



# TSAC REPORT



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## Firefighter Fitness: The Importance of a Complete Fitness Program

*Katie Sell, PhD, CSCS*

Research over the last two decades has demonstrated what firefighters have known for a long time—the occupation of firefighting is one of the most physically stressful and dangerous occupations in the world (1). The occupational demands of firefighting place those involved at a higher than average risk for cardiovascular events (1, 2) and for ergonomic-related disorders, or ERDs (3). Musculoskeletal injury and overexertion are the leading causes of on-duty volunteer firefighter injuries, as highlighted recently in the U.S. Fire Administration's Health and Wellness Guide for Volunteer Fire and Emergency Services (3).

ERDs include muscular sprains and strains, and other conditions related to joint, ligament and tendon health. The presence of ERDs can further increase susceptibility to cumulative trauma disorders or musculoskeletal disorders (i.e., tendonitis, nerve compression), especially in the upper extremities such as the shoulder and back regions (4).

These injuries are most commonly caused as a result of lifting and carrying equipment (i.e., saws, tools, high-rise packs), holding, carrying, and operating hose lines, as well as raising and supporting extension ladders. The repetitive nature of many occupational tasks, the level of force exertion needed, the awkward posi-

tioning in which many tasks are conducted, and exposure to vibrating apparatus (i.e., hand-held power tools) also increases the risk of joint and tissue overuse and subsequent degeneration (4). Muscular strains can significantly impair physical performance and inhibit overall work capabilities. Unfortunately, the physical nature of firefighting tends to prolong the length of time it takes to recover from physical injury.

### Physical Fitness-related Risk Factors

The ability to go from resting to states of high physical exertion without placing undue or excessive stress on the body or necessitating an extensive period of recovery, demands adequate overall fitness. Aerobic fitness and musculoskeletal health are vital for the efficient delivery of oxygen to working muscles, the control of heart rate, blood pressure, body temperature, and stress (i.e., adrenaline rush, muscle tension, and ventilatory response) responses to emergency situations. Low levels of muscular strength, excess body fat, poor flexibility and agility, place an on-duty firefighter at an increased risk and lead to a higher repeat occurrence of strains, sprains, and back pain or disorder (4). Back issues may include, but are not limited to abnormal curvature, herniated or degenerated discs, postural low back pain, lumbosacral strains or sprains, or

sacroilitis (4). Increases in muscular tension, brought on by muscle and joint immobility or stiffness, impairs range of motion and increases the chance of ERDs (1, 4). Poor flexibility restricts range of motion in areas such as the upper body (i.e., shoulders, torso, hip region). Poor back health among firefighters is frequently the result of inadequate levels of muscular strength in conjunction with the physical stress of the required tasks. It may also be caused by the protective clothing and heavy equipment that are frequently used (1). Although injuries of this nature may occur in any given firefighter, ERDs are less prevalent in fitter individuals able to better cope with the occupational stress firefighting places on the body.

### Planning Ahead: Recommendations for Designing a Complete Program

A comprehensive fitness program includes components that emphasize aerobic fitness, muscular strength and endurance, flexibility, agility, core strength, body composition, and back health (5). The following suggestions include important considerations for incorporating each of the aforementioned elements.

Initial aerobic goals should be to build up to 30 minutes of continuous exercise and be an enjoyable form of aerobic exercise that one would want to sustain (this may include cross-training approaches or activities outside of the gym). If improvements in body composition (reduce body fat) are the primary goal, then longer duration (30 – 60 minutes), moderate-intensity (65 – 80% HRMAX) bouts are suggested, combined with an appropriate resistance training program on alternate days to the aerobic conditioning (6). Various approaches such as interval training are also suggested, especially if limited ex-

ercise time is available and both aerobic and strengthening components are being addressed during each exercise bout. Regardless of your goals, exercise intensity is the most important variable to consider as working too hard can lead to injury and drop-out, whereas not working hard enough will promote frustration due to an inability to achieve the desired fitness outcomes. Practical ways to monitor exercise intensity include using a percentage of age-determined maximum heart rate ( $HRMAX = 220 - \text{age}$ ), rating of perceived exertion (moderate intensity: 5 – 6 on a 1 – 10 scale), and the talk test.

