TSAC REPORT

ISSUE 33

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TABLE OF CONTENTS

KEITH CHITTENDEN, MS, CSCS, TSAC-F

ALTERED SPINAL MUSCULAR RESTING LENGTH CORRELATED WITH POOR SITTING POSTURE FOR POLICE OFFICERS

Police officers in various agencies and departments share many responsibilities, a trend which is common throughout departments across the country. Whether an officer works in a state, county, city, or rural department, a large part of an officer's job is centered around being on vehicle patrol. Most officers will spend up to 10 hr a day driving in a car. Prolonged exposure to a sitting posture in a car can create altered resting positions of the back muscles. As a result, weakness in the resting length of muscles such as the erector spinae, multifidus, and rotators may occur. The ligaments of the back such as the posterior longitudal ligament become increasingly weakened from prolonged lumbar flexion (i.e., posterior pelvic tilt from sitting in a car seat), predisposing the officer to posterior pelvic tilt, and possibly decreasing spinal stabilization, and increasing the risk of low back pain (1).

Over a prolonged period, the muscles of the lumbar spine, thoracic spine, and cervical spine can become adapted to this awkward, seated position and may develop alterations in static length-tension tissue relations. One common postural deviation to poor sitting posture is known as forward head posture (3). Forward head posture is formed by the flattening of the lower cervical spine (C3-C7) with the skull in a position of extension (2). This altered structural position can cause changes in the length-tension relationship of the muscles of the spine such as a weakening of the multifidus muscle, the lower trapezium, and the erector spinae (2,4). The upper trapezium, the deep cervical neck flexors, and the scalene muscles are often tight muscles (2). These muscle alterations can cause headaches and a decrease in local muscle function of spinal stability resulting in cervical and lumber disk derangements (including intervertebral disc posterior directed bulge and possibly herniations) (2,4). Forward posture can also affect the upper extremity, which may lead to rounded shoulders, tight pectorals, and lengthened and weakened back muscles such as the latissimus dorsi and the erector spine (2). Due to the tightness in pectoral muscles, shoulders may adapt to the position of internal rotation because the humerus in the glenoid fossa of the shoulder becomes deviated from its normal resting position. This altered position can cause the humerus to be out of static alignment and can cause decreased space for tendons to operate efficiently. This decreased space of the suprahumeral joint can cause functional disorders such as shoulder bursitis and rotator cuff impingement upon shoulder movements such as shoulder flexion and abduction (4). During prolonged "slump" sitting, the deep back muscles such as the multifidus and internal oblique can atrophy and lose their cross sectional area causing a weakening of the back and dysfunction of facet joints (2). As a result, the superficial muscles of the back can become tight and reduce spinal stability. This could cause increased thoracic extension (kyphosis) and increase lumbar extension (excessive lordosis) which could lead to anterior pelvic tilt (2). Anterior pelvic tilt can weaken muscles such as the rectus abdominal, gluteus maximus, and shorten the lumbar erector spinae (4). Anterior pelvic tilt can also limit the flexibility and mobility of the hip extensors (gluteus maximus) and hip external rotators (piriformis muscle) decreasing functional range of motion at the hip joint (4).

Fortunately, something can be done to decrease the risk of experiencing these detrimental conditions. With the appropriate exercise program and supervision from a tactical facilitator, a police officer can minimize the risk of these biomechanical issues. An exercise program that consists of stretching tight structures such as the tensor fasciae latae (TFL)/iliotibial band (IT-band), hamstrings, and piriformis can help relieve tightness and allow better biomechanical movement of the spine and upper extremities (Table 1). The next step is to strengthen the weak inhibited muscles such as the multifidus, erector spinae, gluteus maximus, and abdominals.

STRETCHING

A useful tool in stretching is to use a foam roller. Foam rollers are available in most sporting goods stores. Foam rollers are typically 36-in. or 12-in. long. The mechanism of using the foam roller is to lengthen fibers and fascia of the muscle belly through deep pressure (bodyweight). Using a foam roller, the officer will use his or her bodyweight to move slowly to relieve the "knots" of the muscle (4).

TFL/IT-BAND FOAM ROLL

Start by assuming a side lying position on the roller with the involved leg down against the roller and in position an inch below the pelvic bone. The uninvolved leg will be bent over the involved leg for stabilization. The officer will roll down the lateral aspect of the thigh until just above the knee (Figure 1). The officer should do 1 – 2 sets on each leg for 30 s per leg.

PIRIFORMIS FOAM ROLL

Start by sitting on the roller. The side to be rolled will have the leg in a "figure 4 position" on the uninvolved thigh (see Figure 2). The officer will place their hand down on the floor on the side of the leg that is crossed over on the opposite thigh. The officer will then lean on the side of the buttocks until tension is felt from the force of their bodyweight (Figure 2). The officer should do 1 – 2 sets of 30 s per leg.

STATIC STRETCH OF THE HAMSTRINGS

Unlike foam rolling, static stretching should be held at a constant position in which the origin of the musculotendinous junction is stretched apart from the insertion of the muscle. To stretch the hamstrings, the officer will place their foot on an 8-in. step or box, and cross the foot over the midline of the body without moving the body. The upper trunk is then rotated away from the side of the foot (Figures 3 and 4). The officer will hold the position until a mild stretch is felt for 3 sets of 30 s, and then repeat on the opposite side.

STRENGTHENING

The next step is the strengthening phase for key muscles (i.e., pectoral major, latissimus dorsi, etc.). The main role of these muscles is to help stabilize the spine and pelvis and optimize their movement (1,4). The major muscles that are weakened by poor posture positions are the gluteus maximus, the erector spinae, and the abdominal muscles (rectus abdominis) (1,6). A physioball is a great tool to use to strengthen these muscles. It is appropriate for both beginners and expert-level exercisers. Two exercises that target these muscles are the ball bridge and the ball crunch.

BALL BRIDGE

To start, the officer will sit on the physioball. The officer should walk out until their body is parallel to the floor. Their head and shoulders should be supported on the ball. With their feet shoulder-width apart, the officer should drop their pelvis and glutes towards the floor until there is a bend in the hips. The buttocks do not touch the floor, but should be low enough so that there is slight tension felt in the low back and glutes. At the bottom of the motion, the officer should raise the glutes and pelvis up towards the ceiling until the hips become parallel to the floor once again (Figures 5 and 6). The officer should repeat this for 3 sets of 10 repetitions.

BALL CRUNCH

To start, the officer will sit on the ball and walk out until the low back and top of the buttocks is on the ball (Figure 7). The body should be in a horizontal position near parallel to the ground. The hands can be placed on the chest or cradling the neck. From the starting position, the officer should flex forward until tension is felt in the abdominals (Figure 8). The officer should hold this position for a moment and then slowly return to the starting position in a controlled motion. The officer should repeat this movement for 3 sets of 10 repetitions.

The work and duties of police officers can be perilous and challenging. It is important that the officer maintains optimal postural alignment through the strength and muscular endurance of muscles prone to inhibition and weakness. It is important that the police officer is as flexible as required to avoid static injuries of strains, sprains, and intervertebral disk derangements. Ergonomic positioning is also advisable to an officer that is constantly positioned in a flexed lumbar position for several hours at a time. Keeping the car seat at a position in which the officer can maintain knee flexion of approximately 70 – 80 degrees with the ankles in a neutral position may reduce increased kyphosis and forward head postures. The use of a lumbar roll (i.e., a small towel rolled up and placed against the car seat and low back) can help maintain the natural lordosis of the lumbar spine. Frequent cardiovascular endurance training (i.e., 4 – 6 times a week with a duration of 40 – 60 min per session) is also encouraged in conjunction with the program featured in this article as it may help law enforcement patrol officers maintain good physical condition to be effective and healthy in their job.

