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KEEP IT SIMPLE: PROGRESSION METHODOLOGY FOR DESIGNING EMS PROGRAMS

Fire, rescue, and emergency medical services (EMS) responders face challenging physical situations on a daily basis. Since no two calls are ever the same, designing and implementing conditioning programs can be difficult for tactical facilitators. Factoring in the varied shift calendars over a month of work and it gets even more challenging to design training programs for an entire department.

Do tactical facilitators screen everyone first and then begin an individualized training program? Do they roll out a mandatory or voluntary program? Do they start at the basics and build up, or pick a spot in the middle? Who is going to run the program? Who will track the data? The list of questions is endless so what could be considered the best starting point for a tactical facilitator when designing training programs for an entire department?

The principle of “Keep It Simple” is a great place to start for most tactical facilitators. In this field, athletes and facilitators often go to the big guns first, the big fancy, cool looking exercises. Yet, simple and very effective movements are often overlooked or simply ignored. Recently, this author was at a department that was using all kinds of tires, sleds, boxes, ropes, sand bags, etc. Yet, none of the responders possessed the stability to perform a prone warrior press. When those responders were taken through some basic beginning movements, most of the responders lacked the basic ability to stand on one leg while countering the force of a light weight. Essentially, they had no fine motor control; they had the power but no way to direct that power and their injury rates reflected it.

Sports medicine and tactical conditioning share a similar methodology for training athletes. From rehabilitating an injury, to injury prevention, to advanced conditioning, we start at the basics and as the body adapts we then follow a logical progression to advance the athlete in their sport/profession. One progression methodology that has been used to help tactical facilitators, and especially personal trainers, can be found in Table 1. While simple, it has made an enormous difference for many of the departments exposed to this progression methodology. Not only is it a good reference tool but it has also served to stop the facilitators from assigning an exercise that an individual may not be prepared for. Data shows that 33 percent of injuries come from training to prevent injuries on the job so departments need a tool that can help them to keep fitness progressions on track (4). This progression follows a ground-based approach for the initial phases. The theory is that by teaching basic stances and the ability to control their own body when in contact with the ground many of the injuries common in the fire and EMS services can be reduced (1,3).

Ideally, each phase will last no more than a few weeks as each responder works through the progression until they have mastered the progression level, or the tactical facilitator finds an underlying movement or strength abnormality manifested by poor control, technique breakdown, or inability to perform the movement, exposed through the progression. This progression has also been used as a basic template for return to work and work conditioning for responders on light duty that have suffered a lower body or lower back soft tissue injury (and that have been cleared for exercise but not for front line work).

As the progression is followed, tactical facilitators can also add in basic rolling patterns. Some of the more effective exercises to boost responder movement on the primal level include kettlebell get-ups and kettlebell arm bars. Additionally, there has been success implementing basic strong man exercises to increase overall stability. These include suitcase carries and farmers walks using various fire and EMS gear along with traditional weights and kettlebells.

Since most departments struggle with the implementation of fitness programs and with all command officers constantly worried about exercise causing injury, the progression above can keep facilitators on a logical track. Responders returning to work from an injury can also follow this progression, which will not allow them to progress rapidly while also assisting in clear and simple goal setting.

Often facilitators can make exercise programs too complicated, but by keeping the path clear and simple, yet firmly rooted in proven methodologies, they can safely progress responders to better job-specific fitness and can even correct some underlying imbalances that this progression will expose. The bottom line is reduced injury rates along with improved responder wellness means departments will save money from lower worker compensation expenses. Sometimes those savings are often all a department needs to justify a more robust and formal fitness program.
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.