Resistance training programs can be accomplished in a time-efficient manner. For example, choosing multi-joint exercises to involve several muscle groups reduces the overall number of exercises needed to work the major muscle groups (and multi-joint exercises are typically more functional for everyday activities). These exercises should also be “structural” in nature—loads the spine to promote back/trunk conditioning—and when completed correctly, will promote correct postural alignment and core health. Adherence to correct lifting technique is imperative if the desired results are to be achieved (correct movement patterns for many resistance exercises can be found at <http://www.nasca-lift.org/videos/>).

Musculoskeletal imbalances are a major risk for injury. Consequently, a strong core (i.e., muscles of the lower back, abdomen, and lateral trunk) can be just as important as having good flexibility for avoiding low back injury and/or pain. While the inclusion of multi-joint exercises that necessitate stabilization while lifting will recruit the input of core musculature. Specific core strengthening exercises can also be included if desired. However, if time limitations are present,

isolated core exercises (i.e., side planks) are not necessary if the overall resistance training program is effectively designed. A strengthening program for all areas of the body, including the core, should be balanced—include exercises for agonist and antagonist muscle groups (i.e., lower back and abdominals; upper back/shoulders and chest). Additionally, an appropriate whole body strengthening program can help improve body composition by preserving and potentially increasing lean body mass and thus compliment aerobic exercise (aerobic exercise is needed to metabolize and reduce body fat) (7).

Flexibility training is essential and should not be neglected or rushed. However, static stretches (i.e., holding knee to chest to stretch hamstring) should be reserved for after the exercise bout; dynamic stretching after a short aerobic workout (about five minutes) should comprise the warm-up if the exercise to follow is also dynamic in nature (i.e., game of basketball as opposed to a 30-minute jog). Stretches for all major muscle groups and joints should be included. Stretches should be conducted, preferably, on most days of the week provided the stretching follows some form of aerobic activity, even if only walking (7).

Agility is generally a fitness trait targeted by athletes, but is an important component of firefighter fitness as it reflects an ability to change direction quickly without compromising force production (in the application of a given task) or balance or eliciting an ERD (1). While drills such as the cone drill, presented in the Issue 8 of the NSCA TSAC Report, is an excellent example of purposeful agility training, engaging in physical activities that require quick changes in direction and nimble footwork, such as basketball, volleyball, or tennis, are also practical (and

enjoyable) ways to incorporate this fitness element into a conditioning program.

### Take-Home Message

Injury prevention is much easier (and cheaper) to accomplish, than injury treatment and rehabilitation. Physically fitter firefighters are able to cope better with occupational stresses. While the suggestions mentioned previously are a starting point, further program development and progression will be necessary as fitness improves and will necessitate input from additional resources such as an individual trained in the area of fitness programming (i.e., CSCS, TSAC Facilitator). If health complications or concerns exist, or if currently on medication, physician approval should be sought prior to the initiation of even a moderate-intensity exercise program to avoid any further complications. A well-designed, well-balanced, personalized fitness program does not have to be a burden if one takes the time to plan ahead for potential obstacles and make it part of a weekly routine. #

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## A Hands-on Approach

*Tyler Christensen, CSCS*

**F**rom time to time it should be a goal of a strength coach to touch base with their tactical athletes and perform some of the athlete's specific job tasks to assist in the development of their training. Being familiar with your tactical population's tasks can also develop a rapport between the athletes and coach. Being involved beyond the strength and conditioning room can carry a lot of weight in the tactical arena. When the athletes see that their coach is willing or able to participate in, or demonstrate some of their tasks, the tactical athletes respect that.

In October 2009, the Colorado Springs Fire Department (CSFD) invited personnel from the NSCA to join them for a day of training. Personnel from the NSCA's Tactical Strength and Conditioning (TSAC) program got a hands-on approach to feel what it is like to be a firefighter. The importance of this experience for the NSCA was to learn more about the tasks that first responders experience on a regular basis. Experiencing these tasks first-hand will greatly assist in developing of a better understanding of their training needs, limitations and what the average day for a firefighter can entail.