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TABLE 1. SAMPLE STRETCHING AND STRENGTHENING PROGRAM

STRETCHING	SETS	REPETITIONS
TFL/IT-Band Foam Roll	1 – 2	30 – 90 s
Piriformis Foam Roll	1 – 2	30 – 90 s
Static Hamstring Stretch	3	30 – 60 s
STRENGTHENING	**SETS**	**REPETITIONS**
Ball Bridge	3	10
Ball Crunch	3	10

FIGURE 1. TFL/IT-BAND FOAM ROLL

FIGURE 2. PIRIFORMIS FOAM ROLL

FIGURE 3. STATIC STRETCH OF THE HAMSTRINGS

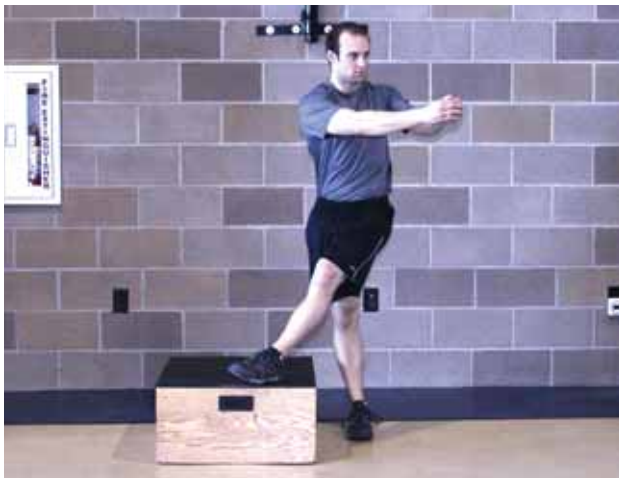

FIGURE 4. STATIC STRETCH OF THE HAMSTRINGS WITH ROTATION

FIGURE 5. BALL BRIDGE - START

FIGURE 6. BALL BRIDGE - BOTTOM POSITION

FIGURE 7. BALL CRUNCH - START

FIGURE 8. BALL CRUNCH - FINISH

DENNIS SCOFIELD, MED, CSCS

EFFECTS OF MILD TRAUMATIC BRAIN INJURY ON ANABOLIC HORMONES, EXERCISE, AND RECOVERY

The views, opinions, and/or findings in this report are those of the author and should not be constructed as an official Department of the Army position, policy, or decision, unless so designated by other official documentation.

Tactical athletes have a high likelihood of exposure to physiological strain and incurrence of stressors from performing physically demanding tasks in hostile and/or austere environments; the physical ramification of which may or may not be superficially observable (26). Thus, managing effective physical training programs for this population can create unique challenges for the tactical facilitator. In particular, the tactical facilitator must have a clear understanding of how injuries incurred during operations can impact physical performance and recovery.

Mild traumatic brain injury (mTBI), also referred to as a concussion, is a common injury among both tactical and contact sport athletes and is defined as an impact, penetration, or rapid movement of the brain within the skull that results in an altered mental state and damage to the brain (31). The Centers for Disease Control (CDC) definition of mTBI includes head injuries with skull fractures, closed head intracranial injuries, and unspecified head injuries with periods of altered consciousness less than one hour (5). It is estimated that 1.7 million head injuries occur in the United States annually, and approximately 5.3 million children, women, and men are living with mTBI-related disabilities in the U.S. (25,31).

In regards to military personnel, TBI rates have significantly increased in U.S. Soldiers and Marines over the last decade (14). There have been more than 287,861 diagnosed TBI cases since the year 2000, with the majority of cases being classified as mTBI and occurring in the non-deployed setting (8). In current deployed military operations, Elder and Cristian report that the most common cause of TBI is blast injury (9). Alarmingly, they further note that estimates of 20% of the first 1.2 million service members who served in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) suffered a TBI; about 60% of whom were not assessed by a healthcare provider for mTBI. Until more recently, there was little awareness regarding the consequence of a blast wave on the brain, thus, service members were less likely to be evaluated for a concussion (especially if there was no loss of consciousness) after a blast event compared to now. This may be a contributing factor to the underreporting of mTBI to healthcare providers during this period. This has important implications for tactical facilitators, who should obtain a clear understanding of the tactical athlete's medical history and also be aware of the potential for a history of undiagnosed concussions. This article will discuss emerging evidence that suggests there may be a high prevalence of pituitary gland dysfunction (hypopituitarism) amongst those who have suffered an mTBI, and as a result, exercise capacity and recovery may be negatively impacted.

Hypopituitarism is defined as a hormonal deficiency in at least one endocrine axis (e.g., hypothalamus, pituitary, testes axis) that results from a pathological condition arising from the pituitary gland or hypothalamus (29). Growth hormone (GH) is an anabolic (growth promoting) diurnal hormone that is secreted by the pituitary gland during sleep and in response to moderate and intense bouts of exercise (11,32). It is estimated that 35 – 50% of those who have suffered a TBI, including mTBI, have a neuroendocrine deficiency (1). GH is the most frequently affected endocrine hormone associated with TBI, such that approximately 15 – 20% of TBI patients have GH deficiency—due in part from the development of pituitary antibodies (20,30,33). Wilkinson et al. reported that 42% of those suffering a TBI from blast injury had GH deficiency (GHD), and that 11% had decreased concentrations of testosterone consistent with hypogonadism (36). It is not known if the cumulative effects of multiple mTBIs are more detrimental in comparison to a single episode in the contribution to the development of hypopituitarism and GHD. In a retrospective case study by Ives et al., a 14-year-old male athlete was diagnosed with hypopituitarism after suffering a series of four mild head traumas that occurred over the course of a four-month period two years prior (17). The youth was given the physical examination and pituitary function assessment after reporting a loss in strength and conditioning and a failure to grow.

In adults, the physiological effects of GH include sustainment of body composition, exercise capacity, and cardiovascular health (6). Consequently, GHD results in reduced cardiac function and exercise capacity (24). A recent meta-analysis by Widdowson and Gibney reported that GH replacement in GHD adults had a significant and positive impact on exercise capacity (35). GH replacement therapy has been shown to be advantageous for GHD following mTBI as well. In a case report published by Bhagia et al., a 43-year-old woman who was diagnosed with GHD following mTBI was given a recombinant GH supplement (3). After six months of therapy, the woman significantly improved muscle strength, peak oxygen consumption, and body composition. The regulatory role of GH also extends to the anabolic hormone insulin-like growth factor (IGF-1) which is involved in many key

anabolic processes such as protein synthesis and glycogen uptake (28). Thus, reduced GH concentrations will likely have a negative impact on the concentration of circulating IGF-1 (27).

Like GHD, suppressed testosterone concentrations have been reported to occur in those who have suffered a TBI (16). Testosterone is an anabolic hormone that modulates lean body mass, physical performance, and recovery (19). Additionally, testosterone also functions to increase protein synthesis, regulate body composition, improve muscle strength, and increase bone density (7,10). Further, low testosterone concentrations have been reported to either transiently or permanently occur in contact sport athletes following TBI. A case study by Tanriverdi et al. detailed a transient decrease in testosterone of an amateur kick boxer after suffering a head trauma (34). Another case study by Auer et al. detailing hypogonadism in a 27-year-old soccer player further suggests that multiple mTBIs adversely affect testosterone concentrations, and that pituitary evaluation is warranted in athlete populations that have suffered mild, but frequent, repeated head trauma (2). Chronic suppression of GH and testosterone concentrations in tactical athletes may have deleterious consequences on exercise capacity and recovery and will likely impact performance of physically demanding occupational tasks.

