Firefighter Fitness Programme

FIREFIT STEERING GROUP

Guidance on
Physical Training for Firefighters

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1. Introduction

It is important to realize that the role of a firefighter can be physically demanding, and consequently firefighters are required to maintain good general levels of physical fitness throughout their careers. As such physical training is an important part of a firefighters ongoing development. In order to maintain the training effect, exercise must be continued on a regular basis. If the training stimulus is not maintained, a detraining effect will occur. The following information is designed to provide guidelines on developing and maintaining cardiorespiratory fitness, muscular fitness and flexibility for firefighting and for general health benefits.

2. Important Safety Information

If you are in any doubt about your health or physical ability to exercise, you should consult a Doctor before commencing any physical training programme. This is especially important if you are (or think you might be) pregnant, if your health status has recently changed, or have not exercised for the last six-months or have had a recent illness or injury.

Remember there are no quick ways to develop good general fitness levels. You must progress slowly and gradually by following a structured training programme to reach your goal. Many people train too hard or too frequently to start with, become injured and end up not being able to train effectively at all. It is better to do too little than too much during the early stages of any fitness programme!

You must wear appropriate clothing during your training. This is especially important with regards to footwear. A good training shoe designed to match your physical characteristics is essential to minimize your chance of injury.

Always begin your training sessions with a thorough warm-up and cool-down afterwards. The warm-up and cool-down will be discussed in more detail later on.

Do not train if you are unwell or injured. It is better to rest than train through an illness or injury. Think long term and not just to the next one or two training sessions.

3. What is Physical Fitness?

Physical fitness is often described as the overall physical condition of the body, which can range from peak condition for performance at one end of the spectrum to extreme illness or injury at the other. Fitness should be seen as a global term with a number of specific components contributing to it. The key fitness components for firefighting are aerobic (long-term) endurance, muscular strength, muscular (short-term) endurance and flexibility. Optimum physical fitness for firefighters translates into being able to carry out firefighting activities successfully and without undue fatigue.

Aerobic Endurance allows you to continue to exercise for prolonged periods of time (> 3 minutes) at low to moderate/high intensity (e.g. running out a number of 70 mm hoses to provide a water supply for a fire). This is typically what limits your ability to continue to run, cycle or swim for more than a couple of minutes and is dependant upon your body's heart, lungs and blood to get the oxygen you breath (aerobic) to the muscles, therefore providing you with the sustained energy needed to maintain prolonged exercise. Typical aerobic activities include walking/hiking, running/jogging, cycling, aerobic dance/group exercise, rope skipping, rowing, stair climbing, swimming, skating, and various endurance game activities or some combination thereof.

Muscular Strength allows you to lift, lower, pull, push and carry heavy objects over very short distances/periods of time (e.g. lifting a 13.5 m ladder back on to an appliance). Your muscular strength is determined by your muscles ability to generate large forces, and is best trained using resistance such as that offered by machines, free-weights or your own body weight. It is important to remember that weight training will not necessarily make you look overly muscular. Most of your improvements in strength will take place without your muscles getting any larger; they will just become firmer, more toned and more skilled at performing the task. When resistance training, a whole body approach should be adopted, with adequate rest taken to allow the muscles to recover before performing further exercises. At least 48 hours rest should be allowed before repeating the exercises. Learning proper technique is important for safe and effective resistance training, and you are strongly recommended to seek professional fitness advice on this aspect of training. Lifting light weights to start with until you have mastered the correct technique is essential.

Muscular Endurance is closely linked to both aerobic endurance and muscular strength, but allows you to continue to lift, lower, pull, push and carry heavy objects for more prolonged periods of time (e.g. carrying a light portable pump (~ 33 kg) from an appliance across a field to an external water source). Muscular endurance is best trained using more moderate resistances over a more prolonged period of activity, such as circuit training using your own body weight as the resistance.

Flexibility refers to your ability to move your limbs and joints into specific positions at the end of their normal range of movement. Flexibility is important as it will allow your body to work in cramped positions without unduly stressing the muscles, tendons and ligaments (e.g. crawling through small spaces or openings whilst searching the floor space for a casualty in a house fire) and may reduce the risk of injury. Flexibility is best developed using slow controlled stretching exercises.