### Grip Strength

A four-story brick training building with a large fire truck parked outside awaited the NSCA personnel upon their arrival. After donning all 75 pounds of gear, the training began. The first task involved learning to mount and dismount the truck. This was made difficult because of the restrictive nature the gear has on a person's range of motion and by the sheer weight of the equipment. The next task involved learning about the fire trucks and the location of equipment, which ranged

from unloading ladders to extrication tools. NSCA personnel soon realized that gripping was limited as well. The gloves that are worn by each firefighter limit the strength of their grip, making grasping heavy objects much more difficult.

Grip strength can be developed in a variety of ways. Wearing fireman gloves in the training process is an option for increasing grip strength and can be done with these exercises. It is important to know your limits and use common sense when training with the gloves (e.g., no Olympic-style lifts).

**A 5-Gallon Bucket of Rice:** The objective of the 5-Gallon bucket of Rice exercise is to grab as much rice as possible while trying to reach the bottom of the bucket. The motion is simply finger extension and flexion until the bottom of the bucket is reached and then followed by a return to the top.

**Farmer Carries:** Farmer carries utilizes a weight plate (size is dictated by grip strength) and involves carrying the plate 40 – 60 yards by using only the finger tips. If your plate has ridges, handles or other forms of grip, do not use these. Make sure that the thumbs are facing straight down to the floor with fingers pinching together.

**Plate Pinches:** Plate pinches involve two smaller plates being pinched together using only the finger tips with the thumb pointing straight down. The weights can be held in front of the athlete or down to the side. Once again, do not utilize any gripping assistance that the plates may offer.

**Pull-ups Varying Grip:** Vary the grip on pull-ups by changing hand position and number of fingers doing the pull-up. A rope or I-beam can be used to do pull-ups as well. A resist-a-band may be offered for assistance to beginners.

### Core Stability

The next task had the NSCA personnel learning how to properly set up ladders and charging the water hoses. The ladders used in training ranged from 14 – 24 feet and each individual learned to set up the ladders using different techniques. To make the training more difficult, electrical lines were placed in strategic locations that had to be avoided and increased the level of difficulty. The NSCA personnel quickly realized that taking a ladder down is just as difficult as putting it up and required core stability. The next task was operating the fire hose. Each individual was impressed with the pressure exerted by the water that flowed through the hose. The task was initially completed with a two-man team where one would control the nozzle and the other would assist in holding the hose. When the hose was controlled by one individual, the task became much harder and core stability became much more important. To be able to lift the ladders, one had to maintain core integrity so the ladder did not push one out of position or come crashing back down. Being able to remain stable through the core also assisted the operators in maintaining control of the fire hose.

Core stability is commonly developed through exercises like planks, rotations, flexions and extensions. Each one of these vectors can be made more or less difficult by modifying implement, sets, reps,

weight, lever length, base of support, speed, load and volume.

**Front Planks:** To begin planks one must start in the prone position with the elbows in contact with ground under the shoulders with the toes tucked under. To perform a plank, one must raise the torso and hips to a modified push-up position with elbows and toes in contact with the ground and maintain contracted abdominals insuring not to sag in the middle or raise the glutes into the air.

**Side Planks:** Side planks are performed while lying on the side, and placing the feet in a toe-to-heel position with the lower elbow in contact with ground under the shoulder. At this point, rise up to a straight plank position with only the feet and one elbow in contact with the ground. It is important to maintaining the top shoulder and hip are constantly pointing towards ceiling. Be sure to train both the left and right sides.

**Russian Twist (Rotation):** A Russian Twist is performed by sitting on the glutes with the knees bent at about 90 degrees and with the heels in contact with the ground. While maintaining contracted abdominals and hip flexors, raise the feet off of the ground by leaning back and balancing on the glutes. At this point, rotate from side to side.

**Hanging Knee Ups (Flexion):** Hang from a bar that allows the feet to be elevated off the ground. Contract the core and raise the knees to the chest. During the eccentric phase, slowly return the body to the starting position in a controlled manner. The knees can be raised to the elbows and to the sides to increase difficulty.

