calculation (208 – 0.7*age) is as accurate as any. Zone 2 would be 70-75% of this number.

This resultant speed will represent the vast majority of conditioning work that the athlete will be doing - and for many individuals, this could be dismayingly slow. Resists the urge to go faster.

Note that the author highly recommends that larger individuals do get

medical clearance before beginning a conditioning program - given the prevalence of stimulant usage combined with larger body size found in high level strength sports, cardiac anomalies are not uncommon, and it is far better to catch these early than to discover atrial fibrillation in the middle of a run.

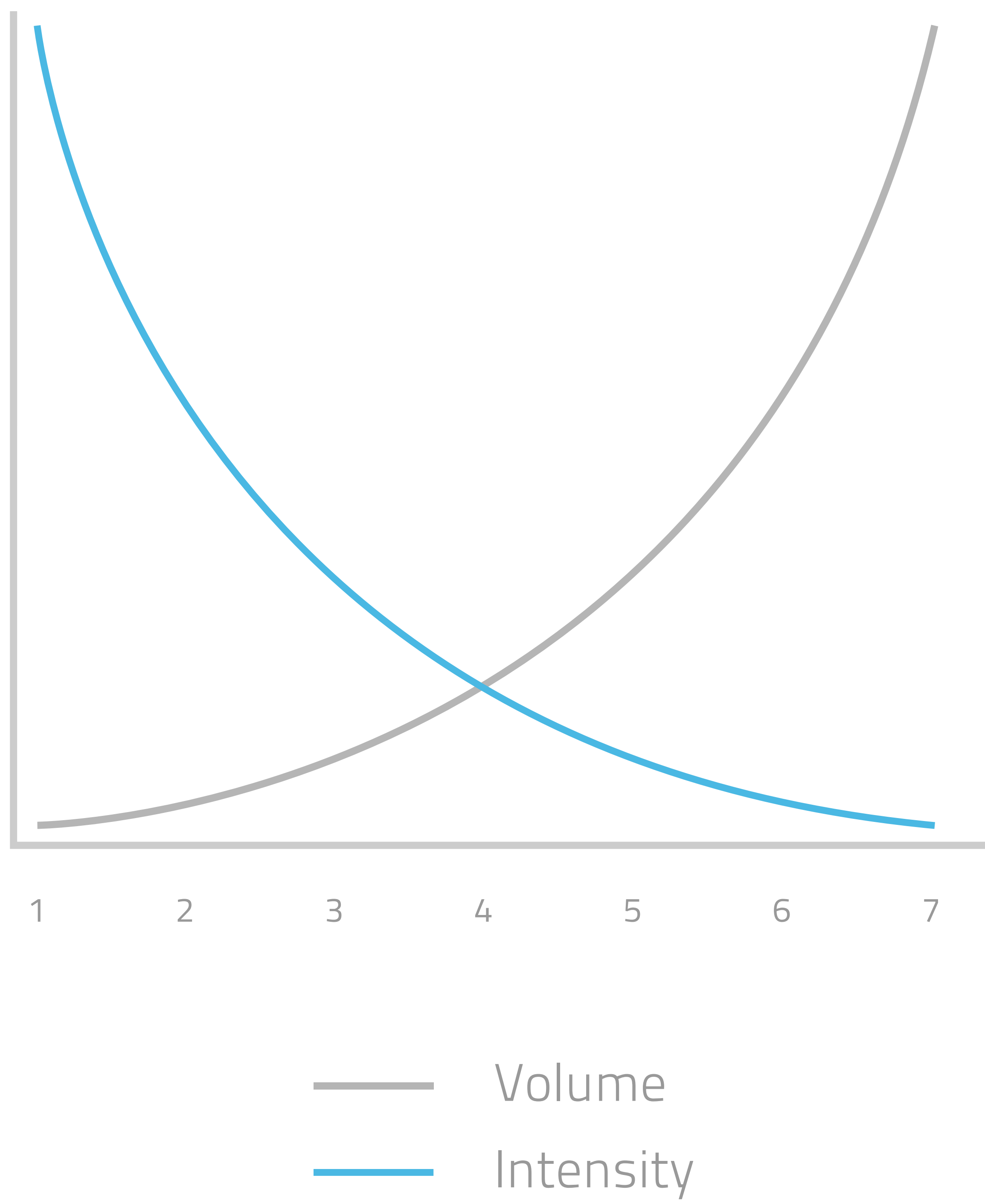
The second component is of course establishing the daily working max for various lifts - if an athlete knows a recent one-rep max (for example, from competition), this can be used as a baseline, but the majority of individuals will need to test their max.

Please note that for a less experienced trainee, a 1 rep max may in fact be less indicative of true peak performance than a three rep max or four rep max, as the heavy load may cause the individual to balk and lose form/panic, which may result in a lower number achieved than the individual is capable of. Since heavy near-max singles in training are rarely the goal, it is far more relevant to establish what a trainee can comfortably handle for a given repetition range. If competition is eventually the goal, form and comfort issues can be addressed later.

BREAKING DOWN THE TRAINING

The most important lesson learned in hybrid training is that the "different" types of training (strength and endurance) cannot be looked at differently at all - regardless of what category a particular component of training falls into, it will have a set of costs, whether these costs be mental fatigue, energy substrates, physical fatigue or damage, and so forth. What the individual is encouraged to do is to first whittle down the required forms of training into a single abbreviated list- the minimal amounts of training required to accomplish the objective. The items on this list should then be put on a continuum from higher intensity/higher skill/lower volume to lower intensity/lower skill/higher volume.

One term used lately that I do really enjoy (Chad Smith writes frequently on this concept) is "consolidation of stressors", and it really represents the cornerstone of this training method - high intensity, low volume work and low volume, high intensity work each requires its own sort of recovery, but most critically, an individual can train one extreme while recovering from another. "Recovery" is systemic to an extent, but it is also structurally specific - a long low intensity bike ride taxes the athlete in very different ways than a heavy squat session, but fast sprint intervals or track cycling starts may present similar challenges to the body as that same squat session - in the former case, it would make sense to place those two workouts at opposite ends of the microcycle, but in the latter case, it would make sense to do them most likely in the same session.



This graph is a loose representation of the volume/intensity undulation over the course of the week. Simple concept- and the sudden drop when you go from day 7 to day 1 doesn't invalidate it- the high volume on day 7, provided intensity is low enough, will not compromise strength output on day 1. (The author trains athletes who routinely set lower body PRs a day or two after long runs/rides).

This is the basic model for building the microcycle - as the components have already been assigned a basic position on the continuum, they can then be placed in the training week accordingly.

ENDURANCE FIRST OR LIFTING FIRST?

There are a number of papers that attempt to study adaptations to each form of training on a biochemical level and address what is optimal for performance gains in each arena - what these papers rarely seem to account for, however, is acute performance, which is the most important factor in determining training quality.

This statement may be controversial - there is a trend in the fitness world that “consistency” and “dedication” matter more than training hard, which make for excellent feel motivational quotes. At the end of the day, however, training has a single purpose - to push the body past its current capabilities to elicit a positive adaptation. If the body is not pushed to this point, it will not adapt. The body has evolved for efficiency, and extra skeletal muscle, building extra blood vessels, constructing new cell organelles - these are not adaptations it undergoes willingly. Understand that quality of training does matter - but also understand that “quality” of training does not necessarily mean coming in fresh depending on the movement. It is entirely possible for a pre-fatigued athlete to reap the benefits of certain forms of training without being able to exert 100% effort, indeed because this pre-fatigued state is compounding the training effect, rather than detracting from it.

So what must be performed fresh, and what can be performed fatigued?

HIGH SKILL HIGH INTENSITY

- Heavy Weightlifting
- Running Sprints (<0:30)
- Technical gymnastics/bodyweight skills (i.e. muscle ups)
- Strongman heavy implement work (Log press, axle clean, stone load - injury potential high)

LOWER SKILL HIGH INTENSITY

- Max effort powerlifts (all compounds- BS/FS/BP/PP)
- Cycling sprints/rowing sprints (<0:30)
- Power variations of Snatch/C&J
- Weighted carries

HIGH SKILL LOW INTENSITY

- Weightlifting form work/light block variations
- Swimming drills
- Mobility/bodyweight work (e.g. Turkish get ups)

- Rehabilitation work

LOW SKILL LOW INTENSITY

- Moderate intensity isolation movements
- Long slow run/ride/swim

Generally speaking, any item from the top of the spectrum belongs first in a workout and should be performed fresh, any item near the bottom can go at the end. Note that time, of course, is a practical consideration as well; volume work for a long course triathlete could involve a six or seven hour brick workout, and few individuals have the time to spend an hour in the weight room before that.

Also note that athlete priority matters here - sprinting for a track athlete is a high skill movement, whereas "sprinting" for a general strength athlete is not a high skill movement, as the former is looking to perfect technique and maximize performance, while the latter is using the sprints as a means to an end, not the end in an of itself.

Additionally, notice that certain "cardiovascular" activities may take priority over certain activities in the weight room, bringing up the potential question "Should I go out, sprint, go in, squat, then go back out for a cooldown run?"

The answer is: yes. Absolutely. Remember, do not differentiate between "strength" and "endurance." There is simply training and rest/recovery.

Period. An example would be a routine designed for a bobsledder - these are individuals who need sprint speed and power, explosive leg strength, and durability- a certain sample day looked like this:

CLEAN

- 50% x 5
- 75% x 3
- 85% x 3 x 4

SPRINT STARTS

- 25m x 10 @ 85%, head down in drive phase for 15m.

BOTTOM UP OHS

- ~165-185 x 6 x 3

WIDE STANCE ARCHED BACK GOOD MORNINGS

- 225 x 8 x 3

4 ROUNDS FOR TOTAL REPS

1. 30 seconds power snatch 65#
2. 45 seconds shoulder to overhead 65#
3. 60 seconds prowler sprints (120#, 25,' switching from uprights to low push)

4. 60 seconds rest

EASY 15 MINUTE COOLDOWN

- stationary bike or jog, 6/10 intensity

Note the construction - highest skill movement is first, as an 85% x 3 clean takes focus, as do sprint starts (though the lack of a significant stride phase reduces the chance of hamstring pull, as many inexperienced sprinters injure themselves through overstriding) - hence these two movements come first. Overhead squats and good mornings, which still take focus but are manageable while fatigued come later in the routine, followed by a “metcon” of moderate to low intensity movements (this individual, incidentally, is an accomplished Weightlifter, hence the power snatch being prescribed with little hesitation), with a low intensity steady state movement finishing off the workout.

