NSCA Tactical Strength and Conditioning

TSAC REPORT

Contents

From the TSAC Director

Robb Rogers, MEd, CSCS

I would like to take this opportunity to update everyone on the latest developments in the Tactical Strength and Conditioning Program since I have assumed a leadership role.

The outreach education program provides 2.5 days of instructional programming at your venue dedicated to your personnel and has been repeatedly well received around the nation. The seminar is loaded with PowerPoint® presentations and hands-on training designed by experts and the topics are tailored by you, to fit your agency's needs and wants. Our goal is to answer the whys with science and provide the what, how, and when with hands-on training. We hope to spark a passion for fitness and excitement for new and interesting methods of training, designed specifically for your team.

The TSAC Program brings you the latest developments in practical science and the newest techniques from the highest level of sports in order to support your training and fitness programming.

Robb Rogers, MEd, CSCS
NSCA TSAC Director

As a former collegiate and professional strength and conditioning coach, with over 25 years of experience, my passion is to provide as much information, in a usable form, for this population of professional athletes. The NSCA has members in educational institutions, weight rooms, performance training facilities and each respective industry (fire rescue, law enforcement and the military) that are very excited to have this platform in which to teach, learn and exchange ideas. It is important to me to communicate, educate and provide resources from and to the local as well as international levels. It is my goal, as the TSAC Director, to distribute effective information in a form that is applicable and highly usable in order to maintain fitness at the highest level.

Nutrient Timing for Tactical Performance

Travis Harvey, PhD, CSCS

While athletes of all types know that good nutrition is vital for complete success, not all athletes and physically active individuals understand the basics of nutrition for performance. In order to optimize performance, there are two things to keep in mind: 1) What to eat on a daily basis and 2) What you need to eat and drink around each and every training session and tactical challenge.

The only things that provide the body with energy are things with calories such as carbohydrates (CHO), proteins (PRO), fat and alcohol. Eating and drinking sufficient quantities of CHO, PRO, and fat (often called "macronutrients") is crucial to building your nutritional foundation. Although alcohol has calories (7 per gram), it does not contribute positively to your nutritional foundation and will typically hinder your recovery (7, 9).

Optimal performance nutrition for athletes requires more CHO, PRO, and fat than non-athletes. Timing the ingestion of these calories can provide a multitude of advantages (6). Here are the typical ranges in grams per kilogram of body mass per day (g/kg/d) that you need to target for each macronutrient. CHO = 4 – 8 g/kg/d; Fat = 0.5 – 1.5 g/kg/d; PRO = 1.4 – 2.0 g/kg/d. Where you fall within each of these ranges depends mostly on what you are trying to accomplish with your body. The tough part about applying this is that you actually have to count the number of grams of each nutrient in the foods you eat. The easy part is that nearly all foods are labeled with this information or you can use free websites to add up all your foods to see where you are at.

Table 1 provides sample programs based on different bodyweights and training types. Examine the table and apply the appropriate ranges for the training type you are performing. Try it for a week or two before tweaking whichever number you think needs to be changed.

Tired, fatigued, don't have enough energy for training? Try adding 1 g/kg/d of CHO to your total daily intake.

Always hungry? Make sure you're ingesting fat and PRO with every snack and meal. If you're doing that, try adding 0.25 g/kg/d of fat to your total daily intake.

Provided you get the right amounts of the right kind of calories for each day, the next and most important step is getting the right combination of calories at the right time (6). Part of putting all of this into place means understanding that not all calories are equal. Although all calories provide energy, they digest, absorb, and get metabolized at different rates. The fastest of all calories is simple CHO (i.e. sugar). Complex CHO, and most PRO, tend to take longer, and all types of fat take the longest to process. Understanding that the body uses calories in different ways and at different times means that we can lay out a plan for the best time to ingest specific types of calories to maximize performance and recovery.

Pre-Activity

Muscles need energy to be able to do work. Providing that energy, primarily in the form of CHO, is typically the best route to take before you train or start an operation. Ingesting at least 0.5 g/kg of complex CHO 1 – 2 hours before an activity is a good starting point. For an individual weighing 185 pounds, this is only 42 grams of CHO. However, if your training is going to involve more than lifting weights or is going to last for more than 45 minutes, you can easily double this amount to 1 g/kg for your minimum, so that you can start with enough energy. Though eating or drinking CHO before resistance training typically does not increase lifting ability, it may very well provide a potent dose of anti-catabolic hormones in the body that, over time, may provide you with greater gains than if you were to train on an empty stomach (4).

