RESISTANCE SUSPENSION TRAINING USING BODYWEIGHT EXERCISE

(The research contained in this document was not compiled by RST Fitness but by TRX which offers a similar resistance suspension trainer device in America)

Scientific Foundations and Practical Applications

The goal of this review is to describe a Resistance Suspension Trainer, the scientific basis of functional training as it applies to a Resistance Suspension Trainer bodyweight exercise and the practical applications from injury to high performance. By leveraging bodyweight and manipulating one's stability, Resistance Suspension Training can scale intensity across a continuum of low to high loads and stable to unstable positions. Functional exercise as performed on a Resistance Suspension Trainer can be used to rehabilitate musculoskeletal injuries or disabilities, prevent injuries, promote health and fitness and enhance performance.

Key findings regarding the benefits of Resistance Suspension Training and/or instability training include:

Effective in reducing the risk of injuries.

- Lower limb injuries by 39%.
- Acute knee injuries by 54%.
- Ankle sprain injuries by 50%.
- Recurrence of ankle sprain decreases two-fold.
- ACL injuries by 88%.

Effective in improving health and fitness.

- Resistance Suspension Training meets the Surgeon General's guidelines for moderate physical activity.
- Resistance Suspension Training can promote weight loss and reduce disease risk.
- Resistance Suspension Training is safe and effective in reducing fall risk.
- Instability training provides a greater variety of training experiences without sacrificing strength, balance and functional performance measures.

Effective in improving performance.

- Vertical jump height increases 9%.
- Hockey players improve skating speed.
- Golfers improve performance.
- 5000 meter runners decrease their time by 47 seconds.
- Military service members improve fitness test scores.

Suspension Training Defined

Suspension Training bodyweight exercise is a uniquely effective training system enabling loading and unloading of movements to meet individual needs and goals. Suspension Training refers to the broad body of unique training movements, coaching cues and program principles that have been created and systematized by Fitness Anywhere. Suspension Training bodyweight exercise requires use of a Resistance Suspension Trainer and is distinguished from traditional exercises in that either the user's hands or feet are generally supported by a single anchor point while the opposite end of the body is in contact with the ground.

A Resistance Suspension Trainer is a highly portable exercise device that can be used to improve the functional qualities of physical fitness. By manipulating body position and stability, a Resistance Suspension Trainer can be used to load the body through multi-planar resistive and neuromuscular exercises in a proprioceptive enriched state or to unload the body. With its versatility in manipulating load and stability, a Resistance Suspension Trainer is a functional training tool that is being used in the treatment and prevention of musculoskeletal injuries or disabilities and to improve fitness and performance.

Benefits of the Single Anchor System

A Resistance Suspension Trainer proprietary single point attachment provides ease of installation, adjustment and use. Some suspension type devices have dual anchor points, requiring more effort for installation and adjustment and making the device less adaptable. A single anchor point is easier to install as it only requires one point of contact and can be attached to any stable object of appropriate height and stability. The single anchor point of a Resistance Suspension Trainer also enables rapid micro adjustments to the length of the suspension strap so the user can quickly equalize handle positioning. Rapid adjustment to equalize strap length on a dual anchor system is not possible, making its use in group settings or with novice users less feasible and transitions to different exercises more time consuming. With dual anchor points, range of motion and loading with upper extremity exercises is limited by the width of the straps, which are typically arranged slightly wider than shoulder width. The single anchor system fosters the simple performance of multi-planar exercises and a wider range of motion with more control over mobility and load.

Versatility of the Resistance Suspension Trainer

A Resistance Suspension Trainer is a versatile training tool that can be used to either support or load movement to improve physical fitness qualities. Physical fitness is a multi-dimensional concept that includes muscular strength and endurance, cardiovascular endurance, flexibility, agility, balance, coordination, speed, power, reaction time and body composition (American College of Sports Medicine, 2006).

To support movement, a Resistance Suspension Trainer can be used to:

1) Unload for stretching and mobility exercises,
2) Unload to perform partial weight-bearing exercises
3) Provide external support for postural stability to assist in learning a movement or minimize the fear of falling.