SIDEBAR

Worth reiterating- there are a number of recent studies analyzing the various roles of mTOR, ampK, and other metabolic pathways, that attempt to better understand the optimal/recommended order of training. Many of these studies recommend conditioning performed several hours before strength training in their conclusions. It is still the author's finding that the athlete's mental state and overall fatigue are far greater factors in determining training quality than attempting to frame recommendations on a cellular adaptation level. This may, of course, change as we learn more - the science is evolving, and though the author has consistently noted superior results with this intensity first/consolidation of stressors approach, it is worth at least understanding the direction that research may indicate.

Scenarios

"I have been a runner since age 11 and have felt the aches and pains that go along with endurance sports. Without going into crazy scientific detail, we know the body is an adaptive organism. Your body learns to cope internally and externally with the environment around it based on what you're used to in daily life. Many times when we are training, racing, or lifting, we overload and get sore, or extremely tired and fatigued. The best athletes understand how to cope with this and simply are not afraid of it, where as the first thing others worry about is "I don't want to get injured training" or

“I don’t want to hurt” This is why periodization is so important, you have a plan dictating when you are going to go hard, and you have a plan dictating when things are supposed to be easy.

You have to expect that after a hard workout, the next 2 days you are going to be sore, you are going to be fatigued. The question is how long will this last and when should you go hard again? For each individual, you do need to follow the basic concepts of periodization but there is also trial and error involved. Just because you are sore and tired, that doesn’t mean with a good warm up you won’t loosen up and have a great workout. In the past, I have done 20-23 mile runs on Sunday, and would schedule my next interval training session Wednesday, giving me two days of recovery in between. I have always been injury-free doing that and it works for me. Lately, I have moved my workout to Tuesday, which simulates doing intervals on more fatigue, which in turn helps me prepare better for the rigors of the marathon between mile 20-26.2.   Below is how I changed my route to adapt to the lessened recovery time in between.

DURABILITY AND MANAGING VOLUME

- Sunday Morning Long Run
- Sunday afternoon - short nap - foam rolling and stretching, big dinner and an early bed time
- Monday: Scheduled massage with an afternoon shakeout run on soft surfaces with supportive shoes - ice bath if needed
- Tuesday: Pretty fatigued - but spend 25 minutes warming up and doing range of motion dynamic movements, slowly letting my body warm up longer to work out stiff legs.
- Tuesday: Longer intervals set early in training, and shorter ,faster sets later in training.

You cannot be afraid to work out as long as you know that you are putting just as much into the recovery as you are the training itself. If you have a setback that is a diagnosed injury, you need to reassess why that happened, and how to line up your schedule. Typically if you start out slightly conservative with recovery and training, you can always add more when you find out how your body works. It is kind of like dressing for cold weather. Always put on layers, and you can always take them off if you get too warm."

Tom Clifford is a USATF Level 2 coach specializing in Endurance. Tom is also a USA Triathlon Certified coach and coaches over 150 athletes. His personal best in the marathon is 2:29:30. Half Marathon 1:08:27 5K: 14:35, 1 mile 4:09 and 70.3 Triathlon 4:03:00. Tom has never been injured from running specifically.

Simply put, the athlete will be sore on this programming, the athlete will be fatigued, the athlete will be underperforming until he or she is peaked, and this is not a bad thing. Understand that this is taking place during training, and that performance during concurrent/hybrid training will always be lower than what it will be when preparing specifically for an event (in the last week or two of peaking, particularly). This is especially important to bear in mind during training… as you can see from the sample routine above, many of the movements will be sub-par in terms of absolute performance, but the training effect will be maintained.

Recover properly, train hard, know when things just hurt (versus when you're injured), and progress.

THE MACROCYCLE

As mentioned earlier, competing in numerous sports does not give the athlete the benefit of an "off season" - though this does not mean the year cannot be divided into fundamentals and sport specific training. For the budding hybrid athlete, it may take at least a token "off season" or "pre-season" to build their competence in their non-main discipline, where their primary skill is disassembled and remains in slow progression mode while they aggressively target weakness in their secondary or tertiary activities.

Envision a pyramid with three discrete components at the bottom - on the left, pure strength, on the right, pure conditioning, in the middle, pure skill. These are separate as the season starts (representing the base). As there is a learning curve with any movement, the recovery cost of poor form combined with higher intensity would simply be too great - poorly performed squats at a high weight, heavy clean and jerks for a non-weightlifter, or fast tempo runs for a non-runner would all take a significant toll on the athlete, and it is far better to build fitness in similar but simpler movements or modalities while perfecting the sport-specific skill component. Hence, these components are differentiated.

As the off season progresses, the three components move progressively closer together, and targeted training becomes a larger and larger component of the programming, while simpler base building becomes less of a factor.

One example: Long distance cycling may be an inferior choice for the typical ultra-runner's off season base building, but for heavier runners with limited trail running experience, the wear and tear caused by long distance trail running may simply be too great to allow them to get the necessary base building hours they need. For these individuals, their off season would be characterized by longer hours on the bike to develop their aerobic base and low intensity high duration tolerance, while technical trail running would comprise a much smaller "skill" component of their training, minimizing risk. As the pre-season progresses and technical skill improves, a greater percentage of the total training time will shift to the trails, peaking right around the first race.

So what about the hybrid athlete who is coming from a position of high competence in one sport and relative incompetence in another? Suppose an experienced strongman or CrossFit games athlete wishes to improve their running?

In this case, they still start at the bottom. Their sport skills must be broken down, while they focus on their base in the running. There are simply too many components in their sport to train as a unit while building a running base - too much overlap. Event work (WODs and moving events, for example) should be worked primarily as a skill component (even if this simply means operating at 70% in them), fundamental limit/peak strength and strength-endurance should be developed on their own, and endurance should be built from the ground up. Only as their endurance component becomes more refined should they progress back to full event training, leading into the competitive season. Again, to reiterate, Hybrid Training is about breaking down every type of athleticism or sport into its fundamental components and targeting each individually.

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NUTRITIONAL SUPPORT FOR HYBRID TRAINING

NUTRITIONAL SUPPORT FOR HYBRID TRAINING

Nutrition itself could encompass an entire text in and of itself, given the tremendous complexity of the subject. Entire college courses, majors, Masters programs, and multiple fields of Doctorate study are devoted to even the most minute components of sports nutrition. This means that any attempt to address it in a small portion of a text on programming would seem almost naïve.

To an extent, this is true, yet it is precisely the complexity of nutrition that makes it relatively simple - the author has found that 95% of nutritional complexities out in the field at the moment account for perhaps 10% of the practical results - the basic rules for nutrition for hybrid programming can be summed up as follows: don't starve yourself, and don't eat like an asshole. (Trevor Kashey to thank for the second part of that sentence). The fact is, the majority of individuals spend entirely so much time focused on macronutrient breakdowns, meal timing, manipulating hormone levels via food, etc, that they miss the fact that their careful caloric calculations are completely incorrect. The single biggest component in eating for performance is indeed caloric intake.

The second biggest factor is carbohydrate intake - excessive protein is one

of the most ridiculous side effects of supplement company propaganda that has done next to nothing for the sake of most athletes or athletic performance. Thankfully, the majority of individuals who stick to a higher protein diet (and lower carb) restrict their athletic endeavors to the weight room and are not as negatively impacted as endurance athletes would be, but as this text is intended for many of those making this switch, it must be noted.

FIRST, A DIGESTION PRIMER

The first, most important thing to understand about nutrition is how what you consume is getting into your body.

When you eat anything, the process of digestion starts in the mouth. Amylase, an enzyme contained in saliva (also produced by the pancreas, but not relevant at the moment), begins to break starches down into individual sugar molecules. Food then makes its way to your stomach, where a number of things happen, but more importantly, a number of things do not happen.

The stomach is not an absorptive organ - it can absorb some water and lipid soluble compounds, as well as small amounts of amino acids, but for the most part, it is really just a large blender filled with acid and a few enzymes. This is important, as food remains in the stomach for hours- one to two hours for small, easily digested foods (say, whey protein), up to five or six hours for large, hard-to-digest meals (rare beef, thick fibrous starches). Bear in mind that this process is a continuum, and there is no timer controlling food's exit rate, just a small aperture that doesn't let large objects through. The speed of gastric emptying is also controlled by various hormones and feedback mechanisms, including the "ileal brake". The ileal brake refers to the ileum- a portion of the small intestine. When nutrients are present in the ileum, the stomach empties more slowly.

Once food is mixed and broken down in the stomach, the bolus makes its way to the small intestine, where buffers neutralize the acid and other enzymes get to work, including all the various proteases that break down protein and the lipases that break down fats. For the next five to six hours, food is pushed through and the majority of nutrients are absorbed, before the remainder is pushed into the large intestine, where it remains for upwards of 20 hours. In that time, bacteria process the remaining nutrients (and fermentation of certain carbohydrates occurs), and water and electrolytes are removed.

This is certainly a much more complex process overall than explained above, but this information is necessary to understand a few basic facts.

First of all, look at the overall transit time - nutrients are being actively absorbed from any meal for well over ten hours. Most nutrients, with the exception of pure glucose and free amino acids (or very short chain polypeptides) do not even begin processing until several hours after ingestion.

On top of this, the presence of food in the small intestine slows emptying of the stomach, which means that nutrients from a meal eaten eight hours ago are still being absorbed and slowing digestion of anything eaten more recently.

Also note that digestion is a 98-99% efficient process- there are minimal nutrients left in human waste matter, and what is left are primarily fibrous starches that we cannot digest (like cellulose), a few undigested food particles, small amounts of fat, and water. Though perhaps not a wonderful subject, this nevertheless illustrates an important point - no matter the macronutrient, your body will absorb it. There is no upper limit to the amount of, say, amino acids your body can break down and pull into the bloodstream.