TABLE 1. PROGRESSION METHODOLOGY (2)

<table>
<thead>
<tr>
<th>PROGRESSION</th>
<th>EXERCISE SELECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (Standing) 2 feet, stable</td>
<td>Rows, transverse, frontal, and sagittal plane presses, counter rotation presses,</td>
</tr>
<tr>
<td>surface</td>
<td>basic chop patterns, basic squat patterns, basic split squat patterns</td>
</tr>
<tr>
<td>2. 2 feet, unstable surface</td>
<td>Same as above but using stability pads, BOSU, grass/sand etc.</td>
</tr>
<tr>
<td>3. 1 foot, stable surface</td>
<td>Rows, transverse, frontal, and sagittal plane presses, basic reach patterns upper</td>
</tr>
<tr>
<td></td>
<td>body, basic hip hinge patterns (toe taps) lower body</td>
</tr>
<tr>
<td>4. 1 foot “mildly unstable”</td>
<td>Rows, presses, perturbation patterns, push/pull counter rotation patterns (light</td>
</tr>
<tr>
<td>(Stability pad, foam pad,</td>
<td>external resistance)</td>
</tr>
<tr>
<td>grass/sand only)</td>
<td></td>
</tr>
<tr>
<td>5. Dynamic movements</td>
<td>Step-ups, step-downs, crossover steps, advanced lunge patterns</td>
</tr>
<tr>
<td>6. Power movements</td>
<td>Powerlifting and kettlebell movements, device pressing (sled) and device pulling,</td>
</tr>
<tr>
<td></td>
<td>and basic striking patterns</td>
</tr>
<tr>
<td>7. Plyometrics and jumps</td>
<td>Focusing on landing mechanics, double-leg progressing to split stances</td>
</tr>
</tbody>
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EVALUATING RECENT TACTICAL FITNESS RESEARCH AND ITS VALUE

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.

Extreme conditioning programs (ECPs) such as CrossFit/P90X/Insanity and different training modes/implements are very popular with tactical athletes. Until recently, this popularity has occurred in the absence of peer-reviewed research testing the physiological responses/adaptations of ECPs. Concerns have been expressed regarding the efficacy/injury risk of ECPs (3). The first full paper on ECPs in a peer-reviewed journal was not published until early 2013 (15). Several tactical research studies were presented at the American College of Sports Medicine (ACSM) Annual Meeting and the National Strength and Conditioning Association’s (NSCA) National Conference that provided much needed data regarding these types of training programs and their efficacy/injury risks. This column will examine the value of this recent tactical fitness research and its usefulness to the tactical population.

EXTREME CONDITIONING PROGRAMS

One study examined the metabolic/cardiovascular responses to a popular CrossFit workout, named “Cindy.” Nine volunteers (7 men, 2 women) who had trained with CrossFit for at least three months were the study subjects (9). All subjects performed a baseline treadmill test to determine maximal oxygen consumption (VO2 max). A portable metabolic analyzer and separate heart rate (HR) monitor were worn during the performance of “Cindy.” Average VO2 recorded during “Cindy” was 33.3 ± 5.5 ml/kg/min, with an average HR of 170.8 ± 13.5 beats per minute (BPM). The “Cindy” workout produced an average caloric expenditure of 260.6 ± 59.3 kcals. The exercise intensity of this ECP would place this “Cindy” workout produced an average caloric expenditure of 260.6 ± 59.3 kcals. The exercise intensity of this ECP would place this “Cindy” workout within the lower range of “vigorous intensity” exercise (64 to 90% of VO2 max) based on ACSM guidelines (9).

Another study compared the strength/power adaptations of CrossFit (CF) trainees to individuals who utilized traditional resistance training (RT). Nine male CF and seven RT individuals participated in the study (13). All study subjects had at least six months of training in their respective areas. Tests included one-repetition maximum (1RM) bench press (BP) and back squat (BS). Upper and lower body power was assessed using the medicine ball toss, vertical jump, and Margaria-Kalamen tests, and NSCA protocols were followed for all of the tests. Interestingly, there were no significant differences in performance between CF and RT groups on any of the tests. The authors noted, “Further research is needed to understand the effects of CF training on strength and power, compared to traditional training styles,” which questions the efficacy of ECPs over traditional RT. Other studies focused on foot-strike patterns and the utilization of various types of footwear.