**Reverse Hyperextension (Extension):** To perform a reverse hyperextension, one must lie in the prone position on an object that allows the upper torso to remain stable and allows the legs to hang off the edge without touching the ground. While hanging, contract the abdominals and keep the chest in contact with the surface. At this point, contract the glutes and extend the legs. The legs should not be raised higher than the head. Return to starting position in a controlled manner.

## Fitness

The training the NSCA personnel experienced then shifted from handling equipment to testing aerobic and anaerobic endurance. Each individual had to climb all four stories of the training building and come back down in full gear. Speed became an afterthought by the third story and it became clear that a pace must be set in order to avoid the onset of complete exhaustion. If this was not enough, the training progressed with the inclusion of face pieces which forced each individual to breathe from their self-contained breathing apparatus (SCBA). This inclusion made the already taxing task of climbing flights of stairs even more complicated. After completing the task a few times and rehydrating, the NSCA personnel faced another curveball in their training session. The CSFD brought out 50 feet of three-inch hose, weighing an additional 37 pounds. This brought the total loaded weight to about 112 pounds for each individual. The hoses were draped over one shoulder, or over the air pack, and had to be carried to the top floor and then returned to the ground floor.

These events demonstrated the need to maintain and increase both aerobic and anaerobic capacities. These capacities can potentially be increased through various exercises.

Long Slow Distance (LSD): Aerobic activity at a “conversational” pace without distress (approximately 70% of  $VO_2$ max or 80% of maximum heart rate) for 30 – 120 minutes, one to two times per week. In return, the tactical athlete will have enhanced cardiovascular function, improved mitochondrial energy production and increased fat utilization (1).

**Intervals:** This type of training is not advised until aerobic endurance has been established. Training at close to Heart Rate max or  $VO_2$ max for 3 – 5 minutes (or as little as 30 seconds) with 3 – 5 minutes of rest (a work-to-rest ratio of 1:1, unless at shorter more intense bouts) for one or two times per week. Intervals increase the  $VO_2$ max and enhance anaerobic metabolism (1).

**Circuits:** Are performed typically above lactate threshold (1). Circuits can utilize both aerobic and anaerobic systems in one workout. Circuit training can develop strength, power and fitness depending how the circuit is constructed (2). This type of training program has a set amount of rest periods and work periods. It is important to maintain quality of repetitions over quantity of work completed to minimize potential for injuries. Circuit training is a great way to develop a base foundation for general fitness.

Upon completion of the training, the individuals from the NSCA had a greater appreciation for the fire department’s knowledge, strength and perseverance needed to perform these tasks on a day-to-day basis. Following the events, the team had an after-action review to further discuss the skills that could be developed in the Human Performance Center to assist the CSFD in becoming more efficient and effective in their daily job. This hands-on approach assisted in building

rapport, gaining a greater understanding of the needs of the training, and developing a base to increase specificity.

Greg Infantolino said, “The training was great. We were able to come up with a few exercises to implement in the HPC. It also gave me a greater appreciation of what these guys do on a regular basis.”

Carol Scheideman the CSFD Firefighter/Paramedic and Peer Fitness Trainer said, “The NSCA/TSAC is a valuable asset for the Colorado Springs Fire Department and this training opportunity was a win-win situation. The trainers were able to have a hands-on experience and can now help our members improve their performance with a better understanding of job skills. We look forward to working with the NSCA again in the future.” †

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# Training the Human Weapons' Platform: The Squat

*Mark D. Stephenson, MS, ATC, CSCS,\*D*

The most important weapon in our nation's arsenal is the human weapon. Viewing the tactical athlete as a weapons platform requires the need to strengthening this platform and will help keep the weapons system functioning effectively and sustain its capabilities for an extended period of time. The tactical athlete needs to strengthen both stationary and dynamically during movement. The weapons platform needs to maintain both strength and mobility. One method used to achieve this goal is by introducing the squat into the tactical athlete's strength and conditioning program.

