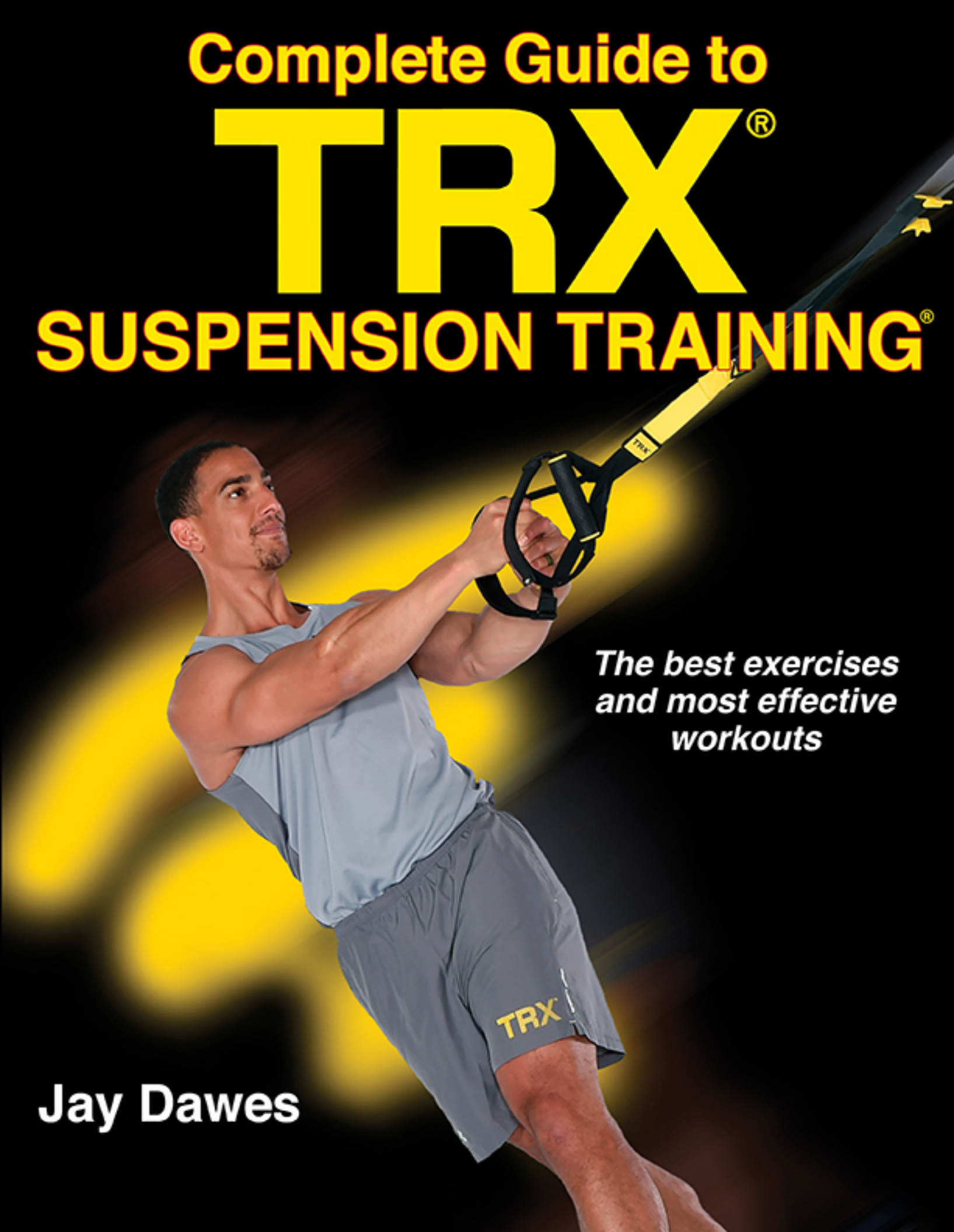
Complete Guide to TRX® SUSPENSION TRAINING®



The best exercises and most effective workouts

Jay Dawes

Complete Guide to TRX® Suspension Training®

Jay Dawes

HUMAN KINETICS

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For my amazing wife, April; my children, Gabrielle, Addison, and Asher; and my mother.

—*Jay Dawes*

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EXERCISE FINDER

(continued)

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INTRODUCTION

Over the years, Suspension Training® has continued to grow in popularity. Spawned from traditional gymnastics training, suspension training takes advantage of the physical laws of nature to improve physical fitness. Using the basic principles of physics, Suspension Training allows the user to manipulate the resistance created by one's own bodyweight to provide the necessary physical stressors for developing and maintaining health and fitness.

Suspension Training as we know it today became popular as a way to develop and maintain fitness among certain populations when traditional fitness equipment was not available. For example, U.S. Navy SEALs used Suspension Training when deployed in austere environments to maintain their fitness and occupational readiness. However, to create such devices, they typically used GI belts and nylon webbing designed to secure equipment to pallets. This concept was eventually commercialized and is now used in a wide variety of health clubs, by sports teams at every level, and in rehabilitation settings.

Working with older first responders (i.e., police, firefighters), masters athletes, and collegiate athletes, many of whom with multiple chronic injuries, required our training staffs to create modifications that could help them maintain and improve performance without aggravating any preexisting conditions. Introducing Suspension Training into their regular training programs provided a safe, versatile, and effective way for them to attain their goals. We found that individuals who started with a regular routine of suspension training experienced increased functional strength, decreased chronic pain, lower injury rates, and better results when performing traditional weightlifting and resistance training routines.

Suspension Training has a place in practically every type of training program. It can be used to develop core strength, mobility, joint strength and integrity, and basic and foundational strength, as well as to target specific strength goals. It can serve as a stand-alone training program or be used with another training program. Whatever the goals, suspension training can help an individual achieve success and improve training outcomes.

Science of Suspension Training

At this time, research on Suspension Training is minimal. However, several basic scientific principles support its use as a training modality. Part I presents some of the science behind Suspension Training and explains how to use these principles to guide training and maximize results.

