OVERCOMING GRAVITY

SECOND EDITION

A SYSTEMATIC APPROACH TO
GYMNASTICS AND BODYWEIGHT STRENGTH

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Overcoming Gravity: *A Systematic Approach to Gymnastics and Bodyweight Strength*
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INTRODUCTION

I never imagined that *The Fundamentals of Bodyweight Strength Training*, the article I wrote for *Eat. Move. Improve.* in March of 2010 would become so popular. After publishing my first book, *Overcoming Gravity: A Systematic Approach to Gymnastics and Bodyweight Strength* in November of 2011, I was overwhelmed by how much support it received. I knew I had to release a second edition, because the first edition did not fully accomplish what I had set out to accomplish. My primary goal for the first edition was to create a comprehensive resource for beginners to learn how the human body works, and to aid the reader as they construct their own workout routines. You have certainly heard the axiom "Give a man a fish and feed him for a day; teach a man to fish and feed him for a lifetime." I wanted to build the information base to feed the aspiring athlete for a lifetime. As is often the way with a work, once published, use of the book brought about many helpful questions. I published several articles on *Eat. Move. Improve.* to clarify content from the book. This edition—not unlike strength training—is built on examination of the successes and the aspects in need of focused work.

Since the release of the first edition, I have learned a lot about simplicity and teaching methods. I hope this second edition will guide you toward learning all you need to meet your own goals.

Mastering your body requires a lot of hard work and persistence, but the potential for overall results is astounding. Bodyweight exercises can be performed almost anywhere with minimal equipment, are fun to play around with, and it doesn't hurt that they can be visually impressive. Strength levels acquired from proper bodyweight training transfers over to all other forms of strength, including weight training. Bodyweight strength training is thus extremely rewarding.

Nothing worthwhile comes without hard work and a fair share of frustration. Bodyweight strength training is no exception. Unlike with barbells there are very few gauges for progress. Athletes may become stuck on certain strength progressions for weeks or even months at a time with little clue how to push beyond plateaus. Stagnation is a very real problem, but with good programming we can fight this tendency. Programming is all about planning, and a good plan will help minimize the plateaus and keep us moving to our individual pinnacle.

Strength and conditioning has been constantly refined and modified in most of the major sports such as track and field, football, basketball, swimming, and many others. However, there are few people who know how to effectively implement progressions and programming in the context of bodyweight strength. Gymnastics gyms simply do not have the monetary resources or consumer demand to hire strength and conditioning professionals to help refine the physical preparation that is required. Likewise, there are no requirements for coaches to know much about strength and conditioning. Thus, there are limited sources of true bodyweight strength programming available. Most of the information is in the heads of high-level gymnastics coaches who do not have the time or inclination to record their expertise. Similarly, knowing progressions for exercises alone does not necessarily mean that one has enough knowledge to implement effective programming.

One such consideration is the importance of *populations*. The way you train a gymnast will not be the way you train a recreational adult interested in the same material.

Overcoming Gravity is an attempt to change that. The primary goal of this book is to allow beginner and intermediate athletes to delve into the world of bodyweight strength training and progress effectively and safely. This book will equip you with the knowledge to build safe and effective workouts and progress in your bodyweight strength movements. Additionally, there will be condensed exploration on subjects that relate to general movement such as endurance, metabolic conditioning, cardio, nutrition, and the like, to add support and stability to the programming and subsequent training.

To equip you with the right tools, I have distilled it in what I call the f*undamental knowledge base*. If you are a personal trainer or a coach this book will serve as a good knowledge base for working with your clients.

Fundamental Knowledge Base

The purpose of the fundamental knowledge base is threefold:

- To provide general training knowledge.
- To emphasize the differences between various populations.
- To combine general training knowledge and the differences in specific populations into examples of training routines at various levels of ability.

The information in the first two categories is broken down into distinct sections:

General Training Knowledge

- Physiological concepts behind strength and hypertrophy training.
- How to set the right goals.
- How to structure routines.
- The methods for programming/planning a routine.

Differences in Various Populations

Training for different skill levels—beginners, intermediates, advanced, and beyond. Training between the sedentary and the active. Training between the young and the old. Training between those who are using exercises for their sport and for those who train for other reasons. Considerations for those who are injured or recovering from an injury.

Section three will integrate the first two categories. If you are confused on the importance of specific information in a chapter, the chapter summaries will have each of these sections broken down into three main aspects. This will enable you to learn to apply concepts correctly within the framework of a routine.

- Knowledge Base
- Application

Part One

FUNDAMENTAL KNOWLEDGE BASE

- CHAPTER 1 -

PRINCIPLES OF BODYWEIGHT TRAINING

SAID PRINCIPLE AND PROGRESSIVE OVERLOAD

In the body, the SAID principle rules all. The SAID principle is simple: **S**pecific **A**daptation to **I**mposed **D**emands. Franklin Henry proposed this concept in his hypothesis on motor learning. However, it applies to all of the systems in the body, including the muscles, nervous system, and connective tissues. The concept is straightforward—if you can apply enough stress to the muscles and the nervous system through intense exercise, the body will adapt to this stress by improving strength and muscular hypertrophy—an increase in size of the muscles. Over time, the application of additional stress to these systems of the body will result in large-scale adaptations in strength, hypertrophy, and connective tissue integrity. This is called *progressive overload*.

Thomas Delorme pioneered the concept of progressive overload while rehabilitating soldiers after World War II. Progressive overload is the key concept behind all strength and hypertrophy training, including both barbell and bodyweight training. Generally speaking, you must progressively add more weight to the barbell in order to increase strength and hypertrophy. Likewise, with bodyweight exercises you must find a way to make the exercises more difficult in order to progressively overload the body and gain strength and hypertrophy. In bodyweight exercises this is executed through manipulating leverage.

There are some differences between barbells and bodyweight exercises. However, muscular force is force on a basic level. Thus, you can see increases in both strength and muscle mass by utilizing progressive bodyweight exercises to overload the muscles and nervous system. Correctly applied bodyweight exercises are comparable to weights for strength and hypertrophy in the upper body. On the other hand, bodyweight exercises are slightly inferior to weights for strength and hypertrophy in the lower body. This is another key concept to keep in mind when assessing and constructing a routine toward your goals.

LEVERAGE

Leverage is a mechanical advantage gained by using a lever. For instance, a see-saw is a simple form of a lever. If you place an adult on one end of the see-saw and a child on the other end, the see-saw will inevitably tilt toward the adult. However, as the adult moves toward the middle of the see-saw—in effect decreasing the mechanical advantage of the weight difference—the see-saw may begin to move up and down. The goal

of advanced bodyweight strength training is to decrease leverage, which reduces the mechanical advantage that muscles have during an exercise, thus increasing the demand of force on the muscles to execute certain positions or movements. This is how astounding strength can be built without the use of external weight.

Decreasing leverage in progressive bodyweight exercises is primarily employed through two different methods: changing the body position and changing the muscle length.

1. Changing the body position decreases leverage.

For instance, both planche and front lever have changes in body position to make the exercise more difficult. Some of the planche progressions are seen in this illustration sequence.

As the body is extended—from the tuck position, to the straddle position, to the straight body position—the exercise becomes progressively harder. Your bones are the levers, your joints act as fulcrums, and your muscles act to apply force. The muscles apply forces to the bones (levers) that rotate around the joints (fulcrums) to move weight against gravity and to manipulate external objects in your environment.

In the case of the planche progression above, the center of mass of the body is shifted further away from the shoulder by straightening the body. This increases the torque on the shoulder, which is the force applied around an axis of rotation. In physics, Torque = Force * Distance. Thus, moving the distance of the center of the mass away from the shoulder will increase the torque. Since our bodies are built on these leverage methods, all forces on the muscles can be thought of in terms of torque on the muscles at certain joint angles. This is the basis of biomechanics.