Tactical athletes must be physically prepared to perform occupational tasks, underscoring the importance of prescribing an appropriate physical training program, performing ongoing physical assessments, and monitoring recovery status. High-intensity exercise programs place a great amount of physiological stress on tactical athletes and frequent exercise bouts with limited recovery will result in plateaued or reduced performance (18). Thus, adequate recovery is essential for exercise progression, injury mitigation, and expeditious return to duty—necessitating careful monitoring of recovery status by the tactical facilitator (4). However, exercising too soon following an mTBI injury is contraindicated, and can result in re-injury and/or delayed recovery whereby concussion symptoms return (13). Once mTBI symptoms have resolved, a graded resumption of premorbid activity is widely cited in the athletic and military literature as the recommended approach to re-establishing exercise routines following mTBI. However, this timeframe is highly individualized, ranging from days to months and should only begin after the tactical athlete has been cleared by a licensed healthcare provider who is trained in the evaluation and management of concussion (15,21,22). As the tactical athlete progressively begins to resume physical activity, acute changes in daily workout regimens may be warranted if they induce or exacerbate concussion symptoms (during the acute recovery phase), show signs of overreaching (short-term performance decrements), or experience overtraining (long-term or prolonged performance decrements, decreased vigor, and increased fatigue), which may occur weeks or months after the concussion is incurred. Monitoring activities of daily living is equally important since factors such as sleep, nutrition, and occupational demands can influence endocrine hormones (e.g., GH and testosterone) and recovery (23). Moreover, GH, IGF-1, and testosterone are potent regulators of exercise capacity and body composition, thus, blunted concentrations of these hormones over time will negatively impact a tactical athlete's ability to recover from frequent and intense physical training compared to their healthy counterparts (12,24). Evaluation of GH and testosterone may be warranted if endocrine pathology is suspected in those with a history of TBI, or for individuals who have had previous exposure to a potentially concussive event that went unevaluated.

In conclusion, emerging research suggests the occurrence of neuroendocrine deficiency in those who have suffered a single TBI and/or multiple mTBIs. There is a high prevalence of GHD reported in those that have suffered a TBI, and testosterone deficiency should be suspected as a comorbid disorder in this population as well. This is an important consideration for tactical athletes as low concentrations of these hormones will have deleterious effects on exercise capacity and recovery, which ultimately has significant implications for successful return to duty. The tactical facilitator must be aware of the consequences of TBI on anabolic hormones, and should therefore carefully monitor the tactical athlete's exercise progression and recovery status. Careful attention to any physiological presentations of overreaching and/or overtraining in this population will ensure that the tactical athlete is referred for medical evaluation and that the physical training program is modified to facilitate exercise capacity and recovery. Therefore, it is recommended that the tactical facilitator be familiar with the tactical athlete's medical history to include that of TBI and mTBI, since the physical and psychological sequelae that follow TBI and mTBI could potentially influence the suitability of the physical training program.

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DIETARY SUPPLEMENTS — WHAT IS BEHIND THE LABEL?

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American's spend over 1.4 billion dollars on dietary supplements annually and more than 50% of military service members use dietary supplements one or more times per week (1,6). A supplement contains one or more vitamins, minerals, herbs, amino acids, or botanicals and includes everything from energy drinks to muscle building supplements. While some supplements may help to improve stamina, body strength, or overall health, others are flat out dangerous or do not contain what is listed on the label. The regulation of supplements is not well understood by all military populations and other consumers. According to a 2002 Harris Poll, "the majority of consumers believed that dietary supplements are approved by a government agency, and two-thirds thought that the government requires the labels of supplements to include warnings of their potential side effects and dangers," (4). Unfortunately, neither of these sentiments is correct and in fact, as a result of the 1994 Dietary Supplement Health and Education Act (DSHEA), dietary supplements are now placed in a separate "foods" category and therefore are exempt from the Food and Drug Administration (FDA) standards and approval (6). There has been a wide range of supplements identified to be contaminated with toxic plant materials, metals, and even bacteria (4). It is suggested that as much as 25% of dietary supplements marketed to enhance physical performance contain ingredients not included on the label (6). Many of these ingredients not only present a safety concern for military populations and compromise readiness, but also could potentially cause a positive urine test for banned substances.

With the current lack of regulation for dietary supplements, it can take months or even years for a product causing harm to be pulled from the market. "For example, the FDA took approximately 10 years after issuing its first advisory about ephedra—a popular weight loss supplement in the 1990s reported to have caused heart attacks, seizures, and deaths—to gather sufficient data to meet the statutory burden of proof before banning it from the market in April 2004," (6). Ephedra, a stimulant, can increase metabolic rate and when taken along with caffeine or exercise can be fatal. According to investigations, at least 15 service members that consumed ephedra died during exercise (6). Another ingredient often found in dietary supplements of concern is DMAA (methylhexanamine or geranium oil), which acts much like an amphetamine or ephedrine in the body and was originally sold as a drug before being discontinued due to potential side effects (5).

Beverages marketed as energy drinks also fall under the category of unregulated dietary supplements and can have adverse side effects. Research from Operation Enduring Freedom in Afghanistan found that almost 45% of deployed soldiers consume energy drinks on a daily basis (2). The most common energy drinks were evaluated for label accuracy and it was found that 25% contained 27 – 113% of the amount of caffeine that was listed on the label (3). Caffeine in excess amounts is linked similarly to serious adverse events occurring with ephedra and DMAA containing products (5).

While dietary supplements are not a replacement for a poor diet, the right ones can help supplement the diet to lead to desired effects. But how do you know what you are getting if they are not regulated and the labels are not accurate? Which supplements are proven to enhance performance and which ones do little more than burn a hole in your pocket? The first thing to do when evaluating a supplement is to see if the product is third-party certified. Third-party certifiers are outside entities that are hired by the supplement company to help the consumer identify quality products that meet FDA, manufacturing, and quality review standards. The five primary third-party certifiers are National Sanitation Foundation (NSF), United States Pharmacopeia (USP), Informed Choice, Banned Substance Control Group, and Consumer Lab (6). Lists of supplements that are third-party tested and certified are a great starting point for finding a quality supplement. However, keep in mind that most supplements are third-party tested on an annual or semi-annual basis, so unless you purchase the exact batch that has been tested, there are no guarantees.

If the particular dietary supplement in question is not third-party certified, it is important to identify if there are any red flags, such as: does it contain over 100% of the daily value, are there ingredients listed that have potential for positive drug tests, is it a high risk supplement (e.g., bodybuilding, weight loss, male enhancement, etc.), or does it contain a proprietary blend where the actual amounts of each ingredient are not listed? The Operation Supplement Safety (OPSS) website is a great resource for additional information on identifying high risk supplements.

Lastly, when contemplating the use of a dietary supplement, it is important to understand what research has been done on the supplement in an environment similar to the one in which its use is intended. For example, you would not want to look at research on creatine's effect on strength training if the intended use is distance events. Another thing to keep in mind is that the supplement company's research on their own product is often biased in favor

of the product. Great resources to help weigh the pros and cons of supplements include the Natural Medicines Comprehensive Database, Australian Institute of Sport, and OPSS.

The use of dietary supplements in the military is high and therefore, educating military populations regarding supplement safety and efficacy is essential. It is important for them to understand that a dietary supplement is not a replacement for healthy eating habits and hard work. However, the right supplement in the appropriate setting can provide a performance edge.

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JASON BARBER, CSCS, TSAC-F, RSCC*D, AND LISA MAEZ, CSCS

BRANCH-SPECIFIC PHYSICAL PERFORMANCE PROGRAMS

The Army Physical Fitness Test (APFT) consists of three events designed to evaluate cardiorespiratory endurance (2-mi run), muscular endurance of the abdominal and hip flexor muscles (2 min of sit-ups), and muscular endurance of the chest muscles (2 min of push-ups). The score of this test is taken very seriously for all military personnel. A pass or fail can determine completion of basic training, promotions, placement in a remedial fitness program, or worst case, separation from the United States Army if unable to successfully pass. The APFT requirements are calculated based on age and gender, and scored through the number of repetitions performed for both sit-ups and push-ups, and completed run time. While the U.S. Army has developed a program that creates a good base of fitness and has published a helpful educational manual, it is important to note that the APFT should not be the sole guide through which to base unit physical readiness programs, but rather should be used as an assessment of health and fitness (1). The fitness or performance needs of soldiers must be defined in order to develop and implement training that will best prepare them for their job tasks.