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CHAPTER 1

Foundation of Suspension Training

It is generally well accepted that performing resistance training on a regular basis can help maintain and improve health, fitness, and quality of life. However, people often encounter obstacles to resistance training, such as time, space, equipment, and cost. Suspension Training® offers a unique approach to resistance training that requires only one portable piece of equipment, and it can be done almost anywhere. In addition, Suspension Training exercises can be used to address a wide range of fitness needs such as enhancing and maintaining general fitness, improving sport performance, and as a rehabilitation or injury prevention tool. This mode of training can be used as a stand-alone exercise regime or be integrated it into a more traditional training program to add variety and prevent staleness and boredom. Additionally, Suspension Training is popular among those who are traveling or who do not have access to a training facility because of its versatility and portability. Based on this, it is no wonder this form of training has become so popular.

Although Suspension Training seems to be a very straightforward concept, a good deal of science is involved in setting up a workout. Suspension Training is based on principles of anatomy, exercise physiology, physics, and biomechanics. The better these principles are understood, the more Suspension Training will make sense as a training option. However, one of the primary goals of this book is to keep it simple. This chapter presents some basic principles to help the reader manipulate training programs and learn how to progress or regress exercises to change the intensity of a training program. It also presents foundational program design concepts to help in the development of fun, challenging, and productive training sessions.

By using a single-point anchor, Suspension Training allows users to take advantage of some basic principles of physics, including Newton's law of gravitation using force vectors, center of gravity, and pendulum. Creating resistance or force requires changing the direction of the force. The Suspension Trainer™ has a single-point anchor with straps, handles, and foot cradles that are perpendicular to the floor when it is allowed to hang, as a result of the object's center

of gravity. When a person grabs the handles, mass increases (due to the person's body mass), resulting in a change in the object's center of gravity. Changing the angle of the straps on the Suspension Trainer changes the application, or direction of the force on the musculoskeletal system, thereby increasing the force of pull, or resistance placed on the body. The result of these forces, or force vectors, and the center of gravity being pulled away creates gravitational potential energy. A single-point anchor system creates a pendulum, converting gravitational potential energy and kinetic energy into work, or resistance.

A variety of ways are available to manipulate the intensity or difficulty of a Suspension Training program based on these principles. For the purposes of this text, *intensity* will be defined as increasing the load on the musculoskeletal system, or increasing the absolute load (i.e., amount of weight which must be moved) such as when changing the vector resistance, angle, or pendulum. *Difficulty* will be defined as any variations that may increase the complexity, or stability demands of a movement or action (e.g., single-arm, single-leg, balance, coordination). Stepping toward or away from the single-point anchor (depending on the exercise), and thus increasing the angle of pull, increases the intensity of an exercise. Ground contact is necessary to resist the forces that are trying to bring the mass back to perpendicular. The wider the floor contact base in the direction of the force vector is, the easier it is to resist the force vector. On the contrary, the narrower the ground contact base in the direction of the force vector is, the more difficult it is to resist the force vector. Consider the game tug of war. As one opponent pulls, creating a force vector, the other opponent must split the feet from front to back to keep from being pulled forward. This increases the base of support along the direction of pull created from the resultant vector, increasing stability along this vector.

There are three methods for varying the intensity or difficulty, or both, of a single-point anchor Suspension Trainer. These methods include:

- changing the stability demands of the exercise (e.g., from dual handles to a single handle, or by altering stance),
- manipulating the angle of pull, and
- changing the position of the center of gravity.

Base of Support

The body's base of support and center of gravity affect exercise intensity. Increasing the base of support makes a person more stable, which makes the exercise easier. Narrowing the base of support increases the difficulty by reducing stability. The most difficult base of support is a single limb (one foot, one arm). See figure 1.1 for examples of base of support levels.

FIGURE 1.1 Bases of support: *(a)* easy, *(b)* moderate, *(c)* harder, *(d)* hardest.

Angle of Pull

Changing the angle of pull increases exercise intensity. It also changes the angle of the body in relation to the ground. Also, increasing the lever arm, or movement arm, of gravitational pull increases the exercise intensity. In other words, the farther the person is from vertical, the greater the resistance will be. See figure 1.2 for examples of angles.

FIGURE 1.2 Angles of pull: *(a)* easy, *(b)* moderate, *(c)* harder.

Pendulum

The pendulum is used in ground exercises in which the feet are placed in the Suspension Trainer and the hands are off the ground. The center of gravity in relation to the perpendicular gravitational pull determines exercise intensity. Exercises in which the head and feet are on the same side in relation to the anchor point are more difficult than those in which the head and feet are on opposite sides of the anchor point—with some exceptions. See figure 1.3 for pendulums.