FOOT-STRIKE AND FOOTWEAR

Running-related injuries are a common occurrence in military populations, and both running form and running shoe type have been hypothesized to play a role. One study compared foot-strike (FS) patterns in U.S. Army Soldiers to determine if differences in FS contribute to injury risk (17). The study investigated FS in 342 male Soldiers from a U.S. Army Combined Arms Battalion. Foot-strike patterns were recorded using high-definition video cameras filmed during a normal training pace. Soldiers also completed a survey related to injuries and training history. Of the sample, 13% of soldiers used a midfoot or forefoot strike (non-heel strike, NHS), whereas 87% of soldiers used a rearfoot strike (heel-strike, HS) pattern. There were no significant differences in self-reported injury between NHS and HS Soldiers. There were also no significant differences in the number of training days modified due to injury. The authors concluded, “Neither FS pattern is advantageous in terms of impact on self-reported, retrospective injury or performance.”

Another study looked at whether differences in footwear might contribute to injury (8). The study subjects were 1,332 males from a U.S. Army Brigade Combat Team. Shoe types consisted of two categories: traditional running shoes (TRS; stability, cushioned, motion control, ) and minimalist running shoes (MRS, ) which are very flexible and have little or no cushioning. The most common shoe type worn by soldiers was cushioned (57%), followed by stability (24%), MRS (17%) and motion control (2%). After controlling for differences in subject characteristics, the authors found no significant difference in injury risk between soldiers who wore a TRS versus MRS footwear.

NUTRITION

Several studies investigated various aspects of nutrition as it applies to tactical athletes. One study tested the effects of a paleolithic (Paleo) diet (a diet commonly consumed by practitioners of ECPs) on blood lipids (16). The subjects of the study included 23 males and 20 females with no previous history of cardiovascular or metabolic disease. The diet consisted of meat, fish, fruit, vegetables, eggs and nuts. The duration of the diet was 10 weeks. The subjects participated in an ECP for the duration of the study. Baseline assessments of body fat percentage and VO2 max were conducted at the beginning of the study, including total cholesterol (TC), low-density lipoprotein (LDL), and high-density lipoprotein (HDL) and triglyceride (TG) ratios. At the...
end of the study, body fat percentage decreased and VO₂max increased, while both TC and LDL significantly increased.

TRAINING MODES
Several studies tested the effects of various training modes, and the corresponding impacts on performance/health risk. One study examined the adaptations from an 8-week kettlebell training program. Seventeen subjects (9 male, 8 female) participated in the study (2). The study also had a control group (5 male, 6 female). The protocol for the 17 subjects included a 5-min warm-up, a cooldown of 5-10 min, and 30-45 min of kettlebell exercises. Compared to the control group, the kettlebell group displayed significant increases in aerobic capacity, leg press strength, grip strength, and core strength. No differences were seen in body composition, static balance, or flexibility. The authors concluded, “Incorporating kettlebell training into a workout routine may provide additional benefits not typically seen with traditional resistance training.” Some resistance training studies have found these additional benefits, so an intervention group utilizing traditional resistance training would have strengthened the study.

PHYSICAL FITNESS TESTING
One study examined relationships between tactical task performance and laboratory measures of aerobic power, strength, body composition, and agility in Naval Special Warfare SEAL Operators (1). Thirty-eight SEAL Operators completed the study. Laboratory measures included body fat percentage, fat-free mass, fat mass, VO₂peak, and lactate threshold, plus isokinetic shoulder, knee, and lumbar strength. Tactical tests included a medicine ball toss, broad jump, agility drills, pull-ups, bodyweight bench press, IRM deadlift, and 300-yard dash. The results indicated that many of the laboratory tests showed significant correlations with the tactical tests. The authors concluded, “These results may provide practical implications for assessing the tactical readiness of Navy SEALs.”

Another study tested associations between isokinetic muscular strength and all-cause mortality in males (12). Data was collected on 5,593 men, 41 – 78 years old, who received isokinetic strength testing for physically demanding labor positions from 1999 – 2002. Based on the results, the authors concluded, “A significant inverse relationship between strength and mortality was demonstrated for males, suggesting that isokinetic strength could be used as a marker of mortality risk.” This research suggests isokinetic strength testing might be a useful addition to regular health assessments of military personnel.