KEY POINT

1. **Good overall fitness is required for the role of firefighter. You should train the whole body to improve or maintain your levels of aerobic endurance, muscular strength, muscular endurance and flexibility.**

4. How to Develop and Maintain Physical Fitness

Any physical training programme has 4 key components that can be manipulated to produce the desired training effect. These are the **mode** of exercise (the type of exercise) e.g. cycling, running, swimming, etc., the training **intensity** (how hard you are exercising), the training **duration** (how long you are exercising) and the training **frequency** (how often you are exercising). By specifically modifying these 4 components of training, you will be able to develop and maintain aerobic endurance, muscular strength, muscular endurance and flexibility. Table 1 outlines the key elements required to develop these specific components of fitness. To improve physical fitness you will need to alter the mode, frequency, intensity, and duration of your exercise above your current level. Your training should be gradual and progressive, starting gently and building up the intensity over time. This will produce an improvement in your fitness by placing greater demands on your body.

The mode, frequency and duration of exercise are easy to plan and monitor with a notebook and stopwatch. Setting the correct exercise intensity for muscular strength and endurance training is usually done by counting the number of repetitions that you are able to perform on a particular exercise. For example, if you were to bench press a 30 kg bar and were able to perform 12 good repetitions before you were unable to complete another lift with good technique, then this weight (30 kg) would be known as your 12 repetition maximum (RM), abbreviated to 12-RM. Hence most muscular strength and endurance sessions use RM as a method of setting the correct exercise intensity, the load used being specific to the particular exercise you are performing. It is initially determined by trial and error (ALWAYS START WITH A LOW/EASY WEIGHT), gradually increasing the weight until you find your particular RM for each exercise. You should keep a note of your specific RMs for each exercise and remember they will keep increasing as you become stronger. For example, if you are able to continue comfortably past your 12-RM on the 30 kg bench press example, increase the weight by small increments until you re-establish your new 12-RM weight for the bench press.

However, the intensity of aerobic exercise is more difficult to determine and hence a number of approaches to setting the correct exercise intensity are presented in Table 2. The easiest way is to rate your effort using the Rating of Perceived Effort (RPE) scale. This scale progresses from 6-20, and the descriptors and example activities associated with each level will help you to relate the scale with the intensity of the activities ranging from rest (RPE 6) to maximum (RPE 20). If you have access to a heart rate monitor (which are now relatively inexpensive) or are using gymnasium equipment with heart rate monitoring facilities, the estimated heart rates associated with each RPE level are shown in the second column. Note that these are typical heart rates for a typical 20-30 year old applicant, but may vary by 10-20 beats per minute between different individuals.

Altenatively heart rate may be also be used to set your training intensity. Firstly you will need to determine what your maximun heart rate is. This maybe done using your age-predicted maximun heart rate. To calculate this subtract your age from 220, hence if your 40 then your age-predicted maximum heart rate would be; 220-40 (age) = 180 beats per minute. Due to individual variations the predicted value is generally within ten beats of your actual maximum heart rate.

If you have the time and desire, you can derive your individual specific heart rate training zones based on the measurement of your maximum heart rate (HRmax). This is best done by monitoring your heart rate during a progressive exercise test such as the Multi-Stage Shuttle Run Test (MSSRT). This test also provides you with a measure of your aerobic endurance fitness, and involves running back and forth between two lines 20 m apart in time to "bleeps" emitted from an audio tape or CD player (these can be purchased from Coachwise Ltd, www.1st4sport.com, telephone 0113-201 5555). Once you know your maximum heart rate, you can calculate your individual heart rate training zones. For example, to calculate your individual heart rate training zone for hard aerobic exercise (RPE 15-16), you would calculate 75-90% of your measured maximum heart rate (see Table 2). If you found your maximum heart rate was 190 beats per minute (b/min), your RPE 15-16 heart rate training zone would be between 0.75 x 190 b/min = 143 b/min and 0.90 x 190 b/min = 171 b/min.

Table 1. The key elements in developing specific fitness components

	Mode	Duration	Frequency	Intensity
Aerobic / Long term Endurance	E.g. 4 mile run, aerobics class/gym session, 5-a-side football	20-60 min (can be accumulated using >10 min blocks of activity throughout the day)	3-5 days per week	Weeks 1-6: RPE 12-16 or 60-85 % HRmax Weeks 7-12: RPE 14-18 or 70-90 % HRmax Lower intensity aerobic exercise is usually associated with longer duration activity.
Muscular / Short Term Endurance	Circuit Training, moderate weight training, e.g. press-ups, sit-ups.	One to three sets (10-50 reps) of 8-12 different exercises	1-3 days per week	Weeks 1-6: 20-50 RM Weeks 7-12: 12-20 RM
Strength	Heavier Weight Training e.g. bench press, squat	One to two sets (each set has 6-15 reps) of 8-12 different exercises	2-3 days per week	Weeks 1-4: 12-15 RM Weeks 5-8: 6-12 RM Weeks 9-12: 4-8 RM
Flexibility	Stretching	10-30 s for each exercise, repeated 1-3 times per muscle group or joint	2-3 days per week (daily if possible)	Move to the point of discomfort but not pain and hold, moving slightly further as the muscle relaxes

Table 1 was adapted from the American College of Sports Medicine: Position Stand on the Recommended Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory and Muscular Fitness, and Flexibility in Adults[1].