To load movement, a Resistance Suspension Trainer has been used in the doctors, at the gym and on sports fields and military bases to:

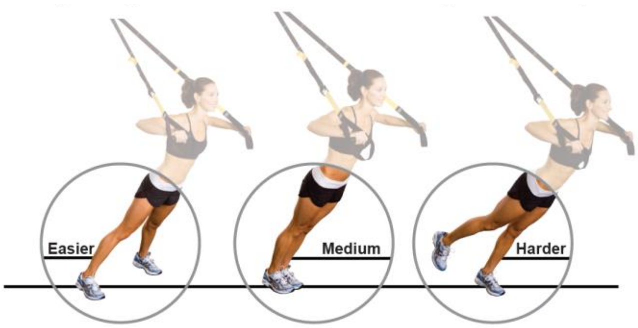
1) Rehabilitate musculoskeletal injuries and disabilities,
2) Improve physical fitness
3) Prevent injuries. In addition to modifying an exercise based on load and stability, both

bilateral or unilateral exercises can be performed for the upper and lower body.
The scalability of exercises along with the high portability make a Resistance Suspension Trainer an effective option for someone undergoing physical rehabilitation, performing a regular fitness program, competing in sports, working in military, tactical or first responder positions or seeking the prevention of musculoskeletal injuries. The versatility of a Resistance Suspension Trainer allows a full range of exercises to be performed, from low to high loads, stable to unstable environments and single to multiple planes of motion.

“Using a portable Resistance suspension Trainer provides us with a new, cutting-edge way to train our athletes in our facilities or on the road…net effect is that our athletes improve their performance while reducing their risk for injury” - Sue Falsone, PT, SCS, ATC, CSCS, Athletes Performance.

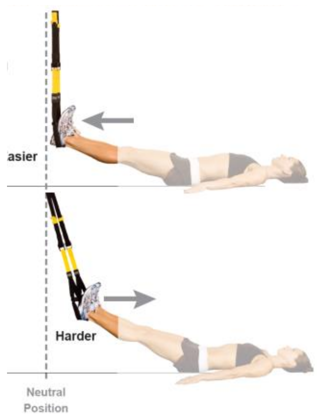
Customizing Intensity with a Resistance Suspension Trainer
There are three key ways to alter the intensity of a Resistance Suspension Trainer exercise by varying a combination of load and stability.

Stability Principle: The size and positioning of the base of support (BOS) relative to the center of gravity (COG) determines the stability of an exercise.



Vector Resistance Principle: The angle of the body relative to the ground determines the resistance/load of the exercise.

Pendulum Principle: The horizontal positioning of the COG relative to the anchor point determines the resistance/load of the exercise.



Functional Training with a Resistance Suspension Trainer
Traditional weight training typically involves single plane exercises performed in a seated or lying position using free weights and machines. In contrast, functional training typically involves an integration of multi-planar total body exercises with variable challenges to load, balance and stability. Popular definitions of functional training vary widely.

Examples include:

- Any activity that enhances a performance outcome (Siff, 2002).
- Integrated, multi-dimensional movement that requires acceleration, deceleration and stabilization in all three planes of motion. Functional training is training that enhances one's ability to move in all three planes of motion more efficiently, whether you're an athlete playing in a sport or simply performing activities of daily living (NASM Education Team, 2010).
- An exercise continuum involving balance and proprioception, performed with the feet on the ground and without machine assistance, such that strength is displayed in unstable conditions and bodyweight is managed in all movement planes (Boyle, 2003).
- The unique movement repertoire of an individual comprised of general and special skills
(Lederman, 2010).

Regardless of how one defines functional training, a Resistance Suspension Trainer is an effective training tool. Through differences in set up, exercise can be performed along a continuum of low to high loads or stable to unstable positions, allowing a broad range of physical fitness qualities and outcomes to be trained in a proprioceptive enriched training environment.

Balance, Stability and the Benefits of Unstable Training

Balance and stability are often used interchangeably to define the maintenance of upright movement or stance.

Balance:

Defined as maintaining equilibrium of the body in static and dynamic conditions. During unloaded static activities, balance is maintained when the body's center of gravity is within its base of support, and stability is the state of that equilibrium (Shumway-Cook & Woolacott, 1995).