What are the physical demands of a U.S. Army soldier? As simple as this question may seem, the physical requirements vary greatly depending on the soldier's branch and Military Occupational Specialty (MOS). A soldier's MOS defines the duties and responsibilities of each soldier. There are over 22 separate branches or corps within the U.S. Army, including Armor, Aviation, Air Defense Artillery, Field Artillery, Engineers, Infantry, Finance, Administration, and Special Forces to name a few. Each branch is staffed by soldiers trained in at least one of the more than 260 MOSs (2). The infantry is the largest branch in the U.S. Army and is America's primary ground combat force. Infantry soldiers specialize in capturing, destroying, and repelling enemy ground forces during combat, whereas engineers build structures, develop civil works programs, work with natural resources, and provide combat support on the battlefield. An infantry soldier must carry loads for hours, sprint to contact or cover, drag or carry injured comrades to safety, and even engage in hand-to-hand combat, whereas, an engineer must operate hand tools and heavy equipment and may engage in repetitive lifting and loading movements.

The U.S. Army has historically made physical fitness and combat readiness a priority for all military personnel. This is seen through mandatory participation in early morning Physical Training (PT) three to five times a week. Unfortunately, it is seen more often than not that soldiers are training to improve their score on the APFT. It makes sense for the soldiers; why would soldiers train any other way, when a passing score of running, sit-ups, and push-ups determines everything? Does this make sense to the sports coach that is concerned with making the athlete better at their sport? Could you argue that if the tactical athlete is fit enough for performance on the battlefield then they should be able to pass the APFT at any time? In order for the training to become more branch-specific, the program needs to be specific to the desired outcome, not just the test scores. Branch-specific programs may decrease training time, needed equipment, and injury rates, and increase combat readiness and soldier interest. By using an already established morning PT period, branches should make the most of this training time to get physically fit, but also to enhance branch-specific skills and movements.

Soldiers are required to respond quickly and effectively on the battlefield and that same training should be replicated in morning PT. Units and soldiers should have in-depth planning of their tactical performance program. They should know what they are doing several weeks in advance with the mindset of increasing performance, rather than the mindset of getting soldiers to "pass" the APFT. By utilizing an efficient workout protocol, soldiers gain more time to train the physical aspect of their jobs. For example, an armor or field artillery soldier may want to work on absolute strength as their job requires them to have much higher levels of strength to lift the munitions required in their job description.

Branch-specific training might incorporate sandbags, weighted vests, hill sprints, and barbell deadlifts during morning workouts to mimic tasks performed during deployments, while also adding an element of novelty to the training. In turn, this type of training can be sustained during deployments, when soldiers may not have access to conventional weights and weight rooms for extended periods of time. A viable option for strength training and injury prevention is suspension training. A suspension trainer is a small and lightweight piece of equipment that a soldier can shove in a rucksack and tie to any tree, pole, or tank.

It is the responsibility of morning PT time to keep soldiers combat ready. Programming during this allotted time can be as simple as using block periodization which would allow the PT leader to only need to develop a 4 – 5 week plan that is repeated throughout the fiscal year. Additionally, this would allow for times at the range, field problems, etc. High-intensity evaluations can be used by units as a group to see where the unit's performance level stands as a group. Other programming considerations might include circuits aimed at paralleling soldiers' MOS duties or coordinating with brigade physical therapists to design injured soldier programs that might be implemented while simultaneously conducting PT. These programs could be based around suspension training systems.

Right now, deployments are becoming further and further apart; however, it is just as important to keep soldiers interested in maintaining combat readiness and a physically fit state. Now is a good time to reevaluate how soldiers and units are training within various branches. Tactical facilitators should perform a careful needs analysis of the various branches that they are responsible for training. Exercises should be relevant to the predominant requirements of the soldier and allow the tactical facilitator to plan more effective branch-specific training programs. In turn, this may create more combat effective soldiers. These soldiers may also benefit from a decreased injury risk while in the service, which will have a direct impact on medical expenses both during and after the soldier's career.

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TABLE 1. SAMPLE BRANCH-SPECIFIC WEEKLY PROGRAM

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
INFANTRY	Cardio: long anaerobic Speed, agility, and quickness Core	Weight training: heavy or muscular endurance Core	Cardio: short anaerobic Speed, agility, and quickness	Weight training: heavy or muscular endurance Core	Cardio: aerobic Core
ARMOR/FIELD ARTILLERY	Weight training: heavy lifting Core	Cardio: long anaerobic Speed, agility, and quickness	Weight training: muscular endurance Core	Cardio: short anaerobic Speed, agility, and quickness	Weight training: heavy lifting Core
FINANCE	Cardio: aerobic Core	Cardio: short anaerobic Weight training: muscular endurance	Speed, agility, and quickness Flexibility Heavy core	Cardio: aerobic Core	Cardio: short anaerobic Weight training: muscular endurance

TRISHA STAVINOHA, MS, RD, CSSD, CSCS

FUELING FOR THE UPPER BODY ROUND ROBIN

The Upper Body Round Robin (UBRR) is a fitness test used by many tactical athletes and special operations in the military (5). The military services generally use timed push-ups, sit-ups, and a run of 1 – 3 mi to assess physical fitness (1). Service members on a physically limiting profile may walk, swim, or bike as an alternate cardio event. This test takes at most an hour with over half of that hour composed of mandatory rest. Scores are based on gender and age. On the other hand, the UBRR is made up of nine events, seven of which measure strength and muscular endurance (bench press, sit-ups, push-ups, pull-ups, kip-ups, dips, and a rope climb), a shuttle run for sprint/agility, and a 5-mi run or ruck. The UBRR test takes about 50 min if the tactical athlete chooses the run and about 85 min if they select the ruck. This does not include optional rest between events.

Due to the mixture of strength and endurance exercises, brief break times, and duration of the event, the UBRR can be a fueling challenge. For the typical physical fitness tests, no pre-test fueling is required. The athlete should be hydrated of course, but a pre-test carbohydrate load is not necessary. For the UBRR, not fueling 60 – 90 min before the event and during could have negative effects on performance. The fuel systems used during the first portion of high-intensity, short duration (60 s) event will quickly deplete carbohydrate stores by the time the athlete gets ready for the run/ruck. This makes fueling for the UBRR challenging.

Tactical athletes preparing for the UBRR should maintain sufficient hydration levels with a minimum of 125 oz for most men and 91 oz for most women per day (2). More fluid may be needed when exercising, particularly in hot, cold, or high altitude environments. Alcohol the night before is never a good idea. Carbohydrate loading will probably not be necessary, but the tactical athlete can do a modified carbohydrate load by performing less activity while eating the same amount in preparation. The night before the UBRR, the tactical athlete should also pack the fuel they will need for the next day.

Critical event specific fueling begins the morning of the UBRR. Eating before exercise, as opposed to exercising in the fasting state, has been shown to improve performance (3). The American Dietetic Association recommends meals with approximately 200 – 300 g of carbohydrates should be consumed 3 – 4 hr prior to exercise for enhanced performance (3). However, this is not always a realistic option for all tactical athletes. This recommendation is more realistic if the event is later in the day but if the tactical athlete only has 1 – 2 hr to fuel because the event is in the morning, 100 g is more realistic. From experience with the UBRR, I recommend meal replacement drinks or energy bars that contain about 40 g of carbohydrate and 10 g of protein during the 1 – 2 hr before the event. Some options include a large bagel with peanut butter, quick oats made with milk, cereal with milk and a banana, or an energy bar. With so many bar varieties, check the labels to ensure they contain at least 40 g carbohydrate since many bars now have really low amounts of carbohydrate and high amounts of protein. The most important thing for the tactical athlete is to consume carbohydrates that have shown to be tolerable in past workouts. Whatever they choose, (not eating is not a choice) it should be something they have previously consumed prior to a workout. For example, if the tactical athlete normally does not eat pancakes before a workout, I would not recommend that as a meal before the UBRR, or any testing event for that matter.

During the event, the tactical athlete should have fluid available to maintain hydration status. Often, the best option is a sports drink that contains electrolytes and carbohydrates. Beverages containing 6 – 8% carbohydrate are recommended for exercise events lasting longer than 1 hr (4).