The Army Physical Fitness Test (AFPT) with an experimental test battery (Military Optimal Performance Challenge or MOPC) was examined in another study. The goal was to determine if the MOPC was a better indicator of military readiness, and removed the effect of body mass on scores (body mass bias, or BMBB.) The MOPC included a 3-mi run, mobility obstacle course, bench press, back squat, and pull-ups (4). The MOPC also included a simulated casualty carry, a 400-m run with weapon and combat uniform, a 140-m simulated dummy carry with weapon, and a 1-mi run. The author’s conclusion was, “For all U.S. active service members, compared to APFT, MOPC offers a more robust approach to military readiness and is free of body mass influence. MOPC composite scores provide commanders an ability to rank order selected personnel’s military readiness.”

One study looked at whether age significantly affected physical fitness tests scores in active duty Air Force and Air National Guard personnel (11). The Air Force has 10-year age groupings for fitness test standards (20-29, 30-39, 40-49, etc.). All other services utilize 5-year groupings, and it has been unclear as to whether the 10-year groups may place personnel in the older half of the age groups at a disadvantage for meeting the test standards. Test results for 1,630 Air Force/Air National Guard were examined in this study. For the push-up (PU) test, no relationship between performance and age was seen in any of the three age groups. For the sit-up (SU) test, decreases in performance related to age were significant only for the 30-39 year age group. For the 1.5-mi run, age-related decreases in performance were significant for all three age groups, including the 20–29 year old group. The authors concluded, “The significant effect of age on run times within the 20–29, 30–39, and 40–49 age groups suggests that requiring all Air Force/Air National Guard within those age groups to meet the same passing score may be inappropriate.”

Another study evaluated the relationship between various body composition measures and performance on the AFPT in college ROTC candidates (10). The subjects consisted of 23 males and 15 females. The subjects’ scores on PU, SU and run tests were compared to the standard Army tape test (ATT), body mass index (BMI), and dual-energy X-ray absorptiometry (DXA). The ATT percentage of body fat was significantly correlated with DXA percentage of body fat in females, but not in males. Neither BMI nor ATT were significantly correlated with total AFPT points, whereas DXA percentage of body fat was significantly related to total points. ATT and BMI accounted for a very small variation in total points (4-5 %) where DXA percentage of body fat accounted for 17% of the variance in AFPT scores. The authors concluded, “Regardless of the method used to assess percentage of fat, differences among ROTC cadets do not appear to greatly impact AFPT. This may be related to the emphasis on and participation in regular physical fitness training for college ROTC cadets, and may not apply to regular Army personnel.”

Research presented at conferences such as NSCA and ACSM provide the scientific foundation for evidence-based training of tactical athletes (6). This is important, particularly when determining whether novel training techniques are safe and effective alternatives to more traditional fitness training. Protocols such as CrossFit, kettlebells, high-intensity interval training (HIIT)
or barefoot running have peaked recent interest, but are any of these really more effective than previous training programs? It is certainly possible that some of these new training methods can be useful; others may fall by the wayside as evidence-based research concludes their ineffectiveness. For example, barefoot running has been hypothesized to improve running efficiency; however, published research to date does not appear to support this hypothesis (7). Some new training techniques hypothesized to improve tactical performance may be useful. However, these techniques need to be rigorously tested via scientific methods, in order to determine if such training actually contributes to making tactical athletes the best they can be.

REFERENCES


ABOUT THE AUTHOR

Guy Leahy is currently serving as an exercise physiologist in Tucson, AZ. Leahy is a member of the ACSM (American College of Sports Medicine), NSCA (National Strength and Conditioning Association), and is a Certified Strength and Conditioning Specialist® (CSCS®). Leahy is the author/co-author of over 30 professional articles, including original research which has appeared in publications such as the Journal of Strength and Conditioning Research, TSAC Report, Medicine and Science in Sports and Exercise, Nature, Science, and Scientific American. Leahy is also a columnist for the TSAC Report. He has presented at several conferences, most recently at the 2013 NSCA and ACSM Annual Conferences. He was also a guest speaker at the 2012/2013 TSAC Conferences. Leahy holds a Master of Education degree from Western Washington University and a Bachelor of Science degree from the University of Oregon. Leahy can be reached at xrciseguy@gmail.com.
THE IMPORTANCE OF GRIP STRENGTH FOR FIREFIGHTERS

Most firefighter activities require a high level of grip strength. For example, if a firefighter does not have adequate grip strength they will have a difficult time opening a fire hydrant, pulling hose, or carrying tools during multiple callouts across an entire shift (all typical job requirements). The International Association of Firefighters and International Association of Fire Chiefs Wellness Fitness Initiative (IAFF/IAFC WFI) incorporates grip strength as one of the physical fitness assessments (5). Yet, strength and conditioning professionals and tactical athletes will often overlook the utility of grip strength without realizing the benefits it plays in overall strength development and injury prevention.

