Here's To Your Health!

A Phoenix Fire Department Health Center Publication

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What are METS? Our annual physical at the Health Center entails a Cardiac Stress Test that measures cardiac health and efficiency in the form of METS. According to NFPA 1582, a firefighter must have "maximal exercise tolerance of <42ml O2/min/kg or < 12 metabolic equivalents (METS)." Workload demands of fire fighting have been shown to exceed these levels.

To understand what a MET is we need to first define and understand Maximal Oxygen Uptake. The oxygen demand of working muscles is directly related to their mass and metabolic efficiency. Therefore, exercise involving a larger mass of muscle is likely to be associated with a higher total oxygen uptake. **Maximal oxygen uptake is described as the greatest amount of oxygen that can be utilized at the cellular level for the entire body.** It has been found to correlate well with the degree of physical conditioning and has been accepted as an index of total body fitness.

The capacity to utilize oxygen is related not only to the lungs effectiveness, but also to the ability of the heart and circulatory system to transport the oxygen and to the body tissues' ability to utilize it. **The maximal oxygen uptake increases and decreases with the degree of physical conditioning.** Resting oxygen uptake is estimated at 3.5 ml O2 per kg of body weight per min; this value is defined as 1 metabolic equivalent, or 1 MET.

The more fit your heart is:

- Resting heart rate decreases because the interior dimensions of the ventricles increase (they can hold more blood) thus increasing stroke volume at rest.

- "Because a given intensity of activity requires a given amount of oxygen, the cardiac output at a given intensity is essentially the same whether one is trained or untrained. Since more blood is pumped with each contraction (with a trained heart), the heart beats fewer times per minute to achieve the necessary oxygen delivery. The benefit of a heart not needing to work as hard to deliver the same amount of blood is obvious.

- The stroke volume during exercise becomes greater therefore; maximal cardiac output is significantly greater following training because of the increase in stroke volume.

- Since a given intensity requires a given amount of oxygen, the heart rate at any given submaximal intensity will be lower.

  Example: An untrained person that runs a 10-minute mile pace measures his heart rate at 150 bpm. After a few months of proper aerobic training, that same person may only raise his heart rate to 125 bpm at the same 10-minute mile pace.

- Aerobic training produces new capillaries in active skeletal muscles, increasing the area for the exchange of oxygen.

- Aerobic training increases the mitochondria density (more of the muscle cell is occupied by mitochondria) which leads to a significant increase in the amount of aerobic enzyme activity in the cell.

The bottom line is that the treadmill/METs program is designed to increase in speed and incline as time progresses. It is not programmed to achieve a steady speed or reset to 0 grade. It will always get faster and more inclined.

Therefore the heart, as the test progresses, will always need to work harder to accommodate the increase in speed and incline. The test shows how hard the heart is working to try to accommodate this increase in speed and incline.
A more fit heart will, because of increased stroke volume and the increased ability to use oxygen due to increased aerobic enzyme capacity, perform the treadmill test more efficiently with a lower heart rate and a longer time to reach the submax rate which is based on the patient's age.
Source: American Council on Exercise Personal Trainer Manual.

Heart Disease: An Epidemic For Firefighters - Landmark FEMA Study Results Released

ATLANTA, March 17 /PRNewswire/ -- H. Robert Superko, MD, principal investigator in the landmark FEMA-sponsored study of firefighters aged 40 and over conducted at Saint Joseph's Hospital in Atlanta, released preliminary findings in the world's first study of first responders at risk of suffering sudden death or other significant cardiac events. Firefighters are known to have a three hundred percent increased risk for cardiac disease as compared to other segments of the population.

"Preliminary findings show that *one third* of firefighters had heart disease that is unrelated to traditional risk factors, such as high cholesterol," says Dr**.** Superko. "Those results are astounding and point at job duties and environment as the primary determinants for early death in our country's first responders."

Dr. Superko, recognized as a leading expert on lipids, cholesterol and advanced metabolic markets and their contribution to heart disease, and his team performed a comprehensive, scientific battery of sophisticated blood and imaging tests on three hundred firefighters in Gwinnett County, Georgia. Gwinnett County first responders were identified for the study following an emotional report by Fire Chief Steve Rolader, following the sudden death of one of his firefighters from cardiac arrest while fighting a house fire.