However, fueling for any event does not end when the tactical athlete crosses the finish line. Post-workout or post-competition fueling is critical to ensure recovery, reduce muscle soreness, and set the tactical athlete up for subsequent success. The tactical athlete should immediately rehydrate with 16 – 24 oz of fluid per pound of bodyweight lost during the event (3). Since most people do not weigh before and after, most tactical athletes can assume that at least one pound was lost. Finally, a carbohydrate intake of 0.5 – 0.7 g per pound of bodyweight lost is recommended within the 30 min immediately post-exercise (3).

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Trisha Stavinoha's Army and dietetic career began in 1998 after earning her Bachelor of Science degree in Nutrition from Texas State University and was accepted into the United States Army's dietetic internship program. Stavinoha earned her Master of Science degree in Sport Nutrition from Long Island University while concurrently competing on their track and field and cross-country teams. She has been a credentialed sport dietitian and strength and conditioning coach since 2008. Her credibility in sport nutrition comes from being a soldier, scholar, and athlete. Stavinoha's experience with athletes includes a wide range of Olympic hopefuls in the Army's esteemed World Class Athlete Program, high school and collegiate cross-country runners, triathlete and endurance athletes, tactical soldiers, Wounded Warriors, and overweight service members trying to pass body fat and physical fitness standards.

JEFF CARROLL

SMARTER NOT HARDER: DEVELOPING THE TACTICAL ATHLETE

Programs proclaiming to be the secret of the elite tactical operator are often broadcast in infomercial-like advertising and gain cult followings as they are perceived to be the next best thing to performance-enhancing drugs. These programs can bring the benefits of a day-to-day plan and steer you toward a certain goal, but keep in mind, the developer has little to no concept of who the athlete is or what stage of development they are in, and therefore cannot maximize their potential. A mentor of mine once told me "any monkey off the street can make you throw up or become so sore you cannot move, but a coach develops and grows an athlete." This article will help identify guidelines to adapt or create a program that will develop the tactical athlete, a basic principle of tactical strength and conditioning.

GOALS

Establishing short- and long-term goals is essential. Walking into a workout without goals is like driving a car without directions—if it does not matter where you are going, then any road will do. Without having goals set in place, failure will be more likely. The goals should be both physical and personal. For example:

1. Run a mile under 05:25 (physical)
2. Read to the children every night (personal)

ASSESSMENT

Each athlete must have a defined baseline, good or bad, it must be determined. Most organizations have predetermined physical assessments, if these are inadequate then add some events to better represent specific needs. This can establish the tactical athlete's stage of development. When training a large group, use the assessments to establish smaller groups by similar ability. Also, include a movement screen to help identify imbalances which will help in injury reduction. Assessments are continual and do not have to be quantified every time. Visual assessments can help provide the proper training load. Many times, the workout plan can be changed after watching previous/current workouts and determining the level of execution.

PERIODIZATION

One of the hardest aspects of training the tactical athlete is the lack of consistent training. It is almost impossible to follow a traditional periodization model because there is no off-season for tactical populations. A concept that can have great benefits in training tactical athletes is planned performance training (PPT). PPT is the timing, sequence, and interaction of the training stimuli to allow optimal adaptive response in pursuit of specific goals (6). A great way to utilize this is by determining the daily goals of each workout and implementing the developmental needs within the workout structure. When executing a traditional periodized program in the tactical setting, it might be 4 – 6 weeks before a different cycle begins, possibly stalling the development process. In a seven-day week, schedules should include developmental workouts without the exclusion of all other physical qualities.

PROGRESSION

Progression is a very important component of a well-designed program and is one of the most frequently violated principles in training (6). Do not prescribe exercises and techniques above the skill level of the athlete. The athlete has to prove consistent execution of a movement before graduating to the next level. These are two basic concepts to follow for a successful programming progression.

General adaptation syndrome (GAS) explains the body's response to stressors, including physiological and psychological stress (Figure 1) (2). The supercompensation phase is crucial in development. If the training is too intense or not intense enough, supercompensation will not occur (6).

Progressive overloading is a progressive increase in the training load above the current training dose. This is a good concept to follow to achieve optimal supercompensation. For the best training adaptations to occur, training loads, training volumes, and bioenergetic specificity have to systematically change over time (2).

STRENGTH AND POWER DEVELOPMENT

A systematic approach to volume and intensity will create overall gains throughout the program. Studying the energy systems and the recruitment of muscle fiber types of the human body and applying them to the proper exercises is the first phase of exercise selection (Figure 2). A very common error is the neglect and overuse of power focused movements. Power translates to faster, more explosive athletes and evidence supports Olympic-style lifts as being effective for improving power output (3). This does not mean that it is always wrong to use a higher repetition power exercise, but the energy system changes after a certain number of repetitions. If the focus is power development, after five repetitions at a higher intensity, the tactical athlete faces diminishing returns and risks injury due to degraded form in complex, compound movements.

Having one repetition maximum (1RM) results are very important for tactical athletes (if desired, using a predicted 1RM model can be used to avoid tactical athletes undertaking a 1RM test). By having these numbers, gains and/or losses can be easily monitored and it can also help to identify developmental needs. For example,

after a 1RM is established, a set of six repetitions should be completed at 85% during a working set of a workout (Figure 3). If the tactical athlete cannot complete this set or completes it with ease, a concern should be raised. If completed with ease, the tactical athlete could be seeing gains. If not able to complete it, the athlete may not be developed enough in the particular repetition scheme or their training adaptations are not optimal. This can be used to adjust 1RM and workout prescriptions without having to continually perform 1RM tests and stress the body. This is one of many ways to use this basic training load chart.

How much is too much? The Training Load Chart and Prilepin's Chart (Figures 3 and 4) give guidelines to proper developmental intensities and volume (1,4,7). Cross referencing these charts can provide guidelines on the development of the athlete.

If the proper numbers are achieved at specific intensities, adjustments can be made. The stimulus can be altered by identifying the goal. If a "heavy" workout is needed, 80 – 89% of 1RM should be the goal for the working sets: 2 – 4 sets of 10 – 20 total repetitions. If prescribing two sets of four repetitions, the tactical athlete should be at 90% 1RM if the 1RM is true. The working sets should be prescribed in a proper repetition scheme that includes warm-up sets (Figures 4 and 5).

Volume and intensity are key components to developing the tactical athlete. Different physiological and performance adaptations can be stimulated by shifting the relative emphasis on these components in training (2). For a tactical athlete who is not physically strong enough and lacks mass to optimally perform his/her job, manipulating the volume and intensity will stimulate hypertrophy.

Workouts that produce predetermined weights do not take into account the specific tactical athlete. Workout 1 is A Workout of the Day from the CrossFit website (5).

WORKOUT 1
Three rounds for time of:

- 15 overhead squats, 95 lb
- 15 "L" pull-ups
- 15 split-jerks, 95 lb
- 15 knees to elbows
- 15 hang cleans, 95 lb
- 15 back extensions, 25 lb

This is a prescribed workout that has predetermined weight/intensity. Performing 95-lb overhead squats, split jerks, and hang cleans can provide different levels of stimulus depending on many factors, including age, weight, height, experience, and sex. For example, consider a 200-lb (47.5%) male versus a 150-lb (63.3%) male doing the same workout, assuming all experience factors are the same. The 150-lb male is lifting 15.8% more of his bodyweight compared to the 200-lb male. There is a significant gap in relative intensities and the intensities can be even greater if actual 1RM values are known. The workout is better executed if the goal of the workout and specific intensities are prescribed.