The squat is a widely used exercise that involves a powerful movement (1, 3). A common goal is to achieve both muscle size and strength (1, 3). There are many types of squatting movements. Along with these variations come different methodologies and applications.

## Back Squat

The back squat is one of the most common squat methods used to develop the lower body (1). The muscles emphasized in this exercise are the quadriceps, hamstrings, and gluteals. The back squat is more gluteal/hamstring dominant. It is performed by placing the barbell on the back of the shoulders and across the shoulder blades. The tactical athlete assumes a Universal Athletic Stance with feet parallel and hips width apart. The tactical athlete begins by lowering the body by pushing the hips back and flexing at the knees until the desired depth is reached. Once the desired depth is achieved, the tactical athlete then returns to the starting position, completing one full repetition.

## Front Squat

The front squat is another common squat method used to develop the lower body. The muscles emphasized in this exercise are the quadriceps, hamstrings, and gluteals. The front squat is more quadriceps dominant. It is performed by placing the barbell on the front of the shoulders across the deltoid muscles. The tactical athlete assumes a Universal Athletic Stance with feet hips width apart. The tactical athlete begins by lowering the body by pushing the hips back and flexing at the knees until the desired depth is reached. Once the desired depth is achieved, the tactical athlete then returns to the starting position, completing one full repetition.

## Staggered Squat

The staggered squat can be performed in either the back squat or front squat position. The difference is in the positioning of the feet. The tactical athlete assumes the Universal Athletic Stance with feet parallel and hips width apart. However, the toe of the rear foot is in line with the instep of the forward foot. The tactical athlete begins lowering the body by pushing the hips back and flexing at the knees until the desired depth is reached. Once the desired depth is achieved, the tactical athlete then returns to the starting position, completing one full repetition.

## Bottom Squat

The bottom squat can be performed in either the back squat or front squat position. The difference is in the starting position. The tactical athlete assumes the Universal Athletic Stance with feet parallel and hips width apart. However, the starting position is in either a full squat

or quarter squat position. The tactical athlete begins by extending the knees and pushing through the heels of the feet in an upward direction. Once in the standing position, the tactical athlete then returns to the starting position by lowering the body by pushing the hips back and flexing at the knees until the desired depth is reached, completing one full repetition.

## Time Under Tension (TUT)

The TUT method is used to increase the amount of time it takes to perform each repetition thus eliciting a higher blood lactate level (3). This method can be applied to any of the above exercises however; it is considered an advanced method and should only be employed by experienced lifters.

## Speed of Movement

Both speed and strength are two of the most desirable physical qualities in athletics. Most often these are trained separately however they are related (2). The tempo that is prescribed should reflect the desired outcome of the exercise. When absolute strength is desired, a longer elapsed time is needed. When explosiveness is the desired outcome, a shorter elapsed time is needed. However the most important outcome we are looking for in the tactical athlete is the Rate of Force Development (RFD). It is possible for someone to have high levels of strength but not be able to generate force quickly. Many programs that use RFD typically have the athletes move through the movement as fast as they can. The issue with this type of instruction is that the muscles spend a larger portion of the time decelerating the load (2). Controlling the speed is the

key element with this methodology. As with TUT, this is a more advanced training method and the athlete should attain high levels of maximum strength before implementing. #

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The banner features a night view of the Walt Disney World Swan and Dolphin Resort. The NSCA logo is on the left, with the text 'NSCA™ 33<sup>rd</sup> National Conference & Exhibition' and 'July 14 –17, 2010 / Walt Disney World Swan and Dolphin Resort / Orlando, FL'. A circular badge on the left contains 'CEUs NSCA 2.0 NATA 20'. On the right, four circular inset photos show people at the conference: a person at a desk, a person on a treadmill, three people smiling, and a person performing a squat.

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## Forward and Rear Lunge: A Functional Exercise for All Tactical Athletes

*Tyler Christiansen, CSCS*

The forward and rear lunges are important to a tactical athlete in movement. The tactical athlete must be able to have the balance and stability to stand and kneel without hindering tactical movements that involve loads exceeding 40lbs—this must be done without tripping, falling or stuttering. This can be done with practice, proper muscle recruitment patterns, and training with loads that are similar to what are carried on typical missions.