"This wasn't the first firefighter in my department to die but I wanted to do something to make it among the last," says Chief Rolader. "This man was 53 years old, in great physical shape and he had no known symptoms of heart disease. We also had lost several newly-retired firefighters to sudden cardiac death. There had to be a way to stop it."

Study volunteers underwent a comprehensive genetic screen of more than a million genes including newly identified KIF6 (statin responsiveness gene) and 9p21 (myocardial infarction gene), advanced phenotype (blood) and imaging analyses, diet and exercise review over the year-long study. Results and explanations were presented to the groups followed by individual consultations. Complete statistical and comprehensive genetics results are expected this year.

According to Dr. Superko, stress and psychological pressures related to the job, as well as diet, exercise issues and inherent personality, interacting with a genetic predisposition to heart disease, probably have tremendous impact on the risk of heart attack in these first responders.

"Imagine being awakened from a dead sleep by a loud, shrieking siren several times during the night, responding through the rush of adrenaline, carrying a hundred pounds of equipment on your back, and meeting people at the very worst possible moments in their lives every day and you can begin to understand the toll it takes on the first responders," says Superko. "And, consider the emotional and psychological stress they encounter each day as they respond to society's most brutal moments from murders to car wrecks and death. Finally, those who serve as first responders have a mind-set and a desire to help people. They certainly bring a competitive nature to the job but also a profound desire to help and to do the best for others. All these elements create an environment that puts them at an increased risk for cardiac disease."

In response to the growing awareness to issues of diet and exercise, Gwinnett Fire Department has instituted exercise programs within local firehouses and the county now re-reimburses for fitness club memberships. The department also educates firefighters on proper diet and nutrition with one-on-one opportunities as well as "lunch and learn' programs in the station houses. And, over the years, the traditional firehouse alarm in Gwinnett stations has been replaced with softer alarms and even-voiced prompts to awaken sleeping first responders.

As a result of the study, Saint Joseph's Hospital and Dr. Superko's team implemented a two month screening program for all Atlanta first responders (firefighters, Police and EMS) regardless of age in order to provide them with some basic and advanced diagnostic tests at prices affordable to firefighters. Several physicians are providing their services free of charge.

"There are tremendous costs associated with early deaths of our first responders in every community as we lose men and women in their 30s, 40s and 50s who are our first line of defense but who don't live to perform their jobs for very long," says Chief Rolader. "With the results of this study, we can implement programs across the country that will save lives." Final results are expected to be submitted for presentation consideration at the annual American Heart Association meeting.

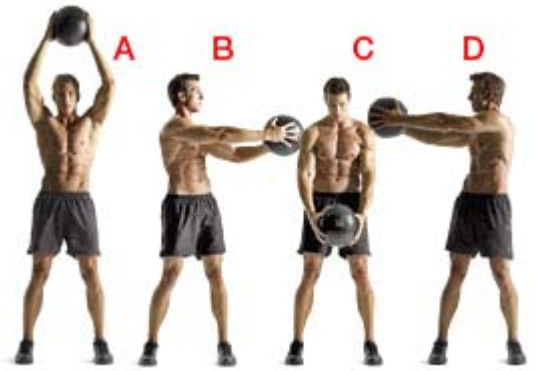
Med Ball 200

This cutting-edge routine is the same one that University of North Carolina strength and conditioning coach Jonas Sahratian uses to whip the Tar Heels into championship-game shape. It's designed to help you build a rock-solid core, burn fat, and improve your sports performance.

Sahratian calls this workout the Med Ball 400. However, Sahratian suggests you start with 200 reps. (Call it the Med Ball 200.) The best part: All you need is a medicine ball to do this workout any place, any time.

Perform this routine at the end of your regular workout or as a stand-alone workout, 3 days a week. (Use a 6-, 8-, or 10-pound medicine ball. Do 20 repetitions of each exercise in the order shown. Complete the routine as a circuit, doing 1 set of each movement in succession and without resting. Too easy? Rest 60 to 90 seconds and do the circuit again.