2. Muscles are strongest at their resting length.

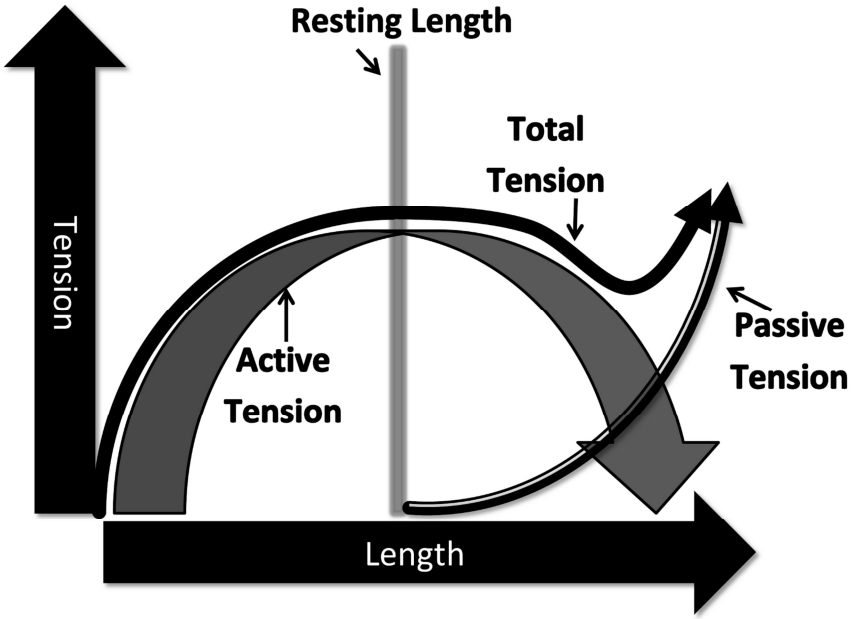
Muscles are strongest at their resting length because that is the point where the maximum number of cross bridges can be formed. A very basic explanation is that cross bridges are formed when the contractile components of the muscle—myosin and actin—overlap, and the myosin mechanically pulls against the actin, which contracts the muscle. Thus, if we shorten or lengthen muscles and then place a lighter load on the body, we stimulate an adaptation as if we were using a heavier weight.

The reason why this works is because maximal or near-maximal contractions stimulate similar neural and muscular adaptations, regardless of the force that is being placed on the muscles. For example, performing decline bicep curls while laying back is much more difficult than regular standing bicep curls or preacher curls. In decline

bicep curls, the arm is moved slightly behind the body, which places the biceps into a lengthened position. The lengthened position ensures that there is less overlap between the contractile fibers within the muscles, which means you are unable to use the same amount of weight as the other curl variations. However, the strength and mass adaptations that are gained are similar, even though you are using less weight in that movement.

Similar phenomena occur in many bodyweight exercises. For instance, pull-ups are a prime example. There are many videos of people performing pull-ups without utilizing full range of motion; they barely get their chin over the bar and they do not fully reach to a straight-arm hang position at the completion of the movement. The reason why people shorten the range of motion is because the exercise often becomes more difficult at the edges of the range of the exercise. Hence, shortening the range of motion allows them to perform more repetitions, which appears more impressive. However, there is some truth to the notion that people who shorten range of motion are cheating themselves out of the full benefit of performance, strength, and hypertrophy.

The phenomenon of placing muscles into short or lengthened states at the edge of their range of motion is termed *active insufficiency* or *passive insufficiency*, respectively. This is illustrated in the muscle length-tension curve below.



Active tension is the force you generate by *voluntarily* contracting a muscle. Passive tension is what occurs when you stretch a muscle out really far, to the edge of its range of motion. At this point, connective tissues such as ligaments and joint capsules have tension applied to them. Receptors within the muscle (called *muscle spindles*) provide feedback to the nervous system, telling it that the muscle is lengthening too much. This alerts the nervous system to activate the muscles, which causes the body to contract the muscle *involuntarily*. This is why your muscles contract when you move them toward end range in flexibility work such as stretching.

Placing a muscle in the short range or at long range—where the active force you can generate is the lowest—allows us to generate a strength training stimulus without the use of additional weight. Advanced strength movements on rings where the arms are held perfectly straight (such as in the iron cross) is a perfect

example. The straight-arm position places the biceps at near maximal length and thus requires significant amounts of strength and mass to perform the movement safely.

In the planche, the anterior deltoid (the primary shoulder muscle) is placed in a more extended position, compared to exercises such as an overhead press. There is less mechanical advantage and the body adapts to this stress by increasing strength and muscle mass. Hence, gymnasts who can perform the planche typically have large shoulder muscles and exceptionally high strength. There are several anecdotes of gymnasts capable of bench-pressing twice their bodyweight when they can perform the planche having never bench-pressed in their lives!

COMMON TRAINING CONCEPTS

A strong familiarity of common training concepts will be important to subsequent chapters. The following are some of the common concepts most important to building a routine.

- **Repetitions (or reps)** – The amount of repetitions you perform in a single set. For example, if you perform 10 pushups in a row before resting, that is 10 *repetitions* in a single set.
- **Sets** – The number of repetitions you perform of a single exercise. For example, you may perform 3 sets of 10 pushups with a period of rest between each set. Sets are usually characterized by a non-arbitrary amount of rest time between them.
- **Rests** – The amount of time you take to rest between each set of an exercise. Shorter *rest* periods are typically better for endurance, while longer *rest* periods are typically better for strength. Rest times for muscular hypertrophy overlap with endurance and strength.

- **Tempo** – The speed at which you execute repetitions. This may influence strength and hypertrophy. Typically, *tempo* is referred to in an XXXX format such as 10x0. Each "X" is a number of seconds per phase of the exercise.
    - First X – Seconds in the initial movement;
    - Second X – Seconds held at the terminal position; (Sometimes there are only two numbers)
    - Third X – Seconds in the counter movement;
    - Fourth X– Seconds held at the initial position before the next repetition.
- **Intensity/Load** – The percentage of 1 repetition maximum (RM) that you use during a set. In other words, it tells you the difficulty of the exercise. Repetitions in a set are performed at a certain intensity or load. For example, a set with 90% 1 RM intensity may allow you to perform 3-4 repetitions to failure. This will only be referred to as *intensity* from here out.
- **Volume** – The total amount of exercises performed in a workout. This can refer to the specific amount of total work on particular muscle groups, such as the pulling muscles (forearms, biceps, and back), or the total amount of work in a workout. Both are important in terms of programming for different populations.
- **Frequency** – How often a workout or exercise is performed.
- **Attribute** – A particular quality that is being trained. The primary attributes, which I have already discussed, are strength, hypertrophy, and endurance. However, there are other attributes, including flexibility, mobility, skill work, cardiovascular, stamina, and more. It is important to understand that different attributes can be trained at different frequencies.
- **Failure** – The point at which you cannot perform another repetition. This book refers to *failure* in the context of *technical failure*, which is the inability to perform another repetition with good form.
- **Work Capacity** – The ability to perform more exercise after adapting to a training program.
- **Deload** – A planned period where various factors of a routine are reduced in order to allow the body to recover and increase work capacity, strength, hypertrophy, or other attributes. This may include one or all of the following reductions to the above factors: repetitions, sets, rests, tempo, intensity, volume, frequency, failure, and work capacity.
- **Plateau** – A *plateau* or *stagnation* in progress is when an athlete on a specific routine has stopped improving their performance—whether in strength, endurance, hypertrophy, or other factors.