A final note on the fate of amino acids - once absorbed, amino acids can be used directly by cells for the synthesis of new enzymes or new cell structures, for the building of structural proteins (such as actin and myosin in the muscles), for the synthesis of other amino acids (via transamination), or used for energy. The latter is important to understand, as deamination (the process by which the amino group is removed) creates two products: Ammonia and a carbon skeleton (Acetyl CoA/acetoacetate or pyruvate). The ammonia is combined with carbon dioxide in the urea cycle, and excreted in urine, and the carbon skeleton can be either used for energy directly or converted into other compounds, such as glucose or fatty acids (though this is a very energy inefficient process). This last point is particularly important, as it is critical to understand that once this amino acid is broken up, your body only sees the carbon skeleton, and doesn't care if this carbon skeleton came originally from a glucose molecule or from a protein.

CALORIC REQUIREMENTS

The issue with calorie calculators is that they tend to be entirely useless. First, they rarely take lean body mass into account, which is a fairly large factor in determining BMR (though often overstated - 1 pound of fat requires about 2 calories per day to support, and one pound of muscle requires about 6, hardly a staggering difference). Second, many calculators take a host of carefully calibrated figures, then multiply them by a massive arbitrary "activity multiplier" that many people completely misinterpret. (For example, somebody who exercises for three hours a day may think they are "highly active", when in reality their office job places them squarely in the "sedentary" category). Finally, individual habits are often ignored - taking the stairs or walking versus taking the elevator or driving can easily add hundreds of calories over the course of a day; another thing ignored is NEAT (non exercise activity thermogenesis), which can include the simple propensity of an individual to fidget or shift or get up for several cups of coffee while at their desk.

Simply put, there is no substitute for simply tracking one's own calories over a period of time (usually a week).

Check this caloric figure against scale weight to determine true baseline caloric needs - provided the individual truly tracks portion sizes correctly and does not "ignore" certain foods, this figure can be the most accurate to use by a large margin. Worth restating is that this requires honesty and exacting tracking - many individuals misreport their food intake, and it takes discipline to learn to track correctly.

Once this baseline has been established, the individual must assess the level of additional activity that will need to be supported. For cardiovascular activity, there are a large number of fairly accurate calculators available on the internet, but the coefficients I typically use are as follows:

- Running: 0.66 calories per mile per pound.
- Swimming: 2.9 calories per mile per pound
- Cycling: 0.29 calories per mile per pound

Bear in mind, inexperienced individuals will be less efficient at these movements, and can burn significantly more, particularly when swimming.

These calories must be replaced, plus 10% (for repair - thoroughly unscientific number backed by precisely zero studies but years of experience), in the course of the individual's daily diet - bear in mind these can be spread out over the week, as daily and hourly fluctuations matter far less than overall anabolic/catabolic state. The author recommends that, of these additional activity-based calories, carbohydrates comprise 80% - the remainder can be evenly divided between protein and fat.

Please note that weight training requires comparatively fewer calories- the relative work to time ratio will typically put weight training at around 1.5 calories per pound per hour for the individual, and recovery from weight training will typically be about 10% of calories beyond that. (Therefore a 200 pound individual who lifts for an hour will need 330 additional calories to fuel their session)

For lean mass gain, a simple method is recommended- beyond these levels, 5% more calories per week until a 0.25-0.5 pound per week steady increase in bodyweight is observed. (0.25 for females, 0.5 for males).

MACRONUTRIENT REQUIREMENTS

Protein is the most over-consumed macronutrient for athletes, which is somewhat amusing as it is the least efficient energy source. Part of this tendency has to do with primary research being conducted on hypocaloric individuals, or individuals who are on an otherwise insufficient diet who show better muscle retention on higher protein. However, the hybrid athlete should never be hypocaloric- this is not a weight loss methodology, this is a performance methodology. Even so, in the case of weight loss, many individuals seek to consume upwards of 1.5g/lb of bodyweight, which is an absolutely absurd number.

To put this in context, burn victims (who have lost breathtaking amounts of tissue) and are fighting for their lives to replenish lost and damaged organs (the skin is an organ) at a high rate, are typically given about 1.5-2g/kg of bodyweight, up to a peak of around 2.5-g/kg for children or the severely injured.

Which means that an individual who is severely, severely injured, far more than any lifter or runner after a long workout, is given a max of around 1-1.2g/lb (conversion done here) of bodyweight of protein. Which makes these recommendations for 1.5+g/lb completely absurd - there is simply no way that the body requires this much, and indeed the majority of amino acids past this point are simply (as mentioned earlier) deaminated, the nitrogen converted to ammonia, then to urea, then excreted... while the rest of the amino acid is used as a horribly inefficient energy substrate.

But what about lean mass gain?

The average hard training natural (non-enhanced) male will find he can gain about 1-1.5 pounds of actual lean body mass every two months. The average female, 1-1.5 pounds every 4-6 months. (Note- any weight gain beyond this that isn't glycogen/water retention is, quite frankly, fat- sorry folks).

This is not a tremendous amount of additional structural protein- given the relative weight of structural proteins in the body, we're talking a few extra grams per day needed to make up new structures, and a few grams beyond that to support their creation (enzymes, cell division, etc.)

This is why we recommend 1-1.25g/kg/day as a baseline - going higher than this is fine, though if calories are high but energy levels and recovery are low, this could very well be because protein comprises too much of the diet, and should be lowered in favor of carbohydrate.

FATS

Getting enough fat is fairly easy - rare is the individual who does not get enough. Once protein minimums have been met, getting enough fat is a simple matter of shooting for about 10-15% of total calories - not terribly challenging. Quality of fats do matter, but for the most part if the majority comes from nuts, fish, or olive oil, this should be more than fine.

The author does not necessarily recommend fish oil supplements, since many tend to be rancid or unstable due to packaging, though cold pressed, non-encapsulated fish oil is often fairly high quality.

At this point, however, the individual could simply have a piece of salmon.

SIDEBAR

A word on “fat adaptation for the endurance athlete” - this is an idea that has been floated for several years now, with the notion that consuming high fat low carbohydrate diets will alter the individual’s metabolism and allow them to perform for hours on pure fat metabolism.

There are even studies that back this up- at 70% of VO2 max, “fat adapted” athletes performed slightly better than carbohydrate fed athletes. As many individuals know, however, 70% of VO2 max is approximately the same level of challenge as playing shuffleboard with a particularly saucy nonagenarian - at ultra low intensities (say, a 100 mile run), this is a viable method. For all higher levels of exertion, however, the fat adapted athletes had far less peak power, sustained power, and they generally fall flat on their faces. In actual race conditions, this is not ideal - the fact is, after training well over 300 athletes, the author has yet to encounter a single high performing “fat adapted” athlete. Carbohydrates are, and always will be, the single best fuel for endurance activity, and if the reader disagrees, he or she is welcome to write their own book.

CARBOHYDRATES

These should comprise the entire rest of the diet. Once protein and fat minimums have been met, carbohydrates round out the meals, as they are an outstanding energy source, and highly protein sparing, there is simply no reason to avoid them or restrict their intake. Carbohydrates = performance, plain and simple. Please note, this can be quite a high level of carbohydrates. Let's take a 220 pound individual training for a marathon, logging 40 miles per week, plus 4 hours in the weight room with a baseline intake of 3600 calories a day. Activity burns about ~5700 additional calories per week from the running and ~1200-1300 from the lifting, plus 10%, which makes this around 33,000 calories per week, or 4700 per day. With protein at 125g per day (mandated), and fats at 52g minimum, this leaves around 900 grams of carbohydrates per day. This is an awe-inspiring number for many gym rats who may be used to carbohydrate intake in the 200-350g range. Bear in mind, however, these are also the individuals who complain that running causes them to lose size and strength, and still struggle to complete their target distances (the author was a prime example when training for his first marathon).

MEAL TIMING

The single most important factor when determining how to structure meal timing is as follows:

Don't eat so much before your workout that you vomit.

Everything else is a distant, distant second, third, fourth, fifth priority. Generally speaking, the body is remarkably good at spreading out nutrient absorption. Given that the stomach (not an absorptive organ) takes 2-3 hours to process foods, the small intestine takes 6-8 hours to absorb most nutrients, and the colon absorbs water, vitamins, and electrolytes for a further 6-12 (at least), it's fairly safe to say that an individual is rarely in a "fasted" state. Because of this, it is exceedingly unlikely that an individual must rush to get in a protein shake after a lifting session, or must pop down gels every thirty minutes during a two hour bike ride.

FACTORS WORTH CONSIDERING

For long duration cardiovascular activity, it is sometimes beneficial to eat, not to fuel the activity, but to fuel recovery. Given the large number of calories needed during the day, a three hour bike ride represents a good portion of waking hours that does not involve eating. Taking in 300-500 calories on this ride will help ensure daily totals are met. In addition, there is value to fueling activity once glycogen depletion starts to become an issue (rarely less than 1:30:00-2:00:00 into activity).

Easily digested carbohydrates can be very useful during long rides, rucks, or runs, provided they are consumed early and regularly.

Granola bars and other more solid foods are a terrible choice, incidentally, as the already-slow stomach transit time is further slowed by decreased perfusion to the GI tract - in other words, lesser blood flow (Note that this is a commonly held theory- exercise itself can decrease blood flow to the gut. The reader should note that recent research has put this up for debate- there is a school of thought that suggests only relative blood flow to the gut is decreased, but absolute blood flow is unchanged, and reduced absorption/peristalsis is due to hormonal factors associated with exercise. Regardless of the mechanism, the effect is the same. Add on postural discomfort if you're on a bike, and you have the recipe for GI upset. The author recommends 1.5g/kg of bodyweight in calories (preferably carbohydrates) during activity longer than 1.5 hours, for both recovery and for performance.

For long duration weight training sessions, it is important to stay hydrated, but there is absolutely no need whatsoever to consume additional calories of any sort during a session.

Large meals the night before a big competition or long training day are not recommended. If the athlete wishes to ensure topped up glycogen stores, a simple depletion/replenishment workout 24-36 hours before competition is ideal.