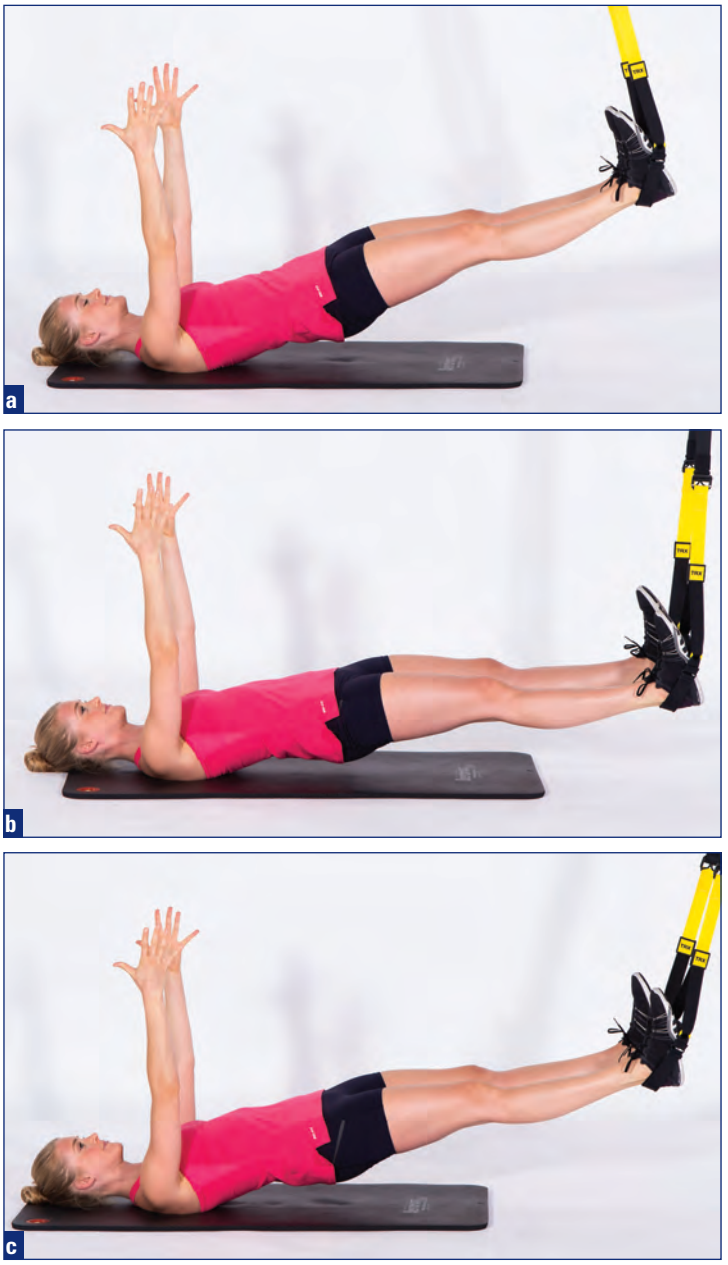

FIGURE 1.3 Pendulums: *(a)* easy, *(b)* moderate, *(c)* harder.

Handles

Using a single handle can increase the difficulty and intensity of some exercises by increasing the amount of neuromuscular control and stability needed to maintain the position. The single-handle grip also creates a significantly greater training demand on the core. When performing exercises unilaterally, on the side of the body with the free arm or leg, gravity tends to pull the body into rotation. Resisting the rotation is an excellent way to build trunk stability and reduce injury potential. Furthermore, unilateral type exercises (i.e., one hand or one foot in the straps) create off-center loading and require greater joint stabilization than traditional bilateral exercises, in which the loads moved are more evenly distributed. Used appropriately, this can provide a great alternative method of developing joint strength and stability.

For single-handle exercises to be safe, the handles must remain together during the exercise. This can be accomplished by grasping one handle in each hand (see figure 1.4*a*). Next, pass the handle in the right hand through the left-handle triangle (see figure 1.4*b*). Now take the handle in the right hand and pass it through the left-handle triangle (see figure 1.4*c*). Firmly pull down, cinching the handles together (see figure 1.4*d*). Test the security prior to performing the exercise.

FIGURE 1.4 Single-handle setup.

Exercises using one limb, either an arm or a leg, require the double-handle setup for most individuals (see figure 1.5). The use of a single handle when a single arm or leg is in contact with the ground requires high levels of coordination, balance, and strength. Only experienced individuals with high levels of strength should attempt such progressions.

FIGURE 1.5 Double-handle setup.

Stance

Foot position is important for modifying the intensity of exercises performed while standing. The wider the base of support is, the lower the intensity and difficulty of the exercise will be. The narrower the base of support is, the more intense and difficult the exercise will be. Any base of support can be adjusted during the exercise to increase or decrease difficulty. The following are the seven basic positions:

- *Shoulder-width*—Stand so that the instep of the foot is in line with the armpits (see figure 1.6*a*).
- *Hip-width*—Stand so that the feet and ankles are directly under the hips (see figure 1.6*b*).
- *Feet together*—Stand so that the feet are touching (see figure 1.6*c*).
- *Staggered*—Stand so that the feet are hip-width apart and the toes of one foot are in line with the instep of the other foot (see figure 1.6*d*).
- *Single-leg*—Stand on one foot (see figure 1.6*e*).
- *Lunge*—Stand so that the feet are hip-width apart. Move one leg backward and the other forward. Bend the forward knee until the shin is perpendicular to the foot. Bend the knee of the back leg until it forms a 90-degree angle. The foot of the front leg should be flat on the ground. The heel of the back foot should be raised, and the weight should be supported on the ball of the foot (see figure 1.6*f*).
- *Plank*—Stand so that the upper body, hips, and legs are in line with one another forming a long ridged lever (see figure 1.6*g*).

FIGURE 1.6 Suspension Training stances: (*a*) shoulder-width, (*b*) hip-width, (*c*) feet together, and (*d*) staggered.

FIGURE 1.6 Suspension Training stances: *(e)* single-leg *(f)* lunge, and *(g)* plank.

Suspension Training can be a very effective way to improve health, fitness, and performance. An understanding of the basic scientific principles behind Suspension Training will help in the creation, progression, and regression of a variety of exercises regardless of training level. The chapters that follow describe how to use these principles to develop comprehensive training programs.

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CHAPTER 2

Benefits of Suspension Training

As mentioned in chapter 1, Suspension Training is very popular because of its versatility, portability, and cost effectiveness. This chapter outlines the many benefits of this unique form of body weight training.

Functional Training

Functional training is a popular buzzword in the fitness community. Over the years, the term has been used to describe exercises performed with a variety of novel types of training equipment (e.g., balance discs, kettlebells, resistance tubing, Indian clubs). However, it is important to stress that a device does not make an activity functional. Furthermore, performing exercises that look similar to those in which one would like to improve, but whose underlying physical characteristics are different, may hinder performance. For example, running while towing a weighted sled can be functional; however, if the sled is weighted too heavily, the runner will have to counteract the load by increasing torso forward lean. This may alter the biomechanics of the activity and also engrain poor movement mechanics, interfering with motor programming.