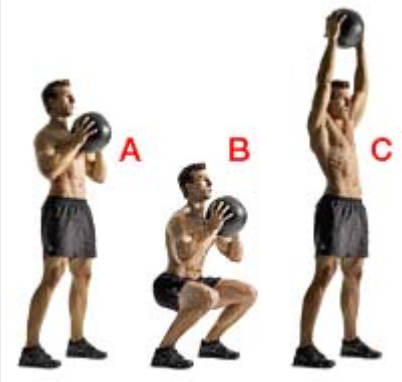
By: Dan Wiederer, Photographs by: John Loomis, Workout Photography by: Beth Bischoff



1. Big Circles. Standing with your feet shoulder-width apart and knees slightly bent, hold a medicine ball with your arms extended directly above your head [A]. Without bending your elbows, rotate your arms counterclockwise [B], using the ball to draw large imaginary circles in front your body [C, D]. Do 10 circles, and then reverse direction to clockwise and do 10 more.

2. Woodchopper. Stand with your feet just beyond shoulder-width apart. With your arms nearly straight, hold a medicine ball above your head [A]. Now bend forward at your waist and mimic throwing the ball backward between your legs -- but hold onto the ball the entire time [B]. Quickly reverse the movement with the same intensity, and return to the starting position. That's 1 repetition.

3. Standing Russian Twist. Hold a medicine ball with both hands in front of your chest and your arms straight [A]. Without dropping your arms, pivot on your right foot and rotate the ball and your torso as far as you can to the left [B]. Then reverse direction: Pivot on your left foot and rotate all the way to the right. That's 1 repetition.



4. Squat to Press. Stand holding a medicine ball close to your chest with both hands, your feet just beyond shoulder-width apart [A]. Push your hips back, bend your knees, and lower your body until the tops of your thighs are at least parallel to the floor [B]. Then simultaneously drive your heels into the floor and push your body back to the starting position as you press the ball over your head [C]. Lower the ball back to the start. That's 1 repetition.

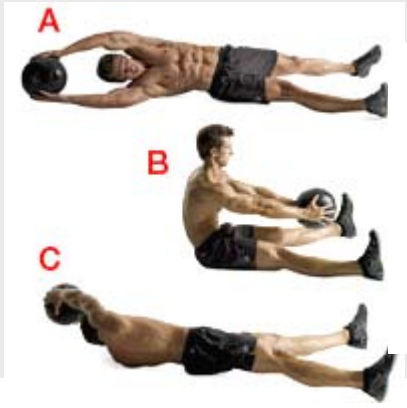
5. Medicine-Ball Situp. Grab a medicine ball with both hands and lie on your back on the floor. Bend your knees 90 degrees, place your feet flat on the floor, and hold the medicine ball against your chest [A]. Now perform a classic situp by raising your torso into a sitting position [B]. Lower it back to the start. That's 1 repetition.

6. Rocky Solo. Sit on the floor with your legs straight, and hold a medicine ball with both hands just above your lap [A]. Twist your torso to the right and place the ball behind you [B]. Then twist all the way to your left and pick the ball up and bring it back to the starting position [C]. That's 1 repetition. Do 10 repetitions. Immediately do another 10 repetitions, but this time start by twisting with the ball to your left.

7. Toe Touch. Grab a medicine ball, lie on your back, and raise your legs so they're straight and perpendicular to the floor. Hold the ball above the top of your head with your arms straight [A]. Without moving your legs or bending your elbows, simultaneously lift your arms and torso until the ball touches your toes [B]. Lower yourself back to the starting position. That's 1 repetition.

8. 45-Degree Twist. Grab a medicine ball and sit on the floor. Lean back at a 45-degree angle, raise your legs and feet off the floor, and hold the ball with both hands in front of your chest, your arms straight [A]. Without dropping your legs or arms, rotate the ball and your torso as far as you can to the right [B]. Then reverse direction, rotating all the way to the left. That's 1 repetition.

9. Suitcase Crunch. Lie on your back with your legs straight. Use both hands to hold a medicine ball above your head and barely off the floor [A]. Simultaneously raise your torso and bend your right knee toward your chest as you bring the ball over your knee and toward your foot. Reverse the movement and repeat, this time bending your left knee [B]. That's 1 repetition.



10. Diagonal Crunch. Grab a medicine ball and lie on the floor with your legs straight and spread wide. Roll onto your right hip and hold the ball with your arms straight at 10 o'clock above the top of your head [A]. To perform the movement, raise your arms and torso and then touch the ball to the floor between your legs [B]. Lower your body, but instead of rolling back onto your right hip, roll onto your left and hold the ball at 2 o'clock above your head [C] before you repeat the movement. That's 1 repetition. Repeat, alternating back and forth in this manner.