Measuring grip strength can be accomplished by a few different methods: spring-loaded compression, air compression, and hydraulic dynameters. The IAFF/IAFC WFI recommends using the JAMAR Hydraulic Hand dynamometer (Lafayette Instrument Company, Lafayette, IN) which measures the force generated by the musculature of the hand and forearm. Since grip is a “force” and not pressure it should be measured in pounds or kilograms. The position of the elbow during testing is often a point of contention. According to a number of studies, grip strength has shown to be greater with less flexion of the elbow, but regardless of elbow position it is recommended that all procedures be normalized before testing to provide an accurate assessment (7,10).

The following research has suggested grip strength could be a possible predictor of current health and physical capabilities. Grip strength was related to differences in endocrine function and hormone release (e.g., cortisol, endorphins) following a night of sleep deprivation (4). This revelation could have important implications for firefighters as they have a high likelihood of incurring poor sleeping habits. The study showed that grip strength fluctuated throughout the day, suggesting that tasks that heavily rely on grip strength may also demonstrate similar fluctuations (4). According to Cappaert, grip strength had time of day differences with the peak being in the afternoon (2). Further studies have shown that grip strength also decreases following a day of intoxication, which suggests a possible correlation between immune function and grip strength (6).

Numerous studies have associated weak or weakened grip strength with poor nutritional status, rotator cuff weakness, fatigue, and overall physical function. According to Sayer et al., there is a graded association between increased glucose level, weaker grip strength, and impaired physical function in older men with diabetes (9). In another study performed at the Sutcu Imam University, values of handgrip strength tests were significantly lower in diabetic individuals compared with a control group (3).

Grip strength was even shown to be a consistent predictor of all causes of mortality in middle-aged and elderly people (8). This is simple and non-evasive measurement could provide the fitness professional additional information that could be combined with other assessments (BMI, bodyweight, etc.) to provide a better understanding of an individual’s underlying health risks and readiness to engage in physical training.

Another area grip strength can be applied is injury prevention and rehabilitation. Common problems such as lateral epicondylitis of the elbow (i.e., tennis elbow) are common overuse injuries in firefighters. For the most part, this problem occurs when there is a muscular imbalance between the elbow muscles and the forearm muscles and common rehabilitative practices include improving grip strength. Another common injury in firefighters is a sprain or strain of the rotator cuff muscles. Research has suggested that grip strength has a significant correlation with rotator cuff muscle strength on the injured side, and that there is an increased likelihood of rotator cuff weakness from a hand injury or disorder (1,10).

Finally, the most overlooked role of grip strength is in monitoring the rate of recovery and/or physical stress following a prolonged callout, or the accumulation of events over the course of a shift. Firefighters are often fatigued, especially within an academy setting. The central nervous system (CNS) usually recovers 5 to 6 times slower than the muscular system, and the central nervous system is most influenced by the quality of sleep, which also affects hormonal function (especially cortisol release) (4). This explains why more is not necessarily better when it comes to physical stress (e.g., excessive physical training on shift) because it could lead to CNS fatigue. Functions of the CNS include the ability to execute movement patterns and exert motor controlling, among others. Therefore, if a firefighter is constantly fatigued, they may have a higher risk of injury (4).

