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PUSH-PULL STATION WORKOUT TIPS IN PREPARATION FOR PHYSICAL POLICE TESTS

Pushing and pulling actions are important gross motor skills frequently seen in tactical tasks. Consequently, they are seen in many occupational physical police tests such as the Royal Canadian Mounted Police’s (RCMP) Physical Abilities Requirements Evaluation (PARE). Physical police tests usually share some basic features. They usually consist of an obstacle course that simulates a pursuit on foot in a rural or urban environment, followed by physical confrontation/body control section. Physical tests of this type usually end with a power struggle that simulates a physical confrontation with an uncooperative participant and/or crowd control. At the RCMP, this simulation is done using a specific machine, shown in Figures 1 and 2, with an 80-lb load. Tactical athletes move side to side from a pivoting point while maintaining the load above ground for six arcs of 180 degrees while pushing and pulling. Other apparatus also can be used by different agencies.

While experience is clearly important, specific and sustained training remains the best guarantee for success in this type of test. This article highlights the close correlation between some muscular strengthening exercises and success with the push-pull machine for better operational and physical preparation.

It is important to understand what influences success when either pushing or pulling. To succeed in either one of these tasks during the test, force must come from the ground (from the legs and hips) and transfer through the core and upper limbs (1,2,3). The upper limbs are in direct contact with the handles or ropes but you have to look at a lower point to target a) the anchor point, and b) the production of force.

LOWER BODY
It goes without saying that developing and or accessing existing levels of strength and power in the lower body are vital to the success of these tasks for the test. Luckily, this is also true for all the other physical skill-related tasks included in PARE (e.g., run, jump, pull, climb). More specifically, it is suggested to prioritize inclusive lower body exercises that solicit several joints at the same time to be performed standing up without the support of a machine or bench (3,6). Exercises such as squats, lunges, and deadlifts will have a greater impact on the ability to produce force during movement than muscle isolation exercises done with machines (4,5). Recommended exercises for lower body development include the deadlift (Figures 3 and 4), front squat (Figure 5 and 6), walking lunge (Figures 7 and 8), and kettlebell squat (Figures 9 and 10).

CORE
To allow the legs to transfer force from the lower body to the resistance, a stable and rigid core must support the tactical athlete. The kinetic chain must be strong and free of energy loss as well. So, in preparation for the push exercises, girdle exercises (co-contraction of back and stomach muscles) are optimal, while back extension exercises are better suited for preparation of pull exercises. Recommended exercises for core development include the suspension side plank (Figure 11), back extension (Figures 12 and 13), kettlebell Turkish get-up (Figures 14 - 17), landmine rotation (Figures 18 and 19), exercise ball hamstrings curl (Figures 20 and 21), and single-leg hip raise off floor (Figures 22 and 23).

UPPER BODY
The third link in the chain is the upper body. When pushing, there is usually a motor pattern between the vertical push and the horizontal push (6). As described before, ideally the movement is done with the lower body pushing on the stable core, which then transfers force to the upper body. When pushing, there is more of an isometric contraction of the chest (pectoral girdle) and the upper back (trapezius, rhomboids) than there is with a traditional push movement like the bench press, for example.

Bench press, chest press, and variations are useful exercises that are recommended for developing upper body strength. However, to enhance movement specificity and more directly reflect the tasks, it is suggested to include exercises such as push-up variations. Recommended exercises for upper body pushing development include the dumbbell curl to press (Figures 24 - 26).
dumbbell bench press (Figures 27 and 28), barbell quarter squat to overhead press (Figures 29 and 30), and suspension push-up (Figures 31 and 32).

When pulling, however, the horizontal pull force will be challenged from a very specific force position, the universal athletic position (the ready position in ground fighting or wrestling) (6). Tactical athletes unconsciously assume this position without even noticing it in various tasks or sports activities that require more than a minimal amount of force. This flexed, forward leaning, balanced position involves bending at the hips, knees, and ankles, and remaining centered over a low center of gravity (1).

It is suggested to include exercises or activities that require horizontal stabilization of a load from a standing position, such as controlling the weight of kettlebells during swinging movements or pulling on elastic bands, pulleys, or training ropes (3).

Recommended exercises for upper body pulling development include the single-arm kettlebell swing (Figures 33 and 34), rope wave (Figure 35), resistance band standing row (Figures 36 and 37), and squat to stand cable row (Figures 38 and 39). Other traditional upper-body multi-joint exercises such as the pull-up (Figures 40 and 41), inverted suspension row (Figures 42 and 43), and single-arm dumbbell row on a bench (Figures 44 and 45) can be beneficial as well.