THE REPETITION CONTINUUM

The repetition continuum has strength at one end and endurance at the other. The strength side is attained through low repetitions and heavier weight or higher intensity where a 1 repetition maximum (1 RM) elicits the most strength. Endurance occurs with less weight or less intensity and more repetitions. There are three very important points to take away from the repetition continuum:

1. Strength and endurance cannot be optimally developed at the same time, since they are at opposite ends of the spectrum. However, a fair amount can be developed at the same time if you want to work on both.
2. Developing maximal strength increases the potential for maximum endurance. The way strength modulates greater endurance is through greater efficiency in contraction of the muscles during

exercise. For example, fatigue occurs much more slowly in endurance runners if they have increased strength because they are using a lower percentage of their strength with each stride. This is why strength training for endurance runners can improve their performance.

3. Strength takes *longer* to develop than endurance and conditioning.

Thus, we come to a couple of conclusions. For a strength-biased sport, you want to prioritize strength training over metabolic or endurance training. For endurance sports, you want to concurrently train strength and endurance. For sports with a mix of strength and endurance, you want to concurrently train in both areas but the proportion of each may vary. However, this does not mean that if you want to maximize your training you should only perform 100% of one particular area. Too much specialization is inefficient.

In general, if you are going to cross-train strength and endurance, but have a focus on one portion over another, an 80/20 split tends to work very well. This means that 80% of your training should be dedicated toward the particular area that you want to develop the most, and 20% of your training can be devoted to the other parts. For strength athletes, this means there should be an 80:20 or 4:1 ratio of strength workouts to endurance workouts. For endurance athletes, this means there should be a 4:1 ratio of endurance workouts to strength workouts.

What you may often find from a split of this ratio is that the effect may be more beneficial than just 100% focus on one particular area of training. For example, some low-level aerobic work for a strength athlete can help increase recovery for strength training, thus allowing you to train harder. Likewise, strength work for an endurance athlete increases efficiency, which tends to lead toward increases in performance. These concepts will be further explored in the cross-training chapter.

CHAPTER 1 SUMMARY
PRINCIPLES OF BODYWEIGHT TRAINING

Knowledge Base

- The SAID principle—Specific Adaptation to Imposed Demands—governs all of the changes that occur within the body in training.
- Progressive Overload is the way to apply the SAID principle to training in order to constantly progress.
- Bodyweight exercises are progressively overloaded by two main factors: Changing the body position for a movement and lengthening or shortening the muscles to put them at a disadvantage.
- Common training concepts include knowledge of how to apply repetitions, sets, rests, tempo, intensity/load, volume, frequency, attributes, failure, work capacity, deloads, and plateaus.
- It is important to understand the repetition continuum from a training perspective, due to the inability to optimally train strength and endurance at the same time, and the fact that strength has more applicability and takes longer to develop than endurance training.
- The focus of training does not need to be optimized to 100% in every area, as that may not always lead to the best results.

Application

The knowledge behind the construction of exercise routines in subsequent chapters will rely heavily on understanding these basic concepts. You can consider the construction of a routine a "puzzle," made up of many different pieces. Your specific goals provide an outline for the puzzle, and the pieces are put together within that framework.

- CHAPTER 2 -

PHYSIOLOGY OF STRENGTH AND HYPERTROPHY

WHAT IS STRENGTH?

Let's assume that you are reading this book because you want to know how to train bodyweight strength rather than endurance. At the very least, your goals are to increase your strength to work on the gymnastic isometric exercises such as the planche or front lever, or you want to be able to use your bodyweight strength for various disciplines such as gymnastics, parkour, wrestling, martial arts, MMA, and the like. These goals are important because knowing how your body will respond to the stress will be advantageous when you start to construct your routines. Overall, strength is predicated on a simple equation:

Strength = Neural adaptations * Muscle cross sectional area.

The force output of a muscle is based on the cross-sectional area of the muscle, angle of attack on the joint, individual limb length, and, most importantly, neural factors. Unfortunately, we cannot control the angle of muscle insertions or limb length, which is why they are excluded in the above equation. Developing strength with focus on these neural factors in conjunction with muscle mass gains will provide faster results. In the following sections, we will go through some of the basic physiology and principles that underlie this equation. *Neural adaptations* are what the majority of strength training is about. However, there is some overlap between developing neural adaptations and *muscle cross-sectional area.* This is essentially a fancy term for *hypertrophy* (increases in muscle size). The bigger a muscle is, the stronger it will be.

One of the main questions brought up by those beginning bodyweight training is the intuitive sense that excessive weight will negatively affect their ability. In particular, extra muscle weight seems to be detrimental to bodyweight to strength ratio. This fear—for the most part—is unfounded. Most of the strength athletes—such as gymnasts—and sports with weight classes have athletes with large amounts of muscle mass comparative to their size. Excessive muscle mass tends to have a net negative effect only when you start to become extremely large; bodybuilder size. This usually means, unless you are taking performance-enhancing drugs, you can never have too much muscle mass. Even in weight-class sports you will see that athletes tend to be shorter and have more muscle mass than taller, with more muscle mass. Thus, training toward both strength and hypertrophy is a non-issue in the long run, as both of these attributes will overlap with each other to develop maximal strength and bodyweight to strength ratio.

THE CENTRAL NERVOUS SYSTEM, MOTOR UNITS, AND MUSCLE FIBER TYPES

Motor units are composed of a motor neuron and all of the muscle fibers it innervates. Innervation is the pathway from the motor neurons in the brain to the muscle fibers. The signals are sent to the muscles via electrical impulses. A single motor unit may innervate many different fibers within a muscle, but only innervates muscle fibers of one of the three types.

Motor units are categorized into a continuum that is similar to the muscle fiber types. At one end, you have low threshold motor units (LTMUs); at the other, you have high threshold motor units (HTMUs). LTMUs correspond to the motor units that innervate the Type I slow-twitch fibers and HTMUs correspond to motor units that innervate Type IIx fast twitch fibers. Between those are medium threshold motor units (MTMUs) that innervate Type IIa muscle fibers. The reason why they are termed low versus high threshold is the amount of activation potential (the electrochemical signal in the brain) it takes to make them activate. The easiest way to conceptually understand this is by the strength-endurance continuum from the previous chapter. LTMUs are more *endurance*-geared, and HTMUs are more *strength*-geared.

LTMUs innervate Type I fibers, which are your *slow-twitch* fibers, and are red in color because of the enormous quantity of mitochondria within them. They have a high capacity for endurance and are the primary muscle fiber type that endurance sports develop. These fibers have the least potential for hypertrophy.

MTMUs innervate Type IIa fibers, which are your *adaptable* fibers, are pink in color. They have characteristics of each of the Type I and Type IIx fibers. Therefore, the type of training can bias these fibers toward either strength and power or endurance. This is why training must be specific to your sport. For example, doing high repetition endurance work when your sport is sprinting (which requires a high power output) will adapt your muscles toward endurance. Incorrect training toward the wrong attribute will make you perform more poorly than your competitors. Specificity in sport is king.

HTMUs innervate Type IIx fibers, which are your *fast-twitch* fibers, and are white in color. They fatigue very rapidly because they can only use anaerobic metabolism to supply their energy, but they also contract very rapidly and are the main type of fiber developed in strength and power sports. These fibers have the most potential for hypertrophy.

The fibers are termed *slow-twitch* and *fast-twitch* because of the rate that they produce force when they contract, not solely because of their energy sources. The fast twitch fibers have the greatest potential for hypertrophy, and they also have the greatest potential for strength and power output.

