Recruit Academy Physical Fitness

As a firefighter, it is important to understand that a high level of wellness and fitness will only be achieved by training all of the components within both the skills- and health-related groups. Because these components are measurable, individual levels of wellness and fitness will range from high to low. If an individual excels in one component but not in another (for example, scores high in cardio-respiratory endurance but low in flexibility), it does not always add up to having a high fitness level. It is important to achieve a high level of health-related fitness for the protection of health. However, as a firefighter, it is also important to achieve a level of skill-related fitness for the protection of your life as well as others.

The information provided is designed to improve all future recruits overall fitness levels while minimizing the risk of injury and preparing recruits to successfully perform job responsibilities. Las Vegas Fire and Rescue is a paramilitary organization and its academy is run in a military-style format. Job requirements dictate that firefighters have certain specific capabilities, including strength, endurance, and aerobic and anaerobic abilities. The Academy physical training program consists of circuit and interval training, muscular strength, core strength, cardio-respiratory endurance and flexibility exercise.

What to Expect at LVFR Recruit Training Academy. Physical fitness is the responsibility of each recruit. Preparation for the job of firefighter should start months to years before the first day at the Training Academy. Each day of training includes some form of physical fitness drill in addition to strenuous firefighting evolutions. As a candidate, if you have embraced a physical fitness mindset, you will ensure that you will be able to keep pace in the training program, both physically and academically. Again, **physical fitness is your responsibility.**

As a firefighter fecruit, your trainers will intentionally induce stressful situations to help you better understand the demands of firefighting, and train you mentally and emotionally to handle work-related stressors. Mental toughness is a character trait of successful recruits.

Recruits attend the academy for several months of intense training. This training includes activities in fire suppression, hazardous materials, emergency medical services, emergency vehicle operations, daily physical fitness and more. It is vital to your success to come in physically fit.

Please visit the link below for instructional video on the fitness testing.

LVFR Fitness Evaluation (youtube.com)

Principles of Physical Training

For the career firefighter, it is important to maintain good health both for on the job and for quality of life after the job. It is also important to have a good fitness level in order to maintain a high level of performance and to stay safe and injury-free on the fire ground.

Four principles apply to all physical training programs: overload, specificity of training, individual differences, detraining, and FITT (frequency, intensity, time and type).

The **Overload principle** must be used to stimulate an increase in fitness level. It means that exercise must be done at a higher level than the body is accustomed to to bring about a training adaptation. Making changes to combinations of exercise frequency, intensity, duration, rest and types of exercise are ways to bring about overload.

Specificity of Training refers to the principle of training–induced adaptations that are specific to the sport or job ultimately training for. Running or cycling may improve cardiorespiratory fitness but it will not improve your tennis performance. Therefore, it is important to train those muscles that will specifically be used for fighting fires or doing work performance.

Everyone responds differently to an exercise program. Each firefighter has individual strengths, weaknesses, goals and needs. For firefighters to meet work performance and fitness standards, as well as to maximize their physical capacity, exercise programs must be individualized.

Detraining will occur if the firefighter does not maintain a regular exercise program. Due to the nature of the job, a firefighter must always be ready and physically able to handle any situation presented. All aspects of the skill- and health-related components must be developed. To achieve the most from any training program and prevent de-training, it is necessary to follow the FITT principle. The number and intensity of the workout are just as important as the time spent exercising.

To help you prepare for a career in firefighting, the staff and cadre at the Training Center have instituted a physical fitness and education program gathered from many fire departments around the world. As you read on, some sections will help you become more knowledgeable and proficient in warming up, stretching, muscular power, strength, endurance, cardiovascular fitness, core training, and making it all come together with firefighter-specific training. There are also major areas that past recruits have failed to overcome, such as nutrition, hydration and recovery, that are extremely important, which will also be covered. Take the time to make every area in this handout a part of your life since YOU have chosen to apply for a career with Las Vegas Fire and Rescue. Do not think that you will be able to come to the Academy to get into shape. You will not only fail but will also increase your chances of injury. Remember the Certified Physical Ability Test (CPAT) is one step in many that gets you closer to your goal of becoming a firefighter.

Physical Training Evaluation

Physical Training Evaluations are conducted three to four times throughout an academy. The recruits can expect to have a PT evaluation within the first few weeks of the academy. This will measure the recruit's entry-level of physical fitness. Again, these standards are the minimum and recruits should be well beyond these minimum standards by the end of the academy. They are merely a first step that helps us determine if you are ready to proceed in this process. We strongly recommend you take advantage of the following provided resources before you consider testing for Las Vegas Fire and Rescue.

Event	Minimum Passing/ Time	Warning	Failure
Hex Deadlift	220 lbs (3 Reps.)	1	Minimum of 3 reps and minimum weight of 220 lbs.
Power Throw	20Ft. 2 attempts (10lbs Slam ball)	1	Failure of both attempts, Not throwing a minimum distance of 20ft.
Hand Release Pushups	30 Repetitions	2	Not completing 30 reps. More than 2 warnings.
Sprint-Drag-Carry	1 Minute 50 Seconds	1	Not making minimum time. More than 1 warning.
Leg Tuck	10 Repetitions	2	Not making minimum attempts. More than 2 warnings.
1.5 Mile Run	13 Minutes 30 Seconds	0	Not Making minimum run time.

Warm-up and Stretching

Warm-up – For any physically active individual, there is always a possibility of sustaining an injury. While some injuries, such as an ankle sprain or fracture, are difficult to prevent, many other injuries are preventable. By following a few simple guidelines, injuries such as muscle strains, tendonitis, and overuse injuries can be reduced. Every workout must begin with a warm-up and end with a cool-down. A warm-up is necessary to prepare the body for exercise by increasing heart rate and blood flow to working muscles. The warm-up should start slow and easy and consist of a general cardiovascular exercise such as walking, jogging or biking. The goal is to break a sweat. After 10 minutes, the warm-up should focus on muscles and movements more specific to the exercise activity planned. Creating a smooth transition from the warm-up to a specific activity is a great way to prevent injuries. For example, a soccer player could pass, dribble, and shoot the ball; a weightlifter could lift light weights before moving onto greater resistance.

Flexibility is a key part of every good warm-up. Once the muscles are warm, they become more elastic and are ready to be stretched. Whether you choose to perform static stretches (by holding each position for 10-30 seconds) or perform dynamic stretches (by moving the body through a functional range of motion) flexibility prepares the muscles, tendons and joints for work by allowing them to move freely through a full active range of motion. The more prepared the body is, the less likely it is to get injured.