MODIFIED WORKOUT 1
The goal is to use low-intensity power, form execution with fast tempo, and cardiovascular training by performing three rounds of:

- 15 overhead squats, 25 – 65 lb (focus on mobility)
- 15 "L" pull-ups
- 2 (each leg) split-jerks at 60% 1RM (focus on bar speed and form execution)
- 15 knees to elbows
- 5 hang cleans at 60% 1RM (focus on bar speed and form execution)

By modifying the workout it becomes more tailored to the desired effect for each tactical athlete. The original workout goal was for a cardiovascular/oxidative state. The workout was also intended for the masses, so that each person could use the same weight without going through the inconvenience of changing the weights (i.e., sacrificing development for convenience). The original repetition scheme was not conducive to power development, not to mention an odd number of repetitions for the split jerk. However, using the modified workout will ensure that all the athletes are at the same intensity for their skill level. Also, this workout is still effective at getting quality repetitions from the power movements and the original goal of cardiovascular/oxidation training still can be achieved. If 1RM values are not known, using bodyweight percentages is still a better option than a one-weight-fits-all philosophy. Figure 6 provides four tables with guidelines on starting weights for common exercises, including adjustments that can and should be made to fit ability levels (8).

CLOSING
In a profession where timing, execution, and mental acuity can mean life or death, physical development deserves the same effort. Tactical facilitators and tactical athletes need to do what is best, as opposed to what is trendy. They need to take the time to develop skills and always ask themselves, "What is the goal of what I am doing?" Most importantly, tactical facilitators and tactical athletes need to stay true to sound principles, science, and hard work.

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FIGURE 1. GENERAL ADAPTATION SYNDROME (2)

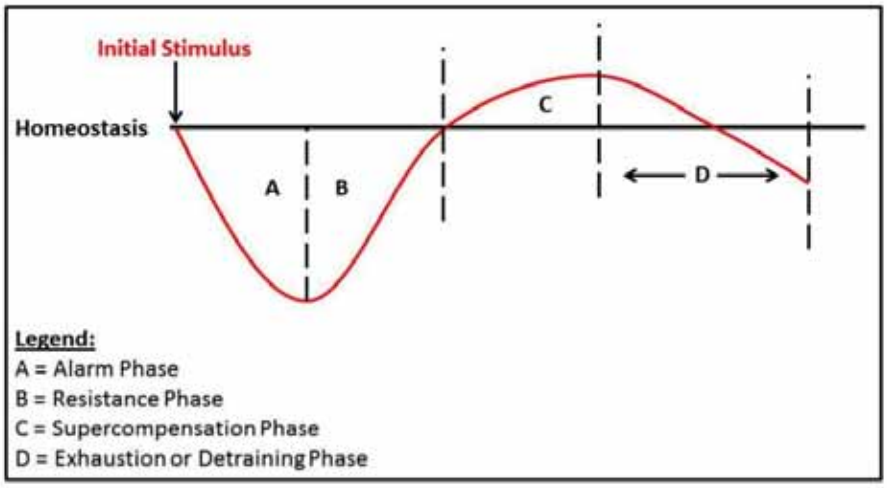

FIGURE 2. EFFECT OF EVENT DURATION ON PRIMARY ENERGY SYSTEM USED (1)

DURATION	INTENSITY	PRIMARY ENERGY SYSTEM
0 – 6 s	Extremely High	Phosphagen
6 – 30 s	Very High	Phosphagen and fast glycolysis
30 s – 2 min	High	Fast glycolysis
2 – 3 min	Moderate	Fast glycolysis and oxidative system
> 3 min	Low	Oxidative system

FIGURE 3. TRAINING LOAD CHART (1,7)

REPS	PERCENTAGE OF 1RM
1	100
2	95
3	92.5
4	90
5	87.5
6	85
7	82.5
8	80
9	77.5
10	75

FIGURE 4. PRILEPIN'S CHART (4)

LOAD (%)	REPS/SETS	OPTIMAL VOLUME (REPS)	VOLUME RANGE (REPS)
60 – 69	4 – 6	24	18 – 30
70 – 79	3 – 6	18	12 – 24
80 – 89	2 – 4	15	10 – 20
90+	1 – 2	7	4 – 10

FIGURE 5. SAMPLE BACK SQUAT LOAD PROGRESSION (BASED ON 300-LB 1RM)

PERCENTAGE OF 1RM	50	70	75	85	90	90
REPETITIONS	8	6	4	4	4	4
WEIGHT (LB)	150	210	225	255	270	270

FIGURE 6. BASIC GUIDELINES FOR COMMON EXERCISES (8)

TABLE 1. LEG EXERCISES					
Exercise	**Untrained Load**	**Novice Load**	**Intermediate Load**	**Advanced Load**	**Athletic Load**
Squats	Bodyweight (20)	35% of BW	65% of BW	100% of BW	125% of BW
Increment change of -10%					
Leg Press	50% of BW	75% of BW	100% of BW	125% of BW	150% of BW
Increment change of -15%					
Single-Leg Press	25% of BW	50% of BW	65% of BW	80% of BW	95% of BW
Increment change of 10%					
Step-Up	BW (20)	10% of BW	25% of BW	40% of BW	55% of BW
Increment change of -5% of BW					
Lunge	BW (20)	10% of BW	25% of BW	40% of BW	55% of BW
Increment change of -5% of BW					
Jump Squat for Power	BW (20)	2.5% of BW	5% of BW	7.5% of BW	10% of BW
Increment change of -2.5%					
Jump Squat for Strength	BW (20)	5% of BW	10% of BW	15% of BW	20% of BW
Increment change of -5%					

TABLE 2. BENT-OVER EXERCISES					
Exercise	**Untrained Load**	**Novice Load**	**Intermediate Load**	**Advanced Load**	**Athletic Load**
Deadlift	20% of BW	40% of BW	60% of BW	80% of BW	100% of BW
Increment change of 5% of BW					
RDL or St. Leg DL	10% of BW	30% of BW	50% of BW	70% of BW	90% of BW
Increment change of 5% of BW					

TABLE 3. UPPER BODY "PUSH" EXERCISES					
Exercise	**Untrained Load**	**Novice Load**	**Intermediate Load**	**Advanced Load**	**Athletic Load**
Bench Press	Push-Ups (20)	25% of BW	50% of BW	75% of BW	100% of BW
Increment change of 5%					
Incline Press	20 Incline Push-Ups	20% of BW	40% of BW	60% of BW	80% of BW
Increment change of 5%					
Behind Neck Press	5% of BW	15% of BW	35% of BW	50% of BW	65% of BW
Increment change of 2.5 - 5%					
DB Bench Press	Push-Ups (20)	15% of BW	35% of BW	50% of BW	65% of BW
Increment change of 2.5 - 5%					
DB Incline Press	20 Incline Push-Ups	10% of BW	20% of BW	30% of BW	40% of BW
Increment change of 2.5 - 5%					
DB Shoulder Press	5% of BW	10% of BW	17.5% of BW	25% of BW	32.5% of BW
Increment change of 2.5%					

TABLE 4 UPPER BODY "PULL" EXERCISES					
Exercise	**Untrained Load**	**Novice Load**	**Intermediate Load**	**Advanced Load**	**Athletic Load**
Pull-Ups	Assisted 50% of BW	Assisted 25% of BW	BW (5)	Bodyweight (15)	BW +5%
Increment change assisted of 10 - 15%					
Pulldowns	25% of BW	40% of BW	60% of BW	80% of BW	100%+ of BW
Increment change of 5 %					
DB Rows (1-Arm)	10% of BW	17.5% of BW	25% of BW	30% of BW	40%+ of BW
Increment change of 5 %					

KAMERON ABSHIRE, MS, CSCS

INCORPORATING OLYMPIC-STYLE LIFTS INTO A DUTY-READY WORKOUT ROUTINE

One of the most popular questions that I get from tactical facilitators is, "what would be the one thing we could change about our programming that would make the greatest difference?" My simple response is to incorporate Olympic-style lifting. For the purposes of this article, Olympic-style lifting will refer to two lifts that test the entire body. These two lifts, the clean and jerk and the snatch, are complex, demanding, and potentially difficult movements that deserve to be part of every tactical athlete's workout regimen. Olympic-style lifting is often passed over by fitness professionals, strength coaches, sport athletes, and tactical athletes (2). The lifts are left out of programming because they are challenging to teach, dangerous if done incorrectly, and most often, because they are unfamiliar to the facilitators of each program. Olympic-style lifts can help develop power, coordination, flexibility, and core stability, which are all incredibly important attributes for the tactical athlete. In addition to physical benefits, these lifts also give the tactical facilitator another way to measure power, and the ability to track progression of athletes using a multi-joint movement that quickly assesses the athlete's entire body. Olympic-style lifts can be practiced in several different ways depending on the facilitator's level of expertise, available equipment, training facility, and schedules. Olympic-style lifts can benefit the programming of many tactical athletes, and when performed correctly they may help build healthier, more powerful, confident tactical athletes.