The Henneman's size principle states that motor units are recruited from the smallest to largest. The LTMUs are considered the smallest and the HTMUs are considered the largest because of their physical size. Additionally, due to the size difference, it takes a lower activation potential to activate LTMUs compared to HTMUs. LTMUs are composed of motor units that activate when the required force to move an object is small. Conversely, HTMUs are only activated when the force requirement is high. For example, LTMUs are activated when we want to lift a small object such as a cup, but HTMUs are only activated when we need to use most of our strength, such as in a near-max effort movement such as lifting heavy furniture. Note that during near-max effort or max effort movements the LTMUs are activated along with the HTMUs.

What this means is, when training for strength and hypertrophy, you generally want to use weights that are heavy or bodyweight exercises that are intense and difficult. We want to preferentially increase the rate of growth and development of HTMUs because they have the greatest capacity for the qualities of power, strength, and hypertrophy, as mentioned earlier. Likewise, we want the MTMUs to be mainly trained toward power, strength, and hypertrophy, since they will take on the qualities of the type of training that is imposed on them, which makes them adapt to express HTMU qualities.

This type of training is performed by moving weights or your bodyweight close to maximal intensity, or with lower-intensity exercises performed rapidly with acceleration. This is the importance of the tempo of the exercise. If the weight is heavy or your bodyweight movement is tough and you can only move slowly, you want to focus on performing the repetitions with good form and technique, as fast as possible. Under higher-intensity movements it is your intent to exert maximal force, even if you are moving slowly. This is the reason why I recommend a fast or accelerating tempo in the concentric phase of the movements, in order to ensure that HTMUs are being fatigued and the MTMUs are being trained to be like HTMUs—to induce gains in power, strength, and hypertrophy. If the intensity is light, then you want to perform the exercise with the intent to accelerate your body or weight through the movement, in order to optimally increase strength and power. This will be explored more in-depth in the section about tempo when constructing a workout routine.

There is some new evidence coming out that training with high repetitions may also confer solid strength gains as long as you train with high intensity every other week. This may be useful for those who are having issues with overuse injuries or want to work with high repetitions more than low repetitions.

NEURAL ADAPTATIONS FOR STRENGTH

There are six primary ways that the nervous system increases strength, aside from the hypertrophy of muscles. These will be the primary adaptations in any strength program, so it is important to understand how they work.

- ***Recruitment*** is an increase in the number of motor units being activated for a specific movement.
- ***Rate Coding*** or ***Firing Rate*** is a decrease in the time between each electrochemical signal sent to the corresponding musculature, which increases rate of contraction.
- ***Synchronization*** or ***Intra-muscular Coordination*** is a decrease in the amount of time between motor units firing and working together.
- ***Contribution*** or ***Inter-muscular Coordination*** is how effectively timed the different contributing muscles to a movement are fired.
- ***Antagonist Inhibition*** or ***Reciprocal Inhibition*** is a reduction of resistance from the muscles opposite of those performing the movement.
- ***Motor Learning*** refers to the neural connections and programs within the brain that will affect your development of learning movements.

We will discuss each of these and their implications for training. You may have heard the term "strength is a skill"—all of these components make up the neural adaptations by which strength is a skill. Some of these components have broad range specificity whereas some do not.

Recruitment increases as force requirements increase. The nervous system has limiters on the amount of force we can produce. Specific structures called Golgi tendon organs in our musculotendinous junctions

(where the muscle starts to become tendon) provide feedback to the brain, which decreases muscle forces to prevent injury in untrained people. Fortunately, with training, the inhibitory effect on force development can be reduced which increases recruitment of muscle fibers. This effect is greatly enhanced and maximized around 85-90% 1 repetition maximum (RM) threshold or approximately 3 RM. Thus, if your primary aim is to gain strength on an advanced program, you will often be programming in exercises in the 1-3 RM range (or close to that repetition range).

Rate Coding or ***Firing Rate*** increases begin to occur after all motor units in a muscle are recruited due to maximal recruitment or fatigue. When the nervous system senses the recruitment of all available motor units, it further increases strength by sending more rapid electrical signals to the muscles to tell them to contract faster. For most large muscles, such as those used mainly for locomotion, this occurs at approximately 90-92% of 1RM (or 3 RM). In many of the finer motor muscles located in the forearm, rate coding may start to occur as low as 50% of 1RM. Postural muscles—which work constantly in the core and support muscles such as the calves—also rely highly on rate coding for improvements in performance.

Rate Coding matters very little for a strength-based program, but is useful to note for those seeking hypertrophy. Muscles that rely more on rate coding tend to be composed of a greater percentage of slow-twitch fibers. Therefore, they respond better to higher repetitions. Thus, the forearms, calves, core, and other highly-rated coded muscles tend to respond better to higher repetitions when you are seeking hypertrophy. On the other hand, two-joint muscles such as the hamstrings, biceps, and many of the larger muscles, such as the glutes, tend to respond best to more difficult exercises with fewer repetitions because of the preponderance of fast-twitch fibers. Ultimately, if your goal is massive amounts of hypertrophy you may need to alternate your repetition range, rest times, and other factors if one style of training does not seem to be working effectively.

Synchronization or ***Intra-muscular Coordination*** refers to the nervous system's ability to organize the muscle fiber contractions to make the system more efficient. In untrained individuals, the nervous system recruits motor units in a random or staccato pattern in order to provide the force necessary for a movement. As we further train a movement the motor cortex is able to synchronize the firing of motor units. Imagine a game of tug-of-war. When a team pulls together in synchronization the force is much greater than each person pulling by himself, out of sync with everyone else. This is how the body becomes more efficient when trained. Skills and exercises that are repeated often show the greatest increases in recruitment and synchronization. This is consistent with practicing skills many times throughout the week and repeating exercises multiple times a week over the course of a program.

For example, in the book *Starting Strength*, Mark Rippetoe suggests that beginners perform the squat three times per week. More advanced strength programs, such as Bulgarian Weightlifting Protocol, may have their athletes performing the Olympic lifts as many as two to three times per day, six to seven days a week. Many other sports, including gymnastics, running, swimming, and the like, benefit from massive amounts of technical practice because they require optimal recruitment and synchronization to perform at the highest level. This is true for every sport. Michael Phelps swims miles every day, even though his events are only about 400m in length. Simply put, if we want to get really good at something we have to do it a lot. This will be an important thing to remember when we start to construct routines.

Contribution or ***Inter-muscular Coordination*** is essentially how effectively you correctly perform a technique. This is the practice part of training that is specific to the movement you are working. For example,

when performing a pull-up you may start the movement with relaxed shoulders. Contribution or inter-muscular coordination is what the body uses to sequence all of the scapular muscles to tighten, which provides a stable base for the shoulders to tighten and then move upward, out of the bottom position. When you are fairly new to exercise your brain may do this quite inefficiently, which is why it is important to learn proper technique in exercises in order to progress safely and effectively.

Antagonist Inhibition or ***Reciprocal Inhibition*** can improve contraction of the muscle. This is usually performed by extensively stretching the opposing muscle you are planning to work beforehand. The reflexes operate similarly. For example, when the doctor hits your patellar tendon with a reflex hammer, the leg kicks out. This is called *reciprocal inhibition*—where the nervous system activates the quadriceps to fire while simultaneously inhibiting the hamstrings from firing. Thus, you can harness this phenomenon to increase contractions in particular muscles. In particular, paired sets—where you alternate between a pushing movement and a pulling movement—are effective at eliciting this response because of the natural relaxation of the muscle after it has been fatigued.