Flexibility is trainable – and must be trained because it is intrinsic to every skill or technique, no matter how simple/complex or power-oriented. It is also movement-specific, which is why an increase in a single range of motion is not our only objective. Through a combination of static and functional stretching and strengthening, your muscles and tendons can increase in length (as well as girth), elasticity and resiliency; and their ability to act in a ballistic "spring-like" manner during explosive movements. The net result: improved mechanical/metabolic efficiency, technical proficiency and injury resistance.

To achieve optimal gains in flexibility, you must:

Stretch only once your muscles are warmed up. When muscles are cold, they are resistant to lengthening and you will not get as good of a stretch. If you can't get the muscles sufficiently warm and stretched, injury is more likely to occur during your workouts.

- Perform your exercises in a full range of motion. This improves your "active mobility," the ability to safely and effectively use your range of motion during dynamic movements.

- Stretch before and after each workout. Doing so will result in better workouts, less soreness and quicker recovery between workouts.

Stretching Methods:

Static Stretching

You should stretch each muscle that you will be working during your workout. When stretching, position yourself so that you feel each stretch in the belly of the muscle(s) and not in the joint(s).

To have a beneficial effect, each stretch must begin gradually and be held long enough for this tightness to subside. Statically (without bouncing), stretch each muscle group to your comfort limit for 10-15 seconds, relax and repeat. You will be able to stretch a little further with each successive repetition.

Dynamic/Functional Stretching

Dynamic and/or functional stretching is taking a stretch (ideally sport or job-specific) and utilizing the speed of movement, momentum and active muscular effort to bring about a stretch.

Dynamic involves moving parts of your body and gradually increasing reach, speed of movement, or both. Dynamic stretching consists of controlled leg and arm swings that take you (gently!) to the limits of your range of motion. In dynamic stretches, there are no bounces or "jerky" movements. An example of dynamic stretching would be slow, controlled leg swings, arm swings, or torso twists.

Dynamic stretching improves dynamic flexibility and is quite useful as part of your warm-up for an active or aerobic workout.

Dynamic stretching exercises should be performed in sets of 8-12 repetitions. Be sure to stop when and if you feel tired. Tired muscles have less elasticity, which decreases the range of motion used in your movements. Continuing to exercise when you are tired serves only to reset the nervous control of your muscle length at the reduced range of motion used in the exercise (and will cause a loss of flexibility).

Once you attain a maximal range of motion for a joint in any direction, you should stop doing that movement during that workout. Tired and overworked muscles won't attain a full range of motion and the muscle's kinesthetic memory will remember the repeated shorted range of motion, which you will then have to overcome before you can make further progress.

Quality - the same principle applies to all aspects of training: you get out of it what you put into it. Stretching is not a motion we go through just because some textbook says so; and it will not be limited to pre- and post-workout, warm-up and cool-down sessions.

Muscular Power, Strength & Endurance

Principles of Strength Training

Muscular Fitness

To increase strength, muscles must contract repeatedly against a constant progression of relatively high resistance. This does not occur during aerobic exercise (for example jogging) alone. Strength training needs to be included in a total fitness program.

Fighting fires involves a great deal of muscular strength, power and endurance. Throwing ladders, climbing stairs in full gear, dragging or carrying victims, chopping through roofs and doors, pulling ceilings, etc., all require muscular fitness.

Strength is the maximal force or torque a muscle or group of muscles can generate at a specified or determined velocity.

Power is the product of force and velocity. It is the rate at which an individual performs work.

Endurance is the time limit or number of times an individual can maintain muscle contractions.

Benefits of Strength

In addition to increasing physical performance, muscular fitness is also important (if not more so) for preventing injuries. Increasing the strength of the muscles around the joint allows the muscles to act as shock absorbers. If muscles are weak, the shock will be absorbed by bone, joints, ligaments and tendons, often leading to pain and/or injury.

Weak muscles and muscle imbalance (muscles of the front of the body are stronger than the back of the body) are responsible for a high percentage of injuries caused by physically demanding jobs such as firefighting and rescue.

Strength training and having stronger muscles also help to increase or maintain bone. Contraction of a muscle over the bone stresses the bone to bend. Bones respond to this stress by growing denser and stronger.

Increasing muscle mass also increases metabolism as an individual gets older. Muscle utilizes more energy (burns more calories) at rest than fat.

Strength/Weight Training Programs

Strength training is a method of improving muscular strength by gradually increasing the ability to resist force through the use of free weights, machines, or the person's body weight. Strength training sessions are designed to impose increasingly greater resistance, which in turn stimulates the development of muscle strength to meet the added demand.

It can be hard to decipher what fitness regimen will deliver results. But truthfully, it's not difficult at all to determine what workout will provide health benefits. An easy way to get started is by utilizing the F.I.T.T. principle. This acronym stands for Frequency, Intensity, Time and Type.

Frequency: As you might expect, this refers to how often you will exercise. After any form of exercise is performed your body completes a process of rebuilding and repairing. So, determining the frequency of exercise is important to find a balance that provides just enough stress for the body to adapt and also allows enough rest time for healing.

Intensity: Defined as the amount of effort or work that must be invested in a specific exercise workout. This, too, requires a good balance to ensure that the intensity is hard enough to overload the body but not so difficult that it results in overtraining, injury or burnout.

Time: Again, this is rather self-explanatory. Time is simply how long each session should last. This will vary based on the intensity and type.

Type: What type of exercise will you be doing? Will an exercise session be primarily cardiovascular, resistance training, or a combination of both? What specific exercises will you perform?

Now you know the F.I.T.T. principle, planning a workout program and getting started should be a breeze. The ACSM (American College of Sports Medicine) has F.I.T.T. guidelines both for cardiovascular work and strength training. For cardiovascular benefits, they recommend exercising for a frequency of 35 times per week, at an intensity equal to 60-85 percent of your maximum heart rate for a time of 20-60 minutes. For strength training, they recommend working out a minimum of two times per week at an intensity that is equal to 70-85 percent of your one rep maximum (the maximum weight you can use for one rep) for 8-10 reps and 1-3 sets. Planning a new fitness routine by breaking it into the four F.I.T.T. principle pieces allows you to quickly create a workout plan that will truly provide you with results.

For beginner exercisers, choosing the type of exercise may be the best place to start mapping out your routine. After all, if you have the perfect frequency, intensity, and time, but hate the actual exercise, then you'll never do it. So, start with something you like. This may be walking, biking, swimming or something else. Next, determine the frequency. Consider how much time each week you truly will devote to this workout. Be realistic. There's no purpose in setting expectations so high that you likely will fail. Remember, the ACSM guidelines are 3-5 times per week, so a good start would be three days.

If you are very limited in your schedule, then determining your time would be the appropriate next step. Otherwise, choose your Intensity level, which will help determine how long your workout session should be. For example, a higher intensity will typically provide more benefits (such as burning more calories in a shorter amount of time). So, choosing to jog may require only 30 minutes of commitment versus walking which may require 45-60 minutes.