HELPFUL TIPS

1. **Friction with the floor or ground:** Non-slip traction or shoe grip with the floor should be used. The shoes are an essential transfer point for the production of force. If the friction coefficient between the shoes and the floor is not sufficient to produce a counterforce, the tactical athlete could slip, which would result in a loss of force. Before the physical test, tactical athletes should enquire about the type of surface where the test will be administered (e.g., wooden floor, synthetic floor, or synthetic grass).

2. **Angle of attack and involvement of the body:** Particularly when measuring the test construct of whole-body pushing ability, handle grip height is an important determinant of the ability to deliver peak forces through the hands (4). To facilitate the transfer of peak forces, the tactical athlete should self-select a grip height that is comfortably between the shoulders and hips, after assuming the universal athletic position. Depending on each athlete’s build, ideal height is approximately halfway between the hips and shoulders when standing up (4). This height should allow tactical athletes to have their arms parallel to the floor when bending down. The position shown below allows the tactical athlete to direct all the vectors of force toward the resistance, which will maximize the chances of success.

3. **Working with an athletic sled:** This type of sled is very specific to push or pull biomechanics. Design of a program in preparation of the physical test should incorporate work with an athletic sled, if available.

In conclusion, these specific exercise suggestions are meant to highlight biomechanical aspects important for success in difficult tactical tasks. The exercise recommended must be included in a logical and structured training protocol that meets accepted industry standards.
PUSH-PULL STATION WORKOUT TIPS IN PREPARATION FOR PHYSICAL POLICE TESTS

REFERENCES

ABOUT THE AUTHOR
Luc Poirier obtained a Bachelor’s degree in Kinesiology from the University of Sherbrooke in 2001. Poirier joined the Royal Canadian Mounted Police (RCMP) in 2003 as a Division Fitness and Lifestyle Advisor (DFLA) for “C” Division (Quebec). Based in Montréal, Poirier works with a population of 1,000 police officers and 600 support employees spread across the province in more than 20 different locations. The role of the DFLA is to administer police occupational tests to members and recruits, to prescribe fitness plans to employees and specialized units, and to create and support initiatives promoting fitness and wellness in the workplace. Poirier also attends various major events in Canada and the United States as a guest speaker on strength and conditioning.

Robert Séguin earned his Bachelor’s degree in Education and his Master of Science degree in Kinesiology from the University of Ottawa. He is currently a PhD candidate at the University of Western Ontario, studying health and rehabilitation. Séguin holds the Inclusive Fitness Trainer Certification (CIFT), the Key Method Functional Capacity Evaluation (FCE) in ergonomics, and the Canadian Physical Activity Fitness and Lifestyle Appraiser Course Conductor. He joined the Royal Canadian Mounted Police (RCMP) in 1997 as a Divisional Fitness and Lifestyle Advisor based in Ontario. In this capacity he serves 1,100 federal RCMP officers in a mandatory health promotion program with a clinical exercise experience of over 5,000 maximal effort police skill-related tests. Séguin’s research focus is human and performance factors predicting passing skill-related job simulations with a gender equity inquiry. He has also given several lectures on cardiovascular screening for maximal effort testing in physically demanding professions.
LOWER BODY EXERCISES