Adding PRO into this pre-workout meal is best because you will absorb more of the CHO and also help prevent muscle breakdown during and after the workout (1). If you are a big runner, you probably know that more than 15 grams of PRO can be rough on the stomach unless you get it in a liquid form and give it plenty of time to digest. But if your activity involves less of the constant bouncing that running does, you should aim for 20 – 30 grams of high-quality PRO (e.g. whey, lean beef, turkey, egg whites, etc.). It is fine if you get some fat in the meal or snack beforehand also, but try to limit this because the more fat you have, the longer it will take for everything to get out of your digestive system and into circulation. The exceptions to this guidance are if your chance to eat before the activity is 3 – 4 (or more) hours out, or if you are going to be active for more than 4 hours. In those cases, adding more fat into the pre-activity meal can be advantageous.

Table 1. Sample Nutritional Programs

Name	Joe		Jim		Jake	
Weight	175 lbs = 79.55 kg		210 lbs = 95.45 kg		195 lbs = 88.64 kg	
Training Type	Endurance		Strength/Power		Everything and then some	
	Range	Total grams per day*	Range	Total grams per day*	Range	Total grams per day*
Carbs	7 – 8 g/kg/d	557 – 636 g	5 – 6 g/kg/d	477 – 573 g	6 – 8 g/kg/d	532 – 709 g
Fat	1.0 – 1.5 g/kg/d	80 – 119 g	0.5 – 1.0 g/kg/d	48 – 95 g	1.0 – 1.5 g/kg/d	89 – 133 g
Protein	1.2 – 1.6 g/kg/d	95 – 127 g	1.5 – 2.0 g/kg/d	143 – 191 g	1.4 – 1.8 g/kg/d	106 – 142 g

**Note: Total grams per day values rounded off.*

During Activity

During your training sessions or mission, the main things you want to ingest during your brief, or non-existent rest periods, are simple CHO and/or essential amino acids (EAA) or branched chain amino acids in liquid form. These ingredients can increase your performance and even decrease your recovery time after the activity (6). This strategy may be of particular interest if you have to perform multiple bouts of physically demanding exercises in one day, or if you have less than 24 hours before you hit it hard again.

Drinking CHO during exercise is usually only recommended to increase performance for endurance types of activity lasting longer than 45 constant minutes (2, 5), but do not forget that we are talking about long-term gains, not just one performance. The ideal range for CHO intake is about 25 – 75 g/hr, divided into 4 – 6 equal doses every hour. Adding 6 grams of EAA to a CHO beverage (or just add to water), can actually increase endurance performance and help recover from any type of intense exercise more quickly (1, 6). An example of this would be adding a scoop of an EAA powder, to a 20oz or 32oz sports drink, shake well and drink throughout the hour of training.

Post Activity

The 60 minutes immediately after you have trained, or finished the mission, are critical to your success for the next time you have to perform. You need to replenish the stores of CHO (known as glycogen) in your body and stop the breakdown of muscle, bone, and tendons. This means that you need fast CHO, fast PRO, and limited fat, as soon as possible.

Replenishing glycogen can restore much of the physical activity abilities very quickly. This is a critical point because many individuals cannot wait a full 24 hours to allow for complete recovery before hitting it hard again. Aim for no less than 0.5 g/kg immediately after activity.

Ingesting PRO after activity also provides very rapid effects in the body, but the results typically take longer to notice because lean muscle does not just double in size overnight and fat does not burn off of the bone after a single workout. However, after a few months of consistently and immediately getting your post-activity nutrition right, you should be able to notice increases in strength and reductions in body fat (8, 10). Also, keep in mind that individuals that are more highly trained and continue to train as they age, require higher quality and faster PRO to continue to achieve optimal recovery of muscles. Complete animal sources of PRO, like whey and casein, are superior to even the best plant PRO like soy (3, 10). Aim for 20 – 30 grams immediately after your activity.

Proper nutrition for performance is critical for your success on the road to becoming an indestructible warrior. Putting one or more of these nutrient timing principles into place can significantly increase your performance and ability to recover over time (6). Get your nutritional timing right so you can perform optimally today, tomorrow, and for many years to come.