Here's a quick example of both a cardiovascular and resistance workout program that utilizes the F.I.T.T. principle. Walk (type) at 4 m.p.h. (intensity) for 45 minutes (time) four times per week (frequency). Perform exercises with dumbbells (type) at 70 percent of your maximum 1 rep strength (intensity) for 8-12 reps (time) 3 times per week (frequency).

Modified Theoretical Model of Strength Training

Phase	Hypertrophy	Basic Strength	Strength & Power	Maintenance	Active Rest
Sets	3 - 4	3 – 4	3 – 4	3	1 – 2
Reps	8 - 12	4 – 6	2 – 3	10 – 8 – 6	15 – 20
Intensity	low	high	high	moderate	low
Volume	high	moderate	low	moderate	high

To minimize injury, it is important to have muscle balance. That means equal strength for opposing muscle groups (equal strength in front and back muscles as well as equal strength in left and right). Including dumbbells and bi-lateral lifts in a strength program will equalize bi-lateral strength. Examples of opposing muscle groups are chest vs. back, quadriceps vs. hamstrings, low back vs. abdominals, etc.

TECHNIQUE is a priority! Good form must always be first. **Do not sacrifice** form for heavier weight.

Always move weight through a full range of motion of the muscles and joints. Muscle groups will get stronger throughout the entire range of motion only if the load is applied at every position.

To maximize a strength training program it is important to use an amount of weight per number of repetitions that takes the muscle being used to muscular exhaustion. If the program calls for sets of 10 repetitions, the weight used should be heavy enough so that the 8th, 9th, and 10th repetition is a struggle to do, but not so heavy that completion of the reps cannot be accomplished.

How many sets should be done? It depends upon what result is needed. It is always good to do a warm-up set if using a weight heavier than the individual is used to. The research tends to show that for 'optimum' strength gains, three sets of a fairly heavy load will produce the most gains in strength.

Speed of Movement

There are two phases of lifting a weight. The initial phase is when the weight is lifted against gravity and the muscle belly shortens in response to the tension. The second phase is when the weight is lowered going with gravity to return to the starting position causing the muscle belly to lengthen with tension.

The weight should be moved as quickly as possible during the initial phase. Because this movement is against gravity as the weight increases this eventually may be hard to do. The muscles will adapt by getting stronger. The second phase where gravity is assisting with lowering the weight should be done slower than the initial phase to stimulate muscle tension as the muscle belly lengthens. Otherwise, momentum takes over for the muscle and it will not receive the full benefit of the load.

TECHNIQUE IS EXTREMELY IMPORTANT AND SHOULD NEVER BE COMPROMISED WITH HEAVIER WEIGHT!

STRENGTH EXERCISES

Lower Body	**Chest**	**Back**	**Shoulders**
Squat	*Bench Press	Bent Over Row	*Arnold Press
Front Squat	*Incline Bench	**Lat Pulldown	*Upright Row
Deadlift	Close Grip Bench	Hang Body Pull	Military Press (front)
Romanian Deadlift	Dips	Seated Row	*Shoulder Series
Straight Leg Deadlift		**Pull-ups	*Reverse Fly
Overhead Squat		Back Extension	Overhead Press
Single Leg Squat		Single Arm DB Row	

Lunge- walking/stationary: Front, Lateral, Back

Step-ups: Front, Lateral

*Try to use dumbbells (DBs) as much as possible for bilateral strength. **Using towels with these lifts will also help increase grip strength.

POWER EXERCISES

Box Jumps Power Clean Hang Clean Clean & Jerk Snatch Hang Snatch

Split Jumps DB Cleans DB Snatch

FIREFIGHTER SPECIFIC EXERCISES

Squat – starting from a standing position, back is straight, shoulders back, head stays level, move hips back and lower body until thigh is parallel to the floor. [If you are in the correct position, you should be able to wiggle your toes in the down position] Keep the back straight and push through the heels to stand back up to start position.

Plyometric Box Jumps – squat w/thighs parallel to the floor; using your arms, explosively jump up to stand (entire foot) on a sturdy box 24 inches or higher, and finish by stepping down.

Lunge Walks – carry a minimum of 45 pounds; keep knees over ankle, press through the heel, back straight and chest up.

Lunge Walk w/MB (medicine ball) Twist – carry a MB w/arms straight out in front of body. As you step forward and go down to the lunge position, rotate your torso (arms remain as straight as possible) and touch MB to the floor opposite bent front leg.

Single Leg Step-Ups – carry a minimum of 45 pounds; step up onto a box 18 inches or higher.

DB Row w/Triceps' Extension – with DB in one hand put opposite knee and hand on the bench. Keep back straight and pull DB from the down position back to hip (similar to starting a lawn mower). From that up position, with the upper arm parallel to the floor extend DB straight back. Repeat the sequence backward to return to the start position.

Overhead Press (from front) – shoulder strength and endurance are essential in firefighting.

Deadlifts – Please consult a Peer Fitness Trainer or strength coach specialist if you are not familiar with this lift.

Power/Hang Clean – Please consult a Peer Fitness Trainer or strength coach specialist if you are not familiar with this lift. You can also look @ http://athleticadvisor.com/Weight_Room/power_cleans.htm

Quad Strength – run/walk backward up a hill. Run sprints backward. These all simulate dummy drag.

Anaerobic Training – track sprints: 2 lap warm-up, 2-minute rest, (1 lap sprint, 2-minute rest, repeat x 4), 3-minute rest, 1 lap backward run, 1 lap cool down. Don't forget to STRETCH AFTERWARD!

Stair Running – If you have access to a weight vest, use it; if not try to take 2 steps at a time. Parking garages and high school/university stadiums are best. Some hotels don't mind if you use a back stairwell.

A List of Exercises and Muscles Worked

CHEST	*SHOULDERS*	*ARMS*
Bench press	Arnold press	Curls
Close-grip bench press	Front press	Concentration curls
Incline press	DB press	Hammer curls
Decline press	One-arm DB press	Low pulley curls
Push-ups	Lateral raises	High pulley curls
Dips	DB reverse fly	Barbell curls
Dumbbell (DB) press	Front raises	Machine curls
DB fly	Side-lying lateral raises	Preacher curls
Incline DB press	Low pulley lateral raises	Reverse curls
Incline DB fly	Low pulley front raises	Pushdowns
Peck deck fly	Low pulley bent-over lateral raises	One-arm reverse pushdowns
Cable crossover fly	One-arm DB front raise	Reverse pushdowns
DB pullover	Barbell front raises	Wrist curls
Barbell pullover	Upright row	Reverse wrist curls
		Triceps extension
		DB triceps extension
		One-arm DB triceps ext.
		Seated DB triceps ext.
		Seated EZ-bar tri ext.
		Triceps kickbacks
		Triceps dips