Motor Learning occurs automatically in the brain and is mostly active for movements that are practiced repeatedly. It occurs all over the cortex in motor planning, the primary motor cortex, cerebellum, and other parts of the brain that are involved in performing movement. This is a primary adaptation of skill work, but it is arguably impossible for one to consciously train it, as the body automatically performs in adaptation to your conscious training. Therefore, we need not go into detail about it. What is important to know, to obtain the benefits of this process, is that you should concentrate 100% while practicing your movements. This will ensure that you are performing them correctly, thus teaching your body the correct movement patterns. If you mess around instead of concentrating with your training, your body will automatically learn sloppy techniques and movement patterns. It has been said "practice makes perfect." However, it is more accurately stated "*perfect* practice makes perfect."

THE ROLE OF THE CENTRAL NERVOUS SYSTEM

The central nervous system (CNS) governs the activation of motor units through a variety of systems that are involved with motor planning, activation, and proprioception—the feedback from the body to the brain about where the body parts are in space and the body's control of them. Since we are not going to look at this in detail, I will say that the CNS, like the muscles, has a set point at which it must be stressed in order to bring about adaptations.

The CNS has a set amount of recovery time that it needs to operate at full capacity. Think of it like a swimming pool. Every time you exercise, you take out some water. Conversely, every time you sleep, take a rest day, eat well, and engage in relaxation or recovery methods not only do you put a little water back in, but you also make it a little deeper and a little further across. Over time, the size of your pool and, therefore, your capacity for water will increase. This is the origin of the term *work capacity*. When you take out too much without replacing it, bad things start to happen. This would be where an athlete starts delving into the overreaching/overtraining realm, which is where progress and performance may plateau or possibly even decline.

Well-structured programs for more advanced athletes have overreaching built into them. Overreaching is planned training beyond a plateau that results in a reduction of abilities such that, after a rest period is taken, the body will adapt and come back with improved abilities over the previous baseline. For example, after a program is completed and a deload week (also called a *recovery week*) is taken, an athlete usually comes back stronger and/or faster. This athlete's pool has increased in capacity during the program, but the water inside of it is not fully replaced until the deload week is taken.

This is worth mentioning because some exercises are more taxing than others. For example, in weightlifting, deadlifts are more taxing than many other exercises because of the large amounts of musculature that are activated during the movement. A *deadlift* is an exercise where there is a bar on the ground, you grip it, and then stand up with it in your hands. It causes significantly more fatigue than most other exercises. This is why deadlifts are placed at the end of many beginner-level programs. Performing them near the beginning would significantly detract from the other exercises in the program because of accumulated fatigue.

CNS Fatigue is an ill-defined concept because there have been no overarching physiological explanations. It could be related to willpower, which is a finite resource. It may even be related to neurotransmitter depletion. For example, we know that taking tests for six hours a day is mentally draining and exhausting. The same is potentially true of extremely intense exercise that activates and fatigues large portions of the brain that is involved in performing movement. We know that high-level powerlifters cannot perform heavy deadlifts multiple times a week. High-level sprinters cannot sprint at full intensity multiple times a week. No high-level athlete can give 100% the majority of the time while training. This is why their routines are constructed to peak during competitions.

As more research continues, it is safe to expect the mechanisms to be further clarified. In the meantime, you should take them with a grain of salt, knowing there is still some uncertainty to what CNS Fatigue actually entails—whether it is neurotransmitters, cytokines, or other factors. Despite the lack of science, good conclusions can still be drawn based on what works in practice.

In bodyweight training, this is analogous to working with supramaximal eccentrics and isometrics. Eccentrics refer to the component of an exercise where the muscles are lengthening, and *isometrics* are exercises where the body is held in one position—without movement—while exerting strength. The *supramaximal component* means that these exercises are too difficult for one to perform compared to a typical repetition. For example, if an athlete is too weak to perform a pull-up for a full repetition they may train utilizing eccentrics by jumping up to the bar and lowering down slowly. Likewise, isometrics may be used in any weak point of the exercise, such as holding the position at the top of the bar (if that is a weak point). All of these tend to fatigue the body more than typical concentric repetitions. Thus, when working with many of these types of exercises each week—or even in a single session—one has to be aware that a plateau in progress may indicate that the best way to achieve progress may be more rest instead of more exercise, which is contrary to what beginners often think when they begin working out.

Later on in this book we will explore constructing programs and how to build in deload periods every four to eight weeks so that you can fully recover from fatigue. These deload periods will double as rest periods, which will allow connective tissues (tendons, ligaments, etc.) some time to heal, as they are typically the first types of tissues to be affected by overuse. When you begin working toward advanced bodyweight movements, two of the most important factors you will need to take into account will be fatigue recovery and connective tissue recovery.

MECHANISMS OF HYPERTROPHY

In the human body, there are three different primary pathways that lead to hypertrophy. The first is mechanical tension. The second is eccentric damage via the popping sarcomere theory and microtrauma. The third is metabolic accumulation, local growth factors, hypoxia, and glycogen depletion based hypertrophy.

Mechanical Tension-based hypertrophy tends to be activated via high intensity exercises like heavy weights and fast movements. This is sometimes referred to as HTMU or fast-twitch fatigue hypertrophy. When there is enough high-intensity mechanical tension on the muscles, the body adds muscle mass in order to compensate. The opposite of this can be seen in the case of a broken bone in a cast: non-movement and non-loading of the nervous system and associated muscle leads to rapid atrophy.

***Eccentric Damage* and *Microtrauma*.** The intensity of an exercise is heavy enough to create damage to the muscles, but also light enough to perform for enough repetitions to create the damage. The accumulation of repetitions at a certain weight takes a certain amount of time to perform. Many trainers have specified this type of hypertrophy stimulus as *time under tension*—the total amount of time that the muscle needs to be under to adapt by hypertrophy. This is what we discuss as an overall factor for hypertrophy when we talk about "volume" of the total exercises, sets, and repetitions for a particular muscle group.

The damage sets various physiological processes in motion, including satellite cell donation and repair. Satellite cells can be thought of as "muscle stem cells," which can fuse with damaged muscles in order to help them repair. These are also what contribute to "muscle memory," where an athlete makes a comeback after taking several years off from training. When they begin training again, they rapidly regain the muscles acquired during their previous period of training. The science behind this shows that the muscles still contain previously fused satellite cells nuclei that aid in rapidly producing the contractile components of the muscle cells again.

***Metabolite Accumulation, Local Growth Factors, Hypoxia,* and the like.** This can be thought of as low-intensity exercise with high amount of repetitions and volume. An example of this type of hypertrophy would be sports that have long, sustained endurance intensity with speed components. For example, cyclists have large quadriceps and rowers have large backs. Another example would be manual labor where one performs a large quantity of light lifting that adds up over the course of a day to create a hypertrophy stimulus. People who work with hammers or plumbers who work with pipes tend to have massive forearms due to low-intensity work they perform consistently over a long period of time.

There are some big misconceptions when it comes to hypertrophy. Specifically, one of the big myths that pervaded the bodybuilding and athletic community for decades is that there was a distinction in the types of hypertrophy that you could build, namely *sarcoplasmic* and *myofibrillar* hypertrophy. *Sarcoplasmic hypertrophy* was thought to occur through utilizing higher repetition ranges such as 8-20 repetitions per set to failure. The specific mechanism of adaptation for this hypertrophy was the metabolic accumulation in the muscle cells. This was exemplified by bodybuilders who tended to have large, but less dense muscles. Conversely, *myofibrillar hypertrophy* was thought to occur through utilizing lower repetitions (such as 1-8) and working more toward strength. The specific mechanism of adaptation for this hypertrophy was the increased accumulation of myofibrillar components of the muscles (such as actin and myosin), which are utilized by the muscles to contract. This was exemplified by strength athletes with muscles that appeared to be very dense, such as olympic weightlifters and gymnasts.