The purpose of these exercises is to strengthen and reinforce proper form for kneeling behind cover, or “taking a knee” to a supported firing position during tactical operations. The forward and rear lunges will prepare the tactical athlete for missions that require him or her to stand and kneel multiple times.

### Forward Lunge

To perform a forward lunge, the tactical athlete will take an exaggerated step forward, keeping the torso erect as the lead foot moves forward and makes contact with the floor. The lead foot should be planted flat on the floor with the foot pointing straight ahead. The lead hip and knee should be flexed slowly, keeping the lead knee directly over the foot. The trailing knee should be simultaneously flexed, with most of the weight on the heel of the forward foot, resulting in a “Double L” position with the toes pointing forward at all times. The “Double L” position refers to the front leg being at 90 degrees with the foot flat on the ground and the rear leg being at 90 degrees with the knee on the ground. While in the down position, make sure that the forward knee stays behind the toes and in front of the heel.



Figure 1. Forward Lunge:  
Start Position



Figure 2. Forward Lunge:  
End Position

Again, it is important to keep the torso erect throughout the entire movement. At this point, the athlete has a choice of returning to the starting position or continuing forward into another lunge while utilizing the opposite leg. When stepping forward to another lunge, it is important to not stutter step but to move fluidly to the next step. Once again, the tactical athlete will want to put emphasis on keeping the weight on the heel of the forward foot at all times.

### Reverse Lunge

To perform a reverse lunge, the tactical athlete would take the same stance except the first step would be to the rear while the weight stays on the heel of the forward foot. To add resistance to this exercise it would be ideal to add a 40-pound weighted vest to simulate the tactical athlete’s gear. Other implements could be a

barbell or dumbbell(s). A single dumbbell could be used to improve stability and is ideal for firefighters to simulate carrying a 50-foot hose weighing approximately 35lbs on one side of the body. For a member of the police or armed forces, the use of a “rubber duck” (fake weapon), a standard e-z curl bar (47 inches long), or a standard 18-inch bumper plate (starting around 5kg) can be used for additional resistance.

The forward and rear lunges are an important aspect of training. They can be administered in the warm-up or during the workout itself. The use of alternative implements is recommended to bring out the specificity of the ultimate mission and reach the fitness goals of the tactical athlete. †

# Combination Training for Peak Power Conditioning

*Buck Blackwood, MS, CSCS*

Is your workout stale and in need of a change of pace? Or is there not enough time in the day to properly train? If the answer is yes, combination training may provide the solution. Combination lifts are widely used among weightlifters but receive little attention elsewhere. This relatively unknown method of training benefits all strength and power athletes by providing explosive, sport-specific movement patterns that are efficient and produce results.

## Added Effort

By definition, combination lifts are the summation of two or more multi-joint exercises or movements trained in one set. Combination lifts differ from traditional lifts in that you perform two or more exercises without any rest for the duration of the set. For example, a traditional workout may call for four sets of four repetitions in the clean, then four sets of four repetitions in the front squat. To perform a combination lift, complete a clean followed by a front squat without putting the bar down. This action accounts for one repetition and the process would need to be repeated four more times to complete a set.

The execution of a combination lift, then, would produce four cleans and four front squats to complete a set of four clean-to-front squat combination lifts. Make no mistake; this style of training is for the highly-motivated and serious athlete who is looking to increase his or her conditioning to the highest level.

## Combined Benefits

This type of training can be of immense benefit to many power athletes because of the recurring explosiveness of this type of training that is similar to their sport. Power athletes require dynamic dexterity to be successful in their performance. Combination lifts train synchronous movement patterns involving the whole body and thereby significantly enhance overall coordination, timing, and the all important element of ground reaction force (1). For example, a combination like the power clean, plus the front squat, plus the push press requires you to perform multiple exercises in a coordinated and powerful manner. By combining pulling, pressing, and squatting movements, this style of training simulates fluid power movement patterns that are essential for sporting success.