BACK	***LEGS/GLUTES***	***POWER/TOTAL BODY***
Pull-ups	Squat	Power clean: bar/DB
Reverse pull-ups	Wide stance (power) squat	Hang clean: bar/DB
Lat pulldowns	Front squat	Power snatch: bar/DB
Back lat pulldowns	Db squat	Hang snatch: bar/DB
Close-grip lat pulldowns	Angled leg press	Push press: bar/DB
Straight-arm lat pulldowns	Hack squat	Box jumps: bar/DB
Seated rows	Leg curl: lying, seated, standing	Dynamic step-ups: front & lateral
One-arm DB rows	Good mornings	Dynamic split squat
Bent over rows	Calf raises: donkey, seated calf	Jump squats
T-bar rows	Seated barbell calf raises	
Stiff-legged deadlifts	Lunges: walking, lateral, front, back	
Deadlifts	Step-ups: front, lateral	
Sumo deadlifts	Hip extension: floor, stand/cable, b-wt.	
Back extension & Reverse back extension	Hip abduction: floor, stand/cable, b-wt.	
Upright rows	Bridging: floor, stability ball	
Barbell shrugs		
DB shrugs		

Cardiovascular Fitness

Principles of Cardiovascular Training

Physical Conditioning for Cardiovascular Fitness

Some firefighters train very sporadically. They might exercise in preparation for an upcoming fitness assessment, but stop training once the assessment is over. However, physical fitness must be maintained year-round, since the need to perform demanding firefighting and rescue tasks may arise at any time.

To increase your level of cardiovascular fitness, you must undertake a regular program of sustained aerobic exercise. As previously mentioned, this program must meet certain criteria. These criteria are collectively referred to as the "FITT principle," standing for the important characteristics of the exercise program:

The most effective exercises for producing an improvement in cardiovascular fitness are those that are performed continuously while using large muscle groups. These exercises cause an increased volume of blood to be pumped throughout the body.

Activities that meet these criteria include jogging, brisk walking, cycling, aerobics, cross-country skiing, swimming, etc. As long as you keep moving at an adequate intensity for a sufficient period of time, the type of exercise you choose is not that important.

Progression

A vital element of an effective cardiovascular exercise program is progression. After several weeks of regular sustained aerobic exercise, your cardiovascular system will adapt by improving itself somewhat, bringing you to a slightly higher level of cardiovascular fitness.

To improve further requires that you do one or more of three things: exercise more frequently, exercise a little longer during each workout, or exercise at a slightly higher intensity. By making incremental changes in your workout every few weeks, your level of cardiovascular fitness will steadily increase. Once you stop making these increments, your level of fitness cannot improve anymore--no further stimulation means no further adaptation.

With respect to increments in intensity, you'll notice as the weeks go by that you have to exercise at a higher intensity just to maintain the same "feel" to your workout. In other words, the level of intensity you once maintained no longer feels very difficult; thus, you naturally exercise a little more intensely to get the same effect. This is a sure sign that you're getting in better shape!

Increments in exercise intensity- be it strength or conditioning- MUST occur gradually. The body cannot adjust instantly to sudden leaps in workload, which often results in INJURY. Improving your level of fitness should be approached as a long-term project that requires dedication, discipline, and patience.

Depending upon an individual’s current fitness level, the greatest amount of improvement in cardiovascular fitness is usually experienced in the first six to eight weeks of the exercise program. After

this initial time period, improvements continue to occur, but at a slower rate. Remember: most machines wear out with repeated use. The human body is the only machine that gets better with use. Regular exercise keeps the body youthful and functioning well.

Warm-up

On the next page, there is a sample beginning aerobic exercise program. It is important before beginning the aerobic workout to prepare your body first by doing 5 – 10 minutes of light aerobic activity followed by doing some of the stretches earlier illustrated. Warming up before aerobic exercise is important for two reasons. Number one, warming up and light stretching of the muscles reduces the risk of injury. Secondly, your aerobic system is not equipped to "instantly" meet the sudden increase in demand for fuel. It is important to gradually "gear up" to a higher capacity and this process will take a few minutes. Warming-up allows the aerobic system to keep up and maintain a constant flow of oxygen and fuel. Otherwise, the anaerobic system may take over to make up the difference and put you into an "oxygen deficit" that may prematurely end your aerobic workout due to exhaustion.

Sample Beginning Aerobic Exercise Programs

Week 1 & 2	*Week 3 & 4*	*Week 5 & 6*	*Week 7 & 8*
15 minutes	20 minutes	25 minutes	30 minutes
Exercise at a **Moderate Intensity**			
Week 9 & 10	Week 11 & 12	Week 13 & 14	Week 15 & 16
30 minutes	30 minutes	35 minutes	35 minutes
Gradually increase the intensity of each workout			
Week 17 & 18	Week 19 & 20	Week 21 & 22	Week 23 & 24
40 minutes	40 minutes	45 minutes	45 minutes

After six months of sticking to this program, you will see a significant improvement in your aerobic fitness level. Once you have achieved a level of cardiovascular fitness you should begin to prepare yourself for the challenges that face you in the academy. You can make your timed runs into distance and challenge yourself on time. The rule of thumb is not to increase your mileage total by any more than 10%. Another avenue to increase cardiovascular fitness is with interval training. Unless you have been performing cardiovascular exercises for several weeks' interval training or speed work is not recommended. If you have been participating in cardiovascular training for several weeks (at least 10 weeks) you may want to incorporate Interval training into your routine. Limit your interval training days to one session per week.

Cooling down

During aerobic exercise, the repeated contractions of large muscle groups act as a secondary pump to circulate blood throughout your body. If you stop exercising suddenly, the secondary pumping action of the muscles ceases abruptly, leading to “pooling” of blood in the extremities of the lower body. This means less blood returning to the heart and brain, which can result in passing out or fainting. Therefore, cooling down is just as important as warming up. So keep moving and gradually slow down your movements over several minutes.

Monitoring Exercise Intensity

What level of intensity is right for you? The ability to monitor and adjust exercise intensity is essential to the safety, effectiveness, and enjoyment of aerobic exercise. "High" levels of intensity may contribute to injury, fatigue, and exercise burnout. "Low" levels will produce little or no cardiovascular effect. Monitoring intensity also helps exercisers document their increasing levels of fitness, which serves as an insensitive to keep working out.

For safe and effective cardiovascular workouts, many experts recommend exercising at an intensity equal to 60 to 90 percent of your maximum heart rate or 50 to 85 percent of your heart rate reserve (Karvonen formula). Both of these methods for determining your target heart rate will be described later. Although heart rate can provide a helpful guide, people are different, so sometimes general rules do not apply.