1 American College of Sports Medicine (1998). Position Stand: Recommended Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory and Muscular Fitness, and Flexibility in Adults. *Medicine and Science in Sports and Exercise*, 30(6), pp975-991.

Table 2. Determining Your Aerobic Endurance Exercise Intensity

Rating of Perceived Effort (RPE Scale) LEVEL - Description	Estimated heart rate (beats/min)	% Maximum heart rate
6 - rest - lying down, sitting		
7 - very very light - standing	<100	<50
8		
9 - very light - walking		
10	100-120	50-60
11 - fairly light - brisk walking		
12		
13 - moderate - jogging (could just talk freely without pausing)	120-150	60-75
14		
15 - hard - steady running - (intermittent talk between breaths)	150-170	75-85
16		
17 - very hard - fast running (talking very difficult)		
18	170-199	85-99
19 - very very hard – sprinting (talking impossible)		
20 - maximum effort	200	100

Table 2 was adapted from the work of Gunnar Borg (1998)[2] and Edward Howley (2001)[3]. The easiest way to use the table is to rate your description of effort using the numbers on the left of Table 2 (e.g. RPE 6 to RPE 20). The effort descriptors (e.g. moderate, hard) and examples of corresponding activities (e.g. jogging and steady running) will help you to relate this scale to the effort required to exercise at these intensities. Using a heart rate monitor can be helpful in supporting the RPE scale to identify the required exercise intensity, and the right side of Table 2 shows the corresponding heart rate range in beats per minute, and the expected percentage of maximum heart rate (if you know yours) associated with each level of the RPE scale.

KEY POINTS

1. **By manipulating the mode, duration, intensity and frequency of your exercise sessions, you will be able to improve and maintain your overall levels of fitness.**

2. **Start slowly and progress gradually as you become more confident and able to cope with the demands of your training programme.**

3. **Use the RPE scale to help determine the required exercise intensity for your aerobic training sessions.**

2 Borg, G. (1998). Borg's Perceived Exertion and Pain Scales. Champaign, IL, USA. Human Kinetics.
3 Howley, E.T. (2001). Type of activity: resistance, aerobic and leisure versus occupational physical activity. *Medicine and Science in Sports and Exercise*, 33(6), Suppl., ppS364-369.

5. Preparing for Exercise (Warm-Up) and Cooling Down Afterwards

Warm-Up: You should always perform a warm-up before undertaking any training session and finish the session with a cool-down. Performing a warm-up prepares the body for the activity about to be undertaken. The length of time needed to warm up sufficiently depends on many factors; however, you should allow at least 5-10 minutes for this important activity. To reduce the risk of injury in the warm-up period, a number of steps should be followed:

Be Specific: Make sure your warm-up session is focused towards the activity that you intend to perform. For example, for cardiovascular workouts, such as running, start with a brisk walk leading into a light jog. For weight training, it is important to warm up the particular joints and muscles that are involved in the resistance exercise (see the section of how to develop flexibility). This will increase blood flow to those muscles and activate the nervous system, prior to any additional stress being placed on them.

Start Slowly: At the start of your workout your muscles will be relatively cold. Start exercising slowly and build up the intensity throughout the warm-up period. This will increase your muscle temperature steadily and keep the risk of injury to a minimum.

Keep Warm: If you are exercising in a cold environment, wear additional clothing during the warm-up period and try not to stand still for too long.

Stretching: For many years it was thought that stretching as part of the warm-up would prevent injuries. However, there is no scientific evidence to support these claims[4]. Stretching to develop or maintain flexibility should be performed at the end of a training session (see section 8).

Cool-Down: The cool-down should follow the opposite principles to the warm-up, gradually reducing the exercise intensity over the final 5-10 min of the session to bring your body slowly back to a near resting state. As the body is already warm from the exercise session when the cool-down begins, this is an ideal time to incorporate some of the exercises designed to develop flexibility, where the stretches should be held for 10-30 s (see Table 1).

KEY POINTS

1. **Always perform a warm-up before and a cool-down after every training session.**

2. **Stretching muscles for 10-30 s after they are warmed up is an appropriate time to develop flexibility.**

4 Shrier, I. (2001). Flexibility versus stretching. *British Journal of Sports Medicine*. 35(5), 364

6. Developing and Maintaining Aerobic Endurance

To maximize the efficiency of your training you should focus on exercises that are similar to those in the NFSTs. These include running/jogging, stepping, stair climbing and other weight bearing activities.