Every fitness professional or tactical facilitator will have their own way of coaching someone through the specific stages of the two Olympic-style lifts. It will be helpful for the tactical facilitator to standardize the message in order to keep it simple and descriptive. Improper teaching can result in injuries, which can result in time off from work. Improper teaching can also turn tactical athletes away from Olympic-style lifts, which in the grand scheme of things, could be incredibly detrimental to optimal physical development. One thing to consider is that, when training tactical athletes, range of movement tends to be an ongoing challenge. The Olympic-style lifts, if done correctly, require excellent range of movement across several joints. The tactical facilitator may choose to break up the lifts into parts (e.g., the initial pull, high pull, front squat, jerk, etc.) in order to get the most out of training. When teaching through these two lifts, tactical facilitators should remember proper, patient, and simplistic coaching may help create a tactical athlete that feels, looks, and moves better in full kit.

When designing a proper program that includes the two Olympic-style lifts, keep in mind that both of these lifts are power movements, and are therefore, physically demanding and mentally taxing (1). The National Strength and Conditioning Association (NSCA) recommends that power movements be organized toward the beginning of a training session in order to get the most out of the exercise while staying safe (1). It is also useful to consider that despite these lifts being power movements, they can also be used as part of a unique high-intensity endurance routine for a tactical athlete who is advanced and already proficient at the lifts. These movements have even been shown to produce far greater power outputs than traditional training exercises, like the squat or bench press alone (2). Incorporating Olympic-style lifts into a workout routine can be quite beneficial, but execution and performance should be supervised by a qualified professional to ensure safety (1,2).

As a facilitator for a tactical team, is it important to remember that every tactical athlete's first duty is to his or her department, so keep the programming efficient and safe. Consider the fact that if it is a duty day, these tactical athletes may have to go on a mission, answer calls, or attend further training later on in the same day. A possible tactical programming schedule could include a day for power, speed and agility, strength, and endurance. Power days are best suited to focus on the Olympic-style lifts. Facilitators should start with a quick overview of the lifts already taught, go through a demonstration, and use a safe weight to avoid injury. The following are a few examples of modified "power day" workouts for a tactical team that include suggested intensities.

POWER 1

1. 4 sets of 10 clean and jerks (60% 1RM)
2. 4 sets of 10 jerk presses (50% 1RM)
3. 4 sets of 10 deadlifts to emphasize the pull (60% 1RM)
4. 4 sets of 10 jump squats using a weighted vest
5. 4 sets of 400-m sprints

POWER 2

1. 4 sets of 6 snatches (60% 1RM)
2. 4 sets of 10 barbell upright rows
3. 4 sets of 15 box jumps
4. 4 sets of 10 front squats (60% 1RM)

The speed and agility day is somewhat of a "rest" day for the Olympic-style lifts. However, this is the day to focus on rehabilitation of the large muscle groups that are recruited during the power day. A session of intense stretching, foam rolling, and massage will keep the legs and back functioning properly

and ready for the strength day. This creates a challenge for the facilitator to keep everyone safe and progressing at an acceptable rate. Tactical facilitators should not take these lifts for granted and assume their tactical athletes can perform them properly. Once again, the facilitator should start with a quick overview of the lifts that were already taught, go through a demonstration, and use a safe weight. They should also pay close attention to body position and joint movements of the athletes and make sure proper technique is utilized throughout. Below are two examples of modified "strength day" workouts for a tactical team that include set and repetition progression suggestions.

STRENGTH 1

1. 5 sets of Romanian deadlifts (reps: 6, 6, 6, 3, 3)
2. 5 sets of back squats (reps: 6, 6, 6, 3, 3)
3. 5 sets of barbell shoulder shrugs (reps: 10, 10, 8, 8, 6)
4. 5 sets of seated dumbbell overhead presses (reps: 10, 10, 8, 8, 6)

STRENGTH 2

1. 5 sets of deadlifts (reps: 6, 6, 6, 3, 3)
2. 5 sets of hang cleans (reps: 8, 8, 6, 6, 4)
3. 5 sets of single-arm bent-over dumbbell rows (reps: 10, 10, 8, 8, 6)
4. 4 sets of barbell lunges (reps: 8, 8, 8, 6)

The endurance day pairs focused repetition of perfect form with intensity and duration. This method keeps the heart rate up while creating the efficient neuromuscular pathway that will allow for safe, successful Olympic-style lifting. This is the day to be creative with implements and competitions to create a fun, challenging workout. Here are two examples of "endurance day" workouts that will challenge the aerobic system and incorporate movements involved with the Olympic-style lifts.

ENDURANCE 1

As many reps as possible in 20 min:

20 sandbag clean and jerks

Half-mile run

10 bodyweight squats

ENDURANCE 2

8 rounds for time:

10 medicine ball front squat thrusters

10 burpees

10 kettlebell deadlift high pulls

10 clap push-ups

50 count of double-under jump rope

In conclusion, the clean and jerk and the snatch are lifts that could benefit every tactical athlete if taught and performed correctly. Every day tactical athletes are asked to move hard and fast all while staying safe and focused. The Olympic-style lifts require the body's power system to do just that; lift hard and fast while staying focused on technique. If the tactical team is not already doing these lifts, it may be a tough sell at first but as someone once said, "If you continue to do what you have always done, you'll continue to get what you have always gotten."

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NICK BARRINGER, MS, RD, CSSD, CSCS

OMEGA-3S FOR THE TACTICAL ATHLETE

Tactical athletes put their bodies through the ringer, so to speak, on a daily basis. Optimal recovery is essential to improve or simply maintain performance. Omega-3 fatty acids can help tactical athletes recover by increasing protein synthesis and protecting muscles from breakdown (1,2,5,6,7).

Omega-3 fatty acids are derived from fish oil and have long been known to promote cardiovascular health. Fish oil is comprised of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). However, more recent research has demonstrated that the benefits of omega-3s might extend all the way to skeletal muscle as a means to promote strength, hypertrophy (muscle growth), and blunt inflammation (1,2,7). As with much research, the first signs of these benefits were seen in animal studies.

Gingras et al. demonstrated that omega-3s helped regulate whole-body protein metabolism in three 5-week experimental periods involving six growing steers. The researchers discovered that feeding omega-3s to the steers improved insulin sensitivity and promoted anabolic pathways (1). The authors pointed out how this research could be of particular interest to humans as loss of insulin sensitivity is one of the contributing factors to muscle loss due to aging.

In a study involving human subjects, subjects were provided a 6-week diet with the same amount of calories and then measurements of insulin sensitivity and inflammation were taken. The subjects then underwent an 8-week experimental diet that was supplemented with 720 g of fatty fish and 15 mL of sardine oil daily. The experimental diet significantly increased insulin sensitivity and lowered C-reactive protein (a marker of inflammation). The study demonstrated that omega-3s could indeed improve insulin sensitivity in humans and possibly protect muscle from catabolic processes by blunting inflammatory markers (7).

Baseline measurements of body composition, resting metabolic rate, and salivary cortisol were taken in another study. Cortisol is the stress hormone the body produces during a stressful operation. When the body produces a significant amount of cortisol, performance and muscle mass both decline. In the study, the subjects were randomly assigned to receive either 4 g per day of safflower oil (control) or 4 g per day of fish oil for six weeks, at which time baseline measurements were repeated. The fish oil group significantly gained more muscle mass, significantly reduced fat mass, and demonstrated a tendency to decrease salivary cortisol levels (3).