Stability:

Defined as resistance to internal and external forces. Following a perturbation, if the behavior of the body or joint is unchanged, then it is considered stable; if it differs significantly, then it is considered unstable (Reeves, Narednra, & Cholewicki, 2007).

Types and Control of Stability

Stability can be discussed at the level of a single joint, multiple joints or limbs or the entire body. Stability is the sufficient stiffness in surrounding tissues and appropriate motor control around the joint(s) to resist perturbations (McGill S. M., 2007). A stable core enables one to effectively transfer forces between the upper and lower body by contracting the appropriate amount, at the appropriate time, for the appropriate duration. This complex pattern involves interplay between the peripheral musculoskeletal system and the central nervous, which continuously adjusts stability and movement through feedforward and feedback systems. Anticipatory postural adjustments (APAs) are a type of feedforward response that precede rapid movements and are important prior to movement to stabilize body segments and increase stiffness in the limbs (Carpenter, Frank, Silcher, & Peysar, 2001). The musculoskeletal system must be trained appropriately to tolerate the loads and duration of loads to which it will be exposed. The nervous system adapts to training and is influenced by the environmental context to provide efficient movements.

Types of Unstable Training

Unstable training can be performed by exercising on an unstable surface or by using an unstable load. Unstable surface training includes BOSU® balls, physio balls and wobble boards. A Resistance Suspension Trainer is a type of unstable load training. An additional example includes performing a dumbbell chest press instead of a machine-based chest press. As a stand-alone device, a Resistance Suspension Trainer enhances balance and stability through unstable load training and may also be integrated with a labile surface for unstable surface training.

Benefits of Unstable Training

Unstable training provides greater sensory feedback to enhance both feedback and feed forward responses of the motor system, thereby increasing the levels of co-contraction and joint stability (Gantchev and Dimitrova 1996). Unstable training provides a high level of muscle activation and limits maximal force output and the resultant joint torques (Behm & Anderson, 2006). According to Cholewicki & McGill (1996), spine stiffness is a correlate of spine stability, and individuals with higher muscle activation have a higher "margin of safety" in terms of stability than individuals with lower muscle activation. In the upper body, unstable training provides the benefit of increased proprioception and neuromuscular control in a closed chain environment, improving joint stability and incorporating training variety (Kibler & Livingston, 2001) (Marshall & Murphy, 2006).

Figure 1
In comparing a suspended bodyweight row (Fig. 1), a standing bent-over barbell row and a standing single arm cable row for muscle activation of the spine and hip extensors, spinal loading and muscle-generated stiffness, Fenwick, Brown, and McGill (2009) showed the suspended bodyweight row participants had the lowest compressive forces and the highest muscular activation.

This has specific applications in rehabilitation and fitness training where one wants to limit joint loading or in performance programs to allow recovery while maintaining muscle recruitment. In the spine there are increased levels of muscular co-contraction during unstable training compared to stable training (Norwood, Anderson, Gaetz, & Twist, 2007) (Beach, Howarth, & Callaghan, 2008) and the lower muscle
activation levels observed during whole body multi-planar exercise is the motor control systems response to organize activity in all muscles to achieve joint stability and balance 3 moments about each joint (McGill & Karpowicz, 2009).

Resistance Suspension Trainers for Musculoskeletal Rehabilitation

Integrative Closed Chain Exercise
It is common in rehabilitation to observe exercises being performed that are localized to the injured or disabled body part. In addition to being able to replicate many traditional therapeutic exercises, a Resistance Suspension Trainer engages the entire body, and hence the core, with every exercise. This full body engagement is partly under volitional control, while challenges to balance and stability rely on feedback mediated adjustments and anticipatory control. In the upper and lower extremities, Resistance Suspension Trainer exercises are predominantly closed kinetic chain (CKC) exercises. Compared to open kinetic chain exercise, CKC exercises result in greater joint stability and decreased shear forces through increased muscular co-contraction/co-activation (Kibler & Livingston, 2001). For example, during an unstable bench press, the triceps and deltoid show increased muscle activation and co-contractions (Marshall & Murphy, 2006).