Steady Pace Running: This should be performed at a comfortable pace (see Table 1). This type of exercise will increase your aerobic endurance fitness. This is included 2 times per week in the programme.

Fartlek Training: This type of training involves changing pace throughout the session. If running is a chosen mode of exercise, a steady pace of running should be interspersed with faster running, sprints, jogging, uphill running and walking. The aim of the session is to work continuously for about 20-30 minutes using the various speeds of running whenever you feel like it. There is no set order to this session, however you should begin with about 5 minutes of steady running before you do any faster running. This session will increase your aerobic and muscular endurance fitness. This type of activity may also be performed in a fitness area with many random intensity programmes available on the aerobic machines (treadmills, steppers, cross-trainers).

Note that running on treadmills or exercising on other aerobic gym equipment does not give quite the same workout as free running outside. Therefore, you should not perform all your aerobic training in the gym. Try to perform 1-2 aerobic sessions per week outside the gym using free running. Where possible you should aim to run on grass or trails, and try to minimise the amount of road running you do. This will reduce the stress placed on the joints of the body and minimise your chance of injury.

KEY POINTS

1. **Free running outside is the best form of exercise to develop your aerobic endurance for the NFSTs.**

2. **Run on grass or trails where possible to reduce the stress on your muscles and joints.**

7. Developing and Maintaining Muscular Strength and Endurance

To improve your strength and/or muscular endurance you will need to exercise against a resistance. This resistance can be your body weight (for example a press-up) or may involve the use of specifically designed equipment such as dumbbells, barbells or resistance machines. Resistance training should be progressive in nature, individualized, and provide sufficient stimulus to all the major muscle groups to develop and maintain muscular strength and endurance. You should follow the guidelines shown in Table 1 to improve these fitness components.

Remember, each exercise will involve lifting, lowering, pushing or pulling the resistance a number of times before you fatigue. These are called repetitions (reps) and the number of repetitions will vary depending upon the type of training you are performing (See Table 1). Each group of repetitions is called a set. Therefore performing 2 sets of 12 RM on the bench press would involve lifting the weight in a controlled manner 12 times (by which point you should be close to fatigue), resting and repeating the exercise again. Do not worry if you are unable to perform all 12 repetitions on the second set. Stop when you fatigue or lose control of the movement. If performing multiple sets, you should rest 1-5 minutes between sets. Avoid getting cold during this time. Keep active and perform some light flexibility exercises to help your muscles recover. Although training multiple sets may increase your strength gains, most of the strength improvements can be obtained with single sets so if time is short, stick to a single set of each exercise.

The effect of exercise training is specific to the area of the body being trained. For example, training the legs will have little or no effect on the arms, shoulders, and trunk muscles. Therefore a whole body approach should be adopted. When using free weights, such as dumbbells, it is important that you ask somebody to 'spot' you during the exercise to prevent you losing control of the equipment as you fatigue and, therefore, avoiding injuries. For this reason it is often a good idea to carry out resistance training in pairs, and you may find this aids motivation as well as increasing the safety of the exercise.

Training for muscular endurance involves performing a greater number of repetitions but with lighter loads than are used for muscular strength (see Table 1). Hence circuit training using your body weight is ideal for developing muscular endurance, where as weight training is best for developing strength. If you are new to this type of training, start for the first 1-4 weeks just using your body weight with circuit training, before progressing to lifting weights. You can develop muscular endurance using weights if you prefer to go to the gym, but remember to use much lighter weights and perform a greater number of repetitions in comparison to strength training (Table 1).

Muscles should also be worked in balance and the following exercises are recommended:

Muscles should also be worked in balance and the following exercises are recommended:

Circuit Training:

Press-up, triceps dip, chin-up, sit-up, back extension, squat, lunge (specific details of how to perform each circuit exercise are given in the circuit training section that follows).

Weight (Resistance) Training:

Chest press, seated row, shoulder press, lateral pull down, squats, lunges, abdominal crunch, back extensions, static bar hold (specific details of how to perform each weight training exercise are given in the weight training section that follows).

NB You should not perform the same resistance exercise on consecutive days. At least 48 hours rest should be allowed before repeating the exercise. Remember, if you are not used to muscular strength and endurance training, you will undoubtedly experience some muscle soreness and discomfort for 12-48 hours after the initial training sessions. This is normal and you should not be put off by this experience. Most of the severe muscle soreness following these types of exercises will disappear after 1-4 weeks of continued strength and muscular endurance training.