That being said, if an individual is looking for a large replenishment after cutting weight, it is critical to note a particular phenomenon of the human body - the lower portion of the small intestine, the ileum, has a feedback system called the ileal brake. If undigested nutrients pass through to this distal end of the small intestine (as, say, if you had a massively large meal), gastric motility essentially stops. This is the body's way of ensuring that nutrients are all absorbed and do not make their way into the colon. What this means is that further food intake may simply sit in the duodenum or even stomach while absorption takes place. Given that food takes about 12 hours to make its way to the ileum, this means one simple thing - a large meal at dinner the night before a competition can very well mean that the individual's breakfast (and every meal for the next few hours) sits in the stomach or upper part of the small intestine and goes nowhere.

Once this brake is released, of course, there is a massive restarting of peristalsis, which, quite frankly, results in a sudden need to find a port-a-john. This essentially means one thing - overfeeding the night before a competition or workout means that you'll get stomach upset from breakfast, won't be able to absorb those morning carbohydrates you may need, and will promptly find yourself racing for the bathroom within an hour or two of competition.

Eat your large meal around lunchtime the day before competition, spread out those calories, and this issue is drastically reduced.

HYDRATION

Proper hydration during any sort of physical activity is an absolute necessity - there are few more self-evident statements in the entire field of sports nutrition. When the body begins to run low on water, the list of systems that become compromised is so extensive that it's almost not worth listing - suffice it to say that anybody who has become dehydrated or severely dehydrated while engaged in any sort of physical activity is well aware how devastating it can be.

HOW IS WATER ABSORBED BY THE BODY?

Water is one of the few substances that the stomach is capable of absorbing - the stomach is primarily a processing station, and few compounds actually make it across the stomach lining into the bloodstream. It is not, however, the primary organ for water absorption, and why this is important will become more relevant later on. The majority of water is absorbed in the small intestine, and what is most critical is

the understanding that most water is not actively transported across the intestinal lining. In other words, there are no cells or transporters that carry water into your bloodstream- it just sort of flows by itself. Why is this so important? Because it means water absorption is heavily dependent on osmotic gradients- if the gut is filled with large quantities of mineral ions (particularly sodium), free glucose, etc., water will remain in the gut to serve as a buffer. If you've ever been on an exceedingly long run and taken in a massive quantity of Gatorade, you'll understand exactly what this feels like. It sloshes around, flows back up into your esophagus, and can inspire truly astounding-looking technicolor yawns.

Most other nutrients, on the other hand, are more actively transported - there are certain receptors lining those intestinal cells (cells called enterocytes, if anybody cares) that pull salts, sugars, amino acids, etc. through the intestinal lining into the cells in exchange for other compounds (e.g. they'll pull in a hydrogen ion at the same time as an amino acid, then exchange the new hydrogen atom for a sodium molecule later.) One interesting fact here is that many compounds are co-transported, for example sodium cannot be efficiently absorbed without some sugars (remember this), as sodium uptake is coupled with glucose uptake, and absorption of both accelerates water uptake (as it forces water into the cells to buffer the two). Almost as importantly, amino acid uptake is also coupled with sodium uptake, an interesting fact that will soon become relevant.

If you are new to the concept of osmotic gradients, or have deliberately blocked out all high school or college chemistry like any other traumatic experience, just simply understand that if you have a semi-permeable membrane (that water can pass through, but nothing larger) with fluid on both sides, and ions or small molecules dissolved on in the solution on one side that cannot penetrate the membrane, the fluid will always flow to the side with the higher concentration of dissolved molecules.

So if your gut is filled with water much saltier than your blood, the water will stay in your gut to buffer the salt. This, incidentally, is why drinking seawater can kill you- not only is the water poorly absorbed due to the high salt concentration (meaning water stays in the gut until the salt is absorbed), but once the salt is in your system, your body needs to buffer it in your blood, then excrete it, which means a huge amount of water ends up being removed from your cells (to maintain equilibrium between your bloodstream and your cells) then dumped into your kidneys (to maintain the gradient between your urine and your blood).

Now, granted, this is simplified - there are a number of ways in which the body can continue to absorb water against an osmotic gradient (look up "three compartment model" if you're truly curious), but the end lesson still holds - if the gut is too full of solutes, water absorption is slowed. The body needs to absorb these solutes in order to optimally absorb the water, which means the more electrolytes, sugars, and other molecules in the gut, the longer this will take. It also means that, in order for optimal absorption, there needs to be good blood flow to the cells in the gut to keep "sweeping" absorbed molecules away... which in turn lets more molecules be absorbed (again, simplified but fundamentally accurate).

So if keeping the gut free of sodium is the best way to facilitate passive water uptake, why not just drink plain water? Well, simply put, for short exercise duration this is indeed often the best option - plain old water is absolutely adequate to hydrate during a typical weight lifting session, short set of sprints, or short distance run in moderate temperatures.

During longer duration activity, however, it becomes important to take in compounds other than water that are lost, which includes the aforementioned sodium, as well as carbohydrates to fuel continued activity.

If you take in nothing but water, sodium and potassium loss through sweat can eventually be exceedingly detrimental to performance, as these compounds are absolutely vital to muscle contraction and, indeed, life in general. (Note that this will not cause cramping - cramps are not caused by low sodium or potassium. The reader is encouraged to repeat this to everybody who will listen until this myth dies. Cramping is caused by under-conditioning; this will be the focus of a later article). Replacing lost carbohydrates is also critical, as glycogen losses will eventually result in the body losing its ability to perform under anaerobic conditions, which means even the most efficient runner will be reduced to a slow stagger.

Hence, the advent of sports drinks - fluids that contain electrolytes that your body needs, as well as glucose to continue fueling activity (and aid water/sodium uptake). During moderate duration exercise, these sports drinks may seem like a godsend - they taste good (your body craves the salt and sugar), they go down easily, and they taste better than lukewarm brackish bottle water. The electrolytes replace those being lost through sweat, and the glucose is both useful for extending performance and for assisting in electrolyte uptake.

There is one major issue with these drinks, however - they are almost all calibrated to be ideally absorbed by a body at rest. Once the body begins to exert itself, blood concentrations of certain electrolytes and carbohydrates can decrease, and most importantly, circulation to the gut can decrease. This last point bears explaining - when you exercise, the body shunts blood away from momentarily less essential systems (like the digestive system) and towards more essential systems (heart, lungs, muscles). If less blood is getting to your digestive tract, what does this mean for nutrient absorption? Remember how water is passively diffused and relies on the bloodstream to keep those molecules flowing away from the gut? If that slows down, suddenly the body can no longer establish a strong gradient (since those molecules that were previously being actively carried into the bloodstream then swept away are now just sitting there), and water just ends up sitting in the gut as a buffer.

The purpose of all the background information was to drive home a point - pure water alone can be detrimental to long term performance, as athletes require other nutrients to function, while too much sugar or salt in the digestive system will slow water absorption and result in a similar performance decrease, along with severe GI distress.

So what is ideal? Sports drinks, as mentioned earlier, tend to become increasingly too high in electrolyte and (mainly) sugar concentrations as activity increases, as the uptake of these nutrients slows and they begin to accumulate in the gut. The ideal glucose concentration used in Oral Rehydration Therapy (ORT - for patients with cholera or other diseases affecting the GI system whose lives depend on absorbing water and electrolytes, but who may not have access to an IV)- about 7 grams of carbohydrates per 8 ounces of fluid.

SIDEBAR

A side note here of relevance- ORT is clinically just as effective as IV rehydration in a healthy individual not experiencing severe GI distress - in other words, there is actually no reason to use an IV bag after a weight cut, for example. Simply drinking an isotonic rehydration solution is every bit as effective. Quite frankly, this is not really open for much debate - this is a clinical standard.

Remember how amino acids are also coupled to sodium uptake? Some ORT formulations use small amounts of free floating amino acids to aid in hydration, and as these use different transporters that create different gradients (amino acids use a hydrogen ion gradient), the two can work in unison under similarly stressed conditions. Therefore adding amino acids to a drink can help - one critical item to mention, however, is not all amino acids are absorbed with sodium - the main amino acids aiding in sodium absorption are Aspartate, Glutamine, Alanine, Cysteine, Serine, and Glycine. Leucine also has some affinity for this process, though the branched chain amino acids in general are not the strongest sodium transporters. Small peptides (more than one amino acid linked) are also absorbed with sodium, though these are less easily dissolved in drinks, and harder to digest when the stomach is under stress. (If anybody has tried Accelerade™, they may notice it is incredibly effective at hydration until the gut begins to slow down, as the peptides from the whey protein contained within are no longer effectively breaking down in the system.)

SO THE IDEAL SPORTS DRINK?

The author has used a recipe in the past that is quite effective:

PER 24 OUNCES OF WATER

- 1/2 tsp salt
- 1/4 tsp baking soda
- 1/2 tsp no-salt (potassium chloride). Sub 3 squeezed lemons if you can't find this
- 3-4 tbsp honey or table sugar
- 3-4g BCAAs
- 2g glutamine
- 100-300mg magnesium
- -12g waxy maize

This is the recipe recommended to many of Complete Human Performance's military athletes who are doing extremely long rucks, ultra runners, etc. Please note, the author collaborated with Chaos and Pain to produce a product called Mercury, which is this ideal formula packaged together in a way that no longer tastes absolutely horrible (quite good, in fact). As the product was formulated 100% with hydration and sustained energy in mind, the author recommends it unequivocally.

SUMMARY OF KEY POINTS

Hybrid training is fundamentally a relatively straightforward concept - as mentioned earlier, there is no magic to it, no tricks, no hormone manipulation, none of that cleverness.

The basic principles are very well-established: consolidation of stressors, understanding and monitoring all components of recovery, and breaking down and targeting the various components of performance individually.

It is this simplicity, with all the complication removed, that returns results.

What the author hopes that the reader will get out of this book is a better understanding of the nuances involved, However, as these principles are applied, what are the various details that provide a particular challenge for crossover athletes, on both sides of the spectrum, and what special considerations must be taken?