If you are an avid member of the fitness community, you may know that recent research has shown myofibrillar and sarcoplasmic hypertrophy are likely to be a misnomer. There is little if any distinction between them. The main difference would be the strength from those who train with higher repetition ranges and those who train with lower repetition ranges. Likewise, muscle biopsies of the different athletes show that the cellular components of muscle cells will increase proportionally, even in different types of training. Thus, the differences in appearance could be caused by one's hydration level, amount of subcutaneous body fat, intramuscular fat accumulation, or similar factors. For instance, when bodybuilders cut down their body fat for their shows, they certainly have a very dense muscular look, like strength athletes. This is useful information for us because it tells us that the body responds to stress by adding muscle, which can be used effectively regardless of how it was obtained.

One must still consider the importance of the divergent nature of training utilized by strength athletes and those who want to maximize hypertrophy. This involves changing up the programming in regard to frequency of exercise and progressive overload on the muscles. Generally, as you become more experienced, your exercises become more intense. Thus, you may have to increase or decrease frequency based on the particular discipline that you are involved in and the type of practice. In the case of gymnasts, this may be training multiple sessions a day for six or perhaps even seven days per week. However, much of this will be skill work rather than strength work. You may experience positive gains in strength because strength is also a skill. Alternatively, if your goal is maximal hypertrophy, you may want to utilize split routines that put high amounts of volume onto the muscles, thus forcing them to adapt.

Eccentrics and isometrics are of particular importance when discussing bodyweight programming. An example of isometric exercises are the back lever, front lever, and planches. An example of eccentric exercises would be slowly lowering from the top of a pull-up or starting in the top position of a dip and slowly going down. Isometrics are particularly interesting because they branch over multiple pathways toward hypertrophy. In fact, many methods of exercise combine one or two of the different pathways we have discussed. Isometrics are biased toward mechanical tension and metabolic adaptations, while eccentrics are biased toward mechanical tension and eccentric damage hypertrophy the most.

Studies indicate that isometrics and eccentrics tend to recruit HTMUs right off the bat to sustain their contractions. This makes sense, as they are very difficult movements. The irony of eccentrics is that the studies on eccentric training seem to indicate that one-second eccentric movements are better at stimulating hypertrophy and strength adaptations than longer eccentrics, such as six seconds. This means that fast eccentrics preferentially activate the HTMUs, which have the greatest potential for power, strength, and hypertrophy. This understanding is accentuated by one's understanding of physiology. In longer eccentrics, the occluded blood flow to the muscle and greater time under tension also means they are biasing toward metabolic slow twitch adaptations. Likewise, isometric holds that are too short will not give one enough volume to force adaptations. However, isometrics held too long may bias one's adaptations toward higher levels of endurance. What this means for training is that one needs to perform their isometrics in the "sweet spot" ranges in order to maximize strength and hypertrophy benefits. This will be explored at length in later chapters on routine construction.

As research continues these mechanisms without a doubt will be further clarified; so one should take them with a grain of salt. There is still some uncertainty surrounding the factors that lead to muscular hypertrophy.

Here is one of the primary concepts for you to take away from this section: While it is important to know that certain adaptations and differences in hypertrophy mechanisms may occur, there is really no such thing as unwanted hypertrophy—unless it makes one too heavy for their sport or weight class.

The second primary concept you should take away from this section is the fact that overall volume in the context of frequency means the most in regard to hypertrophy. The volume of the exercise on particular muscles must exceed a certain threshold for hypertrophy, which in effect will increase as your muscles get bigger. This is easily seen in the difference between beginners and bodybuilders. Beginners can have significant hypertrophy with relatively few exercises while bodybuilders have tons of volume in their routines. Likewise, frequency plays a role as there are many occupations—such as in construction and furniture movers—where one's work is their only "workout" for the day, but their body will add hypertrophy in response to the muscle stress that comes from repeatedly moving heavy objects.

The concept of ensuring enough volume for hypertrophy in your exercise routine will also be explored as you learn to construct your own custom routine. We will outline some simple concepts on how to work with certain repetition ranges and sets to obtain the right amount of volume. This is why there is no discussion specifically on the "best" repetition ranges in this section, though generally 5-15 repetitions tend to give beginners an adequate amount of volume to achieve hypertrophy.

If you are interested in studying this topic further, Brad Schoenfeld and Mike Zourdos have published some excellent research on hypertrophy and overall volume.

OPEN AND CLOSED CHAIN EXERCISES

Open Kinetic Chain (OKC) exercises are performed in a manner that leaves one's limbs free to move. These exercises involve movements of the limbs in space, weighted or unweighted. The weighted versions of these are isolation exercises (such as leg extensions and hamstring curls on machines). Some examples of OKC upper-body movements are biceps curls and triceps extensions.

Closed Kinetic Chain (CKC) exercises are performed in a manner where one's limbs are not free to move. Typically, these movements are performed with barbells or bodyweight. Weighted versions of these exercises include squats, deadlifts, and the Olympic lifts, where one's feet are fixed against the ground and the body is moved against it. Likewise, almost all bodyweight movements are closed chain—the hands or feet are fixed against the ground or other implements. Single leg squats, dips, pull-ups, pushups, and handstand pushups, are all performed with one's hands fixed against the ground, bars, or rings.

Bench and press are barbell exercises that are stabilized in space; this represents somewhat of a hybrid between OKC and CKC exercises, as you stabilize the weight (like many OKC exercises) but your hands are fixed while doing so (like CKC exercises). When you take a look at the strength difference between semi-OKC exercises—such as the press/military press—and a pure CKC exercise—such as the handstand pushup—you will see that the CKC exercise tends to be stronger than the semi-OKC exercise. For example, if you subtract the arm weight from the handstand pushups, you will likely find that you can perform more handstand pushups comparable to the weight you can press. This is likely due to internal factors that result from co-contraction and increases in kinesthetic feedback to the body.

The main thing to keep in mind is that CKC exercises are more applicable for building strength in the upper body. However, it is more difficult to track your progress as it is not easy to reliably measure incremental improvements like adding weights to a barbell. If your goal is hypertrophy, CKC and semi-CKC exercises typically work best. These could include compound barbell exercises (squat, deadlift, bench press, etc.). One interesting phenomena is that the overhead barbell press tends to be a better muscle mass builder than the handstand pushup, which requires significantly more body stabilization, thus limiting the amount of force that can be used in performing the movement. This slightly decreases the amount of hypertrophy gained from the movement due to less mechanical tension.

If your ultimate goal is purely hypertrophy, it is generally a good idea to perform primarily barbell-type exercises. This is not to say you cannot gain an impressive physique with bodyweight exercises, it will just take longer.

For rehabilitation, you will primarily use OKC exercises because they allow you to easily isolate specific weaknesses, target specific structures that need to be strengthened, or improve certain movement patterns. The goal of therapy is to work your way back to gross motor CKC movements. For example, if you are undergoing therapy for an ankle sprain, you will begin by performing mostly OKC exercises, which will help strengthen the muscles in the leg and prevent them from atrophying. However, as you improve range of motion, strength, and other factors you will begin performing more gross movement patterns—such as squats and standing drills—to strengthen the ankle so it can perform athletic movements again. Likewise, with something like elbow tendonitis, you would begin with isolation exercises to rehabilitate the injured area and eventually progress to function-based movement such as pull-ups or other compound exercises. We will discuss this more in the injury sections of this book.

To summarize, closed chain exercises emphasize stabilization in the core and extremities because body position plays a role in its interaction with the ground, parallettes, or rings. This means that bodyweight exercises tend to rely more on progressions rather than adding weight. They work extremely well in the development of strength, proprioception, and kinesthetic awareness. When you can add weight to them—such as with a weighted vest—it makes progressions much easier to handle. The benefit of performing more open kinetic chain exercises is that they can be regulated easier with weights. This is especially true if you have an injury or weakness that may benefit from exercise that is focused on certain muscles, tendons, or other structures.