Now that we have an idea of what is not functional, let's discuss what *is* functional. In simple terms, *function* can be defined as a desired purpose. In relation to human performance, most often *function* refers to the ability to move fluidly at the required speed and using the appropriate amount of force to execute a given task. Therefore, functional training may be defined as any form of training that improves movement quality and enhances a performance outcome (Siff 2003).

Rather than thinking of exercises as either completely functional or completely nonfunctional, we can think of all exercises as on a continuum. The functionality of an exercise is largely determined by the amount of carryover, or transfer, it has to a given activity. For example, if a training goal is to improve performance in the pull-up, the exercise with the highest likelihood of meeting

this goal would be the exercise itself. However, performing other exercises for the back, such as a suspension row, lat pull-down, seated row, or bent-over dumbbell row, may improve performance in the pull-up because they develop similar muscle groups. Even the biceps curl, which is normally considered a nonfunctional isolation exercise, can improve pull-up performance because the biceps are secondary movers in this action. Another example is the glute bridge. Although this exercise does not appear to have a direct relationship to any athletic movements, it strengthens the glutes, which are essential for controlling the hips during movements such as running and jumping. Poor glute strength may also contribute to valgus collapse (i.e., the knees moving inward while running, sprinting, and jumping), making an athlete more prone to injury.

In general terms, exercises that require stability through increased synergy have increased functional value (Orr 1999). Most activities, whether in sport or daily life, require us to move effectively and to manipulate our bodies to produce, reduce, and stabilize forces (see figure 2.1). This requires a combination of both stability (i.e., resistance to movement) and mobility (i.e., the ability to move). Although these concepts appear to be diametrically opposed, without one the other suffers. Producing efficient movements at the joints requires a base of stability (i.e., proximal stability) that allows the arms and legs to move fluidly through their intended ranges of motion (i.e., distal mobility). Consequently, inadequate mobility or stability may compromise movement. This is the reason for emphasizing proximal stability and motor control of the trunk first in the training program. Doing so optimizes distal mobility.

When using a Suspension Trainer, one or both limbs of either the upper or lower body are supported in handles or foot cradles. At the other end of the Suspension Trainer is an anchor point. The design of this device increases the demands on the user to control their body weight in multiple planes of movement and at multiple joints, while adding varying and progressive degrees of instability. Thus, the user must often recruit more muscles to remain stable while performing a movement. This improves what is referred to as top-down stability. Other devices, such as gymnastics rings, also develop top-down stability. However, unlike rings, most Suspension Trainers use a single anchor point with a limited-slip locking loop. This allows the user to add progressive amounts

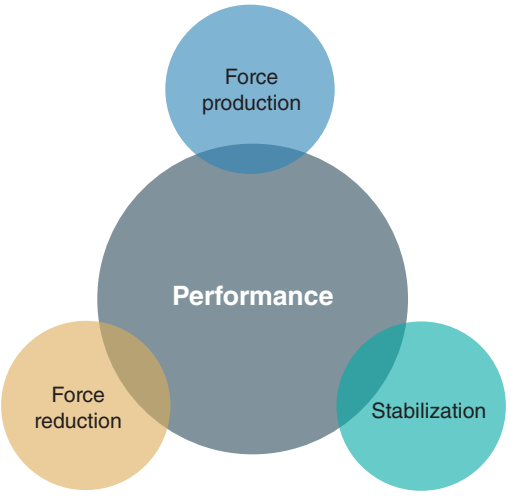

FIGURE 2.1 Essential elements of performance.

of instability to the training programs, which may improve joint stability and body awareness and increase the muscular activity of the core.

Although instability may hinder the total amount of force produced by the prime movers when compared to training in a stable environment, the stabilizer muscles around the joints and the trunk may become more active to resist unwanted motion. Therefore, Suspension Training can be particularly useful for athletes in overhead sports (e.g., baseball, softball, volleyball, and handball players, and quarterbacks in American football) because it may improve scapular control and strength in the muscles of the serratus anterior and those surrounding the shoulder. These improvements may help prevent both acute and chronic shoulder injuries. Suspension Training may also improve kinesthetic awareness and proprioception. This is simply a greater awareness of where the body and joints are in time and space. Enhancing these qualities may have a positive impact on performance as well as aid in reducing injury risk. Furthermore, shoulder injuries are very common in the general population because this ball-and-socket joint can be compromised during overhead lifting and lowering activities. Therefore, top-down instability training may also improve performance in activities of daily living and in recreational sports and resistance training, and reduce injury in the general population.

From a functional perspective, Suspension Training may challenge the trunk stabilizer muscles. Since Suspension Training increases the stability challenges of the trunk and the joints, these exercises may be well suited as preparation to lift heavier resistance. As one attempts to stabilize the joints, contractions of the agonist and antagonist muscle groups that surround the joints may contribute to a greater neuromuscular activation. Because a base of stability is required to produce and reduce force, Suspension Training exercises may be performed as a dynamic warm-up prior to more traditional and complex exercises. For example, a suspension push-up or chest press may be performed prior to a bench press to stimulate, or activate, the stabilizer muscles surrounding the shoulder prior to overloading the prime movers (e.g., pectoralis major, anterior deltoids, and triceps). Additionally, the Suspension Trainer can turn traditional single-joint isolation exercises, such as the biceps curl, into total-body exercises by increasing the demand for core stabilization. Given that the ability to resist unwanted motion in the trunk, or core, is essential in many activities of daily living and sport, this variation may be considered more functional than a similar exercise performed while seated or using a machine with a fixed movement path.

Fitness and Performance

Suspension Training has been shown to improve a variety of fitness and performance measures in recreationally active populations. Janot and colleagues (2013) found that younger (19 to 25 years) adults experienced significant improvements in flexibility, balance, core endurance, and lower-body strength when performing exercises twice a week for seven weeks using a Suspension Trainer. In this same study, the researchers also discovered that middle-aged (44 to 64 years) adults using Suspension Training experienced significant improvements in both core endurance and lower-body strength as well as improved, yet not statistically significant, increases in balance and flexibility. These improvements were similar to those of people performing traditional resistance training in all but one

area, lower-body strength. Those in the resistance training group experienced greater overall improvements in lower-body strength than did those in the Suspension Training group. This was most likely due to heavier training loads being used in the traditional resistance training group. However, this should not be seen as a negative finding in the support of Suspension Training. Rather, it supports the use of multiple training modalities to elicit specific adaptations.