The first appendix, which contains various routines for various athletes, incorporates many of these ideas and give a sense of how they can be compiled. Many of these routines are pulled directly from custom plans that have been created for the author's various clients over the years, but understand they are not set in stone - they are simply a representation -

one way of setting up the programming that should “work” as a backbone for the majority of people.

Finally, a sincere thank you for making it this far - I can only hope that the information herein contained at least a few nuggets of knowledge that will help make you, the reader, a better athlete. If you’ve come this far and haven’t found something you can use, then I haven’t succeeded. If you have, then this has been worthwhile.

To good health, to new challenges, and to reminding yourself that we’re all in this to have fun. Enjoy the training, enjoy the competition, but above all, don’t take all of this too seriously. Close the book, close the laptop lid, and before you do anything else, pet the dog, hug your kid, hug your spouse, and remember that what you just read here isn’t life itself, it’s a hobby. Then come back and kick ass.

Cheers,

ALEX VIADA

Durham, NC, February 8th, 2015

A

APPENDIX

A ROUTINE FOR EVERY IMAGINABLE ATHLETE

APPENDIX A

A ROUTINE FOR EVERY IMAGINABLE ATHLETE

PAGE #	PROGRAM TYPE
TBD	Road cycling and powerlifting to be released April 2015
TBD	Training for Selection to be released April 2015
TBD	Training for Selection and Powerlifting to be released April 2015
TBD	MMA to be released April 2015
TBD	Track Cycling to be released April 2015
TBD	Track Cycling and Powerlifting to be released April 2015
TBD	General strength for short to mid distance runners to be released April 2015
TBD	General strength for ultra runners and long course triathletes to be released April 2015
TBD	The All Arounder- aesthetics, strength, and endurance to be released April 2015

NOTATION

USAGE	EXERCISE
(S)	Speed- lift performed at maximum velocity
(P#)	Paused- # = lift paused for seconds
(C###)	Cadenced- # eccentric, # hold, # concentric
BP70% 3 x 5	Lift – percentage of max – reps – sets

PROGRAMMING TABLE LEGEND

USAGE	EXERCISE	USAGE	EXERCISE
BBC	Barbell curl	IBP	Incline bench press
BP	Bench press	JS	Jump squat
BrP	Burpee	KBS	Kettlebell swing (Or Kentucky Breakfast Stout)
BBR	Barbell row	LC	Log clean
BS	Back squat	LP	Leg press
BTNPP	Behind the neck push press	LP	Log press
C&J	Clean and jerk	LR	Lateral raises
CD	Circus DB	MU	Muscle up
CGBP	Close grip bench press	OHS	Overhead squat
CR	Cuban rotations	PC	Power clean
DB	Dead bench	PP	Push press
BXJ	Box jump	PS	Power snatch
DBF	Dumbbell fly	PU (#)	Pull up (with added weight)
DBPO	Dumbbell pullover	RDL	Romanian deadlift
DBR	Dumbbell row	RP	Rack pull
DL	Deadlift	S	Snatch
DP	Deficit pull (deadlift)	SC/SL	Stone carry/Stone load
DS	Drop snatch	SGBBR	Snatch grip barbell row
FC	Farmer's carry/farmer's walk	SGDL	Snatch grip deadlift
FS	Front squat	SS	Split squat
GHR	Glute-ham raise	T2B	Toe to bar
HC	Hang clean	Th	Thrusters
HC	Hammer curl	WL	Walking lunge
HLR	Hanging Leg Raise	YW	Yoke walk
HP	High Pull	ZS	Zercher squat

ENDURANCE

USAGE	EXERCISE
TR	Tempo run- zone 3.5-4.0 - +/- 10% of race pace
I/R	Intervals/repeats- zone 4.0+ - Above race pace
LSR	Long slow run- max zone 2.9 – Below race pace
LSRD	Long slow ride- max zone 2.0 – Below race pace
TT	Time trial + / - 5% of race pace – peak effort for given distance
MP	Mile pace
RP	Race pace
THRSH	Threshold pace - Unsustainable
RR/Rd/Rw	Recovery run/ride/row
RW	Row
AD	Airdyne

POWERLIFTING AND GENERAL AEROBIC CONDITIONING

DAY	STRENGTH	CONDITIONING	NOTES
ONE			
	BP 90% x 2	Rest	
	BP 75% x 6 x 2		
	PP 85% x 5 x 2		
	BBR 85% x 5 x 3		
	PU 10 x 3		
TWO			
	BS/DL 90% x 2	AD sprints	
	BS/DL 75% x 6 x 2		
	FS/RDL 85% x 5 x 4		
	HLR x 10 x 3		
THREE			
	Rest	TR 0:30	
FOUR			
	BP(S)75% x 5 x 2	RRw 0:10-0:20	
	CGBP(C303) 70% x 6 x 3		
	LR 80% x 6 x 3		
	BBC: 75% x 8 x 2		

DAY	STRENGTH	CONDITIONING	NOTES
FIVE			
	Clean variant	TR: 0:30	
	Snatch variant		
	BS/DL 70% x 8-10 x 2		
	SS: 75% x 8 x 3		
SIX			
	Rest	Rest	
SEVEN			
	Rest	LSR/LSRD- 60-90 min	

PRIORITIES AND PITFALLS

This routine has several major objectives- the first is increasing the three competitive powerlifts (squat, bench, and deadlift), which stands above all other considerations. As these are the priority, specific s/b/d programming is incorporated FIRST. Specific work capacity in the lifts is important, and since endurance goals are nonexistent (beyond general aerobic conditioning), conditioning will be divided between lifting-specific strength-endurance and general easy aerobic conditioning of multiple modalities- the emphasis here being NON-INTERFERENT. The primary concerns in this routine would be relatively simple- keeping the "conditioning" stimulus light enough and targeted enough that it does in no way compromise strength gains or progress. There are two upper and two lower body lifting days, one focused more on maximum power output, the other on RFP/hypertrophy. Note that the percentages here are simply recommendations to give an idea of relative volume. Notice also there is very little <75% load- warm up sets are NOT listed.

PROGRESSION

To progress this routine, it is recommended that the heavy lifting days rotate between heavy singles (not a true 1RM, but a training max), heavy triples, and heavy sets of 4 or 5. The lighter days should rotate accessories depending on weak points, though rarely will these vary tremendously unless a lifter has a serious issue. Every 5-6 weeks, maxes should be recalibrated (via RPE adjustments- i.e. when "95%" feels far too easy.) Please note that nearly any basic lifts can be substituted here, as long as the general "higher intensity early in the week and lower intensity later in the week" concept is maintained. For the cardiovascular portion, progression should be fairly linear- the airdyne sprints and tempo run should gradually increase in intensity and duration, though they should still be limited to 20-45 minutes per workout, and the long slow distance work can increase gradually in distance. Note that the LSR/LSRD should be roughly heart rate limited- zone 2 or slow and easy is the goal here, and exceeding this should be avoided. A heart rate monitor is highly recommended here to maintain a strong hold on intensity- the biggest mistake that can be made is in forcing higher intensity and pacing increases if fitness has still not yet caught up.

POWERLIFTING AND A 5K

DAY	STRENGTH	CONDITIONING	NOTES
ONE			
	BP 90% x 2	I/R @ 400m-800m	
	BP 75% x 6 x 2		
	PP 85% x 5 x 2		
	BBR 85% x 5 x 3		
	PU 10 x 3		
TWO			
	BS/DL 90% x 2	Rest	
	BS/DL 75% x 6 x 2		
	FS/RDL 85% x 5 x 4		
	HLR x 10 x 3		
THREE			
	Rest	TR: 0:20-0:40	
FOUR			
	BP(S)75% x 5 x 2	Rest	
	CGBP(C303) 70% x 6 x 3		
	LR 80% x 6 x 3		
	BBC: 75% x 8 x 2		

DAY	STRENGTH	CONDITIONING	NOTES
FIVE			
	BS(S): 75% x 5 x 3	Rest	
	BS(P): 75% x 4 x 3		
	SGDL: 75% x 8 x 2		
	JS: 70% x 4 x 4		
	HLR x 8 x 3		
SIX			
	Rest	LSR- 60-90 min	
SEVEN			
	Rest	RR; 0:10-0:20	

PRIORITIES AND PITFALLS

This routine differs from the previous in that conditioning now takes a slightly higher priority- as running a 5k specifically is an objective, the endurance portion is more focused on running itself. The strength training portion can remain identical- all that NEEDS to change is the running modality. Note that, due to the extra running, the lower back is given a slight break in day 5 (as this can compromise form), and the actual run days are shifted slightly to really make the tempo run a slightly higher quality (as this is the most race-specific). The biggest concern here for the individual is WASTING a run- these ALL need to be focused on some major progression- since mileage here will be significantly lower than most 5k running programs, it's critical that tempo runs get a bit more intense week to week, intervals and running drills are high quality, and recovery runs/ long slow distance runs are NOT skipped or cut short. In addition, given the running emphasis, finding good surfaces to run on is of course critical, as is finding the correct pair of shoes (preferably two pairs)

PROGRESSION

To progress this routine, it is recommended that the heavy lifting days rotate between heavy singles (not a true 1RM, but a training max), heavy triples, and heavy sets of 4 or 5. The lighter days should rotate accessories depending on weak points, though rarely will these vary tremendously unless a lifter has a serious issue. Every 5-6 weeks, maxes should be recalibrated (via RPE adjustments- i.e. when "95%" feels far too easy. Please note that nearly any basic lifts can be substituted here, as long as the general "higher intensity early in the week and lower intensity later in the week" concept is maintained. For the 5k portion, note the minimal (4) running days- as this routine starts, the intervals will likely have to be fairly short with longer rest periods- and remember, there is NO purpose to doing an interval signficantly faster than target race pace (sprinting a 200 or 400m does not translate particularly well to a 5k- and while this may be useful for high level runners, for those with powerlifing aspirations as well it is counterproductive.) The tempo run should be JUST slower than race pace, and can vary between underdistance and overdistance. The long slow run should nearly always be overdistance (except for the very novice runner), and significantly slower than race pace. The recovery run should be at approximately LSR pace as well. Please note- aqua jogging or easy cycling can replace the recovery run on occasion.