Several other limitations exist:

- Fitness gains depend to some extent on your current level of fitness. If you are unfit, you will begin to achieve cardiovascular benefits at intensity levels below 60 percent maximum heart rate. If you are in great shape, you may need to work at higher intensity levels to show improvement.
- Some people--including hypertensive, cardiac patients, diabetics, and pregnant women--do not have a "normal" heart rate response to exercise.
- Antihistamines, cold medications, antidepressants, and tranquilizers affect the heart rate that might make monitoring inaccurate.
- Caffeine and nicotine affect heart rates in ways that can influence this type of monitoring technique.

For these reasons, it is recommended that you use a simple "talk test" or "exertion awareness check" to ensure that you maintain a moderate level of intensity during the workout.

Talk Test

You should be able to breathe comfortably, deeply, and rhythmically during aerobic exercise--even be able to carry on a conversation. But, if you are gasping or are short of breath, or cannot talk or answer a question, you probably should reduce your exercise intensity.

Exertion Awareness Check

During exercise, use any simple method to evaluate on a "gut level" how hard you are working. A numerical scale such as the "Rate of Perceived Exertion" (Borg scale) might be used.

“Rate of Perceived Exertion”

6 Like brushing your teeth

7 Very, very light

8 ----------

9 Very light

10 ----------

11 Fairly light

12 ----------

13 Somewhat hard

14 ----------

15 Hard

16 ----------

17 Very Hard

18 ----------

19 Very, very hard

20 Cannot continue

Calculation of a Target Heart Rate

Process		Example
Step 1:	Calculate your predicted maximum heart rate	220 - 30= 190
Step 2:	Take your resting heart rate	60
Step 3:	Subtract your resting heart rate from the predicted maximum	190 - 60= 130
Step 4:	Multiply the figure calculated in Step 3 by **percent of intensity desired** (50% or .5 to 85% or .85)	130 x .5= 65
Step 5:	Add the figure calculated in Step 4 to your resting heart rate	65 + 60= 125
Step 6:	This is your estimated target heart rate	*125 (at 50%)*
Step 7:	Repeat steps 4 & 5 using .85 to get a target heart rate for 85%.	130 x .85= 111 111 + 60= 171

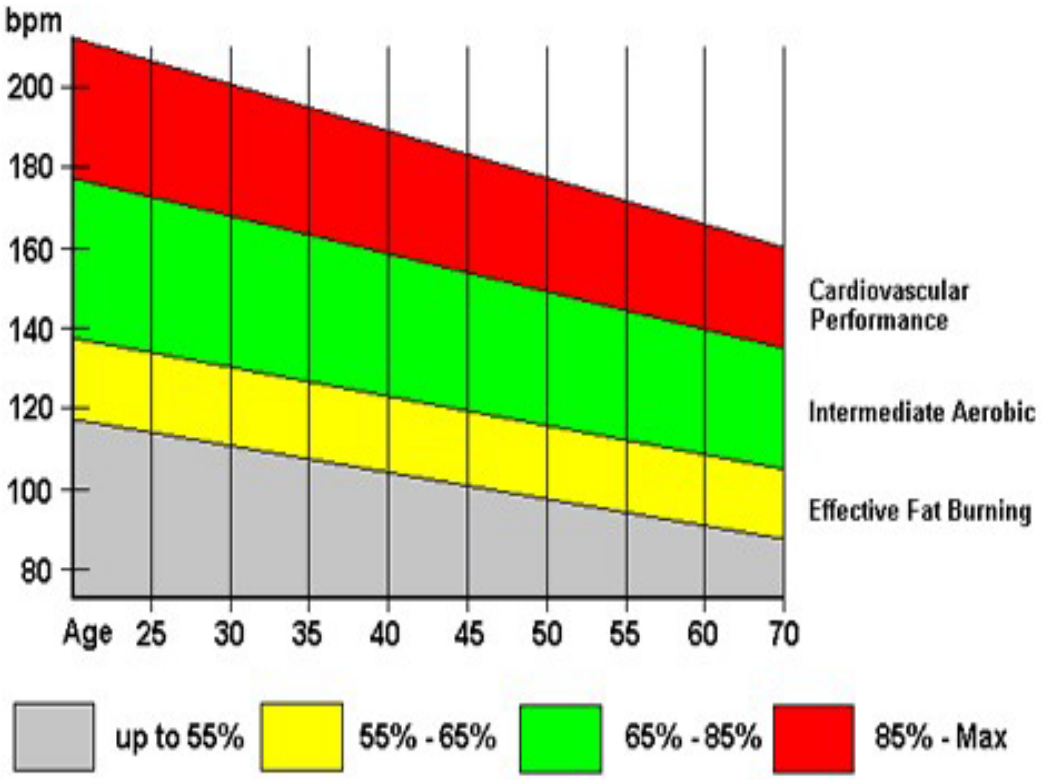
[For a 30-year-old man with a resting heart rate of 60 beats per minute (bpm)]

171 (at 85%)

Exercise heart rate range for a 30-year-old man with a resting heart rate of 60 bpm is:
125 bpm (at 50%) to 171 bpm (at 85%)

You can also use this chart to determine your training heart rate zone.

Training Heart Rate Zone



Use the charts below to calculate your estimated oxygen uptake and cardio-respiratory fitness level.

Estimated Maximal Oxygen Uptake

(VO 2max) for 1.5-Mile Run Test

Time	**VO 2max (ml/kg/min)**	**Time**	**VO 2max (ml/kg/min)**	**Time**	**VO 2max (ml/kg/min)**
6:10	80.0	10:30	48.6	14:50	34.0
6:20	79.0	10:40	48.0	15:00	33.6
6:30	77.9	10:50	47.4	15:10	33.1
6:40	76.7	11:00	46.6	15:20	32.7
6:50	75.5	11:10	45.8	15:30	32.2
7:00	74.0	11:20	45.1	15:40	31.8
7:10	72.6	11:30	44.4	15:50	31.4
7:20	71.3	11:40	43.7	16:00	30.9
7:30	69.9	11:50	43.2	16:10	30.5
7:40	68.3	12:00	42.3	16:20	30.2
7:50	66.8	12:10	41.7	16:30	29.8
8:00	65.2	12:20	41.0	16:40	29.5
8:10	63.9	12:30	40.4	16:50	29.1
8:20	62.5	12:40	39.8	17:00	28.9

8:30	61.2	12:50	39.2	17:10	28.5
8:40	60.2	13:00	38.6	17:20	28.3
8:50	59.1	13:10	38.1	17:30	28.0
9:00	58.1	13:20	37.8	17:40	27.7
9:10	56.9	13:30	37.2	17:50	27.4
9:20	55.9	13:40	36.8	18:00	27.1
9:30	54.7	13:50	36.3	18:10	26.8
9:40	53.5	14:00	35.9	18:20	26.6
9:50	52.3	14:10	35.5	18:30	26.3
10:00	51.1	14:20	35.1	18:40	26.0
10:10	50.4	14:30	34.7	18:50	25.7
10:20	49.5	14:40	34.3	19:00	25.4

W.W.K. Hoeger, and S. A. Hoeger. *Principles and Labs for Fitness and Wellness, 8th Edition.* Belmont, CA: Wadsworth Thomson Learning, 2005.