Depending upon the phase of rehabilitation and the individual's needs, exercises with a Resistance Suspension Trainer may be modified to place more emphasis on motor control adaptations than tissue adaptations. During the performance of whole body, multi-planar exercises, muscular and joint forces are distributed across the body, and while the total muscular activation is lower than that of single plane exercises, the exercise difficulty is rated as strenuous by participant's (McGill & Karpowicz, 2009). This has implications for the active patient or client, who desires the "feeling" of a good exercise session, yet may not be able to tolerate the stresses of a vigorous training session or it isn't part of their periodized plan.

Finding activities that enable patients to confidently perform and progress on their exercise program is important to long term success (Vlaeyen, de Jong, Geilen, Heuts, & van Breukelen, 2001). Increasingly, physical rehabilitation practitioners are finding Suspension Training bodyweight exercise is scalable across a wide range of loads and can integrate the entire body into every exercise, challenging balance and stability and facilitating greater proprioceptive and neuromuscular control. For lower extremity rehabilitation, a Resistance Suspension Trainer can be used as a de-weighting device to allow partial weight-bearing exercise in the early phases of rehabilitation or as a safety device as they progress to full weight-bearing exercise. Once full weight-bearing exercise is achieved, multi-planar exercises challenging proprioception and neuromuscular control can be incorporated to restore function.

With a Resistance Suspension Trainer, muscle activation levels and joint loads can be manipulated by varying the angle of the body and level of stability for each exercise. Based upon the patient's stage of healing and goals, a Resistance Suspension Trainer can be used as a replacement or complement to traditional exercise devices used in musculoskeletal rehabilitation programs. By incorporating the entire body, muscular forces will be shared across the body, enhancing proprioception and the patient's awareness of how his body moves.

Core Stabilization and Strengthening

Core stabilization and strengthening is typically trained across a continuum of motor control, endurance, strength and power exercises, with the early phases of rehabilitation or injury prevention emphasizing motor control and endurance through changes in torso stiffness and later stages of fitness and performance training emphasizing strength and power by enhancing torso rigidity. Most exercises with a Resistance Suspension Trainer begin and end in a plank or plank variation, with low load planks used to enhance stiffening of the spine. Volitional stiffening of the spine has been performed by abdominal hollowing or abdominal bracing. Abdominal hollowing draws the navel towards the spine and increases intra-abdominal pressure (Richardson & Jull, 1995), yet it results in 32% less stability than abdominal bracing, which involves a co-contraction of the muscles surrounding the spine (Grenier & McGill, 2007).

A decrease in core muscular endurance (McGill S. M., 2007) and the size of the trunk muscles as measured by MRI (Hides, Boughen, Stanton, Strudwick, & Wilson, 2010) are related to low back pain. In the torso, the transversus abdominus is under anticipatory control and shows a burst in activity prior to arm or leg movements (Hodges and Richardson, 1997a, 1997b), while the non-contractile and contractile tissues provide sensory feedback via proprioceptors and muscle spindles, respectively.

Specific motor control training can help restore the deep abdominal muscles that show delayed activation and histological changes secondary to injury or pain and has been shown to be beneficial for spondylolisthesis (O'Sullivan, Phyty, Twomey, & Allison, 1997), acute low back pain (Hides, Jull, & Richardson, 2001), and pregnancy-related pain (Stuge, Veierød, Laerum, & Vøllestad, 2004). It is equally important to have the ability to relax the muscles of the core as it is to know how and when to activate muscles.

For many people, especially those with a history of back pain, too much muscle activity is the problem, not too little, and low load exercises with diaphragmatic breathing can help reduce this excessive activity (McGill S. M., 2007). This suggests the importance of feedforward and reflexive motor control training enhancing torso stiffness prior to enhancing torso rigidity, a goal of core stabilization training.

In the progression form core stabilization to core strength, higher loads and postures can be included in the exercise program.