All these movements are useful in their unique contexts. If you are reading this book you probably have an interest in bodyweight strength, including the various isometric hold positions that gymnastics is known for. Additionally, most people have some aesthetic goals, such as looking good naked. If these are your goals, this book is a good fit for you.

CHAPTER 2 SUMMARY

PHYSIOLOGY OF STRENGTH AND HYPERTROPHY

Knowledge Base

- Strength = Neural adaptations * Muscle cross sectional area.
- Neural adaptations are enhanced when working with the intensity of exercises. These include increased neurological efficiency in motor recruitment, rate coding, synchronization, contribution, reciprocal inhibition, and growth and pruning.
- Muscle cross sectional area is the increase in muscle hypertrophy (muscle growth).
- If your goal is strength *and* hypertrophy, you will want to execute movements as explosively as possible with good technique. This will help recruit and stimulate the HTMUs, which are composed of fast-twitch fibers that carry the greatest potential for strength and hypertrophy.
- Practice does not make perfect; *perfect* practice makes perfect.
- Work capacity is naturally increased as you train. You can think of it as building a larger sized pool to replace a smaller pool. Thus, training and recovery are equally important as training takes away water from the pool and recovery expands the pool and puts water back into it. Training programs should include planned deloads to allow for proper recovery.
- Eccentrics and isometrics can be used extremely effectively in a training program, but they should not make up the majority of your program because they are extremely taxing on the central nervous system.
- Hypertrophy tends to occur through three mechanisms: mechanical tension, eccentric damage and microtrauma, and local metabolic and hypoxic factors.
- There is no such thing as myofibrillar or sacroplasmic hypertrophy, just hypertrophy.
- Beginners tend to do best with a 5-15 repetition range. For maximal hypertrophy, you will want to work in the 5-20 range and even outside of it, with all sorts of different modifications to your program.
- CKC movements are typically better for generating strength and muscle mass. Specifically, CKC bodyweight movements are better at generating strength, while CKC barbell exercises are better at generating hypertrophy. They do overlap some.
- OKC exercises are good for targeting specific weaknesses or rehabilitating injuries.

Application

It is important to know how the physiological concepts play a role in constructing a workout routine. These will be helpful once you start implementing your routine, because you will be able to use your knowledge of body physiology to problem-solve your routine on your own. For example, if your goal is maximum hypertrophy, you will want to alter the tempo, rest times, exercises, and other factors in your routine to ensure that you continually progress. In the following quote, consider "knowing yourself" to be your body's physiology and your workout routine to be your enemy.

If you know the enemy and know yourself, you need not fear the result of a hundred battles.
If you know yourself but not the enemy, for every victory gained you will also suffer a defeat.
If you know neither the enemy nor yourself, you will succumb in every battle.
~ Sun Tzu

- CHAPTER 3 -

PROGRESSION CHARTS AND GOAL SETTING

Now that we have learned how bodyweight exercise and the concepts that underlie strength and hypertrophy work, let us start putting together pieces that will help us properly construct a routine toward specific goals. If you already have goals, excellent—we will work to construct a routine toward them. If you do not yet have goals, this chapter will help you figure out what you want to achieve and how to construct a routine focusing on relevant goals.

PROGRESSION CHARTS AND HOW TO USE THEM

Information on bodyweight training can be found scattered throughout the Internet. Fortunately, there are now some resources available on many of the progressions used in training, though there is virtually no way to ascertain levels of skill and strength progression. That is why this book includes some strength and progression charts that will hopefully change the way you think about bodyweight exercises. These "skill and strength progression charts" are much like the "skill charts" that you would see in a Role Playing Game (RPG). You level your character by training and then using your "skill points" to raise various stats and abilities. This is similar to the bodyweight skill and strength progressions.

In bodyweight strength training, there is a wide range of pulling, pressing, isometric strength elements, and handstands that can be learned. Each of these require specific training and much effort to effectively learn them. Like with RPG's, once you learn a skill or attack there are certain new progressions that are available for you to start learning. One of the great qualities about training is, like RPG's, there is often some overlap in the qualities. For example, if you put a lot of training energy into handstands and handstand pushups, there will also be carryover to strength in other pressing movements like pushups or dips. Like an RPG, various skills draw from multiple attributes at once.

The one thing that is novel about the charts in this book is that many of the elements are based on the Federation International of Gymnastics (FIG) level of difficulty for skills. In the code of points (COP), there is a difficulty scale that ranks from A to G, from easiest to hardest, respectively. FIG regulates the COP and standardizes the basic difficulty level of all gymnastics movements allowed on each apparatus—swinging, strength, and dismount elements. This book will not discuss the merits of swinging elements or dismounts, but it will focus on the various technical and strength progressions that are used by bodyweight practitioners to develop insane amounts of strength, flexibility, and a muscular physique.

The goal here is to categorize and give you an idea of the difficulty level of each bodyweight strength progression. Therefore, you will have a much easier time of choosing particular skill sets and chaining progressions together. The charts provided offer an approximate knowledge of where each skill and strength elements lie on the continuum. The charts are broken down into four specific categories—Basic Skills, A-level Skills, B-level Skills, and C-level skills. Each of these skill levels has four subcategories with the difficulty of the exercises increasing from level to level.

The ability to progress consistently is the focus of any sport and any weight lifting program. The same is true for gymnastics and bodyweight strength training. This is worth the repetition because we can learn from this concept that gymnastics and bodyweight training are not so different from other sports and barbell training. As you look at the charts and track your abilities it may be noted that you are advanced in one area or lagging in another. This is common. We each have our own strengths and weaknesses depending on our genetics, limb lengths, training schedules, sleep schedules, nutritional factors, stress levels, and similar factors.

It is more beneficial to focus on weaknesses and bringing deficient skills and strength progressions up to the level of your more advanced abilities. Shoring up your weaknesses will keep you healthier than if you solely pursue one set of strength or skill progressions. This is especially important if there is a vast difference in pulling versus pushing or a lack of development, especially in regards to the L-sit, V-sit, and manna progression. For instance, even if your goal is planche alone and you do not care about front lever, back lever, manna, and other exercises, you still have to build strength in your posterior shoulder in order to attain the necessary muscle mass and strength to achieve the planche progressions. Subsequently, it is necessary to work to shore up your weaknesses as much as possible. This will allow you to facilitate optimal progress and prevent injury.

Making a copy of these exercise charts is strongly recommended because it will be awkward to continually flip back to the exercise section located at the end of the book. These copies will be a good comparison to mark down your goals, cross off exercises as you complete them, and track your progress. If you are unable to make copies of the charts, they are available on the *Eat. Move. Improve*. website at eatmoveimprove.com.

While those who have been in the gymnastics and bodyweight strength communities for some time may know the common abbreviations and technical terms of the skill and strength progressions on this chart fairly well, many of you will have to refer to the chart and then look at the progression to see what they are. There is an abbreviation list at the beginning of Chapter 23.

THE LEVEL SYSTEM

The charts are categorized in sixteen different levels of strength and skills. When you look at each of the levels, they show a similar level of ability horizontally. Each of these sixteen levels are divided into four groups of four. As you can see from the left hand side, each quartile is categorized into the four categories I mentioned previously—Basic Skills, A-level Skills, B-level Skills, and C-level skills; each broken down into four distinct categories of programming based primarily on athletic skill standards.

