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.

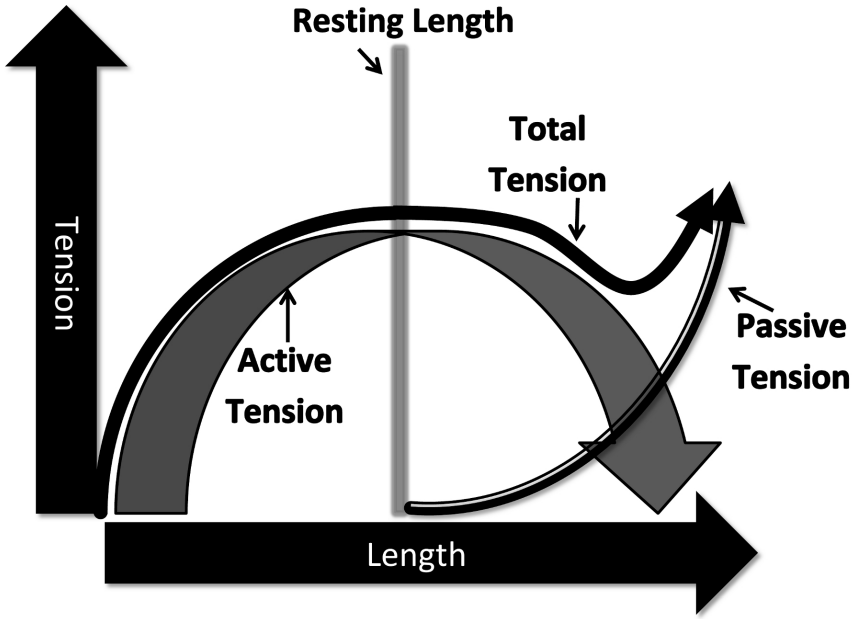
Muscles are strongest at their resting length because that is the point where the maximum number of cross bridges can be formed. A very basic explanation is that cross bridges are formed when the contractile components of the muscle—myosin and actin—overlap, and the myosin mechanically pulls against 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.