Figure 2

An example is the ***suspended push-up (Fig.2), which shows a significantly increased activation of the abdominal wall muscles and lattissimus dorsi compared to standard push-ups, making it an effective upper extremity and abdominal exercise*** (Beach, Howarth, & Callaghan, 2008)***.***

Spine loads appear to be position-specific, with lower spinal loads in pulling exercises and higher spine loads in pressing exercises, each with higher muscle activation levels when compared to the stable version of the exercise.

This is not to imply that higher spine loads are bad. In athletics, spine loads may be high, and training programs should be structured to permit the individual to develop an appropriate motor response to a variety of postures and load. Using a Resistance Suspension Trainer allows practitioners to integrate the core into every exercise along a full continuum of motor control, endurance, strength and power training.

Resistance suspension Training for Health & Fitness

Health Promotion & Weight Loss
Fitness can be modified through all types of physical activity. Patients seen in a clinic for a musculoskeletal problem or clients beginning an exercise program often present with negative health and fitness measures that can influence their ability to heal or train, increase their risk for re-injury or otherwise negatively influence their quality of life. Rehabilitation and fitness professionals are in a unique position to promote physical activity by utilizing their unique skills to develop therapeutic programs that incorporate the minimum dose-response of physical activity for their patients. Both younger and older adults can use a Resistance Suspension Trainer as part of their exercise program. Dr. Christian Thompson (2010) at the University of San Francisco determined that ***Resistance Suspension Training is a safe and effective exercise modality in older adults who were deemed to be at risk for an accidental fall.***

This research, which has been peer reviewed by the American College of Sports Medicine, was an eight week training program using a Resistance Suspension Trainer bodyweight exercise system to enhance functional fitness in a group of older adults. Significant improvements were measured for the Functional Reach Test and the Timed Up-and-Go Test (TUG). Additionally, ***Resistance Suspension Training meets the Surgeon General's guidelines for moderate physical activity*** (Dudgeon, Aartun, Herrin, Thomas, & Scheet, 2010) (Scheett, Aartun, Thomas, Herrin, & Dudgeon, 2010) ***and can be used as part of a clinical fitness program to***

promote weight loss and reduce disease risk, improving one's quality of life and decreasing the long term costs of health care.

Physical activity and exercise prevents the occurrences of cardiac events and reduces the risk of stroke, hypertension, type 2 diabetes mellitus, colon and breast cancers, osteoporotic fractures, gallbladder disease, obesity, depression and anxiety. At any age, individuals who change from a sedentary lifestyle to a physically active lifestyle lower their rate of disease and premature mortality.

All Levels, All Places, All Goals

With its portability and ease of use, a Resistance Suspension Trainer is a solution for your clients or patients to be consistent with their exercise program as they can use a Resistance Suspension Trainer at home, outdoors or on the road. For those returning to the gym and looking for individual instruction or group classes, The ability to scale exercise across a wide continuum of challenge allows people of all ability levels and all goals to find a way to effectively incorporate instability training into their programs. Many exercise programs have a high rate of recidivism, and Suspension Training may increase exercise compliance through the ability to create a wide variety of novel activities and provide musculoskeletal benefits for those who do not have access or want to complete intensive free weight training programs. ***Instability training provides a greater variety of training experiences without sacrificing strength, balance or functional performance measures and should be incorporated into the training program of inexperienced trainers*** (Kibele & Behm, 2009)***.***

Resistance Suspension Training for Injury Prevention & Performance

Injury Prevention in Sports

A systematic review of neuromuscular training, which includes unstable surface and unstable load training for sports injury prevention, showed that ***exercise programs incorporating instability exercises were effective in reducing the risk of lower limb injuries by 39%, acute knee injuries by 54%, ankle sprain injuries by 50% and upper limb injuries*** (Hubscher, Zech, Pfeifer, Hansel, Vogt, & Banzer, 2010)***.***

While a specific dose-response was unable to be determined by the review, at least 10 minutes of neuromuscular training performed two or more times per week was shown to reduce injuries (Hubscher, Zech, Pfeifer, Hansel, Vogt, & Banzer, 2010). Trunk and hip neuromuscular training is advocated for the prevention of non-contact anterior cruciate ligament (ACL) injuries in female athletes, who are considered to be at higher risk due to biomechanical differences (Myer, Chu, Brent, & Hewett, 2008).