Suggested VO2 Max Levels for FIRE FIGHTERS

VO2	1.5 Mile Time
50+ **OPTIMAL**	under 10:20
46 – 50 **Recommended**	10:20 – 11:29
40 – 45 **Marginal**	11:30 – 13:14
<40 **Inadequate**	over 13:15

FITNESS LEVELS – normal population

(Based on VO 2max in ml/kg/min)

Gender	Age	Poor	Fair	Average	Good	Excellent
	≤ 29	≤ 24.9	25-33.9	34-43.9	44-52.9	≥ 53
	30-39	≤ 22.9	23-30.9	31-41.9	42-49.9	≥ 50
Men	40-49	≤ 19.9	20-26.9	27-38.9	39-44.9	≥ 45
	50-59	≤ 17.9	18-24.9	25-37.9	38-42.9	≥ 43
	60-69	≤ 15.9	16-22.9	23-35.9	36-40.9	≥ 41
	≥ 70	≤ 12.9	13-20.9	21-32.9	33-37.9	≥ 38
	≤ 29	≤ 23.9	24-30.9	31-38.9	39-48.9	≤ 49
	30-39	≤ 19.9	20-27.9	28-36.9	37-44.9	≤ 45
Women	40-49	≤ 16.9	17-24.9	25-34.9	35-41.9	≤ 42
	50-59	≤ 14.9	15-21.9	22-33.9	34-39.9	≤ 40
	60-69	≤ 12.9	13-20.9	21-32.9	33-36.9	≤ 37
	≤ 70	≤ 11.9	12-19.9	20-30.9	31-34.9	≤ 35

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General Body Fat Percentage Categories

Classification	***Women (% fat)***	***Men (% fat)***
Essential Fat	10 – 13%	2 – 4%
Athletes	14 – 20%	6 – 13%
Fitness	21 – 24%	14 – 17%
Acceptable	25 – 31%	18 – 25%
Obese	32%+	25%+

Core Strength Training

The core region consists of far more than just the abdominal muscles. In fact, core strength training aims to target all the muscle groups that stabilize the spine and pelvis. It's these muscle groups that are critical for the transfer of energy from large to small body parts during many activities.

The muscles of the trunk and torso act to stabilize the spine, pelvis, and shoulder girdle. From this solid, balanced base the limbs can be moved powerfully and under control. Before rapid movements of the extremities can take place, the central nervous system stabilizes the spine in anticipation (1). The rate at which the core muscles stabilize the spine may have a direct effect on the power of limb movement (2).

Core strength training differs from many traditional weight training routines by working both the lower back and abdominals in unison. The same is true for the upper and lower body. All athletic movements incorporate the core in some way. Very few muscle groups are isolated. Instead, the whole body works as a unit, and core strength training endeavors to replicate this.

What are the benefits of core strength training to us?

- Greater efficiency of movement
- Improved body control and balance
- Increased power output from both the core musculature and peripheral muscles such as the shoulders, arms, and legs
- Reduced risk of injury (the core muscles act as shock absorbers for jumps and rebounds etc.)
- Improved balance and stability
- Improved athletic performance!

Objective – to train the core muscles in a functional manner to prevent injuries and improve performance in firefighting tasks as well as improving the foundation for all movements to occur from.

Method – perform a series of exercises daily utilizing the major muscle groups of the core which includes your abdominals and your back mainly: rectus abdominis, transverse abdominis, external oblique, internal oblique, multifidus, erector spinae (minor core muscles gluteus maximus, trapezius and latissimus dorsi).

Exercises – core work can be done daily, focusing on muscle endurance and exhaustion.

18-week Program for Core Strength Training

Week 1:

Perform basic test to determine baseline – 1 minute sit-up test & plank for time

Learn proper techniques for main exercises. Focus on form over speed to prevent injury and ensure proper execution.

Learn and Use proper breathing techniques of blowing all the air out on the exhale and contraction phase, inhale on the rest and inhale phase (focuses attention on the transverse abdominal)

Week 2 – 6:

Going for time: perform exercises, varying the order, for 5 – 10 minutes each day

Exercises: Basic sit-ups, criss-cross, hip lifts w/legs extended straight up, double leg lower lift, double leg hold varying height, planks, planks with toe taps to the side, planks with arm extension, roll-ups, swimming

Week 7 – 12:

Perform progress test to determine level of fitness – 1-minute sit-up test & plank for time

Going for time: perform exercises, varying the order, for 10 minutes each day

Exercises: Basic sit-ups, criss-cross, hip lifts w/legs extended straight up, double leg lower lift, double leg hold varying height, planks, planks with toe taps to the side, planks with arm extension, roll-ups, swimming

Adding – spidermans, mountain climbers, plank knees in and out, medicine ball side to side, medicine ball side to side with legs extended, chops

Week 13 - 18:

Perform progress test to determine the level of fitness – 1-minute sit-up test & plank for time

Going for time: perform exercises, varying the order, for 10 minutes each day, increasing the intensity and duration of harder exercises

Exercises: Basic sit-ups, criss-cross, hip lifts w/legs extended straight up, double leg lower lift, double leg hold varying height, planks, planks with toe taps to the side, planks with arm extension, roll-ups, swimming

Add more advanced exercises spidermans, mountain climbers, plank knees in and out, medicine ball side to side, medicine ball side to side with legs extended, chops, walking push-ups, alternating sliding arms, and legs in plank with a push-up, teasers.