The strength and conditioning professional should always be aware of the athlete’s physical and mental state, and possibly modify the nature of a conditioning program on those days where the athlete looks tired and fatigued due to inadequate recovery. A population-specific periodized training program that allows for proper rest and recovery is important for helping recruits in a firefighter academy produce the highest quality of work and experience the best physical and academic gains. Grip strength is a simple indicator of physical readiness and provides feedback on the recruit’s ability to perform at a high level. Not every workout can be hard, therefore monitoring your grip strength throughout an academy will allow for higher quality of work with a reduction in injury risk. Given the important role of grip strength in many
physical and mentally. The goal of the strength and conditioning professional is to find the right balance of effective training that will enhance their performance while offering adequate recovery from the stresses related to training. Trying to gauge this can be quite daunting especially when a strength and conditioning professional may have over 40 or more athletes. The California Regional Fire Academy recently implemented grip strength as a simple measurement of recovery. This allowed the academy to implement a more specific training program that allowed the athletes to train hard but also provide enough recovery. Table 1 shows an example of trends in grip strength from a sample of athletes (11 of the 40 are presented) during the first 10 weeks of an 18-week training protocol at the California Regional Fire Academy.

Most of the tactical athletes were able to perform at a higher level early in the week, but as the week progressed, they became fatigued. The same can be seen as the weeks started to add up, so the fitness program was developed to compliment the fluctuating stress levels. Speed was placed in the early part of the week due to high neural fatigue and the distance of 40 yards was selected to help reduce hamstring injuries. As the weeks progressed so did the focus on execution, as many of their central nervous systems were exhausted. If speed training was applied later in the week (e.g., Friday), the athletes would not have been able to perform at or near maximal effort (which is needed when developing speed), and could have increased the chance for injury. A sample program of the structure of the first four weeks of this program can be found in Table 2. Most of the athlete’s grip strength responded in a similar manner regardless of athletic ability, sex, or age. The one common denominator was that they all fluctuated slightly throughout the week and across the 10 weeks.

REFERENCES


ABOUT THE AUTHOR

Katie Sell is an Associate Professor in the Department of Health Professions and Kinesiology at Hofstra University. She currently teaches undergraduate and graduate courses in exercise physiology, physical fitness assessment, and exercise programming. Her primary research interests lie in the area of physical fitness assessment and exercise programming for wildland firefighters and law enforcement personnel. She is currently on the National Strength and Conditioning Association (NSCA) Tactical Strength and Conditioning Special Interest Group (SIG) Executive Council.

John Hofman is one of the leading experts in the field of first responder health and wellness. As the Strength and Conditioning Coach of the Sacramento Fire Department, Hofman oversees the Wellness Centre, coordinates the department’s medical and fitness assessments, develops recruit fitness training, works with pre-employment medical and fitness evaluations, and assists the department’s 20 certified Peer Fitness Trainers. In addition, Hofman also works as the Strength and Conditioning Coach for the California Regional Fire Academy, Sierra Fire Technology Program, as well as numerous other fire departments in Northern California. In 2012, he was appointed the Health and Wellness Coordinator of the Firefighter Cancer Foundation.
### TABLE 2. SAMPLE FIVE-DAY TRAINING

<table>
<thead>
<tr>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>Speed</td>
<td>Power</td>
<td>OFF</td>
<td>Strength</td>
</tr>
<tr>
<td>10 x 40 m sprints</td>
<td>3 sets of 4-6 reps</td>
<td>3 sets of 6-8 reps</td>
<td>3 x 1200 m every 8 min</td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td>100% effort</td>
<td>85-90% 1RM</td>
<td>75-85% 1RM</td>
<td>70-80% MHR</td>
</tr>
<tr>
<td>Recovery</td>
<td>Full recovery</td>
<td>90 s rest between sets</td>
<td>90 s rest between sets</td>
<td>N/A</td>
</tr>
<tr>
<td>1:3 ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. MB overhead toss</td>
<td>1. Hex bar deadlift</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Olympic clean</td>
<td>2. Horizontal row</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Bulgarian squat</td>
<td>3. Half kneeling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Pull-up</td>
<td>4. Half kneeling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Half kneeling, single-arm press</td>
<td>5. TRX body saw</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>bottoms up carry</td>
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When working at a police academy in the basic training section, tactical facilitators often need to get creative with building equipment options to train their athletes to help meet the requirements of certain training programs. Below are some solutions to the issue of not having the proper equipment for specific exercises. These fitness equipment options can be made with left over scraps from the maintenance department.