FIGURE 3. DEADLIFT

FIGURE 4. DEADLIFT

FIGURE 5. FRONT SQUAT

FIGURE 6. FRONT SQUAT

FIGURE 7. WALKING LUNGE

FIGURE 8. WALKING LUNGE
PUSH-PULL STATION WORKOUT TIPS IN PREPARATION FOR PHYSICAL POLICE TESTS

**FIGURE 9. KB SQUAT**

**FIGURE 10. KB SQUAT**

**CORE EXERCISES**

**FIGURE 11. SUSPENSION SIDE PLANK**

**FIGURE 12. BACK EXTENSION**

**FIGURE 13. BACK EXTENSION**
PUSH-PULL STATION WORKOUT TIPS IN PREPARATION FOR PHYSICAL POLICE TESTS

FIGURE 14. KB TURKISH GET-UP

FIGURE 15. KB TURKISH GET-UP

FIGURE 16. KB TURKISH GET-UP

FIGURE 17. KB TURKISH GET-UP

FIGURE 18. LANDMINE ROTATION

FIGURE 19. LANDMINE ROTATION
PUSH-PULL STATION WORKOUT TIPS IN PREPARATION FOR PHYSICAL POLICE TESTS

FIGURE 20. EB HAMSTRINGS CURL

FIGURE 21. EB HAMSTRINGS CURL

FIGURE 22. SINGLE-LEG HIP RAISE OFF FLOOR

FIGURE 23. SINGLE-LEG HIP RAISE OFF FLOOR
UPPER BODY EXERCISES

FIGURE 24. DB CURL TO PRESS

FIGURE 25. DB CURL TO PRESS

FIGURE 26. DB CURL TO PRESS

FIGURE 27. DB BENCH PRESS

FIGURE 28. DB BENCH PRESS
PUSH-PULL STATION WORKOUT TIPS IN PREPARATION FOR PHYSICAL POLICE TESTS

FIGURE 29. BB QUARTER SQUAT TO OVERHEAD PRESS

FIGURE 30. BB QUARTER SQUAT TO OVERHEAD PRESS

FIGURE 31. SUSPENSION PUSH-UP

FIGURE 32. SUSPENSION PUSH-UP

FIGURE 33. SINGLE-ARM KB SWING

FIGURE 34. SINGLE-ARM KB SWING
PUSH-PULL STATION WORKOUT TIPS IN PREPARATION FOR PHYSICAL POLICE TESTS

FIGURE 35. ROPE WAVE

FIGURE 36. RESISTANCE BAND STANDING ROW

FIGURE 37. RESISTANCE BAND STANDING ROW

FIGURE 38. SQUAT TO STAND CABLE ROW

FIGURE 39. SQUAT TO STAND CABLE ROW
PUSH-PULL STATION WORKOUT TIPS IN PREPARATION FOR PHYSICAL POLICE TESTS

FIGURE 40. PULL-UP

FIGURE 41. PULL-UP

FIGURE 42. INVERTED SUSPENSION ROW

FIGURE 43. INVERTED SUSPENSION ROW

FIGURE 44. SINGLE-ARM DB ROW ON BENCH

FIGURE 45. SINGLE-ARM DB ROW ON BENCH
THE IMPORTANCE OF TACTICAL FACILITATORS TO TRAINING AT ANY DEPARTMENT

As coaches and trainers, we all want the best of the best. Every coach or trainer would want the newest and best functional training equipment, sleds, kettlebells, floors, etc. But does high-end equipment and facilities guarantee success? One common and overriding theme has emerged; as a profession we need to take a step back and simply observe.

As an example, compare the training facilities of two drastically different departments: Department one has a fantastic training facility. It looks like a hybrid between a CrossFit gym and a strength coach’s dream with nice rubber flooring, a huge jungle gym in the middle of the room, endless kettlebells, Olympic lifting bars, dumbbell racks, benches, plyometrics boxes, sandbags, medicine balls, and more. Clearly, this department consulted with someone who understood public safety and functional fitness.

This facility runs three organized CrossFit sessions per day and has a part-time coach as well as some police officers and firefighters that occasionally help. While this facility is available to all of the police officers and firefighters of a city with a population of over one million, it appears that only 40 - 60 first responders use it each day. Most of the trainers are unfamiliar with how to ensure safe and effective usage for the majority of the equipment. Additionally, the CrossFit coaches lack the insight to prevent injury through their individualized and periodized approaches to programming.

One other concerning part of this state-of-the-art facility is the glaring lack of soft tissue conditioning tools such as foam rollers, massage balls, massage sticks, etc. This lack of equipment indicates that the department and the gym staff may not be giving adequate attention to pre- and post-exercise tissue conditioning (3).

Compare that facility to department two, which is a large county sheriff’s office that has a minimal budget for their training. The officers have access to a local community college gym but do not use it due to the distance from their station. Instead, they were able to clear out a nicely sized room and place an old universal machine in it.

In order to turn it into a usable facility, they also added a wall-mounted pull-up bar, two suspension trainers, and kettlebells in a variety of weights. They also benefited from a sale at the local sporting goods store in order to acquire some mats, resistance bands, and a stability trainer. Finally, the department added soft tissue conditioning tools such as foam rollers, massage balls, and a massage stick.

The trainers are all thoroughly educated on the use and individual application of these fitness tools and basic protocols are established to ensure safe and effective usage of the facility. This fitness program is not mandatory for all tactical athletes in the department, but participation within the department hovers around 50%.