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Prepare to Move

Tyler Christiansen, CSCS

"The battlefield is a scene of constant chaos. The winner will be the one who controls that chaos, both his own and the enemy's."
Napoleon Bonaparte

A tactical athlete must be able and ready to start, stop, and move in multiple directions on and off the battlefield. Being able to control the body within different parameters, and planes of movement, is essential to being in control during chaos. If a tactical athlete can learn to be in control during these movements, the focus will shift away from chaos and to mission-essential tasks. Being able to start, stop, and change directions effectively and efficiently is defined as agility (1). It is important that tactical athletes increase agility by controlling their bodies in space (propioception). This will reduce injuries, improve mission efficiency, and potentially save lives.

When developing an agility program, the tactical athlete should consider safety, technique, and the "S.M.A.R.T" principle:

Safety

General: Participants should not have orthopedic limitations, be pregnant, have a heart condition, or be morbidly obese. Be sure to limit high-impact exercises for obese individuals. Participants must possess a base strength, flexibility, and balance. Slip-free footwear and a private training area are recommended for optimal training conditions. Be sure to keep the program within the participant's physical ability (1).

Advanced

Crawl, walk, run. It is important to learn how to properly accelerate, decelerate, and change directions. Begin the program with simple movements and over time advance to more complex movements. Completion of a needs analysis of movements in the mission will assist in determining proper drills. Incorporate work-to-rest intervals of 1:3 to 1:5 (2)—meaning, if the event took ten seconds, the rest would last 30 – 50 seconds.

Technique

When performing agility drills, the head needs to stay in a neutral position, facing forward. Turn head, shoulders, and hips in sequence when changing directions, with the hips and shoulders following the movement of the head. Incorporate explosive arm action at 90 degrees during drills and be sure to stay on the balls of the feet.

Figure 1. One-leg hops

S.M.A.R.T (3): Think of each of these components when starting an agility program.

Synchronization

Coordinate the body and mind to work together in proper movement patterns with increased skill development.

Mobility

The ability to maintain control during a variety of purposeful movements, at the required speeds.

Agility

The ability to start, stop, and change direction effectively and efficiently.

Reaction Time

The ability to respond to external stimuli quickly and with ease. A tactical athlete should train within various planes of movements in both predetermined (set-up drills) and non-predetermined (reaction drills) structures (2). Listed below are predetermined structures. Remember to be resourceful when setting up these drills. Different objects can be used as markers. A resourceful athlete does not need ladders to perform ladder drills. The dimensions of an agility ladder can vary in length. The stepping areas are 20 inch squares for the foot to be fired into, that can easily be drawn in the sand.

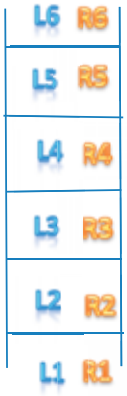

Figure 2. Two-leg hops

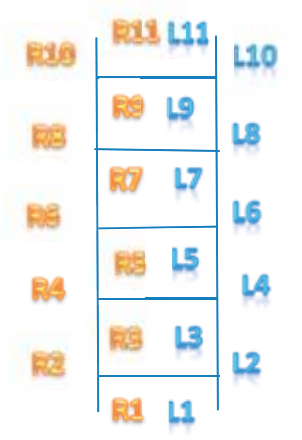

Figure 2. Two-In, Two-Out

Being physically prepared for the mission involves agility, strength, power, and endurance. It is a leader, or a future leader's responsibility to keep mission-ready at all times. Being able to start, stop, and change direction in an effective and efficient manner is one step of being physically fit, mission-ready, and a tactical athlete.

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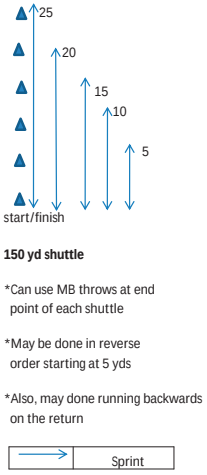