In a group of female soccer players, the incorporation of a neuromuscular and proprioceptive training program reduced the incidence of ACL injuries by 88% in year one and 74% in year two (Mandelbaum, et al., 2005)***. Basketball and soccer players with a prior ankle sprain have a two-fold decrease in the recurrence of an ankle sprain through the incorporation of balance and proprioceptive training into their normalconditioning program*** (McGuine & Keene)***,*** (McGuine & Keene)***; and musculoskeletal injuries in youth aged 15 to 17 were significantly reduced with neuromuscular and proprioceptive exercises*** (Olsen, Myklebust, Engebretsen, Holme, & Bahr, 2005)***.***

The risk of injury may also be decreased by addressing physical fitness qualities of the musculoskeletal system to improve resistance to fatigue or durability. In cyclists, fatiguing core exercises resulted in altered lower extremity kinematics, which may subsequently decrease efficiency of movement (Abt, Smoliga, Brick, Jolly, Lephart, & Fu, 2007). A decrease in efficiency may ultimately effect performance and decrease the tissue tolerance to continued loading. When an athlete has a non-painful biomechanical dysfunction or inefficient kinematics and is exposed to increasingly heavy loads, body positions that are compensatory to the dysfunction or the stresses of training and competition, there is an increased risk that the biomechanical dysfunction is either going to prohibit the athlete from progressing in his training or worse, develop a musculoskeletal injury.

The vast majority of athletic endeavors involve stable surfaces where instability is applied further up the kinetic chain. A comprehensive training program should include unstable exercises to ensure spinal stability is trained under a broad range of conditions (McGill S., Karpowicz, Fenwick, & Brown, 2009), mastery of movement skill and enhancing the functional qualities of the musculoskeletal system. Suspension Training can be used for unstable load training in the upper extremity and torso, with the feet on a stable surface. In performance conditioning where external loads and speed of movement are greater than what is found in rehabilitative and fitness settings, the technique of movement becomes increasingly important to reduce the risk of injury. Unstable load training can be used to enhance awareness of how the body moves through the conscious need for greater attentional demands to the task and unconsciously through feedback and feedforward mechanisms.

"You can only put fitness on top of dysfunction for so long before you get an injury." – Gray Cook, MPT, OCS, CSCS, Functional Movement System

Unstable training and core stability exercises are key components of training programs designed for injury prevention. In spite of the effectiveness for injury prevention, a common criticism of unstable and core stability training in strength sports has focused on two factors, the decreased load one can move while utilizing unstable training and the high core stability achieved during traditional heavy training.

Core stability is inherent with heavy traditional closed chain training such as a deadlift or squat, which may preclude the need for other core stabilization exercises. Kohler, Flanagan and Whiting (2010) examined the amount of weight lifted and EMG activity under four seated overhead pressing conditions; stable load/stable surface, stable load/unstable surface, unstable load/stable surface and unstable load/unstable surface and found more weight could be lifted under stable conditions. EMG activity of the abdominals, external oblique and erector spinae were greater under stable conditions, most likely due to the increased load. In comparing the differences between unstable surface and stable surface training on selected performance measures, Cressey, West, Tiberio, Kraemer, and Maresh (2007) showed greater improvements in jumping, sprinting and agility measures in the stable surface training group. However, stability in the spine is required for the efficient execution of performance based skills, and a comprehensive program should include a certain level of destabilization type exercises (Behm, Drinkwater, Willardson, & Cowley, 2010), to help reduce the risk for injury (Willardson, 2007).

Performance Enhancement with Unstable Training

Athletes must balance the high demands of their training with appropriate recovery to optimize adaptation and manage their risk of injury. Activities that prevent injuries enhance performance by proxy, as an uninjured athlete can continue to train. For strength athletes, this may be completed by performing a destabilizing exercise using a Resistance Suspension Trainer following a ground-based strength exercise like the deadlift, squat or clean. Structured in a blocked fashion, with agonistantagonist pairings will allow the body to recover sufficiently between exercises without increasing the rest normally taken between the strength-based exercises, effectively increasing volume without a concomitant decrease in intensity. Unstable training could also be used for de-loading phases or within a periodized program as a way to decrease joint stress without decreasing muscle activation levels. The decision to include unstable training will depend upon the phase of the training, the needs of the individual and the demands of the sport.