Public safety departments often have ingrained culture that can be very challenging and resistant to change, even if it is positive change brought on by a strength and conditioning professional. On top of that, adding union resistance, overtime, and job-related stresses can make it very hard to help bring about change. An analogy is used in leadership training when it comes to motivating groups and enabling groups to change. This analogy is called the rider and the elephant. The coaches and trainers are the riders and their group of tactical athletes is the elephant. The coach or trainer can prod, motivate, incentivize, and even pay the elephant to work out and be fit. Sure, for a while, the elephant may head in the direction the rider wants, but at some point, the rider may become complacent or present a path that is inconstant or too difficult.

In the case of department one, they have a mostly clear path and excellent intentions but the riders get confused from time to time and the elephant finds another path to take. This department’s state-of-the-art facility is not used properly and therefore, their money is not spent well.

For department two, the path is simple and easy to reproduce. The trainers have developed multiple periodized progressions to account for the least and most fit tactical athletes, and everyone between. In addition, they incorporate many self-care soft tissue conditioning techniques into all aspects of training. This means that even during driver training, the law enforcement officer must first use tools like the foam roller to warm-up.

A coach or trainer’s main underlying goal should always be to help the team and the individual, as part of the team, advance in their training and job performance. Coaching and training in the public safety environment poses challenges for tactical facilitators as every department has different command structures, training calendars, training staff, and facility issues that the facilitator must account for. Finally, there is a lot of controversy surrounding mandatory versus voluntary fitness programs and even annual job-specific physical abilities testing.
As the rider of the elephant, it is up to coaches and trainers in the public service environment to understand that no two departments are the same. When attempting to get on or steer the elephant, the tactical facilitator must be able to understand all the variables at play, such as the group dynamics, the differing cultures, and the “mood” of the department. Without this big picture, it will often prove challenging for the coach or trainer to steer the elephant efficiently.

As the data shows, the money is what can be counted and lost workdays due to injuries presents a problem for any public service department (4). Specifically, reduction of soft tissue overexertion injury (both on the job and from training), a measurable reduction in Occupational Safety and Health Administration (OSHA) recordable lost workdays (rate and severity of injury), and a reduction in health care benefit use, are a few of the measurable data points that can be tracked for program effectiveness (2).

Remember, tactical coaches or trainers may have an illusion of control but the group being trained is very dynamic and fluid. As a professional who may or may not have the trust of the elephant, the rider should avoid assuming that the elephant will continue down their set path. As a final word of advice, beware of the lowest common denominator: 3% of any department will not comply, and this group can often deviate the entire group from the path (1). If the rider engages them early and often, then the elephant will likely become much easier to guide.

REFERENCES

ABOUT THE AUTHOR
Bryan Fass is an expert on public safety, injury prevention, fitness and wellness, speaking, consultations, as well as being an author of the “Fit Responder” and column writer for officer.com, firerescue1.com, and ems1.com. Fass works nationally with departments, corporations, and state and local governments to design and run targeted injury prevention and wellness programs for public entities and private organizations. He is frequently contacted for expert opinion and content contribution for all aspects of public safety. President and founder of Fit Responder, Fass also functioned as a paramedic for over eight years.
THE PHYSIOLOGICAL IMPORTANCE OF HYDRATION FOR THE TACTICAL ATHLETE

It is vitally important for tactical athletes to remain hydrated when training or performing in hot and humid environments. Optimal performance is greatly dependent on regular and frequent consumption of fluids. This will ensure that tactical athletes do not experience any disruptions in their specific training tasks and it will help to keep them efficient and effective at their job. It is important to educate tactical athletes on the benefits and requirements for consumption of fluids during training or on-the-job duties. Understanding basic human physiology can benefit any tactical facilitator or tactical athlete in training as well as help enhance their performance in the field.

When a tactical athlete sweats, sodium (NA) and water are lost from the body. Sweating is a mechanism that acts to prevent an increase of core body temperature. During exercise in a hot, humid environment, the body can cool itself by sweating water out through the skin, which will cool the skin through evaporation. If the body does not sweat, there is an increased risk of an elevated core body temperature. This can be fatal if the core temperature is not returned to its normal temperature within a reasonable amount of time (3).

Sodium is important because it helps to provide normal osmotic levels of extracellular fluids within the body (1). During prolonged exercise, the body’s sweat contains a ratio of 7:1 sodium lost compared to potassium lost (1). Human sweat normally contains 40 - 50 mmol of NA per liter of fluid lost (1). Decreased sodium levels will increase the rate of bodily fluid loss, thus affecting the plasma level in the blood (1). As exercise duration increases, more sodium is lost. A significant decrease of sodium in the body is known as hyponatremia. Hyponatremia is defined as <130 mmol of plasma NA+ in the body (2).