Figure 3. 150-yard shuttle

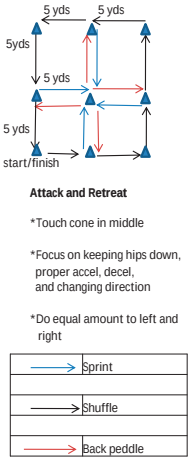

Figure 4. Attack retreat

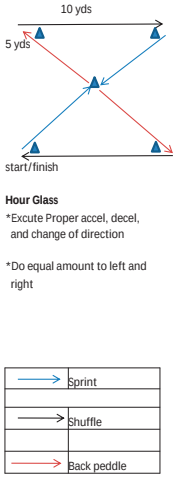

Figure 5. Hour glass

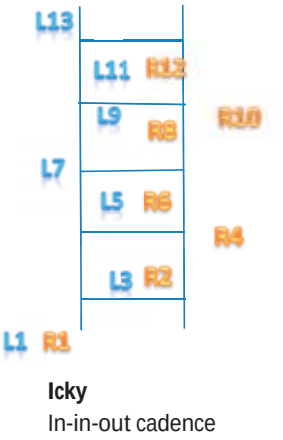

Figure 6. Icky shuffle

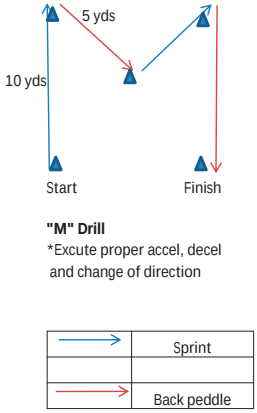

Figure 7. M drill

Core Vector Training

Robb Rogers, MEd, CSCS

The core is a section of the body roughly defined as the area from the armpits to the knees, and more specifically, as the 29 pairs of muscles that support the lumbo pelvic-hip complex that stabilize the spine, pelvis, and kinetic chain during functional movements (2). Most movements occur through the core, after beginning somewhere else. For instance, in jumping, the area of the core will move toward the ground as the arms reach back, or up, and the legs flex. Upon forceful extension of the arms and legs, the body is propelled upward with the force moving through the core to the blocked arms. When sprinting, the arms and legs dynamically move throughout the range of motion in order to generate body velocity and propel the core forward. These ballistic arm and leg movements occur around a generally stable, strong core. If the core lacks strength with balance and stability then energy leakage can occur upon force production or force absorption and the power generated by the limbs and transferred through the core can be lost, resulting in less power generated for a technique or a compromised ability of the body to absorb force properly. During force reduction, the pattern of force reduction compensation can lead to injury due to core weakness and imbalances.

When training the core, it is important that the many vectors of stress for force reduction and planes of motion for force production be addressed, as the demands of operational fitness occur at high speeds, high forces and at a variety of angles. Training the core in a variety of angles is similar to the approach taken in training the angles of attack in the combative arts. The attack vectors of martial arts are; up and down, diagonally up and down, right and left, across the body from right to left, vice versa, and finally straight in, which is unnecessary for core development.

If the core can be trained in these various angles, with a variety of implements, then it will be better prepared to withstand, as well as transfer, the forces needed in preparation, operations and deployment (1). The labels for the various vectors are:

Straight Down	Slams
Straight Up	Scoops
Side to Side	Twists
Diagonally Up	Lift
Diagonally Down	Chop

The stances are relatively simple to master, as there are four basic stances with three levels of difficulty. There is the lunge stance (kneeling or standing), the squat stance (kneeling or standing), the single-leg stance, and diagonal variations of each. To vary the level of difficulty, shorten the stance from wide to narrow. The lunge stance starts out with the feet about 1 – 2 widths wider than, or away from the opposite knee. The next level of difficulty places one foot/knee on one side of a line and the opposite foot/knee on the other side of the same line. The most difficult lunge stance is achieved when both feet/knees are on the same line, as if on a balance beam.

In the squat stance, the easiest stance is set wider than the width of the hips. To increase the difficulty, the stance narrows to the width of the hips. The most difficult stance to maintain core stability during a strength movement is a stance where the feet are closer than the width of the hips. Needless to say, the single-leg stance is the most difficult to maintain balance and stability of all of the stances, and execute pillar core training.