In another study, Smith et al. took 16 healthy older adults and randomly assigned them to receive either omega-3 fatty acids or corn oil for eight weeks. The rate of muscle protein synthesis was measured both pre- and post-supplementation during basal, post-absorptive conditions, and during a period where the subjects were given extra insulin and amino acids. The corn oil group showed no increase in muscle protein or anabolic signaling across all testing. The omega-3 group showed that when omega-3s were added with amino acids and insulin there was an even greater anabolic response (6).

The concern with the previous study is it was conducted on an elderly population. Smith's team repeated this study using a younger population (25 – 40-year-olds). The subjects were provided 4 g per day of omega-3s for eight weeks. Again, it was demonstrated that omega-3s have a synergistic effect when the body is exposed to more amino acids and insulin (5).

The previous studies demonstrated the positive effects that omega-3s can have on muscle growth. However, a study by Rodacki et al. looked at muscle strength specifically. In this study, Rodacki's team had one group only strength train for 90 days, one group strength train and receive 2 g per day of fish oil for 90 days, and one group strength train and receive fish oil at 2 g per day for 150 days. The third group also started fish oil supplementation 60 days prior to training. Peak torque and torque rate improved for all groups, but the fish oil groups gained more strength than the strength training only group and performed better in functional tasks compared to the strength training only group (4). This showed that omega-3s can help promote functional capacity and also muscular strength (4).

For tactical athletes, sometimes it is not about gaining muscle and getting stronger but rather just keeping the strength and muscle already gained. For this point, Kamorlat et al. showed that cells in a starvation state when exposed to EPA reduce protein breakdown by 22% compared to the control (2). This study demonstrated that not only does fish oil have anabolic potential but also has the potential to be anti-catabolic during periods of caloric restriction. The ability to spare muscle during calorie restriction could make fish oil a powerful ally when dieting and during periods of high stress and low calorie intake like those seen in certain military scenarios.

It has been shown that omega-3s can aid in increasing muscle mass, muscle strength, potentially blunt inflammatory and catabolic signals, as well as protect the muscle currently attained even during times of caloric restriction. There are also other potential benefits of omega-3s involving protecting the brain and enhancing cognition but that is best left for another article. According to most studies presented here, 3 – 4 g of omega-3 fatty acids per day in the form of either fish and/or supplementation will benefit tactical athletes in many ways.

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BRYAN FASS, ATC, LAT, EMT-P, CSCS

LESSONS FROM THE FIELD — A PERSONAL RETROSPECTIVE

Public safety is a profession for a very unique group of individuals. If you have worked on the street, it is a calling. I was called to public safety, paramedicine specifically, during my clinical practice days. I began my journey as an athletic trainer who focused on spine rehabilitation, chronic pain, and sports performance. Early in my career, I spent time in various outpatient clinics where I picked up techniques and methodologies for decreasing pain and returning my patients to normal function.

It was early in my clinical days that I earned my Certified Strength and Conditioning Specialist® (CSCS®) certification which helped me to refocus on my roots of strength and conditioning. During this stretch, I was also introduced to a lot of alternative medicine techniques and became certified in a number of manual therapy techniques. Nutrition also became a clear link to pain and performance during this time.

Eventually, I became unchallenged and, like many, I wondered about medical school and the prospect of becoming a physician assistant (PA) or physical therapist (PT). So an easy path to get some additional experience outside of the rehabilitation realm was to "get my patch." So into paramedic school I went, and 16 months later I emerged as a newly minted, wet behind the ears, and frankly, scared medic. This is where my education truly began. Enter the world of public safety, fire and Emergency Medical Services (EMS), and law enforcement. Enter a world where everything I know to be true, just, proper, and proactive does not exist. It is a world where sleep, coffee, and fast food are an accepted way of life; a world where fitness and wellness makes you an outcast; and I realized that I did not fit the "mold." Back then, catchy phrases like "tactical athlete" and "tactical facilitator" did not exist.

For eight years, every weekend I would leave my scrubs at home and gear up into my uniform and leave the safe clinical world behind to work as a paramedic. Every shift and every call was an education in the inner workings of the human body and humanity. I also had the privilege of working with some truly amazing and dedicated individuals that would and did lay their lives on the line for complete strangers. I also had the privilege of helping many of my partners, peers, and brothers in all services begin to heal themselves. Almost all of these responders had let their bodies go: sleep was far more important than exercise to them, and they ate a lot of food from the gas station. They all had some sort of pain and injury. All of them had sustained multiple soft tissue injuries from patient and equipment handling, and the only path to retirement was medical disability.

For 14 years, I have had the privilege of learning from and helping our dedicated first responders; so what have I seen and learned?

1. There is what you should do and what you could do: I would love to ask my responders to lay on the floor and stretch, do some focused spine stabilization, and maybe some core work but many first responders are also inherently lazy and the floor is probably dirty. Keep the stretches functional, quick, and very job-specific. Even better, if you can tie it to their apparatus or the TV, your success rate will skyrocket.

2. Exercise is still mired in gym class, football practice, or academy physical training: Almost all first responders we have trained across the country will ultimately relate fitness to what they did or learned in the past. In many cases, their idea of exercise will be filled with bad experiences and pain or injury was involved because they were ultimately coached poorly. For other ex-athletes that revert to their competitive training programs from years past, they should proceed with caution. Important variables such as training intensity and exercise selection should reflect current goals and be realistic given their time away from training. Design exercises that are progressive, easy to perform, include all personnel, and can be done with simple equipment.

3. Everything gets donated (or made): I cannot tell you how many departments and bases we have gone to and simply had our jaws drop, and not in a good way (although there are a few that make coaches very happy). Most departments have been "given/donated" equipment that is so old, poorly designed, rusty, or simply broken that it is sometimes dangerous. When we as a profession of tactical facilitators make recommendations and "design" programs, please keep in mind that behind the scenes this is what many tactical athletes have to work with.

4. There is no exercise that is truly job specific: This is a tough one and always open for debate—I for one have spent countless hours trying to come up with a solution. For example, how do we create/modify/use an exercise that will prepare the body to lean over a bathtub at 03:30 (after running 16 calls already) and rapidly extricate a patient that has gone into cardiac arrest and needs cardiopulmonary resuscitation (CPR) immediately. Also, the patient is in one of those old ranch style homes that was built in the 1960s with a very small bathroom. So only two people can get into the room and the patient is wet and they are covered in excrement—welcome to the real world. The tissue torques and loads placed on these two responders, who

will be desperately trying to stay clean in the process, will drastically exceed National Institute for Occupational Safety and Health (NIOSH) recommendations.

5. It is a big country: I have had the privilege of traveling the country to train, speak, and consult with fire, EMS, and law enforcement departments. One thing that I can share with you is that no matter what state, federal, or association recommendations exist, and there are a lot, there will be a lot of diversity. Some departments have robust fitness/wellness programs while others have none. Often the departments that are struggling to succeed have not been trained very well or have never had good employee buy-in and that is one place that the TSAC Program and NSCA have been helping to lead the way. While I wish all responders looked and acted the part, the sad fact is that obesity rates in public safety are the same as those in the general population.

6. My go-to list: As all good coaches have, I too have a go-to list of exercises that have served me well. These exercises are also very progressive, meaning that we teach a basic variation and then add in more complex variations as the first responder progresses. My list is also rather simple because I hold this one thing to be very true: make it hard or too complicated and they will not do it. My go-to list includes: kettlebell get-ups, kettlebell swing progressions, kettlebell clean to press, bowler squats, crossover step-ups, single-leg deadlifts, suspension trainer workouts (can be mounted to the back of the truck), counter-rotation presses (core press), lunge matrix, pull-ups, and just about any variety of a row (focusing on posterior chain and maintaining a 2:1 posterior/anterior ratio). Last but not least, it is important to remember to use different types of soft tissue mobilization such as massage sticks, foam rollers, and massage balls.

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