Unstable training has also been shown to increase sports performance. Incorporating balance training into a five week program resulted in 33% improvement in static balance and 9% increase in vertical jump height (Kean, Behm, & Young, 2006). Additionally, Behm, Wahl, Button, Power and Anderson (2005) reported a positive correlation (0.65) between maximum hockey skating speed and static balance test in young hockey players. It is thought that improvements in performance due to unstable training allow one to optimize force direction during the skilled event by decreasing the sway observed with training.

Functional and core strengthening training can improve performance and fitness measures in golfers (Thompson, Cobb, & J, 2007) and has produced greater results compared to stable training in a group of
female athletes (Myer, Brent, Ford, & Hewett, 2008). In recreational and competitive 5000 meter runners, core stabilization exercises were shown to increase performance after six weeks of training (Sato & Mokha, 2009). The runners in the core stabilization group decreased their average 5000 meter run by 47 seconds, compared to 17 seconds for the control group.

Resistance Suspension Training for Military and First Responders

Military personnel and first responders are similar to athletes in the types of physical demands they must tolerate. Standardized training programs aimed at developing the level of fitness required for the successful job performance have led to overuse injuries and less than optimal performance and prevention outcomes. Unstable training can be a valuable part of a training program to prevent injuries and maintain physical preparedness in military and first responder personnel.

Sprains or strains accounted for nearly 49% of acute outpatient visits across the military in 2004, resulting in over three million days of limited duty (Ruscio, et al., 2010). Sports and physical training was the number one, two or three activity associated with each of the five leading Department of Defense injury types (Ruscio, et al., 2010). Musculoskeletal injuries, which are largely avoidable, are the greatest health and readiness threat to the US Armed Forces, with 70-80% of musculoskeletal injuries in the military due to overuse injuries. These overuse injuries result in 25 million lost duty days, affecting nearly 50% of the military force and costing the military $1.5 trillion annually, or $3000 saved per injury avoided (Joint Services Physical Training Injury Prevention Work Group, 2008).

During initial military training, about 25% of men and about 50% of women incur one or more training related injuries (Joint Services Physical Training Injury Prevention Work Group, 2008). ***A report by the US Army Public Health Command showed the prevention of overtraining by including multi-planar, neuromuscular, proprioceptive and agility training was one of the most effective measures for the prevention of musculoskeletal injuries*** (Joint Services Physical Training Injury Prevention Work Group, 2008) and found good evidence that increasing the proportion of physical training time devoted to improvement of body movement skills reduces injuries.

With the goal of creating safe and effective conditioning programs, the US Army developed Physical Readiness Training. Through gradual progressions, a wide variety of the types of exercise and quality execution of the exercises, the US Army was able to decrease overuse injury rates by 32% (Vickers, 2007). Dynamic core stabilization exercises increased the sit-up pass rate (5.6%) for a physical fitness test in military training (Childs, et al., 2009). Using a Resistance Suspension Trainer improved the run (6.4%) and sit-up (5 ± 2) tests in members of the Citadel military academy who were preparing for the Citadel physical fitness test (Aartun, et al., 2009).

Similarly, injury rate was decreased in first responders whose exercise program improved core strength and functional movement (Peate, Bates, Lunda, Francis, & Bellamy, 2007). Incorporating a Resistance Suspension Trainer can reduce injury risk by more evenly distributing the musculoskeletal stresses of training and enhance neuromuscular control.

Summary

Exercise programs of any type should be tailored for the goals and needs of the individual. Whether one is training to rehabilitate an injury or disability, weight loss, performance or injury prevention, a Resistance Suspension Trainer is a safe and effective functional training tool. Resistance Suspension Training should be a part of any comprehensive training program across the spectrum of function. Research will continue to be developed to further elucidate the benefits of Suspension Training for rehabilitation, fitness, performance and injury prevention.

Author:
Brian Bettendorf, MA, MSM, RCEP
Director, Rehabilitation Segment
Fitness Anywhere - TRX

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