- Beginner: Levels 1-5
- Intermediate: Levels 6-9
- Advanced: Levels 10-13
- Elite: Levels 14-16

It should be noted that some of the movements considered here as advanced—such as the iron cross, full planche, and other isometrics—are actually considered to be intermediate level moves in gymnastics. The concepts for attaining strength, in themselves, are the same. Gymnastics coaches will simply be taking their gymnasts past the abilities on these charts as they progress. There is a consistently higher level of volume of skill work in gymnastics, so that may take away from specific strength training. However, since gymnastics is a lifetime sport where the strongest gymnasts will have at least ten to fifteen years of training or more under their belt, this is fine. Your aim should be toward consistent progress based on the programming measures delineated in this book or other resources.

CLASSIFICATION OF DIFFERENCES IN THE LEVEL SYSTEM

What constitutes a *beginner* from an *intermediate* or *advanced* athlete? This is the first question we want to answer because it tells us how to implement programming for each of these various populations. The length of time spent training matters little when considering if someone is a beginner or a different skill level. For example, we all know people who have been hitting up the gym for several years, but rarely make any noticeable progress because their training is stagnated. Thus, length of time spent training plays almost no consideration in determining if an athlete is a beginner, intermediate, or beyond.

Instead, it is better to think of skill level in terms of ability level. How well can one perform a handstand? Can they execute a muscle-up or back lever with solid technique? Can they squat twice their bodyweight? The primary reason to use ability level as the basis for categorizing athletes is that it's a measurable standard. If you have the strength to execute a certain bodyweight or barbell movement then you have a proficiency to be able to exert force under control with your central nervous system (CNS), and you tend to have the physiological adaptations required to handle certain amounts of training.

Knowledge of overall ability level is important because the body will progress much faster at lower levels than it will if you already have higher levels of strength. Similarly, if you can execute a certain movement safely and effectively then your muscular and connective tissue strength will be built up to a certain level to handle a certain amount of training. These are important factors to know, as programming will differ between populations based on your strength level. Programming is formulating the knowledge you have on training to build yourself an effective exercise plan to progress in your abilities over a number of weeks or months.

The programming needs for the beginner are different than those with intermediate, advanced, or elite strength. The level of programming will vary between the levels of strength, because you cannot expect to train similarly to someone who is stronger or weaker than you.

For example, classic barbell beginner programs have a very basic level of complexity. They focus on the major compound lifts, such as the squat, deadlift, and bench press. This is ideal for those just starting out because they can progress very quickly, often from session to session. As you improve your abilities in strength and hypertrophy, it takes a progressively greater stress to cause similar adaptations to occur. Thus, the complexity of your programming must increase through changing the structure of the workouts to adjust intensity, volume, repetitions, and frequency. Depending on your individual training history, modifiable factors—such as stress, sleep, and nutrition—and unmodifiable factors—such as genetics and limb lengths—a training program may need to be specifically tailored from one individual to another, even if they are on the same strength level.

It's not necessarily the case that changes must be made when transitioning between levels, because everyone is different. However, training programs may need to be modified if your progress starts to plateau. There will always be those few who can ignore this because they are already strong. There will also be those who will have to start using more complex programming techniques before they transition from one level to the next.

The vast majority of beginner programs focus on full-body workouts performed three times per week. On the other hand, an Olympic weightlifter may visit the gym as often as three to five times in a single day, with only one or no days off each week. A gymnast training for the Olympics may be in the gym to practice movements forty hours per week, not including strength training performed on the side. Contrasting beginners and elite athletes is an obvious way to see the differences between those who have little exposure to training from those who have years of training experience. You would not want to throw a beginner into the volume of training that an elite gymnast performs, because the beginner would likely get injured within a few weeks.

It seems like common sense for most people, but often people who are sedentary come into the gym and attempt to learn everything at once. The Internet is full of videos of people trying to run, lift, and play a sport at the same time, after being sedentary for years. Their enthusiasm is to be commended, but it would be irresponsible to recommend large amounts of volume to them as they beginning their training as there is a much higher propensity for injury.

Action Steps for Untrained Beginners:

- Introduce fundamental exercises and become proficient in them.
- Utilize higher repetitions to solidify movement patterns and build connective tissue strength.
- Focus heavily on individual weaknesses. For example, a desk job often creates or perpetuates poor posture or alignment that can increase risk of injury if not addressed. Similarly, a sedentary lifestyle tends to create or perpetuate poor mobility and flexibility, which may need to be directly addressed with additional effort focused on those attributes.
- Begin a generalized, balanced routine that starts with high repetitions and then transitions to traditional strength training.

Action Steps for Trained Beginners:

- Emphasize consistency in training. Discipline is the most important factor in making progress. Skipping workouts is bad, unless you are facing an overuse injuries or there is a personal emergency. There is merit to the common saying, "*The best program is the one you stick to*."
- Place an emphasis on training in the five to fifteen repetition range, in order to ensure good muscular development and strength.
- Keep your routine balanced in terms of pushing and pulling exercises.
- Add in exercises to maintain structural balance if imbalances start to develop. Typically, this will mean something like adding more horizontal pulling if you trained in mostly pushing exercises before beginning bodyweight training. Pull heavy sports such as climbing may require additional pushing exercises.
- Allow your body to adapt to strength training, especially in the connective tissues and underlying structures, such as bones and joints.

Action Steps for Intermediate:

As you move into the intermediate range, your training needs will begin to diversify based on your goals. Because your needs will become more specific, a full-body routine will be less effective. Training will need to become more specific in nearly every area, including skill work, sport-specific skills, flexibility, mobility, prehabilitation, and rehabilitation. Ask yourself if the primary reason for your training is strength, endurance, or hypertrophy and tailor your workout accordingly. Here are a few examples:

- Strength – increase the amount of frequency as much as possible without overtraining or developing overuse injuries. Endurance – start to work strength at lower volumes in order to keep efficiency of exercises high and work the specific endurance exercises with high repetitions. Hypertrophy – start splitting from a full-body routine into various splits. This will be addressed in Chapter 5.
- Adapting frequency, volume, and intensity of training in order to maintain progress must occur at the intermediate range. Also learn to use more complex training programming.

Action Steps for Advanced:

- Training becomes even more specific and geared toward your sport or primary reason for training.
- Shoring up weak links becomes vastly more important if you desire to progress in your training. For example, when training with one-arm pull-ups, the back tends to be much stronger than the arms, due to the amounts of straight-arm work done in gymnastics. In this situation, bicep curls or other bicep exercises may be useful in addressing the weak link, which will improve strength overall. Likewise, the same is true for barbell lifts such as the deadlift, which uses the legs, hips, and back extensively. Many people who are posterior chain dominant will have a weak link in the back or quads. In this case, specific isolation work may be effective.
- While sleep, nutrition, and eliminating stress are important for beginners and intermediates, dialing in further in these areas will help increase progress vastly. Even small improvements will add up when improving strength and/or muscle mass starts to become notably difficult.
- Understanding how your body responds to training is important. In this stage, keeping a training log can be quite beneficial because you can review how your body responds to certain rests, deloads, and intensity/volume of exercises. This makes planning your weekly workout routines much easier.

These are some of the main ideas that you want to keep in mind as you progress with your training, in order to ensure that there is always a purpose for your training beyond your goals. This is especially true for trainers coaching multiple athletes. When training, it is easy to get sidetracked into minutia, and the experience of a veteran coach can help cut through the things that matter less in the big picture of training. Your emphasis should be on the things that will maximize your improvement (or the improvement of the athletes you are coaching), while staying injury-free and on track to reach your goals.

Let us check out the charts and then move on to setting and achieving goals.

SETTING AND ACHIEVING GOALS

The first step you want to take with goals is to select a direction for your training—for strength, endurance, hypertrophy, or other attributes. Let us recall some basic facts. The repetition continuum has strength on