As for modalities used to implement core training, an excellent method for learning proper techniques would be to use a cable trainer or light to medium resistance tubing, in order to give resistance in the proper ranges of motion. To learn to properly execute the movements, the athlete should begin with the wide-lunge stance and execute the chop and lift movements. The key to these movements is to properly set the base of support, contract the down knee glute and stabilize through the lower core so the hips, naval and heart all face straight ahead and do not move. The handle of the cable/tubing is chopped down or lifted up in a diagonal pattern, driven and initiated by the glutes, transferred through the core and expressed via the mobility of the thoracic spine and shoulders. The twist is executed from a parallel-kneeling squat stance and the same cues for the torso are emphasized. However, the difference is that the handle is moved from just outside one shoulder to just outside the other shoulder. In the scoop the tubing/cable will pass between the legs of the athlete and be extended vertically up and away from the body with no flexion or extension of the lower core or lumbar spine. The slam will be executed by beginning the movement from an overhead position while in a parallel-kneeling stance. Upon bracing the core, the tubing/cable will be pulled down and away from the body without flexing or extending the lower core/lumbar spine.

Medicine balls are excellent for mimicking the movements of various vectors, and stress the ability to maintain a tall pillar core without arching or collapsing with rotation. The medicine ball can also be thrown to the floor, or off of a wall, in the various vectors in order to increase the power developed and force transferred through the core. The most stressful implement to use in core vector training, is the water ball.

The water ball is simply a small stability ball containing about a gallon of water, or 8.8lbs. To create a water ball, get a small piece of tubing or hose and fill a stability ball with water until a gallon of water is amassed within the ball. During the movements, the added water will move around inside the ball and cause the core to react and proprioceptively stabilize in order to execute the movements.

Another way to execute core vector training is by using dumbbells and ankle weights to move the limbs through a variety of movement vectors. A 2 – 5lbs dumbbell and 2 – 5lbs set of ankle weights are sufficient for most any athlete for these exercises. While on the back, extend the dumbbell above the head with one arm and extend the opposite leg in sequence. During this training, the same-side leg should be flexed at the knee while the arm is flexed at the elbow. Complete the movement by bringing the dumbbell and ankle weight up, to meet in the middle for a movement similar to a sit-up. As the dumbbell and ankle weight are returned to the ground, it is imperative to get long through the core but to not arch the back.

The second vector involves moving the arm to a "2 o'clock" position and the opposite leg to an "8 o'clock" position followed by executing the same sit-up movement in a diagonal-type vector.

The final vector starts from a totally different position. Extend the arm straight up, above the shoulder, toward the ceiling while extending the opposite leg above the hip in a similar fashion. Move the arm away from the body toward a "3 o'clock" position and move the leg away from the center of the body toward the "9 o'clock" position. Neither the arm nor leg should touch the floor, as the core of the body fights to keep the belly button facing straight up to the ceiling. Do not let the belly button follow the straight leg away from core and be sure to maintain contact with the ground with both hips throughout the movement.

The same concept can be utilized on a stability ball for a "superman" type of exercise where the body is face down on a mat and the arms are raised above the head with the legs outstretched. However, there is a change in the vectors and emphasis of motion. However, by adding a dumbbell to one arm, and ankle weights, the exercise provides a different aiming point and cue for technique execution. Most people will coach and execute the movement by reaching toward the ceiling with the arm and leg. The optimal execution is to reach the foot and hand long and low toward a meeting point between the wall and floor and let the long, stable core support the shoulder extension at the shoulder and hip extension at the hip. The foot should not be raised higher than the glute and the arm should not be raised above shoulder during the motion. The cue is to reach and get longer through the back-side core.

The vectors for the normal "superman" involve the use of either the same arm, or opposite arm. The second vector has the arm at "2 o'clock" and the leg at "8 o'clock." The final vector places the arm at "3 o'clock" and the opposite leg at "9 o'clock" respectively. The knee will need to be flexed in order to get the thigh to the 9 o'clock position.

This series of exercises is an excellent method to strengthen and stabilize the core in patterns, in order to enhance performance as well as help to prevent injury.

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Suspension Training and Movement Quality for Operational Readiness

Chris Frankel, MS

Physical fitness for tactical operators is the foundation for traditional approaches to fitness testing and training for the military, police and other first responders. However, the concept of operational readiness represents a paradigm shift in how physical qualities are measured, evaluated and developed. Physical fitness is the ability to perform occupational, recreational, and daily activities without becoming unduly fatigued (1). Operational readiness can be viewed as the ability to meet any combat or duty situation, accomplish the mission and continue to fight and win. Operational readiness requires on-ground, off-ground, combatives and includes general as well as "mission specific" qualities and skills. While physical fitness is a component of operational readiness, surviving and winning is the critical objective for the tactical athlete.