Beginner	***Intermediate***	***Advanced***
Sit Ups	Planks	Planks w/arm/leg lifts
Knee planks	Side Planks	Side planks w/lifts
Knee side planks	Mountain climbers	Planks w/Hip Dips
Crunches	Bicycle Crunch	Planks w/inner rotation
Birddog	Butterfly	Planks with Toe Touches
Leg lifts	Flutters	Adv. Birddog
Criss Cross	Hanging Leg Raises	V ups
Classic wood chop	Hanging Oblique Leg Raises	Alternating V ups
Crunches w/twist	Oblique Crunches	Russian twist w/resistance
Hip lifts	Russian Twist	Spiderman
Heel touches	In and Outs	Russian twist w/resistance
Superman	Scissors	Straight leg Pendulum
	V in's	
	Knee bent Pendulum	

Firefighter Specificity Training

We train for how we play, isn't it obvious that we should incorporate tools to train at a level of true firefighters? Most work done at fire incidents is 20 minutes in length with possible repeated bouts. These workouts should be done at an intensity equal to being on the fire ground. Again we should not begin at this level of training if you have not completed a basic workout program, are able to perform exercises in proper form, and are ready to take it to the next level. Here are some of the most basic movements performed by firefighters and mimicking these exercises should increase all levels of your performance:

1. Crawling
    - Great for core stability & strengthening shoulder joint.
    - Can be used in a variety of directions and positions (forward, lateral, w/sled)
    - Keep hands under shoulders to avoid shoulder impingement
    - Tighten core muscles during exercise
2. Getups/Burpee
    - Total body agility

3. Power sled/dragging
    - Useful in developing strength, power, and simulating fire ground activities
    - Very little eccentric component so there is little residual soreness
    - Use bilateral or unilateral (one-sided) movements
    - Minimum distance for results is 100yards per exercise
4. Cable and band pulls
    - Trains the pulling system: grip forearm, biceps, and back muscles
    - Pull from a variety of angles to simulate fire ground activities
    - Vary grip positions and implement for overall effectiveness
    - Cables develop strength while bands are better for assistance and conditioning
5. Core series
    - Helps train the core musculature in a functional manner to prevent injuries and improve performance in tasks and sports
    - Improves foundation for all movements to occur from
    - Use multiple positions: plank, side plank, and bridge
6. Chop
    - Trains abdominal muscles in a true functional manner including deceleration during back extension to prevent low back injuries
    - Can use different implements (DB, KB, hose, weight plate, sandbag) to perform exercises
    - Can safely chop from different angles and patterns to train entire low back, hip, core, and shoulder areas.
7. Pushups
    - Great for developing core stability, wrist flexibility, upper body muscle endurance, and strength
    - Use a variety of hand positions

- Feet can be placed on the ground, on the box/step up, or stability ball for added stability challenge.

8. Deadlift
    - Aids in developing lower body, core, grip, and back strength
    - Can use barbell, hex bar, DB, KB, sandbags, hose, plates
9. Lunge
    - Aids in developing lower body strength, stability, balance, and power
    - Can lunge in various directions and multiple planes of motion (sagittal, frontal, and transverse
10. Step-ups
    - Useful in developing lower body strength, balance, stability, and power
    - Helps improve job-specific endurance when wearing PPE, or a weight vest
    - Can step at various heights and in different directions for total leg and hip development
11. Overhead press
    - Useful in developing shoulder and upper body strength, balance, and stability
    - Improves job-specific tasks on the fire ground.
12. Equipment carry
    - Useful in developing upper body strength, arm strength, balance, and stability
    - Improves job-specific tasks on fire ground.

Workouts in this area are 20 min or less of compound functional movements done at a high intensity with possible repeated bouts. These workouts can be done with little or no equipment, depending on what you or your gym can provide. Obviously, with more equipment, there is more flexibility in the workouts. Training at this level teaches you to push past your comfort level and to dig deep inside to finish the workout. Here are some Body Weight Workouts. Cross fit is a useful tool, as you increase your strength, stamina, endurance, and commitment you can begin to incorporate more weight with your exercises. You can also begin to mimic certain firefighter tasks in your workouts.

Basic Body Weight Workouts.

7 min of Burpees – Proper form, do not cheat, and be consistent and strong during your movements. Count the total number of burpees. Try to implement this in your total fitness program set your goals and improve on your numbers.

20 minute workout of AMRAP (AS MANY ROUNDS AS POSSIBLE) – Count the number of rounds and improve on your number. Completion of all exercises equals one round.

1. 5 pull-ups
2. 10 push-ups
3. 15 squats

50- 40- 30- 20- 10- reps of Mountain climbers and high knee jumps. Remember to be explosive and strong in your movements and range of motion. Do not sacrifice proper form for quickness. As you get stronger and more consistent with your workouts these will become easier.

Max reps in 2 minutes of Sit-ups, rest 1 min, back extensions, rest 1 min. Remember, your range of motion.

Example 20 min AMRAP workout advanced. Add in an equipment carry, an overhead press, or a core series to change the intensity of the routine. Advanced WOD would be structured as follows; 5 pull-ups, carry two 40-pound dumbbells 50 feet, 10 push-ups, overhead press 30-pound dumbbells, 15 squats, 15 V-ups (core). Again this will be more advanced, do not attempt if you are beginning your program for the first time. Take the time to get your form down, run through the basic workouts, and as you increase your fitness level begin to challenge yourself. Become creative within your fitness program and routine. You can see proper form on exercises and videos at www.crossfit.com/cf-info/exercise.html. Criteria for exercises should be safe and effective, ability to scale up and down, high transfer of effect, ability to train multiple planes of motions, and movement-based (general or specific). Remember to include all areas in your training. To become a well-rounded and fit individual we have to work on our weaknesses no matter how difficult they are for us.

Remember, as a firefighter it is important to understand that a high level of wellness and fitness will only be achieved by training all of the components within both the skills and health-related groups. There are many ways to train and add as many tools as possible to help you achieve your goals.

Hydration & Nutrition

Hydration

Water is the most essential component of the human body as it plays an important role in the function of cells. Important functions of water include transportation of nutrients, elimination of waste products, regulation and maintenance of body temperature through sweating, maintenance of blood circulation and pressure, lubrication of joints and body tissues, and facilitation of digestion. More than half of the human body is composed of water, and it is impossible to sustain life without it.

WATER LOSS

Exercise produces an elevation in body temperature, which depends on the intensity and duration of exercise, environmental conditions, clothing worn, and metabolic rate. To get rid of the excess heat, your body secretes sweat, which is primarily composed of water and electrolytes such as sodium. The evaporation of sweat is the primary mechanism of heat loss during exercise. Exercise can lead to substantial water and electrolyte loss from sweat leading to dehydration and, in cases of excessive fluid intake, hyponatremia (low sodium in the blood). However, considerable variability exists from person to person concerning sweat loss. Therefore, the fluid and electrolyte requirements needed for the athlete are variable from person to person as well. If water and electrolytes are not replaced from these losses, the athlete will have a decrease in performance and perhaps an adverse effect on his or her overall health.