Garnacho-Castaño and colleagues (2014) found that untrained men who performed a circuit training program that included both a domed training device (BOSU) and a Suspension Trainer (TRX) three days a week for seven weeks experienced significant improvements in maximal strength, average and peak velocity, and average peak power during both the bench press and back squat exercises. Significant improvements were also seen in vertical jump height when performing the squat jump and countermovement jump exercises. Although this is compelling evidence that instability training using a Suspension Trainer can improve these variables during the early stages of a resistance training program, advanced athletes may not experience similar results. Rather, advanced athletes would likely be better served by using Suspension Training as part of a comprehensive strength training program aimed at preventing injury, encouraging core development, and preventing monotony and boredom from stagnant training programs.

Suspension Training can be used to improve strength or endurance, or both. The attribute best developed may depend on initial strength levels. Individuals who already have a great deal of muscle size and strength may not increase their size and strength significantly with Suspension Training because they will not be moving as much weight when then use the Suspension Trainer in comparison to their normal training routines. These individuals may want to emphasize muscular endurance in working with Suspension Training, which they can still gain. For those who aren't very strong, Suspension Training may increase their muscle size, strength, and endurance because they have a higher training ceiling than those who are experienced in strength training. As a general rule of thumb, those who can perform no more than 10 repetitions of a given exercise should emphasize muscle size and strength rather than endurance. In contrast, those who can perform significantly more than 10 repetitions of a particular Suspension Training exercise would be best suited by using that exercise to develop muscular endurance. In order to shift a training program's focus between these attributes, exercise resistance may need to decrease to train endurance and increase to train strength. This can be done easily by selecting different exercises that change the total amount of body weight that must be lifted, by adding external resistance (such as a weighted vest), or by manipulating body position in relation to the anchor point.

Both strength and endurance exercises should be performed as part of a strength training program. Therefore, the current level of strength in a particular exercise or movement often dictates the most appropriate places in which to incorporate Suspension Training exercises into a training program to achieve the best training effect. For example, a suspension squat or lunge would be unlikely to improve overall strength in someone who is very strong on the back squat. However, it could be used to improve mobility by unloading the body while keeping some stress on the legs to prevent detraining, as part of a compound set during a hypertrophy cycle to increase the density of a training session, or to isolate the stabilizer muscles of the hip to reduce the risk of injury or improve neuromuscular control or balance.

Injury Reduction and Rehabilitation

Previous injuries, habitual movement patterns, and repetitive stress may lead to a variety of anatomical constraints. These constraints may decrease the ability to produce efficient movement by creating compensatory movement patterns. When these patterns are performed chronically, neuromuscular inefficiency and tissue breakdown are common. This may lead to pain or increased injury risk.

Core stability, or the effective recruitment of the muscles surrounding the trunk and pelvis, is essential to produce, reduce, stabilize, and transfer forces through the spine, as well as to control the muscles that surround the lower back and pelvis (Mok et al. 2015). Thus, the ability to maintain core stability has a profound effect on injury prevention. Given that training with suspension has been shown to result in improvements and progress in core stability exercises (Byrne et al. 2014; Mok et al. 2015; Snarr and Esco 2014), incorporating this modality into a training program seems intuitive if injury prevention is a concern. Performing a push-up using suspension may also strengthen the rectus abdominis just as effectively as performing abdominal crunches. Because Suspension Training results in less shortening of the psoas, it may be preferred for people with low back pain (Snarr et al. 2013).

Ease and Adjustability

The configuration of the Suspension Trainer allows the user to adjust the working angle to manipulate body angle and either increase or decrease the training load for each exercise. Melrose and Dawes (2015) conducted a study to evaluate the percentages of body mass people using Suspension Training were required to move with their torsos at angles of approximately 30, 45, 60, and 75 degrees and with their feet directly under the anchor point. Not surprisingly, they found that as people leaned back and their torsos became less vertical, resistance increased (37.44 $\pm$ 1.45 percent of body mass at 30 degrees, 52.88 $\pm$ 0.59 percent at 45 degrees, 68.08 $\pm$ 1.95 percent at 60 degrees, and 79.38 $\pm$ 2.14 percent at 75 degrees). Making these small adjustments in body position is significantly easier than changing weights between exercises, which is beneficial in a group training session in which multiple users of varying fitness levels are using the same equipment. In addition, manipulating the base of support (e.g., lifting one leg) can introduce additional balance and stabilization challenges to meet the task-specific demands and current physiological abilities of individual exercisers.

Affordability and Portability

One of the major benefits of Suspension Training is the ability to perform a wide variety of exercises in a small space. This makes it ideal for home gyms and for those who travel frequently. Furthermore, Suspension Training equipment is significantly less expensive than gym memberships. Because the device can be packed and transported easily, Suspension Training is frequently used by military and first responder personnel, especially during deployment.

Suspension Training is unique in its ability to strengthen the intrinsic stabilizing muscles and joint structures. Its benefits include adaptability, portability, and versatility, making it ideal for maintaining muscular strength and endurance anywhere. Integrating Suspension Training into a workout program may also develop accessory muscles, assisting in overall strength development.

Using Suspension Training in a rehabilitation program may also develop the body's core region, lending support to many other structures. Moreover, incorporating it into a daily program requires minimal instruction and supervision by professional staff.

Setup, Safety, and Success

Setting up the Suspension Trainer properly results in effective exercises. The system must also be secured appropriately to avoid injury. As with any exercise program, consultation with a health care provider is recommended, especially for those who have had muscle or joint injuries. Although Suspension Training exercises involve the use of body weight, due to the intensity generated when muscles are under tension for extended periods, as well as the instability of the primary platform, Suspension Training exercises can increase stress on joints and ligaments.