The good news is tactical operators have gained recognition as an athletic population with specific job demands and training qualities needed to maximize preparation and performance. More good news is strength and conditioning professionals are becoming increasingly validated as a valued part of the comprehensive solution for tactical fitness and readiness. The challenge for strength and conditioning coaches is to stay on the cutting edge of methodologies, strategies and tools for developing the tactical athlete.

Training for operational readiness requires systematically identifying, developing and maintaining physical qualities ranging from sustained sub-maximal efforts to explosive movements for striking and powerful displacement of mass (2). Different physical testing batteries are used across branches of the military, police, fire departments and other emergency workers for various purposes including recruitment criteria, professional advancement and motivation. Traditionally, these testing protocols have focused on local muscular endurance using callisthenic type exercises including push-ups, pull-ups, sit-ups, timed runs and obstacle courses. As readiness supplants the traditional view of fitness as the goal, testing and training has evolved to include power, agility and "movement quality" to a higher degree. This is evident by inclusion of vertical jump, shuttle runs and movement screening into testing protocols.

Suspension Training® offers a uniquely effective and efficient solution for the physical demands of tactical operators and the constraints on time and facilities they experience. The portability and virtually universal access to training solves time and space limitations for deployed personnel and first responders with equipment and facility limitations. In terms of quality of training, Suspension Training is a no-compromise way to address the needs for operational readiness. This article focuses on movement quality and movement training applications using Suspension Training.

Movement Training

Strength and conditioning by definition means generating muscular force. Creating strong and powerful movements involves movement strategies, timing, sequencing, mobility and stability. These components can often be overlooked in traditional training programs where absolute strength is the focus. Training for durability means resistance to injury and breakdown in performance. Durability should be of primary concern for operational success and to minimize lost time on duty and in training. If one operator goes down to injury, acute or chronic, there is a ripple effect throughout the rest of the team to fill in.

Figure 1. Elbow Flexion

Scientific evidence continues to support measuring, evaluating and training "functional movement" to improve performance from both a work capacity and durability perspective (3).

Suspension Training is great for evaluating and enhancing movement quality leading to improved strength, mobility, stability and power output. One of the unique abilities of Suspension Training is to unload movements and create the appropriate resistance for proper range

of motion and sequencing. For example, when performing a bent-over or inverted row a common error is to initiate the movement with elbow flexion, thereby not maximizing involvement of the retractors and depressors of the shoulder girdle. This improper sequencing is often the result of too great a load and a "high threshold" movement strategy. Using Suspension Training and appropriate cueing, a horizontal pulling movement can be performed at an individually appropriate body angle to encourage proper mechanics of thoracic spine extension, scapular retraction and depression, followed by elbow flexion (figure 1).

Another example is unilateral leg work. Using Suspension Training to unload the movement encourages proper body alignment, torso angle, core activation and mobility in the hip, knee and ankle as seen in the single-leg squat (figure 2), crossing balance lunge (figure 3) and suspended lunge (figure 4).

Dynamic stretching movements to reduce tension in hypertonic muscles paired with strength or power exercises in the opposing muscle groups provides immediate feedback and improved performance in most cases. Using Suspension Training to "break tension" before you "make tension" is an effective strategy and easy to perform. Here is an example of a chest stretch (figure 5) performed prior to a deltoid "Y" raise (figure 6). Another example is a hip flexor stretch (figure 7) paired with the suspended lunge. Suspension Training allows stretching across all planes of motion against a fixed resistance, in effect closing the kinetic chain. You can use the same piece of equipment to unload strength movements, as well as, load flexibility and mobility movements. The line between strength and flexibility training is blurred and performance improves.

No matter the tactical athlete's need for operational readiness and general fitness, clean movement patterns are a necessary and often overlooked component of training. Suspension Training provides an easy and effective way to implement the missing link between flexibility and strength training for optimal performance. #

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Figure 2. Single Leg Squat

Figure 3. Cross Balance Lunge

Figure 4. Suspended Lunge

Figure 5. Chest Stretch

Figure 6. Deltoid "Y" Raise

Figure 7. Hip Flexor Stretch

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NSCA Tactical Strength and Conditioning

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As the worldwide authority on strength and conditioning, we support and disseminate research-based knowledge and its practical application, to improve athletic performance and fitness.

TSAC Editorial Review

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