Hyponatremia can occur at rest or during exercise because of ongoing sweat loss after exercise and eventual sodium depletion. The signs and symptoms of hyponatremia include disorientation, altered mental status, coma, headache, vomiting, bloating, lethargy, and swelling of the extremities (2). Hyponatremia can also be caused by the dilution of sodium due to overconsumption of water in a short time period (e.g., drinking two gallons of water in less than three hours). Excessive water consumption in a short time period is called water intoxication. Water intoxication can be fatal as it dilutes the plasma sodium volume in the body (2).

In a hot, humid environment, hydration is critical for maintaining core body temperature and replacing lost fluids and electrolytes. Approximately 60 - 70% of bodyweight is water. In order to reduce the risk of dehydration, fluid loss must match fluid intake. According to the American College of Sports Medicine (ACSM), aerobic exercise becomes compromised when fluid loss exceeds 2% of body mass (5). Frequent hydration is important to prevent dehydration. Dehydration interferes with performance in exercise and job performance. Dehydration has adverse effects on muscular strength, endurance, coordination, fatigue, peripheral vision, and mental concentration. If exercise duration exceeds an hour, rehydration time will increase proportionally (4% of bodyweight of fluids lost can take up to 24 hours to be replenished) (2).

Depending on a tactical athlete’s weight, fluid consumption of 1,500 – 2,250 mmol, or 6 - 8 oz, of fluid every 15 - 20 min during exercise can help prevent dehydration (2). The ACSM recommends that tactical athletes consume one pint of fluid for every pound of bodyweight lost (5). To prevent electrolyte loss from prolonged exercise lasting over an hour, a tactical athlete should consume a beverage containing a low dose of carbohydrates and glycerol (i.e., 1.0 - 1.2 g of a 500 – 700 ml beverage) (6).

Another way to decrease fluid and electrolyte loss is to condition the body for activity in the heat. This is known as heat acclimatization. Research has shown that conditioning in a humid environment decreases the concentration of mineral/electrolyte loss and increases the efficiency of sweating, which cools the body and regulates constant core temperature (4). It is recommended that tactical athletes exercise in humid environments (at a progressive rate) and drink adequate fluids with carbohydrates and glycerol during exercise bouts lasting over an hour. This will increase performance and avoid heat-related illness from low sodium levels (4).
REFERENCES


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Keith Chittenden is currently a Certified Strength and Conditioning Specialist® (CSCS®) and a Tactical Strength and Conditioning Facilitator (TSAC-F). He holds a Master’s degree in Exercise Science from the California University of Pennsylvania, and is currently a doctor of physical therapy student at the University of Hartford. Chittenden has over 12 years of experience with performance-enhancement and post-rehabilitation for athletes of multiple sports, police officers, and military personnel.
OPTIMIZATION AND STANDARDIZATION OF FITNESS TESTING IN POLICE ACADEMIES

In the last 15 years, there seems to have been a drop in the average fitness levels of new recruits entering police academies. It would be useful to see the average fitness levels at police academies around the country in a statistical and quantifiable format—but that information is difficult to obtain. There are several factors that make analyzing numbers across the country a difficult task.

One difficulty in analyzing these numbers is inconsistent testing protocols. The method of testing is equally important as choosing the test itself. For example, if consistent protocols in testing are not known or followed during push-up testing, the required hand distance could vary drastically which could ultimately change the outcome of the test. This is just one specific example of how protocols could differ. Staying with the push-up example, compiling the numbers from every push-up fitness test in the nation would still not be helpful as the numbers would all represent different values and none would be comparing the same quality of push-ups. Additionally, even if a downward trend in national average fitness levels existed, the information would need to be made available to the commanding staff, and they would need to find it significant enough to warrant action.

Part of the problem depends upon the background of those who conduct the fitness testing. Oftentimes officers are appointed to train the academy based on the way they look, the schedule of trainers available, or training experience. That experience comes from a number of places—typically the background is martial arts, endurance, or general fitness but every academy is different. These appointed officers are often placed in a situation where they have to perform to their best ability in something they may have no previous experience. Therefore, they may try to learn from the Internet or their local gym, or they may be sent by the academy to get training elsewhere.