Circuit Training:

This circuit is designed to develop muscular endurance and uses minimal equipment. You will need a gym mat and a stepping platform of about 30 cm in height. Choose 5-10 of the exercises listed below according to your fitness level. Five exercises are plenty if you are just starting your training regime. You can add further exercises as you become stronger. It is wise to consider the muscles that each exercise works so that you place them in an order which avoids targeting the same muscle groups straight after one another e.g. press ups and seated triceps dips both target the muscles at the rear of the upper arm (triceps); squats and lunges both work the muscles at the front of the upper thigh (quadriceps).

You can use the guidelines presented in Table 3 for muscular endurance to build a simple circuit. For example, you could perform 30 seconds of each of the exercises listed below (where you should aim to perform 12-50 RM), with 30-60 seconds rest between each exercise. You could make the circuit session more aerobically demanding by performing box stepping during the 30-60 seconds recovery period. As you progress, repeat the circuit a further 1-2 times. You can adjust the number of exercises (5-10), the difficulty of the exercises, the exercise time (20-60 seconds), the recovery duration (20-60 seconds) and the recovery activity to suit your fitness level.

Table 3. Example of a simple circuit that can be carried out without specialist equipment

Exercises	Alternative
Press up	Knees Press up (easiest), Box press up (easier); Declined press up (Hard)
Squat thrust	Alternate squat thrusts (less stress on the back)
Abdominal crunch	
Squat	
Lunge	
Burpee	
Back Extension	Hands under forehead (harder), hands behind head (hardest)
Seated triceps dip	
Tuck jump	
Stride jump	
Recovery	
Rest	Marching on the spot, Step ups, Rope Skipping

Don't forget to warm up before and cool down after performing the circuit exercises.

Circuit Exercises

Press Up

1. Start with your body facing the ground, arms extended and feet hip width apart on the floor. Lower your body towards the floor by bending the arms and then return to the start position by straightening the arms.
2. The knees press-up involves exactly the same technique except that the knees are placed on the floor instead of the feet.

Tips: Maintain a natural back throughout the exercise, keeping the whole body and head aligned. Keep your body a couple of inches off the ground at the end of the lowering phase and ensure elbows are not locked out at the end of each repetition. Perform the exercise under control. It is important to maintain a good technique and if the exercise is too hard, then try the knee press up. To make the exercise harder, try the declined press up.

Alternative press up exercises

Knee Press Up

Box Press Up

Declined Press Up

Squat Thrust

1. Start from a press-up position, with feet hip width apart and arms slightly wider than shoulder width. Bring your feet towards your body in a springing motion (thrust) so that the knees are in line with the shoulders. Thrust your feet back to the start position and repeat the exercise.

Tips: Keep your body and head aligned when in the start position ensuring your back does not hyper extend or arch.



Alternate Squat Thrust




1. Start from a press-up position, with feet hip width apart and arms slightly wider than shoulder width. Bring one foot towards your body whilst the other leg remains extended once in this position thrust the bent leg backwards and bring the extended leg towards your body at the same time. Repeat the exercise. Finish in the press-up position when th exercise is complete.

Tips: Throughout the exercise keep your body and head aligned.

Abdominal Crunch

1. Start lying face up on a mat, bending the knees to 90° by bringing your feet close to your buttocks. You can either fold arms across chest, or place your hands straight in front of you or lightly behind your head. Draw your belly button towards your spine by contracting your lower abdominal muscles. Whilst holding this contraction and breathing normally, slowly raise your shoulders towards your thighs by curling your upper back off the floor while keeping your lower back on the floor.

Tips: Lower shoulders and upper body slowly and with control and do not bounce your back off the mat. Do not use your arms to pull your neck and head forward. Keep head in line with spine.



Squat

1. Start from an upright position with hands resting on the side of the head or crossed in front of your body. Bend your legs until your thighs are parallel with the ground and then return to the upright position.

Tips: Keep your back in a natural position and look forward throughout the exercise. Keep heels in contact with the ground and ensure knees are directly over your ankles and feet during the squat.



Lunge

1. Start from an upright position with hands resting on the side of your head. Step forward with one leg and bend at the knee until your thigh is parallel to the ground. The back leg should still be slightly bent and used for balance. Stand up and return to the start position.

2. Repeat this exercise, stepping forward with the other leg.

Tips: Keep your back in a natural position throughout the exercise and look forward to help maintain balance. Ensure the front foot is planted straight on the floor so that the knee is directly over the ankle during the lunge.



Burpee

1. Start standing up, squat down to a crouching position and thrust legs out behind your body before returning to the crouching position.
2. From the crouching position stand up, ready to start the exercise again.

Tips: Keep your body straight and aligned on the squat thrust, with hands just wider than shoulder width and feet hip width apart.