Suspension Trainer Anatomy

A general understanding of the anatomy of the Suspension Trainer is helpful. Figure 3.1 identifies the parts.

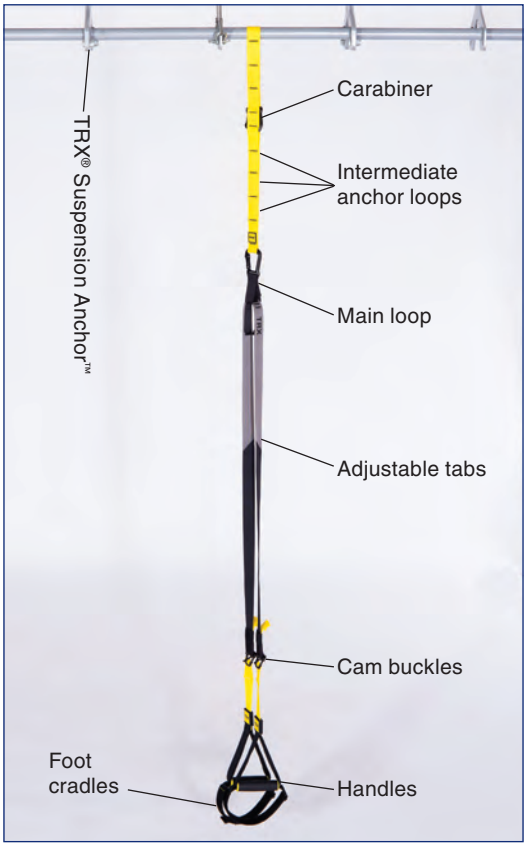

FIGURE 3.1 Parts of a Suspension Trainer.

Anchoring the Suspension Training System

Anchoring the Suspension Trainer requires a sturdy structure that can support the user's weight, such as a beam, bar, or tree limb. The area around it must free of debris to provide enough space to perform the exercises safely. A door can be used as long as the Suspension Trainer has a door anchor attachment.

Hang the Suspension Trainer by wrapping the anchor strap around the structure (see figure 3.2*a*); then, secure it by fastening the carabiner to the appropriate loop (see figure 3.2*b*) so that it hangs straight (see figure 3.2*c*). Be sure to test the weight before using it by pulling firmly on the straps and then gradually shifting weight to the Suspension Trainer.

If using a door, be sure to clip the strap into the loop of the door anchor (see figure 3.3*a*). Place the door anchor over the top of the door (see figure 3.3*b*); then close the door securely (see figure 3.3*c*). Note that the door should open away from the user, allowing the doorjamb to provide extra support during the exercises.

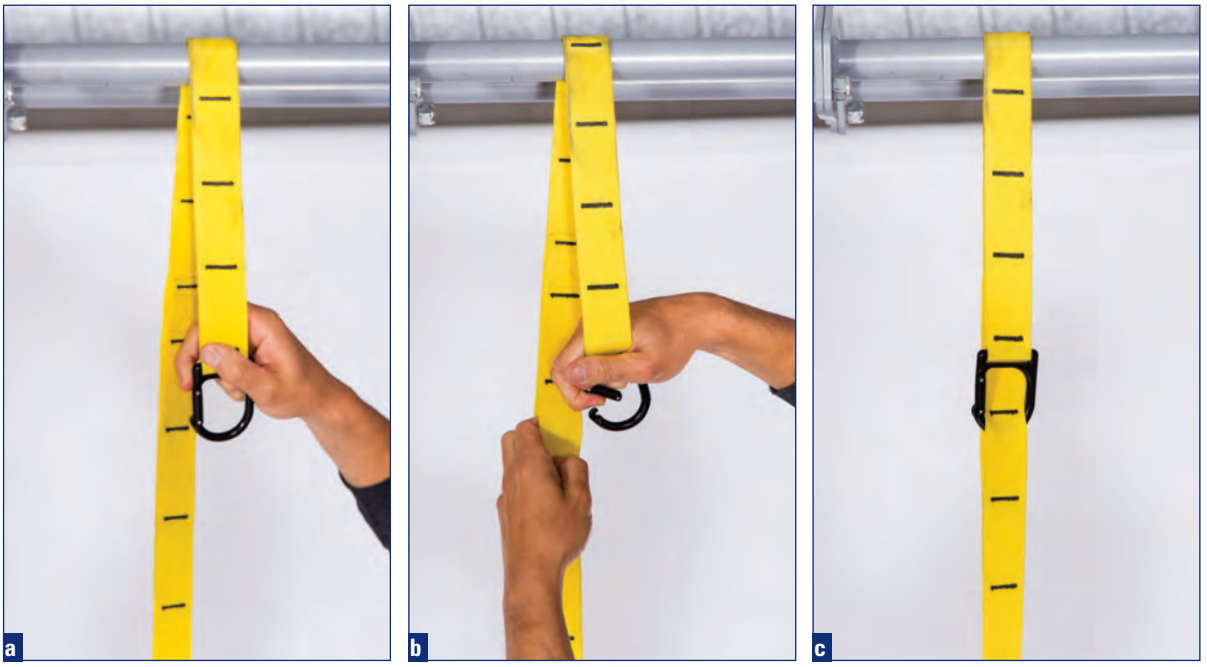

FIGURE 3.2 Anchoring a Suspension Trainer around a beam.

FIGURE 3.3 Anchoring a Suspension Trainer around a door.