One of the most popular places to send officers to get training on law enforcement standards is the The Cooper Institute®. Here officers are educated on anatomy, weight machines, and common personal training protocols. After their training, these officers are not personal trainers, but rather, paramilitary instructors responsible for training large groups of people, often with little assistance, no resources, and a learn-as-you-go mentality. They are also not likely equipped with tools and knowledge to lead large groups. Therefore, they often fall back on the information they learned from their own resources about how to teach exercises that will weed out the weak-minded trainees, while not causing unreasonable trends in acute and/or chronic injury, rhabdomyolysis, or heat illness. However, this education is not a replacement for an accredited certification such as the Tactical Strength and Conditioning Facilitator (TSAC-F).

“Old school” training methods worked in the past, but fitness trends are different today. If the average recruit is coming in with a lower level of fitness, it could create problems. Most academy instructors are still implementing the same training techniques that were being used when they were in the academy. Having a minimum fitness requirement prior to entry into the academy helps, but it is not the only need. Training instructors need to be educated in a way that they can accurately test an academy with proper supervision to ensure the quality of testing is upheld to a high standard. There needs to be a way to analyze this information in a way that is going to reflect the proper intensity of training and areas with which to focus, as well as a way to make improvements based on these testing outcomes. Training instructors need to know how to manage a group, train a group, make training relative to the job, reduce the incidence of injury, and improve recovery. This further stresses the importance of obtaining the TSAC-F credential for any appointed officer or training instructor.

The unintentional consequence that faces all police academies is a severe reduction in the number of officers interested in trying out for specialized units. While the cause for this is unknown, some of this could be attributed to the declining average fitness level of the recruits, or the inability of the academies to properly educate training instructors. Even though any small change has the potential to create a ripple effect, changes should be made to the system that is currently in place in order to optimize and standardize fitness testing in police academies.

ABOUT THE AUTHOR

Kelly Kennedy is one of the nation’s leading experts in fitness training for police. While working for the largest Police Department in the Southeast United States, she has physically trained and tested over 4,000 police recruits and officers since 1999. After graduating with a Master’s degree in Health Education with a specialization in Exercise Physiology, she worked as an adjunct instructor at Florida International University. She has a consulting business called Fit-to-Enforce.com and an iPhone app called iEatburn. Kennedy is certified with American College of Sports and Medicine (ACSM) as a Health Fitness Instructor (HFI); National Strength and Conditioning Association (NSCA) as a Certified Strength and Conditioning Specialist® (CSCS®); Certified International Society of Sports Nutrition (CISSN), as a certified CrossFit Instructor, Defensive Tactics Instructor; and earned a PhD in Educational Leadership from Lynn University.
UNNECESSARY ROUGHNESS: INCIDENCE AND PREVENTION OF ANKLE SPRAINS IN TACTICAL ATHLETES

The views expressed in this article are those of the author, and do not necessarily reflect the official position or policy of the Air Force, the Department of Defense, or the U.S. Government.

Ankle sprains are one of the most common musculoskeletal injuries in civilian populations (16,30,31). Ankle sprains are even more frequently observed in military personnel, with an incidence rate more than five times greater than seen in civilians (5,29). From 1998 – 2006, the number of service members who sustained ankle sprains was 423,581 (5). While the ratio of male/female ankle injuries varied by the military service, overall, females were 21% more likely than males to suffer an ankle sprain. The greatest sex-specific difference in ankle sprain rates was seen in the Marine Corps, where females had 60% greater ankle sprain rates than males. Females also had a higher incidence of ankle sprains in the Army and Navy. There was no difference in risk for ankle sprains between males and females in the Air Force.

Age also affected risk of ankle sprains. For the Marine Corps, Army, and Navy, the greatest rates of ankle sprains occurred in service members less than 20 years of age, and declined with age (5). In most cases, rates of ankle sprain for females were higher than those of males in each age group, with the exception of Navy personnel in the 25 – 29 year old age groups. Interestingly, age-related injury patterns in Air Force personnel differed significantly from those of the other services. In contrast to the other services, ankle sprains were less common among female Airmen in the 20 – 24, 25 – 29, and 30 – 34 years of age groups than males. There was no difference in rate of ankle sprain injury between genders in the 35 – 39 year old group. Comparing services, the highest overall rate of ankle sprains was observed in the Marine Corps and the Army, with the Navy and Air Force sustaining much lower rates (5). Several risk factors for ankle sprains in tactical athletes have been identified (1,5,19,29,30).