POWERLIFTING AND A MARATHON

DAY	STRENGTH	CONDITIONING	NOTES
ONE			
	BP 90% x 2	I/R @ 800m-1650m	
	BP 75% x 6 x 2		
	BP(S)75% x 5 x 2		
	PU x 10 x 3		
	BBR: 85% x 4 x 2		
TWO			
	BS/DL 90% x 2	Rest	
	BS/DL(P) 75% x 6 x 2		
	SGDL: 75% x 8 x 2		
	JS: 70% x 4 x 4		
THREE			
	Rest	TR: 0:30-1:00	
FOUR			
	IBP(C303) 75% x 5 x 4	Rest	
	CGBP(C303) 70% x 6 x 3		
	LR(C212) 70% x 8 x 3		
	BBC: 75% x 8 x 2		

DAY	STRENGTH	CONDITIONING	NOTES
FIVE			
	BS(C302): 70% x 8 x 3	TR: 0:30	High carb day
	SS: 75% x 8 x 3		
	RDL: 75% x 8 x 2		
	WL: 60% x 8 x 4		
	HLR x 8 x 3		
SIX			
	Rest	LSR- 60-180 min	
SEVEN			
	Rest	RR — 0:20-0:40	

PRIORITIES AND PITFALLS

This routine differs from the previous in that the running distance picks up SIGNIFICANTLY. The strength training portion modifies slightly to emphasize hypertrophy on the second day- muscle loss will be more of a concern, so maximum force and RFP work is consolidated, while hypertrophy gets its own day. The running training here is highly variable- though you'll notice that the distance is still greatly end-loaded in the week to have the majority of the mileage done on the weekend. This is a BIT of an abberation- simply put, steady weekly mileage and resistance training do not mix, the recovery cost is too high. The long slow work starts out quite relaxed in pacing and remains that way, with mileage steadily picking up as the runner's bones and joints adapt to the stress. Interval/repeat work lengthens as well- fast 400's have absolutely no pace in marathon work for an individual who's also concerned with leg recovery. The recovery has also become exclusively a run- as mileage overall is already quite low, every opportunity to get on the road must be taken.

PROGRESSION

To progress this routine, it is recommended that the heavy lifting days rotate between heavy singles (not a true 1RM, but a training max), heavy triples, and heavy sets of 4 or 5. The hypertrophy work should rotate rather frequently as well, though it is recommended that the basic cadenced bench, squat, and some split squat or lunge variation remain. Note that these repetition ranges are not set in stone- nor are the percentages. The objective is simply to work the vast majority of the muscles involved in the big three through a full range of motion to complete concentric fatigue, or close to failure. The running itself shows a wide range of durations, which indicate that as the individual progresses, the distances should steadily increase- remember that the LSR should remain nearly the same pace, and certainly the same low intensity, throughout the training cycle- the author strongly encourages at least 3-4 2.5-3 hour runs as part of training, at minimum, to get the athlete accustomed to breakdown and various issues that arise with longer running distances. The tempo runs are perhaps the most questioned component here- they should remain just about at or slightly faster than "race pace", based on CURRENT predicted race pace (which could be quite slow if the individual is new to marathons. What is more important here is effort- they should remain "steady-uncomfortable"- a solid push but not to the point where the individual finds energy levels flagging after 10 minutes. As the race approaches, the long runs should be used to practice eating and hydration strategies as well.

POWERLIFTING AND TRIATHLON

DAY	STRENGTH	CONDITIONING	NOTES
ONE			
	BP 90% x 2	Swim- drills	
	BP 75% x 6 x 2	Swim- intervals	
	BP(S)75% x 5 x 2		
	DBPO: x 12 x 3		
	BBR: 85% x 4 x 2		
TWO			
	BS/DL 90% x 2	Bike intervals 0:30-0:50	
	BS/DL(P) 75% x 6 x 2	Vo2 -> fast TT repeats	
	SGDL: 75% x 8 x 2		
	JS: 70% x 4 x 4		
THREE			
	Rest	TR: 0:30-1:00	
FOUR			
	IBP(C303) 75% x 5 x 4	Swim- steady state	
	CGBP(C303) 70% x 6 x 3	up to 110% race distance	
	LR(C212) 70% x 8 x 3		
	BBC: 75% x 8 x 2		
	CR: x 12 x 2		

DAY	STRENGTH	CONDITIONING	NOTES
FIVE			
	BS(C302): 70% x 8 x 3	Short depletion ride	High carb day, post-ride
	SS: 75% x 8 x 3	Moderate TT/race pace	
	RDL: 75% x 8 x 2		
	WL: 60% x 8 x 4		
	HLR x 8 x 3		
SIX			
	Rest	LSR/LSRD/Brick	
		30-300 minutes	
SEVEN			
	Rest	RR— 0:20-0:30	

PRIORITIES AND PITFALLS

This routine bears certain similarities to the PL and marathon template. The strength training portion does indeed still emphasize hypertrophy on the second day- muscle loss will be more of a concern, so maximum force and RFP work is consolidated, while hypertrophy gets its own day- note that the upper body work now contains a few movements to support cycling and swimming on the hypertrophy day. Note the short duration of swim workouts as well- these long 5000-8000 meter swim workouts that most Ironman programs will have in them (even many Olympic/70.3 programs have incredibly long-relative to race distance- swim workouts) are VERY counterproductive to upper body power production (for the strength athlete), so they are dramatically shortened. Cycling takes a fairly big front seat in the triathlon training, though note that endurance volume is STILL lower than a typical triathlon training program. Simply put, this is one of the most difficult programs to manage, as there are so many training priorities, none of which can be compromised. It is HIGHLY recommended that the individual does not attempt to do their first long course triathlon after 16 weeks on this program- it may take the better part of six months to get in the total training volume needed to succeed at these distances.

PROGRESSION

To progress this routine, it is recommended that the heavy lifting days rotate between heavy singles (not a true 1RM, but a training max), heavy triples, and heavy sets of 4 or 5. The hypertrophy work should rotate rather frequently as well, though it is recommended that the basic cadenced bench, squat, and some split squat or lunge variation remain. Note that these repetition ranges are not set in stone- nor are the percentages. The objective is simply to work the vast majority of the muscles involved in the big three through a full range of motion to complete concentric fatigue, or close to failure. Note that there is not a single full rest day- as the week contains two swims, two rides, two runs (one of which is a recovery), and a brick or long slow ride/run, the individual will be doing SOMETHING every day. This does mean that an actual full week off (with minimal active recovery) may be needed every 6-8 weeks, depending on burnout level. Note a few things- the bike intervals on day 2 should rotate between higher intensity Vo2 type intervals and longer duration time trial intervals- a lot of this time should be spent in full aero. Swim drills should be focused purely on efficiency, and intervals should be calibrated to never go more than 2-3 seconds per lap faster than race pace (targeted). The depletion ride the day before the long slow workout should be of MODERATE intensity, and carbs should be taken in immediately afterwards for maximum glycogen replenishment.

POWERLIFTING AND ULTRA RUNNING

DAY	STRENGTH	CONDITIONING	NOTES
ONE			
	BP 90% x 2	Rest	
	BP 75% x 6 x 2		
	BP(S)75% x 5 x 2		
	PU: 10 x 3		
	BBR: 85% x 4 x 2		
TWO			
	BS/DL 90% x 2	30-90:00 run- steady	
	BS/DL(P) 75% x 6 x 2	pace > race pace	
	SGDL: 75% x 8 x 2		
	JS: 70% x 4 x 4		
	FS: 60% x 15 x 3		
THREE			
	Rest	30-45:00 steady	
		recovery pace	
FOUR			
	IBP(C303) 75% x 5 x 4	Rest	
	CGBP(C303) 70% x 6 x 3		
	LR(C212) 70% x 8 x 3		
	BBC: 75% x 8 x 2		

DAY	STRENGTH	CONDITIONING	NOTES
FIVE			
	BS(C302): 70% x 8 x 3	45-60:00 steady run	
	SS: 75% x 8 x 3	> race pace	
	RDL: 75% x 8 x 2	with full race day	
	WL: 50% x 15 x 4	nutrition plan	
	HLR x 8 x 3		
SIX			
	Rest	LSR: 1:00--~6:00	
SEVEN			
	Rest	RR- 0:20-0:30	
		OR	
		Second LSR (for 100k+)	
		1:00-3:00	

PRIORITIES AND PITFALLS

This routine is actually one of the simplest to write, but most taxing to execute. As with the other long distance endurance/PL concurrent programs, strength training portion does indeed still emphasize hypertrophy on the second day- muscle loss will be a MAJOR concern, so maximum force and RFP work is consolidated, while hypertrophy gets its own day. The running is steady and almost exclusively slow paced- speed work and intervals, in the conventional sense, are not quite as necessary as during comparatively short and fast events (like the marathon). Note “faster than race pace” is utilized quite a bit- bearing in mind that even world class ultra runners are typically “racing” their 100 milers at a blistering 9-10 minute mile. One advantage of hybrid training here is that due to the frequent lower body resistance training, the legs are always in a state of minor fatigue, which is excellent preparation for race week, particularly if lifting volume is lowered leading up to a race. This routine leverages these lower body days, substituting a bit of extra leg volume for additional running, and letting the athlete reap the training benefit of fatigued-state running without having to put in as many miles. Note the distance/duration range here is for a 100k.

PROGRESSION

To progress this routine, it is recommended that the heavy lifting days rotate between heavy singles (not a true 1RM, but a training max), heavy triples, and heavy sets of 4 or 5. The hypertrophy work should rotate rather frequently as well, though it is recommended that the basic cadenced bench, squat, and some split squat or lunge variation remain. Note that these repetition ranges are not set in stone- nor are the percentages. The objective is simply to work the vast majority of the muscles involved in the big three through a full range of motion to complete concentric fatigue, or close to failure. For the running, note that the overall intensity seems fairly static. Worth pointing out is the two days completely off running, which the legs will sorely need! Both upper body days give the legs complete rest, while the weekend should hammer at the longer distances with a full ultra strategy (walking hills, race day nutrition, frequently contemplating quitting and getting a beer, shitting in the woods), while the runs earlier in the week should be steady paced, just over race pace with minimal nutrition. The exception is the Friday run- this is the opportunity to start a MINOR refeed for the long run on Saturday. Every third week, the Sunday run should be a longer back-to-back type run- rather than a shorter recovery it should essentially be a continuation of saturday's long run.