Back Extension

1. Start lying face down on a mat. Bend arms so that your hands are touching the side of your head and elbows pointing at 90° to your body. Raise head and chest off the mat as high as comfortably possible. Hold for 1 to 2 seconds before lowering your head and chest.

Tips: Do not tense the shoulder muscles. If you find this hard, try the exercise with hands down beside your buttocks (see below).



Seated Triceps Dips

1. Place your hands on a platform about 30 cm high, and start facing away from the platform with legs stretched out in front. Lower your body by bending your arms and return to the start position by straightening your arms.

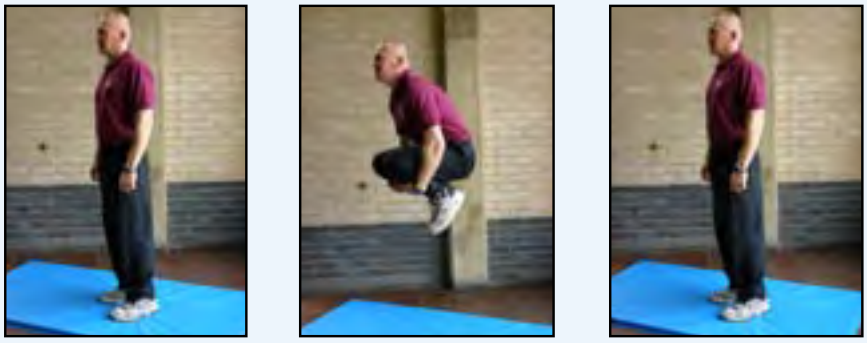
Tips: Keep your back in a natural position, legs straight and feet together. The exercise is only effective if the lowering phase occurs entirely by bending the elbows. Lowering the body by dipping from the shoulders will not produce the desired training effect.



Tuck Jump

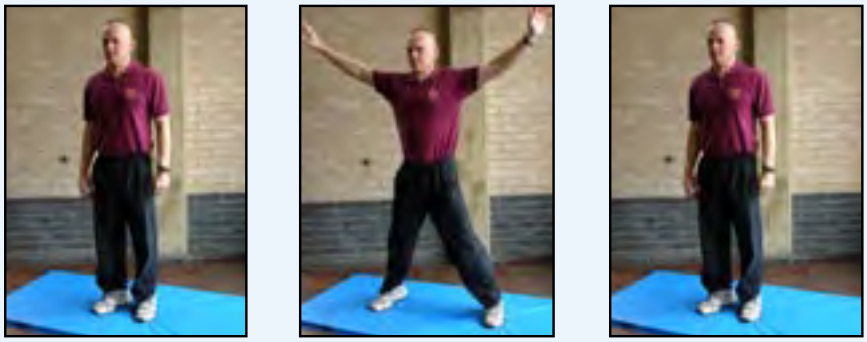
1. Start from a standing position, bend your knees slightly and then jump up, tucking the legs up under your body and hugging arms around your legs. Return to the start position and repeat the exercise.

Tips: Look forward and keep your head up to maintain balance.



Stride Jump

1. Start from a standing position and then jump into a star position with legs striding to about twice shoulder width and raising arms to a '10 to 2' position. Jump back to the start position bringing legs back together and arms back down to the side.



Step Up

1. Stand in front of a stair or platform about 20-30cm high, and then step forward and up onto the stair with one foot, followed by the other. Step back down off the stair, one foot at a time to return to the start position. Repeat the exercise starting by stepping up with the other foot.

Tips: Keep your head looking forward. Ensure both feet are on the stair before coming down off it again.

Weight Training Exercises

With all weight training exercises, breathe freely when lifting and lowering the weight. Do not hold your breath!

Chest Press

1. Start lying flat on the bench with your feet planted firmly on the floor either side of the bench, with arms extended and the weights in your hands.
2. Slowly lower the weight to chest level. Push the weight back to the start position.

Tips: Ensure your back is in a natural position and not excessively arched. Perform slowly and in control.


Seated Row

1. From a seated position, with arms extended in front of the body and knees slightly flexed, draw your hands into your abdominal area squeezing the shoulder blades together.

Tips: Look straight ahead and maintain the natural curve of your back. Keep elbows tucked close to the body throughout the movement.

Note: The subject is not holding dumbbells; the handle is connected to a weights stack via a cable pulling the handle towards the feet.


1. From an upright position, with dumbbells overhead, slowly lower the weight to shoulder level. Push the weight back up to the start position.

Tips: Ensure your back is in a natural position and not excessively arched. Perform slowly and in control.