**PVC Pipes Can Be Used and Filled With Sand or Water**

Take a PVC pipe of any diameter, and cut it into three or four foot lengths. Cap one end with an end cap that has been fitted to the diameter of the pipe. Bond one end cap with PVC cement and allow it to dry completely. Once it is dry, fill the pipe with sand or water (or both). Cap the other end of the PVC pipe and make sure it fully dries upright before laying flat (Figures 1 and 2).

**Agility Ladders Can Be Created With Duct Tape and Rope**

It does not look as pretty as commercial agility ladders, but this alternative option for agility ladders can be constructed by taking two 10-ft pieces of rope, and taping flat pieces of plastic, or additional rope, with duct tape to provide the rungs. The length in between each rung is comfortable at about 16 inches. The width is approximately 18 inches in this example (Figures 3-6).

**Gallon-Sized Water Containers Can Be Used for Running, Swinging, Curling, and Lifting**

Have each athlete bring two empty gallon-sized water containers for their program. These can be used while performing squats, lunges, overhead squats, Turkish get-ups, and alternating weighted runs and non-weighted runs, and provide a much less expensive option than traditional free weights. There are boundless combinations of drills that can be performed with these jugs once they are filled. The jugs weigh approximately 8 lb each, and when running with one in each hand can become extremely heavy and uncomfortable.

Running with the jugs is challenging and it takes some degree of finesse and practice. These jugs can increase the difficulty of a training run by alternating running a half of a mile with the jugs, and a half of a mile without them. They can also be implemented with other exercises for added resistance.

**Use a Tennis Ball for Running in Formation**

While running in formation with your academy, take a tennis ball to throw towards the front, or sides of the formation. Call out a randomly assigned athlete to retrieve the ball as soon as possible and return to formation. These drills are good when trying to include random interval training.
USE A BASKETBALL TO ROTATE WITHIN THE INSIDE OF THE FORMATION WHILE RUNNING
When running in formation, the ball is passed continuously to each athlete. If the ball is dropped for some reason, the entire group has to drop and perform a designated number of calisthenic exercises that increase in number with every successive drop.

OLD TRACTOR TIRES FROM FLEET CAN BE USED FOR FLIPPING
This suggestion might not be that innovative but various sizes of tires can provide a progressive training scenario for the athletes to understand how technique must change based on load. Small tires can be used for agility runs, and progressively larger tires can be used throughout the same agility run (Figure 7).

PVC PIPES CAN BE USED TO CREATE HURDLES
Most academies have a maintenance department that is responsible for repairing equipment. Tactical facilitators can often take some of the extra pieces of PVC pipe and create hurdles for drills. The parts can be cut in any dimension needed. Just make sure to provide support on only one side of the hurdle so they tip if they are touched (Figures 8 and 9).

DRAGGING DUMMIES RENDERED USELESS FOR TESTING PURPOSES CAN BE USED FOR MAN DOWN DRILLS
Often old dragging dummies are tossed or used as targets on the range. When a training dummy is old and rendered useless for testing purposes, it is a good tool to use for victim down scenarios, practicing lifting odd objects, and carried a given distance. It is best to train athletes to use proper form while lifting or dragging a dummy—having a lighter dummy allows form to develop, and over time the development of better coordination.

Training with calisthenics is an effective training modality for your academy, but the use of tools and equipment to create innovative ways to train can always help with motivation and progression. Your supervisors will appreciate the effort, your athletes will appreciate the training, and they might even pick up some good ways to train in the future. All law enforcement agencies experience budget shortfalls, and this can sometimes make equipment purchases for fitness low on the hierarchy of needs. When it happens to your department, use some of these options to create your own equipment.

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 iEatnburn. 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.
MOVEMENT SCREENING: A PERSONAL RETROSPECTIVE

The views and statements expressed in this article are that of the author and may not be the views of the NSCA, or the TSAC program.

There has been a lot of discussion on the pros and cons of movement screens over the years. Recently, I took the time to determine the value of movement screens for strength and conditioning professionals and their value on the effectiveness of training.