STRONGMAN AND GENERAL AEROBIC CONDITIONING

DAY	STRENGTH	CONDITIONING	NOTES
ONE			
	OHP 90% x 2	Row intervals	
	PP 75% x 6 x 2	20:00-30:00, 5 x 3:00	
	HC 85% x 5 x 2		
	BBR 85% x 5 x 3		
	PU 10 x 3		
TWO			
	FS 80% x 4 x 3	Rest	
	DL/18"DL 85% x 3 x 3		
	OR		
	DL/18"DL 75% x reps		
	PC 75-80% x 4 x 4		
	ZS w/pause 80% x 4 x 2		
THREE			
	Rest	TR 0:30	
		Can sub elliptical	
		or stationary bike	
FOUR			
	LC/LP	Rest	

DAY	STRENGTH	CONDITIONING	NOTES
	CD		
	Axle C&J		
	Axle PP		
FIVE			
	YW	RR 0:20-0:30	Sub carry medley for RR
	SC/FW		
	WL		
SIX			
	Rest	Rest	
SEVEN			
	Rest	LSR/LSRD- 45-60 min	

PRIORITIES AND PITFALLS

Important to note with any Strongman program is that the event training should be focused on the specific show being trained for- there is otherwise too much variety in how implements can be used, and while a strength base is still needed (as evidenced by the two generic lifting days), the events themselves must be targeted (though certain technique work is always beneficial.) As it is also important to spend extra time on form and technique in the event movements, the recommendations contained her are very broad, and essentially simply divide the days between a static day and a moving/loading day. The conditioning component itself is again meant to be minimally interferent- as Strongman itself has a conditioning component (however minor), general work capacity may have MORE application to performance than in, say, Powerlifting. Note, however, that having "Fresh legs" will become even more important for these athletes, so special attention should be paid to the level of intensity (which is quite low for the majority of conditioning, as moving events and certain loading events already begin to tap into those short duration "endurance" pathways, reducing the need for interval training). Notice with this split, "sprint" work is restricted to rowing- posterior chain local work capacity is more important than developing sprint speed!

PROGRESSION

To progress this routine, it is recommended that the heavy lifting days rotate between heavy singles (not a true 1RM, but a training max), heavy triples, and heavy sets of 4 or 5. The event days are deliberately vague- the number of events and nature of events can vary tremendously- the important factors to remember here are that the lifting should support the event work (hence the front squat emphasis over back squat, for example), and the events (and accessories to support them) should be tailored to the athlete and the show. It is especially important to maintain the "loading/lifting" and "moving" split- otherwise this program will quickly overwhelm recovery. The weekend "ride or run" is fairly long in duration, and the modality should suit the athlete (i.e., a ride would be recommended for a HW+). Monday's rowing session should REMAIN a row if at all possible- the additional grip work and lower back emphasis can be tremendously helpful, and is something that many SM cannot incorporate enough in the author's opinion. (The zero impact nature of it is also beneficial). When progressing the conditioning, care should be taken to keep the total time and intensity down on all but the interval day- this is enough baseline minutes of cardiovascular activity to maintain health- any additional work capacity accrued as the athlete improves should be directed towards moving events or medleys on the moving day.slightly faster than “race pace”, based on CURRENT predicted race pace (which could be quite slow if the individual is new to marathons. What is more important here is effort- they should remain “steady-uncomfortable”- a solid push but not to the point where the individual finds energy levels flagging after 10 minutes. As the race approaches, the long runs should be used to practice eating and hydration strategies as well.

STRONGMAN AND A 5K

DAY	STRENGTH	CONDITIONING	NOTES
ONE			
	OHP 90% x 2	RR — 0:10-0:20	
	PP 75% x 6 x 2		
	HC 85% x 5 x 2		
	BBR 85% x 5 x 3		
	PU 10 x 3		
TWO			
	FS 80% x 4 x 3	I/R @ 400m-800m	Sub metcon for I/R
	DL/18"DL 85% x 3 x 3		
	OR		
	DL/18"DL 75% x reps		
	PC 75-80% x 4 x 4		
	ZS w/pause 80% x 4 x 2		
THREE			
	Rest	Rest	
FOUR			
	LC/LP	Rest	
	CD		
	Axle C&J		

DAY	STRENGTH	CONDITIONING	NOTES
	Axle PP		
FIVE			
	YW	TR: 0:20-0:40	High carb day
	SC/FW		
	WL		
SIX			
	Rest	Rest	
SEVEN			
	Rest	LSR- 60-90 min	

PRIORITIES AND PITFALLS

Important to note with any Strongman program is that the event training should be focused on the specific show being trained for- there is otherwise too much variety in how implements can be used, and while a strength base is still needed (as evidenced by the two generic lifting days), the events themselves must be targeted (though certain technique work is always beneficial. As it is also important to spend extra time on form and technique in the event movements, the recommendations contained her are very broad, and essentially simply divide the days between a static day and a moving/loading day. Note also that the two faster paced runs are ALWAYS on lower body days. One note here- most Strongman competitors are aware of how long an "event" day can take during training-simply setting up the implements, warming up, loading, reloading- these can already be exceedingly long workouts, and including a tempo run at the end here can make this a VERY long day. Be prepared for this. One other noteworthy point- the Day 2 can actually incorporate medley/metcon type workout rather than intervals at the end, provided the medleys include a longer run component to build actual running speed (not simply sprinting).

PROGRESSION

To progress this routine, it is recommended that the heavy lifting days rotate between heavy singles (not a true 1RM, but a training max), heavy triples, and heavy sets of 4 or 5. The event days are deliberately vague- the number of events and nature of events can vary tremendously- the important factors to remember here are that the lifting should support the event work (hence the front squat emphasis over back squat, for example), and the events (and accessories to support them) should be tailored to the athlete and the show. As mentioned, the interval day can be replaced with medleys, but it is important that the tempo run remain independent. Also note, after a moving day, the tempo run may feel artificially challenging- the lower back will be quite fatigued, and chances are a tired upper back and shoulder girdle will make it challenging to maintain good run form. It is highly recommended that the individual warm up and/or perform the 100-up running drill (google is your friend) to get running posture back. Tempo may also have to be adjusted to be slightly slower than “target” pace to account for fatigue. The long slow run MUST remain a run for these individuals, and truthfully cannot be shortened to less than 60 minutes if any level of running performance is the goal- these longer duration aerobic pathways require a minimal level of training, and this is essentially IT.

HYPERTROPHY AND GENERAL AEROBIC CONDITIONING

DAY	STRENGTH	CONDITIONING	NOTES
ONE			
	BP 90% x 2	Recovery row	
	BP 75% x 6 x 2	or	
	OHP 75% x 6 x 3	Recovery run	
	BBR 85% x 5 x 3	0:20-0:30	
	DBR: 70% x 10 x 3		
TWO			
	BS/DL 90% x 2	Stair stepper	
	BS/DL 70% x 8-10 x 2	or	
	FS x 70% x 10 x 2	Tempo run	
	GHR x 10 x 4	0:30-0:40	
	HLR x 12 x 2		
THREE			
	Rest	Rest	
FOUR			
	IBP(C303) 75% x 8 x 2	Rw 0:30	
	CGBP(C303) 70% x F x 3		
	DBF(C403) 70% x 8 x 3		
	LR 80% x 6 x 3		

DAY	STRENGTH	CONDITIONING	NOTES
	BBC: 75% x 8 x 2		
FIVE			
	BS(C203): 75% x 8 x 3	AD TT 0:30-0:40	
	RDL: 80% x 6 x 2		
	LP x 10 x 4		
	FS(C302): 70% x 10 x 3		
SIX			
	Optional Accessory	Rest	
SEVEN			
	Rest	LSR/LSRD- 60 min	

PRIORITIES AND PITFALLS

This routine is intended in part for all around aesthetics- it is worth noting that the majority of "bodybuilding" routines, particularly near competition time, incorporate a great deal of general aerobic conditioning- indeed basic "cardio" is often central to "contest prep". The author HIGHLY recommends that bodybuilders or anybody interesting in lifting for hypertrophy pay special attention to concurrent training- building aerobic adaptations in new mass (i.e., ensuring that new muscle mass is well perfused, and the heart itself is trained to support greater body weight as the individual gains new mass) is FAR easier and healthier than gaining this mass, then later attempting to elicit these adaptations. The cost to weight gain will be minimal if done correctly, and in fact the greater general work capacity, along with more efficient energy substrate utilization, could certainly help the individual athlete have more productive lifting sessions. Also worth noting- this routine can be adapted for weight LOSS as welll, as the overall programming should help minimize lean mass loss. Note there is still a strength-focused day along with a hypertrophy-focused day- to avoid overly excessive potentially 'negative' endurance adaptations (including excessive movement economy), some power/speed work is still needed.

PROGRESSION

To progress this routine, it is recommended that the heavy lifting days rotate between heavy singles (not a true 1RM, but a training max), heavy triples, and heavy sets of 4 or 5. The hypertrophy days make heavy use of cadenced work- note that this is not necessarily to maximize time under tension, though this is a component- this is also to ensure strict, full range of motion muscle contraction and minimize the contribution of both inhibitory (spindle) and disinhibitory (golgi) stretch reflexes. There is a great deal of flexibility within this framework- provided the same basic upper/lower body split is maintained, the upper body can become a push/pull divide, and the lower a "quad-dominant/back dominant" divide, though the author would recommend that the same power versus hypertrophy split be maintained, and these ALTERNATE weekly. (i.e. pull power and push hypertrophy one week, push power and pull hypertrophy the next). An additional accessories day can take place on the weekend on day 6- this day can be targeted towards shoring up weak points in the individual's physique, though high intensity, full body work here is not recommended.

For conditioning, note the various modalities- alternating between rows, runs, steppers, and airdynes/stationary bikes is an important part of the plan. (The reader could see how a triathlon program could be substituted here as well!).