Lateral Pull Down

1. From a seated position, grasp the overhead bar just wider than shoulder width. Lean back slightly and pull the bar down, drawing the elbows in towards the side of your body until the bar touches the top of your chest.
2. Return the bar to the start position maintaining control throughout.

Tips: Do not swing during the exercise.


Squat

1. From a standing position with feet a comfortable distance apart and dumbbells in your hands, bend at the knees and flex at the hip until your thighs are parallel with the floor. Push through the heels to return to the standing position.

Tips: Ensure that the knees are directly over your ankles and feet.


Lunge

1. From a split leg position, with one foot in front of the other and dumbbells in the hands, lower the back knee towards the floor so that the front thigh is almost parallel with the ground. Push off the front leg to return to the start position.

Tips: Look straight ahead. Ensure the front knee is directly over your ankles and feet.


Abdominal crunch

1. Start lying face up on a mat, bending the knees to 90° by bringing your feet close to your buttocks. Fold arms across chest, or place your hands straight in front of you or lightly behind your head. Draw your belly button towards your spine by contracting your lower abdominal muscles. Whilst holding this contraction and breathing normally, slowly raise your shoulders towards your thighs by curling your upper back off the floor while keeping your lower back on the floor.

Tips: Lower shoulders and upper body slowly and with control and do not bounce your back off the mat. Do not use your arms to pull your neck and head forward. Keep neck in line with spine.

Back extension

1. Start lying face down on a mat. Bend arms so that your hands are touching the side of your head and elbows pointing at 90° to your body. Raise head and chest off the mat as high as comfortably possible. Hold for 1 to 2 seconds before lowering your head and chest.

Tips: Do not tense the shoulder muscles. If you find this hard, try the exercise with hands down beside your buttocks.

Static bar hold

This exercise is really a muscular endurance task, but is included here as it requires access to a weights bar. It is a specific exercise that replicates the demands of carrying the two 70 mm hoses and the light portable pump simulator during the equipment carry test (see section 9).

1. Pick up a 30-33 kg bar with both hands using an overhand, underhand or combination grip (you will be allowed to adopt any one of these grips during the light portable pump simulator carry section of the equipment carry test (see section 9).
2. Hold the bar steady at or just above waist height (as you will be walking with the bar during the equipment carry test and it needs to be clear of your legs.
3. Maintain this hold for up to 90 seconds or until grip begins to weaken.
4. Then place the bar down under control, shake out arms and hands and rest for 30 seconds.
5. Repeat this sequence 1-3 times and build up the duration until you can complete a 90 seconds static hold on the first repetition.

Tips: Make sure you keep your back as vertical as possible, your bottom down towards the ground and look forward when you pick up or lower the bar. You should pick up the bar using your legs, not your back! Try alternating your chosen grip over the three repetitions to find the one you are most comfortable with.

Underhand grip

Combination grip

Alternative static bar hold exercise to improve hand grip muscular endurance

The static bar hold is designed to improve the muscular endurance of your back, shoulder and forearm muscles. If you can not access a 30-33 kg weights bar, or specifically want to improve your hand grip muscular endurance, you can use a squash or tennis ball. Simply squeeze the ball and hold for 3-15 seconds or until your grip weakens. Rest for 10-30 seconds and repeat 3-10 times. You could perform this exercise every day to help increase your hand grip muscular endurance, which is a key factor on the equipment carry selection test (see section 9).

8. Developing and Maintaining Flexibility

Flexibility exercises should be incorporated into your overall fitness program, sufficient to develop and/or maintain your range of motion. Flexibility training may reduce your likelihood of injury, reduce muscle soreness following exercise and may enhance muscular performance. To develop your flexibility, you should follow the guidelines in Table 1, holding each stretch for 10-30 seconds and repeat each stretch 1-3 times. As the body tends to be fairly static during your flexibility training, it begins to cool down. Therefore, flexibility training is ideally suited to follow on from an aerobic endurance or muscular strength or endurance training session, and can form an integral part of the cool-down period. Not only will stretching at this time help your muscles to relax, it avoids having to build in separate training sessions for developing flexibility into a weekly plan, saving valuable time and effort.

The following examples show you how to stretch the major muscle groups of the body.

Triceps and Upper Back Stretch

1. Sit or stand upright with one arm bent, raised overhead with arm next to your ear, and your hand resting on your opposite shoulder blade.
2. Grasp your elbow with the opposite hand.
3. Inhale and pull your elbow behind your head.
4. Hold the stretch and relax.
5. You should feel the stretch in the back of the arm and under your arm pit.

Rear Shoulder and Upper Back Stretch

1. Sit or stand with one arm straight.
2. With the other hand grasp above the elbow of the straight arm.
3. Inhale and pull the arm across the chest and in towards the body.
4. Hold the stretch and relax.
5. You should feel the stretch in the back of the shoulder and upper back.