FLUID BALANCE

Thirst is a signal that your body is headed toward dehydration. Therefore, it is important to drink before you feel thirsty and to drink throughout the day. Thirst is not a good indicator of hydration and should not be used to monitor hydration status. One way to check your hydration status is to weigh yourself before and after exercise. The before-exercise measurement is best as a nude weight first thing in the morning after urinating. Comparing your body weight before and after exercise can be used to estimate your sweat loss and your fluid requirements. Any weight loss is likely from fluid loss, so drinking enough to replenish these losses will maintain hydration. The table below shows us that over a one percent loss in body weight indicates dehydration and over five percent indicates serious dehydration. These fluid losses need to be replaced. **% Body Weight Change**

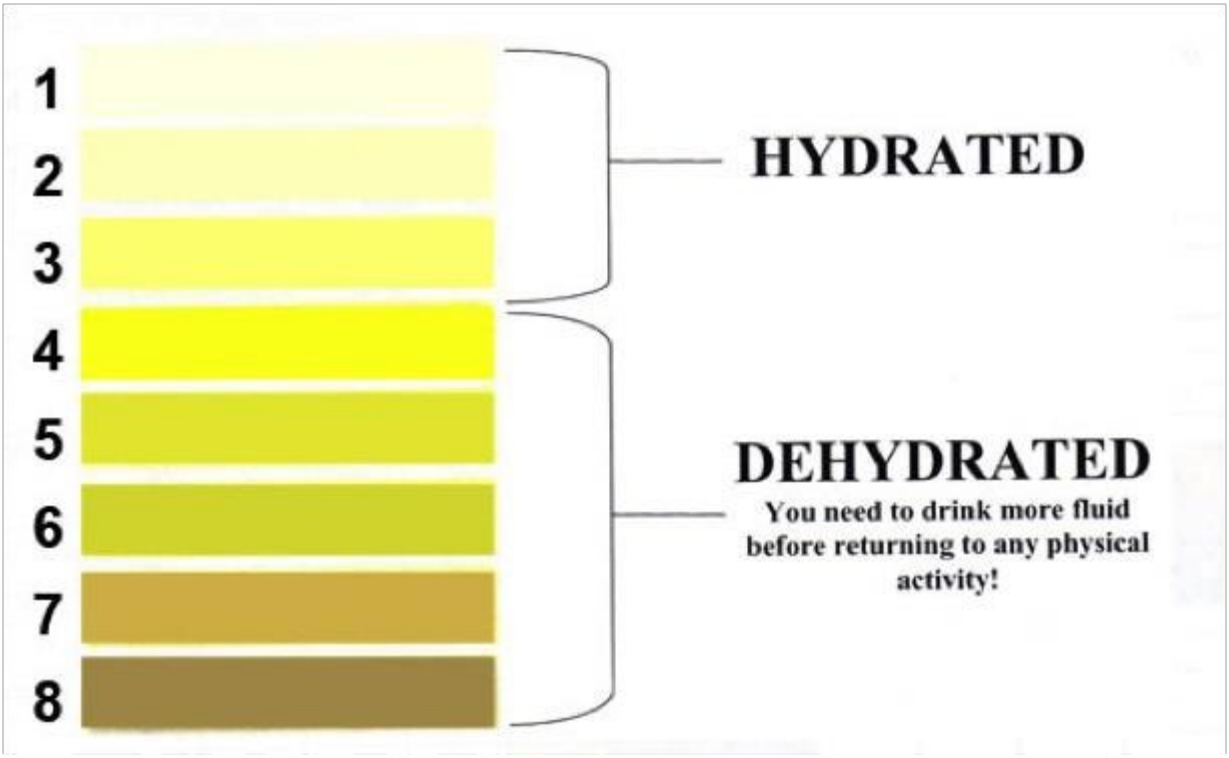
Well Hydrated -1 to +1%

Minimal Dehydration -1 to -3%

Significant Dehydration -3 to -5%

Serious Dehydration > -5%

Another way to check hydration status is the urine color test. A large amount of light-colored urine means you are well-hydrated. The darker the color, the more dehydrated you are.



DEHYDRATION

Dehydration is the loss of fluids and salts essential to maintain normal body function. Dehydration occurs when the body loses more fluids than it takes in.

Dehydration can lead to:

- Muscle fatigue
- Loss of coordination
- Inability to regulate body temperature
- Heat illness (e.g., cramps, heat exhaustion, heat stroke)
- Decreased energy and athletic performance

Moderate caffeine intake does not affect hydration status or urine output. Enhancing the palatability of a fluid will help to encourage fluid consumption. This can be done with proper flavoring, proper salt (sodium) content, and drinking a cold beverage (15-21 degrees Celsius).

SPORTS BEVERAGES

Carbohydrates within a sports beverage help to replenish your sugar (glycogen) stores and electrolytes help to accelerate rehydration. Sports beverages for use during prolonged exercise should generally contain four to eight percent carbohydrates, 20-30 meq/L of sodium, and 2-5 meq/L of potassium. The need for carbohydrates and electrolytes in sports beverages increases with prolonged activity.

Carbohydrate consumption helps to sustain and improve exercise performance during high-intensity exercise longer than one hour as well as lower-intensity exercise for longer periods. You should ingest one-half to one liter of a sports drink each hour to maintain hydration. Also, sports drinks should not exceed a carbohydrate concentration of eight percent.

HYDRATION BEFORE EXERCISE

Check your hydration status before exercise because there is a wide variability in fluid needs for each person.

• Drink 16-20 fluid ounces of water or sports beverage at least four hours before exercise.

• Drink 8-12 fluid ounces of water 10-15 minutes before exercise.

Consuming a beverage with sodium (salt) and/or a small meal helps to stimulate thirst and retain fluids.

HYDRATION DURING EXERCISE

• Drink 3-8 fluid ounces of water every 15- 20 minutes when exercising for less than 60 minutes.

• Drink 3-8 fluid ounces of a sports beverage (5-8 percent carbohydrate with electrolytes) every 15-20 minutes when exercising greater than 60 minutes. Do not drink more than one quart/hour during exercise.

HYDRATION GUIDELINES AFTER EXERCISE

Obtain your body weight and check your urine to estimate your fluid losses. The goal is to correct your losses within two hours after exercise.

• Drink 20-24 fluid ounces of water or sports beverage for every one pound lost.

OVERHYDRATION

Overhydration, also called water intoxication, is a condition where the body contains too much water. This can result in behavioral changes, confusion, drowsiness, nausea/vomiting, weight gain, muscle cramps, weakness/paralysis, and risk of death. In general, overhydration is treated by limiting your fluid intake and increasing the salt (sodium) that you consume. If overhydration is suspected, you should see your doctor for appropriate lab tests and treatment. You should not consume more than one liter per hour of fluid.

Nutrition

While attending and training before an academy recruits are required to bring their own food for the day. It is very important to eat and drink healthy throughout the day. Fire recruits should consume a diet that includes complex carbohydrates, proteins, and fats. Nutrition is just as important as the actual physical training itself. What you take into your body will greatly influence how you are able to perform physically. Remember, what you are eating will be the fuel for the fire that carries your body and mind through the physical fitness training you will be doing. To improve your personal level of fitness, it is important that nutrition plays just as important a role in your plan of exercise itself. See Wellness Coaches of America Handouts for more information on Nutrition.

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