Adjusting the Suspension Trainer Length

Adjusting the Suspension Trainer to the appropriate length before each exercise is important to ensure an appropriate training load. The following are typical lengths and positions:

- *Fully shortened*—Adjust the tabs so that they are at the highest point; that is, closest to the anchor (see figure 3.4*a*). This position is primarily used for exercises involving the back, such as row exercises.
- *Mid-length*—Adjust the tabs so that they are approximately at the midpoint of the straps (see figure 3.4*b*). This position is primarily used for exercises involving standing such as the biceps and triceps press.
- *Mid-calf*—Adjust the tabs so that the foot cradles are even with the middle of the user's shin or calf, which is approximately 12 inches (30 cm) off the ground (see figure 3.4*c*). This position is primarily used for exercises involving prone and plank positions.
- *Fully lengthened*—Adjust the tabs so that the bottom of the handles are approximately 3 inches (8 cm) off the ground (see figure 3.4*d*). This position is primarily used for all chest press exercises.

Gripping the Suspension Trainer

There are several ways to grasp the handles during Suspension Training exercises. Some require a specific grip, whereas others use a variety of grips to increase difficulty. The following are the three basic grips:

- *Supinated*—Palms facing up. This grip places a greater demand on the biceps and wrist flexors.
- *Pronated*—Palms facing down. This grip places a greater demand on the rhomboids and wrist extensors.
- *Neutral*—Thumbs facing up or palms facing inward. This grip reduces stress to the shoulder joint and can be used as a modification in any exercise.

Practicing Suspension Training Safely

When using a Suspension Trainer, check and recheck the anchor system prior to use to ensure that it can support weight. Generally, the issue is not related to the system itself (it is designed to support weight); rather, the issue is often related to what the system is anchored to. For instance, when anchoring the Suspension Trainer to a door, a heavy exterior door is much safer than a hollow door usually found between rooms. Use a deadbolt when anchoring to an external door to reduce the risk of the door opening during an exercise. Also, if using the Suspension Trainer in the single-handle configuration, check and recheck the handles to be sure they are secured together prior to use.

The location around the Suspension Trainer should be clear of debris, and the ground should be level and dry. If using the system outside, clear the training

area of any loose debris. Do not use electrical poles for anchor attachment, and ensure that there are no electrical wires near the anchor system.

The following are other important guidelines to follow to ensure safe training:

- Never stand in the handles or foot cradles.
- Do not use the Suspension Trainer as a swing.
- Wipe any sweat off the ground, handles, and foot cradles to avoid slipping.

FIGURE 3.4 Suspension Trainer strap lengths: *(a)* fully-shortened, *(b)* mid-length, *(c)* mid-calf, *(d)* fully lengthened.

- Periodically spray the straps, handles, and foot cradles with an antibacterial spray to reduce the risk of transmitting illnesses or disease (such as MRSA), especially if used in a group setting.
- Be cautious about using hand lotion prior to training because it can increase the risk of slipping off the handles.
- Perform all exercises on resilient flooring with a nonslip surface to reduce the risk of slips and falls and to reduce joint stress.
- Make sure the Suspension Trainer is not rubbing against any skin during use to avoid skin abrasions.
- Wear lightweight and nonrestrictive clothing designed for exercise; other types may restrict or hinder movement.
- Perform exercises in an open area free of debris and sharp objects.
- Avoid exercises that may aggravate current or previous injuries.
- Be familiar with, and practice and master, basic exercises prior to performing more advanced variations.
- Perform Suspension Training exercises with caution if you have major orthopedic limitations or are morbidly obese. Do not perform exercise variations that require greater balance challenges (e.g., single-leg variations), at least in the initial stages of training, if you have these conditions.
- Perform a 5- to 10-minute general warm-up prior to training.

When setting up and using a Suspension Trainer, safety is paramount. Following the general guidelines in this chapter will help ensure safe and effective Suspension Training. However, it is the user's responsibility to be aware of the surroundings and make any appropriate adjustments to maximize safety.

Physical Assessment

Periodic physical assessments help determine whether training adjustments are needed and when to increase exercise intensity. This chapter addresses the nuts and bolts of physical assessment and it provides suggestions for testing exercises when using the Suspension Trainer.

Considerations Before Testing

Before undertaking a physical assessment, people need to be familiar with the exercises they will use in the assessment. Moreover, the assessment itself must be both valid and reliable in order to provide accurate and helpful information. These issues are addressed in greater detail in the following section.

Preparedness

Practicing the exercises before the assessment itself reduces the likelihood of using a less-than-optimal technique during the assessment. A 5- to 10-minute general warm-up prior to testing is also recommended. This general warm-up should include movements that will progressively increase your heart rate, respiration rate, and perspiration rate. Walking or jogging for 3 to 5 minutes followed by some light weight exercises performed on the Suspension Trainer would be an appropriate warm-up. Special attention should be given to make certain that the exercises selected and the intensity of the exercises related to the warm-up do not negatively affect the testing process. If fatigue is accumulated during this portion of the testing process, it may have a negative impact when performing the actual test.

Validity

Validity refers to the ability of a test to accurately measure a specific outcome or attribute. For example, for determining lower-body strength, a test that measures strength in this area, such as the rear-foot elevated split squat, would be ideal. In contrast, to measure upper-body strength, a test such as a push-up or row would be most appropriate. To determine strength gains in the biceps, the biceps curl would be the best option for isolating this area. Test selection is largely based on the targeted attributes. The more specific the selection is, the more helpful the results will be.

Reliability

Reliability refers to the consistency of the results. The following are guidelines for improving the reliability of an assessment:

- Perform all tests indoors in a consistent environment (i.e., temperature, humidity, training surface) to reduce variability.
- Adjust the handles and foot cradles to the same length during every test, and place the feet the same distance from the hanging point. Based on the nature of this training device, these small alterations can create significant changes in the testing load. Failure to be consistent with the setup will not allow accurate comparisons.
- Consider body mass. Significant increases or decreases in weight may alter the results because more or less weight is being moved. This is a particularly misleading factor for those who accrue a large amount of muscle mass. Although they may be significantly stronger, they still must move more mass than in their original test. Therefore, the overall amount of weight moved is greater. This may result in a net zero gain in the number of repetitions performed or in the amount of time holding an isometric position. In reality, improvement has occurred because they are moving or stabilizing a higher load.
- Do not perform tests when significantly fatigued or when experiencing muscle soreness; these conditions can affect results. As a general rule, perform testing 48 to 72 hours after the last exercise session to reduce the effects of soreness and fatigue.
- Reassess every four to six weeks.
- Always give your best effort.