## Combined Lifts

Before you jump into combination training, you need to give some thought to why you want to incorporate this type of training into your existing program and what the goals of combination training should be. In general, the goals include (2):

- Improved neuromuscular coordination
- Increased workload and intensity of your training
- Maximum stimulation of your muscles
- Increased cardiovascular benefits of free-weights
- A dynamic and efficient workout

In your selection of lifts be sure to choose those exercises that emphasize basic pull-

ing, pressing, and squatting movements. The basis for these combination lifts are weightlifting movements such as the snatch and clean and jerk. Other exercises may be substituted, but it is important to always include ground-based total body movements that are performed explosively. By varying exercise selection and the combination of patterns, you can design a dynamic and challenging workout.

Here are two examples of combination lifts with technique tips (3):

### *Clean + Front Squat + Jerk*

First: Execution of the clean requires you to first extend the legs, then the body upward in an explosive movement, finally shrugging the shoulders and rising up on the balls of your feet before pulling under the bar and receiving it at the shoulders. Upon catching the barbell, continue into the bottom position followed by returning to a standing position.

Second: Maintain a good rack of the barbell with your elbows high and torso erect, then descend into the bottom position of a front squat and return to a standing position.

Third: Return to a hip-width stance, maintain or adjust the racked barbell if needed (your chin should be tucked in), bend your knees to a quarter-squat position and explode by extending your knees and getting onto the balls of your feet, followed by pushing under the barbell and landing in a split position. That completes one rep and you should reset to the starting position of the clean and continue with the prescribed number of reps until the set is complete. Then you can rest.

### *Snatch + Back Squat + Push Press*

First: The width of your grip in the snatch is wider than in the clean. Execution of the snatch requires you to first extend the legs, then the body upward in a powerful movement, finally shrugging the shoulders and rising up on the balls of your feet before pulling under and pushing up hard against the barbell. Upon catching the barbell in an overhead position, continue into the bottom position followed by returning to a standing position.

Second: Lower the barbell with control into a back squat position and complete a deep squat.

Third: Return to a hip-width stance and maintain a snatch grip, keeping your trunk upright, dip and bend the knees followed by a powerful extension driving the bar vertically as high as possible. That completes one rep and should be followed by resetting to the starting position of the snatch and continuing with the prescribed reps until the set is complete. Then you can rest.

Both combination lift examples detail an overly simplified progression of movement patterns. As with any highly technical athletic skill, proper performance of the exercises is essential to both the safety and success of the lift. Hands-on coaching of the weightlifting movements is mandatory. Finally, any successful system of training requires consistent implementation to produce results.

## **Programming**

The equipment required for combination training can be found in any well-equipped facility for weightlifting: platforms, bumper plates, and high-quality “Olympic” bars. Dumbbell combinations may also be used to train around certain upper-body injuries or improved unilateral training.

Combination lifts are especially useful during the competitive phase of training or high-volume training cycles, but should be limited to three or four complex movements per workout. This is carried out 2 or 3 days a week using no more than six repetitions per set. Do not implement more than six repetitions per set because the movements should be explosive. Sets should range between two and four depending on how many separate combinations are being trained. Manipulate intensity by selecting a resistance that allows completion of the full number of required repetitions using perfect technique. Always make technical proficiency the determining factor when increasing the weight.

The choice of different combinations is limited only by your imagination to match the movements in the weight room to those performed in competition. Initially, an athlete’s physical condition and technical proficiency will limit the degree of difficulty. First, practice the weightlifting exercises separately (i.e., clean, jerk, and snatch). Then, add basic exercise combinations with no more than two complex movements like the clean and jerk. As with any strength training program, adaptation will occur, thus progressive combinations with multiple complex movements are needed to challenge an athlete’s skill and physical condition. Again, always make technical proficiency the determining factor when designing complex variations. Lastly, program design should avoid training combinations exclusively; include specific exercises to address muscle balance and injury prevention.

Combination lifts are ideal for in-season training or for a new approach to a stale workout. Time, effort, and acceptable strength levels can be maintained with this style of training. However, be warned that combination training is not for the faint of heart. †

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