WEIGHTLIFTING AND GENERAL AEROBIC CONDITIONING

DAY	STRENGTH	CONDITIONING	NOTES
ONE			
	Sn	AD/TR 0:20-0:30	
	Sn variation		
	Clean variation		
	BS		
	HLR		
TWO			
	C&J	Rw Intervals	
	Jerk variation		
	PP		
	SGBR		
THREE			
	Rest	Rest	
FOUR			
	Sn	AD 0:15-0:20	
	Sn variation		
	PC		
	FS		

DAY	STRENGTH	CONDITIONING	NOTES
FIVE			
	C	TR: 0:30	
	Clean variation		
	Jerk/jerk variation		
	DS		
	HLR/T2B		
SIX			
	Optional Accessory	LSRD 45-60	
SEVEN			
	Rest		

PRIORITIES AND PITFALLS

This routine is perhaps one of the most controversial in its general recommendations- not the layout per se (it is exceedingly simple), but rather than overall concept- steady state cardiovascular conditioning is still frowned upon in much of Weightlifting simply because Weightlifting already requires such a large time investment, and places such an absolute premium on sport practice and explosiveness. Conditioning time detracts significantly from this emphasis, and given the Weightlifter's generally high frequency approach, specific work capacity is rarely lacking. Therefore, for the Weightlifter, cardiovascular conditioning exceptionally low on the totem pole as far as priorities go. Generally speaking, conditioning should be simple, varied in modality (to prevent burnout), and relatively consistent (as the week itself is fairly static as far as loading and intensity go), though note that this relatively simple Weightlifting routine does rotate emphasis on the days and incorporate appropriate conditioning accordingly. Essentially, this template is just demonstrating how to incorporate variety-specific routines for Weightlifting and running, and Weightlifting and triathlon, will be coming in later installments.

PROGRESSION

The lifting routine here is far more complicated than can be expressed in a simple template- there are a dozen schools of thought for progressing the C&J and Snatch, and generally the framework listed above can be easily modified. What is noteworthy, however, is that the beginning of the week is still higher intensity than the end, with rowing being the chosen modality for interval work (as it is ABSOLUTELY important that the Weightlifter neither her hamstrings through sprinting, nor risk patellar tendonitis via cycling (common on stationary bikes). The airdyne work should remain airdyne if at all possible, with minimal pure stationary biking- the hand assist both increases the overall full body fatigue, and again, decreases the relative load on the legs. The long slow ride is the only pure cycling workout there is- and SLOW is the emphasis, with MINIMAL power output, generally bringing the heart rate up to a mid zone 2 and staying relaxed. For the rowing, setting the buffer quite low is recommended- easing the load on the lower back per stroke and increasing the overall pulls per minute. Swimming may also be substituted for row intervals- Weightlifters have very good shoulder mobility, and will not be as hampered by the extra mobility swimming gives as, say, a strongman or powerlifter.

CROSSFIT COMPETITION AND A MARATHON

DAY	STRENGTH	CONDITIONING	NOTES
ONE			
	PP 80% x 4 x 3	I/R @ 800m-1650m	Upper body metcon
	OHP 75% x 6 x 2		5-10 minute- targeted
	Jerk 75% x 5 x 2		skills
	SGBBR		
TWO			
	C&J 80% x 4 x 4	Rest	
	Clean variant		
	BS/DL 80% x 5 x 2		
	SGDL: 75% x 8 x 2		
	BxJ: 70% x 4 x 4		
THREE			
	Rest	TR: 0:30-1:00	Chipper, 0:20-0:30
			OR
			Random WOD
FOUR			
	PP 70% x 8 x 2	Rest	Gymnastic practice
	CGBP 50% x 12 x 2		HSPU/MU/Ring Dip
	HC/HP		(Non-metcon)

DAY	STRENGTH	CONDITIONING	NOTES
	Jerk variant		
	Muscle snatch		
FIVE			
	Clean variant	TR: 0:30	Lower body metcon
	Snatch variant		10-15 minutes,
	BS/DL 70% x 8-10 x 2		targeted skills
	SS: 75% x 8 x 3		
SIX			
	Rest	LSR- 60-180 min	
SEVEN			
	Rest	RR — 0:20-0:40	

PRIORITIES AND PITFALLS

Note that the usage of the term CrossFit implies that this is an individual who is looking specifically to compete in the Open, Regionals, or Games. This is NOT a CrossFit-sanctioned routine and NOT a licensed CrossFit training program. In this case, the emphasis is almost entirely on sport specific preparation- but the nature of CrossFit competition is such that it REWARDS the increased aerobic base that marathon training can provide. Please pay special attention to the relative LACK of intensity in the conditioning portion- the BIGGEST FAILURE of many training programs

B

APPENDIX

BEER PAIRINGS

APPENDIX B

BEER PAIRINGS

Selecting the proper beer to accompany a given workout is an absolute must - once physical recovery is in order, proper... oh forget it. This section exists because of beer.

RECOMMENDED BEER PAIRING FOR HEAVY SQUAT OR DEADLIFT WORKOUTS

Heavy, maximal effort lower body workouts lasting between 45 and 60 minutes are best followed by Imperial stouts- the deep, rich flavor is soothing without being biting, and if the squats didn't put hair on your chest, the correct beer certainly will. This is true regardless of gender.

-Alesmith Speedway Stout, a potent yet exceptionally smooth stout with a strong vanilla/coffee aroma. Kicks hard but finishes with an almost sweet aftertaste. No need to spring for the rare variations, the basic stout here is all you need.

-Goose Island Bourbon County Stout, one of the richest, most overwhelming stouts the author has tried, and in his opinion beats out Three Floyds Dark Lord and Kentucky Breakfast Stout for sheer flavor.

-Stone Imperial Stout, a top tier beer you can find in nearly any specialty beer shop

RECOMMENDED BEER PAIRING FOR COMBINATION LOWER BODY/RUNNING WORKOUTS

These are perhaps the most exhausting of all workout combinations, heavy lower body resistance training followed by cardiovascular conditioning leaves the athlete both mentally and physically exhausted.

Trappist ales are perhaps the finest recovery beer yet known to man. The author has absolutely zero scientific backing for this statement, so it is up to the reader to accept this on blind faith because, well, Trappist ales are fantastic and I said so.

Generally speaking, "quads for quads" is a good mantra here - that is, a good quadrupel (technically a strong dark ale or strong dubbel). This, in fact, is what these beers were originally brewed for - specifically to help people's legs recover after long days of activity. (Note - this is not true at all and was just made up on the spot).

Brasserie de Rochefort's excellent Rochefort 10 is one of the finest trappist ales in the world - its complex, smooth, boozy flavor will help the drinker forget about the pain that he or she just experienced. The 11.3% abv helps there too.

On the domestic side, though obviously not a true Trappist ale, Unibroue's Maudite is a very reasonably priced, flavorful strong dark ale hailing from Canada, and a solid substitution.

If the reader cannot find either of these, it is recommended that he or she purchase a 12 pack of Natural Light and use these as cold packs around the legs for recovery. Do not under any circumstances drink one accidentally.

RECOMMENDED BEER PAIRING FOR WEIGHTLIFTING

High skill movements require a beer style with a similar sharp kick- a solid double IPA may seem clichéd, but is nevertheless still highly recommended for these individuals.

Stone's Enjoy By IPA is one of the more accessible of these beverages, as many of the traditional "top" IPAs (Heady Topper, Hopslam, Pliny the Elder and Younger) are so limited in their release that the recommendation is all but useless.

Dogfish head's 90 minute is another classic that holds its own against any of these specialty brews - common does not mean inferior, and Dogfish (along with Stone) have managed to mass-produce incredibly high quality brews of this sort.

RECOMMENDED BEER PAIRING FOR RUNNING

A good saison is the best option after a tempo run or long slow distance run. The grass undertones complement the outdoor activity, and the slightly funky brett flavors will make you forget all about the dog poop you stepped in halfway through the workout.

Boulevard's Saison-Brett is an excellent choice here- bready and funky but still refreshing, with an 8.5% abv hard kick.

And of course, Brasserie Dupont's Saison Dupont is an outstanding old standby that you can't beat for classic sweet, refreshing, bready goodness.

If you did your workout on the treadmill, then just do a few shots of Bacardi 151 and go sit in the corner- nothing can make your day any better.

RECOMMENDED BEER PAIRING AFTER A SWIM

Nothing cuts the chlorine or salt aftertaste like a good Flemish red. These unique beers are less fruity than lambics, with a tart smack in the face that'll wash the god awful water flavor out of your mouth and probably clear the water out of your ears within seconds.

Rodenbach makes a good, solid red, exemplified by their Vintage, though their Grand Cru is about as standard as they come - a can't-go-wrong option.

If you want to get a bit more vinegary, which is recommended after open water swims (to clear the salt out of your lungs and sinuses), the Verhaeghe Duchesse De Bourgogne is the author's absolute favorite. Please note, if you are unfamiliar with the style, this will taste like balsamic vinegar, so tread carefully.

All else being equal, the author would always recommend tracking down a good Samichlaus to have on hand if all pairings fail, you're feeling crushed after a hard week of training, your legs hurt, your arms hurt, your soul hurts, and you just want to get hammered. At 14%, a few bottles of this will have you feeling no pain whatsoever.

Good luck.

APPENDIX C

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ABOUT THE AUTHOR

Alex Viada is an NSCA Certified Strength and Conditioning Specialist and USA Triathlon Coach, is the founder and co-owner of Complete Human Performance. He has over twelve years of personal training and coaching experience with athletes of all ages and levels, specializing in training Powerlifters, triathletes, and military athletes.

A graduate of Duke University (biochemistry) and an MS(c) in physiology, Alex spent eight years in the clinical research and health care consulting field before moving to coaching full-time. His company, Complete Human Performance, currently consists of ten extremely talented coaches, who have combined to coach over 350 hybrid athletes. These athletes including nationally ranked powerlifters, nationally ranked strongman competitors, Kona qualifying triathletes, top ten OCR competitors, Boston qualifiers, bodybuilders, and numerous successful SOF candidates, among many others.

ALEX VIADA

THE HYBRID ATHLETE