Suggested Testing Exercises

This section presents basic testing exercises for gauging fitness progress. Although any of the exercises in this book can be used as a test, these provide a good general assessment of current fitness level. If you experience pain during any of these exercises, obtain medical clearance prior to beginning a training program.

Elbow Plank

Lie facedown with forearms facing away from the anchor point. Place one foot in each stirrup. From the facedown position, lift the hips and torso until the elbows are directly under the shoulders and the upper arms are perpendicular to the ground using one continuous movement (see figure). Measure this test by tracking the time spent holding the plank position with perfect form and technique. As soon as technique breaks, the test should be terminated. This should be the first test performed in the series. If unable to perform this exercise, substitute the standing plank (see pg. 140).

Suspended Push-Up

Face away from the anchor point and place the feet in the foot cradles. Place the hands on the ground approximately shoulder-width apart. Set the body in a straight line, or plank position. While bracing the trunk and keeping the arms straight, pull the shoulder blades down and together (see figure *a*). Bend at the elbows to lower the body to the ground, keeping the torso flat and rigid, until reaching a 90-degree angle at the elbows (see figure *b*). Push the body back up to the starting position. This test is measured by counting the number of repetitions performed within a set period of time (e.g., one or two minutes), or by counting the number of repetitions performed with good technique or until volitional fatigue. During this test, one may rest in the starting position. If the individual is unable to maintain a proper plank position (i.e., hips drop or rise), the test should be terminated and the number of repetitions to this point should be recorded.

Inverted Row

Face toward the anchor point and grab the handles (one in each hand) using a neutral grip. While keeping the arms completely straight, position your feet directly underneath the anchor point and lean back until the torso is at approximately a 45-degree angle to the ground (see figure *a*). Pull the shoulder blades together and downward. Pull the body toward the anchor point by bending the arms and extending the shoulders (see figure *b*). Slowly extend the arms and allow the shoulders to flex to return to the starting position. This test is measured by counting the number of repetitions performed within a set period of time (e.g., one or two minutes), or by counting the number of repetitions performed with good technique or until volitional fatigue. During the test, one may rest in the starting position. If the individual is unable to maintain a proper plank position (i.e., hips drop or rise), the test should be terminated and the number of repetitions to this point should be recorded.

Reverse Lunge

Face away from the anchor point with the hands on the hips and place one foot in the cradles (see figure *a*). The other foot should be firmly planted on the ground with your weight evenly distributed between your big toe, your little toe, and your heel. While maintaining a rigid torso, allow the lead leg, ankle, knee, and hip to bend until the top of the thigh is parallel to the ground (see figure *b*). Extend the lead leg and bring the back foot forward until back in the starting position. This test is measured by counting the number of repetitions performed within a set period of time (e.g., one or two minutes), or by counting the number of repetitions performed with good technique or until volitional fatigue. During this test, one may rest in the starting position. If the individual is unable to maintain balance, the test should be terminated and the number of repetitions to this point should be recorded. After completing this, place the opposite foot in the stirrups, and then repeat this procedure using the opposite leg.

How to Use the Results

The information gathered from testing can be used in several ways. This section explains how to use this information to determine how effective the training program is and how to adjust it to continue making progress.

Tracking Progress

Figure 4.1 is a blank Suspension Training assessment tracking sheet for measuring fitness progress.

FIGURE 4.1 Suspension Training Assessment Tracking Sheet

	Date: _____	Date: _____	Date: _____
Suspended push-up			
Inverted row			
Reverse lunge (left foot on ground)			
Reverse lunge (right foot on ground)			
Elbow plank			

From J. Dawes, 2017, *Complete guide to TRX® suspension training*™ (Champaign, IL: Human Kinetics).

Measuring Change

One way to gauge fitness progress is to simply look at the amount, or percentage, of change from testing date to testing date. To calculate the amount of change, subtract the value of the previous test from the value of the current test. Take a look at the completed tracking sheet in figure 4.2. If the athlete was able to perform 20 push-ups during the first test, and 12 weeks later was able to perform 30 push-ups, this would be a net change of 10 push-ups. The percentage of change could also be calculated as follows:

1. Subtract the old value from the new value:

   30 push-ups (current test) – 20 push-ups (previous test) = 10 push-ups

2. Divide the amount of change by the old value:

   10 push-ups (amount of change) / 20 push-ups (previous test) = 0.50

3. Convert to a percentage by multiplying the decimal number by 100:

   $0.50 \times 100 = 50\%$ increase

FIGURE 4.2 Suspension Training Assessment Tracking Sheet for Sample Athlete

	Date: September 11	Date: October 10	Date: November 12
Suspended push-up	20	25	30
Inverted row	12	15	18
Reverse lunge (left foot on ground)	10	13	15
Reverse lunge (right foot on ground)	8	11	14
Elbow plank	35 sec	50 sec	75 sec

Improving Symmetry

Asymmetry refers to the differences between the right side and left side of the body when performing certain exercises. The sample athlete's results in figure 4.2 reveal a right versus left asymmetry of 20 percent on the rear-foot suspended reverse lunge in the first test. After approximately 8 weeks of training, this asymmetry decreased to approximately 8 percent difference. Although this is subject to some debate, a bilateral deficit greater than 10 percent may present a risk of injury. As shown, after 12 weeks of training, injury risk was reduced significantly as a result of the athlete's developing greater symmetry between the limbs.

Adjusting the Training Load

Test exercises provide an idea of the current fitness level. Meeting the goals of a training program requires adjusting the resistance by progressing or altering the demands of the exercises to stay in the desired repetition ranges (see table 8.1).

Testing is an important step in the design of a training program. Periodically assessing progress provides the best opportunity to achieve the desired results from a training program.