It is important to note that Functional Movement Screen (FMS) is not designed to prevent injuries. A movement screen should be utilized as a baseline for movement but not a predictor of future injuries. That does not mean movement screens are not helpful. Movement screens can be incredibly valuable in helping strength and conditioning professionals recognize movement patterns and imbalances to identify potential risk. Over the years, it has been a great tool for coaches to determine if someone experiences pain during a particular movement. These screens are also good for developing a coach’s eye for evaluating proper technique and movement patterns.

Utilizing a movement screen can improve a coach’s cues by redirecting attention to movement patterns and exercise selection. Being a former elite-level athlete, I always paid attention to the smallest details. When I began training others, I always felt that every exercise was a screen in some respect. Years later and having more knowledge, I found my hypothesis was correct – every exercise is a screen. Initially, the FMS helped me train my eyes to look for little discrepancies, but over time (and hundreds of screens later), I started to see things simply by having someone perform a lunge, step, single-leg balance, or push-up.

One of the top risk factors for tactical populations is a previous injury; unfortunately, good movement does not guarantee reduction of the reoccurrence of an injury. Strength and conditioning professionals still need to include strength, endurance, coordination, and skill to address the physical attributes required to perform the physical tasks of the job. Movement screens would be a great addition to any coach’s toolbox but all coaches must realize that it does not solve the problem nor predict injury. Strength and conditioning professionals still need to take into account other variables such as general fitness and mechanisms of injury (i.e., did improper movement patterns account for, or attribute to, the initial injury?). Oftentimes, tactical operators build specific fitness on top of poor fitness and functionality, which can be a formula for disaster.

If incorrect movement patterns are not addressed by proper programming, injuries can occur. While screenings will not predict injuries, they can help strength and conditioning professionals guide tactical programming to address weaknesses that may lead to injuries. This only emphasizes the importance of certified strength and conditioning professionals concerning program design and the effectiveness of training for tactical populations.

In a recent study published in the Journal of Strength & Conditioning Research 60 firefighters participated in a 12-week program to evaluate the effectiveness of training (1). Individuals were graded on how they chose to perform rather than how they could perform (which is more realistic to the fire service). The results showed that 68% of the participants scored a 1 on the overhead squat. All participants scored 2 or 3 on the in-line lunge (scale of 1 to 3). This showed that many of the participants might have been building specific fitness on top of poor fitness/ functionality through their previous training. It also provides much to glean for the professional tasked with designing a follow-up program to address these imbalances.

What this study tells me is that maybe I should not have a firefighter perform overhead squats due to a screening score of 1 (maybe lunges would be a better exercise to prescribe). On the other hand, it shows me that I cannot solely rely on the screen and that I need to apply other variables to create a better formula to improve the training effectiveness for my firefighters (e.g., the job, lifestyle, health history, etc.). Over time, I can collect further data and try to identify trends within those departments, which would be helpful in developing a return to duty policy or a better injury prevention program, thus improving the effectiveness of training.

It is important for strength and conditioning professionals that work with tactical populations to motivate them to exercise. The key is to provide the correct exercises that will enhance performance, help reduce injuries, and at the same time be easy enough to perform without my supervision. Movement screens are a valuable tool that can assist in the recognition of improper movement patterns and the selection of proper exercises to address those weaknesses.

Overall, I think movement screens are a great tool for assisting in the creation of personalized training programs. To call the movement screen a predictive system is really doing it injustice. If one makes those types of claims and someone gets hurt it only diminishes the perceived value and the use of that tool. Effective training programs should be structured by external factors such as general fitness and previous injury.
as time and goals, but an often overlooked tool is the inclusion of movement screens to address improper movement patterns and imbalances.

REFERENCES

ABOUT THE AUTHOR
John Hofman is one of the leading experts in the field of first responder health and wellness. As the Strength and Conditioning Coach of the Sacramento Fire Department, Hofman oversees the Wellness Centre, coordinates the department’s medical and fitness assessments, develops recruit fitness training, works with pre-employment medical and fitness evaluations, and assists the department’s 20 certified Peer Fitness Trainers. In addition, Hofman also works as the Strength and Conditioning Coach for the California Regional Fire Academy, Sierra Fire Technology Program, as well as numerous other fire departments in Northern California. In 2012, he was appointed the Health and Wellness Coordinator of the Firefighter Cancer Foundation.

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