A study utilizing United Stated Military Academy cadets supports the finding that female cadets are significantly more likely to sustain an ankle sprain than male cadets (29). With males, a higher height, weight, and body mass index increased ankle sprain risk. With females, there were no significant differences in injury risk based on these variables. Male cadets who performed more push-ups and sit-ups, and had faster 2-mile run times on average were at greater risk (29). For females, there was no difference in risk based on physical fitness test results. There was no significant difference in ankle sprain injury risk between intramural and intercollegiate athletes. When examining ankle sprain incidence by sport for males, basketball, rugby, lacrosse, and soccer exhibited the highest rates of ankle sprain injuries. In females, cheerleading, soccer, basketball, and volleyball exhibited the highest rates of ankle sprains.

Another study utilizing the same population found that for syndesmotic ankle sprains (the dreaded “high” ankle sprain) there was no difference in incidence between genders, but for medial ankle sprains, males were three times more likely to suffer such an injury (28). Football, team handball, soccer, and basketball were the sporting events associated with the highest risk of syndesmotic ankle sprains while men’s rugby and gymnastics had the highest incidence rates of medial ankle sprains.

A recent exhaustive review of military physical training injuries concluded that there are only six interventions which had a sufficient evidence base to recommend (4). Two of those recommendations (wearing of semi-rigid ankle braces and agility/balance training) are also important components of ankle sprain prevention/rehabilitation. Several studies have found that semi-rigid ankle braces significantly reduce ankle sprain injury rates up to nearly 50% (3,9,15,17,23). For example, one study using United States Military Academy cadets concluded that a semi-rigid ankle brace worn during competitive basketball games significantly reduced the incidence of ankle sprains (23). A randomized controlled trial comparing the use of a semi-rigid ankle brace to an elastic support bandage to treat lateral ankle sprains found that the semi-rigid brace produced significantly better improvement in ankle joint function compared to the elastic bandage (3).

Several papers and systematic reviews have found that agility/balance training is an effective tool for prevention and treatment of ankle sprains (1,7,8,12,13,14,18,20,21,22,26,32,33). One prospective study used a multi-station proprioceptive exercise program in basketball players (8). At the end of the season, the intervention group suffered 35% fewer ankle sprains than the control group. In addition, biomechanical tests documented that the intervention group significantly improved postural sway and joint position sense relative to the control group. A related study used a similar multi-station program to study the effects of proprioceptive training on subjects with chronic ankle instability (7). At the end of the 6-week study, the intervention study displayed significant improvements in joint position sense, postural sway, and muscle reaction times compared to the control group.
Another study utilized an 8-week, home-based proprioceptive training program for athletes ages 12–70 who had sustained a previous lateral ankle sprain. At the end of the one year follow-up, the intervention program was associated with a 35% reduction in risk of recurrence (13). The greatest benefit was seen in athletes whose original sprain was not medically treated. A follow-up study using the same subject group found that the proprioceptive training program was significantly more cost effective in preventing recurrences of ankle sprains than more traditional care (12).

More limited evidence suggests strength training may also be effective for treatment and prevention of ankle sprain injuries (2,6,10,11,24,25). A 6-week study used athletes with functionally unstable ankles (6). The intervention group participated in a rubber tube-based strength training program three times per week. At the conclusion of the study, the intervention group demonstrated significant improvements in dorsiflexion strength and eversion strength, as well as improvements in plantar flexion and eversion joint position sense. Another 6-week study using subjects with functional ankle instability found that the use of rubber tubes and an ankle exercising machine three times a week resulted in significant increases in inversion/eversion power (24). Unlike the study above, the training program did not result in significant improvements in joint position sense. Another intriguing study used a specially designed bi-directional bicycle pedal as part of a 6-week high-intensity interval training program on a cycle ergometer (11). The study subjects all exhibited a history of repeated ankle sprains. The subjects in the intervention group significantly improved peak eversion torque, figure-of-eight running time, and single-leg stance speed compared to the control group.

In summary, ankle sprains are a very common musculoskeletal injury in civilian populations, and the rates of ankle sprain injuries in military populations are even higher than those of civilians. A variety of effective options exist for the treatment/prevention of ankle sprains (14). The use of semi-rigid ankle braces and agility/balance training, in particular, are well supported in the research literature (4). The research to date suggests that proprioceptive training using a wobble/balance board or related device three days per week is an effective training modality for tactical athletes engaging in high-risk activities, as well as those tactical athletes who are rehabilitating a previous ankle sprain. Considering the high toll of ankle sprains on military readiness, the regular implementation of such training would likely lead to measurable improvements in military task performance.

REFERENCES


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THE BENEFITS OF HEAT ACCLIMATION FOR FIREFIGHTERS

A majority of firefighters realize the need for both strength training and cardiovascular training. For those looking to improve their cardiac health and performance, heat acclimation training may be the answer. The University of Oregon, a main contributor to research into the effects of heat adaption training, performed the following study.

METHODS

In a climate-controlled lab for 10 days, 20 elite cyclists were divided into two groups: a study group of 12 and a control group of eight (2). All 20 cyclists performed a time-trial of 45 min of cycling followed by 10 min of rest, then another 45 min of bike training before and after a 10-day acclimation period. During the acclimation period, the study group trained in hot weather to acclimate while the control group performed the exact same training in a cool environment with no heat acclimation. All 20 subjects tested lactate threshold, performed a VO2 max test (a test of maximal aerobic capacity), and completed various other blood testing before and after the trial (2). The following benefits/results of heat acclimation were shown:

Result 1: Plasma volume increased. This increase occurred in all test subjects in quantities of 4 - 8%. This is important because plasma makes up approximately 55% of blood volume (1). Blood plasma is responsible for the transport of red blood cells, electrolytes, hormones, glucose, and proteins (1). When the body is in a hot environment, the main source for heat reduction is evaporation. To facilitate this evaporation, blood vessels dilate close to the skin and throughout the muscle. This allows the body to reap the full effect of the circulating air by evaporating sweat, which causes the skin underneath to be cooled. The same cooled blood plasma is then transported through the muscles and to the remainder of the body.

Result 2: Cellular respiration proficiency increased. Heat in the body can actually potentiate oxygen’s affinity to the hemoglobin on red blood cells to a point. After being carried down through the blood stream, mitochondrial cytochromes help cleave the oxygen molecule from the red blood cell and put it to work, making the body’s main unit of energy adenosine triphosphate (ATP).

Result 3: Maximal aerobic capacity increased. This may take weeks before it is noticeable, but it happens. The VO2 max increased by an average of 8% in the study group, while no improvements in maximal aerobic capacity were seen in the control group (2).

Result 4: The experimental group increased power output at lactate threshold by 5% (2). Lactate threshold is the maximal amount of lactic acid the body can clear. The body clears lactic acid by putting it back into circulation to be used as energy by other organs. Lactic acid actually transfers back metabolically to pyruvate before producing ATP but if there is a pool of oxygen, this will continue to occur quickly. The liver will also take in accumulated lactic acid and use it in gluconeogenesis to regulate blood glucose levels while the body has higher levels of lactic acid due to higher intensity work.

CONCLUSION

There are some important safety concerns to address before attempting to train in the heat. It is important to remember that the study conducted tests on elite-level athletes. Novice tactical athletes should seek the guidance of a certified Tactical Strength and Conditioning Facilitator (TSAC-F) before attempting heat acclimation training. One of the major concerns for safety is heat-related illness. Warning signs of a heat-related illness include feeling faint, feeling sick, dizziness, feeling shaky or unsteady, and blurred vision. These early signs of heat illness should be closely monitored when performing heat acclimation training.

Another major concern for training in the heat is hydration. Knowing how much water to consume during heat training is difficult. Since 60 – 70% of bodyweight is water, fluid loss must match fluid intake during this type of training. According to the American College of Sports Medicine (ACSM), aerobic exercise becomes compromised when fluid loss exceeds 2% of body mass and they recommend that tactical athletes consume one pint of fluid for every pound of bodyweight lost (3).

As seen from the results of the study, training in the heat has benefits for firefighters seeking to improve performance on the job. It is important to be aware of the risks of training in the heat and take proper precautions to avoid heat-related illnesses.
REFERENCES


ABOUT THE AUTHOR
Alex Hughes is a firefighter for the Grand Ledge Area Emergency Service Authority and is an avid weightlifter. He holds the Tactical Strength and Conditioning Facilitator (TSAC-F) certification through the National Strength and Conditioning Association (NSCA). Hughes also holds two degrees with honors in Fire Science and Paramedic Technology and is currently working toward earning his Certified Strength and Conditioning Specialist® (CSCS®) through the NSCA. He has also proctored the Candidate Physical Ability Test (CPAT) testing for the Lansing Regional Fire Training Academy.
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