Chest and Upper Back Stretch

1. Kneel on the floor facing a bench or chair.
2. Extend your arms above your head with your hands side by side and bend forward to rest your hands on the bench or chair with your head in its natural position.
3. Exhale and let your head and chest sink towards the floor.
4. Hold the stretch and relax.
5. You should feel the stretch in your chest and upper back.

Quadriceps Stretch

1. Stand upright with one hand against a surface for balance and support.
2. Bend the opposite knee to the hand that is outstretched and raise your heel to your buttocks.
3. Slightly bend the supporting leg.
4. Exhale, reach behind, and grasp your raised foot with the other hand.
5. Inhale, and pull your heel towards your buttocks.
6. Hold the stretch and relax.
7. You should feel the stretch in the top of the thigh.

Hamstring Stretch

1. Sit upright on the floor with both legs straight.
2. Bend one knee and slide the heel until it touches the inner side of the opposite thigh.
3. Lower the outer side of the thigh and calf of the bent leg onto the floor.
4. Exhale, and while keeping the extended leg straight, bend at the hip and lower your extended upper torso from the hips towards the extended thigh.
5. Hold the stretch and relax.
6. You should feel the stretch in the back of the thigh.

Groin Stretch

1. Sit upright on the floor with your legs bent and straddled and feet flat against one another.
2. Grasp your feet or ankles and pull them as close to your groin as possible.
3. Exhale, rest your elbows on your knees, pushing them down towards the floor.
4. Hold the stretch and relax.
5. You should feel the stretch in the inside of the thighs.

Calf Stretch

1. Stand upright slightly more than an arms length from a wall.
2. Bend one leg forward and keep the opposite leg straight.
3. Keep the heel of your rear foot down, sole flat on the floor and feet pointing straight forward.
4. Exhale, and bend your front knee toward the wall
5. Hold the stretch and relax.
6. After 10 to 15 seconds slightly flex the knee of the back leg keeping the heel of the foot down.
7. Hold the stretch and relax.
8. You should feel the stretch in the back of the lower leg.

Soleus Stretch

1. Stand leaning slightly forward more than an arms length from a wall.
2. Bend one leg forward and keep the opposite leg straight.
3. Keep the heel of your rear foot down, sole flat on the floor and feet pointing straight forward.
4. Exhale, and flex your rear knee toward the wall and floor
5. Hold the stretch and relax.
6. You should feel the stretch in the back of the lower calf.

Buttocks and Hip Stretch

1. Lie flat on your back with one leg crossed over the knee of the straight leg.
2. Inhale, bending the uncrossed leg off of the floor in towards the body ensuring that you head shoulders and back remain on the floor.
3. Hold the stretch and relax.
4. You should feel the stretch in your buttocks and lower back.

WARNING:

A significant reduction in aerobic fitness occurs after only 2 weeks of not training. However, if you begin to feel tired and worn out, do not be afraid to take a few days off and rest. You could even build in recovery weeks after weeks 4 and 8 where you may only do 1-2 steady pace runs of 20-30 mins to maintain your fitness before pushing on with the programme. Remember this is a general programme and must be modified by yourself or your fitness instructor to suit your needs and match your rate of fitness progression.

KEY POINTS

1. **You must listen to your body and modify the programme to suit your individual needs and rate of fitness progression. REST is important too so do not be afraid to miss a couple of sessions or build in a recovery week if all the training is becoming too much to cope with.**

9. Exercise and pregnancy

Exercise during pregnancy (ACSM, 2000)

Exercise and physical fitness have dramatically gained in popularity over the past several years, and have assumed important roles in the lives of many women. Physical activity and reproduction are normal parts of life, and for normal healthy women, combining regular exercise and pregnancy appears to benefit both mother and baby in many ways. Thus, a healthy woman with a normal pregnancy may either continue her regular exercise regimen, or begin a new exercise program.

The American College of Obstetrics and Gynecology (ACOG), as well as the American Society for Obstetrics and Gynecology (ASOG), recommends that normally healthy pregnant women may continue an already-established exercise regimen. Pregnancy is a normal physiological state characterized by growth of both mother and fetus. From conception onward, the fetus develops into a baby, and the mother experiences both physical and psychological growth. All mothers want the best possible health for themselves and their babies, but some women and physicians are concerned that regular maternal physical activity during pregnancy may because miscarriage, premature delivery, poor fetal growth, or musculoskeletal injury. For normal pregnancies, these concerns have not been substantiated. Indeed, participation in regular weight-bearing exercise has been shown to improve maternal fitness, restrict weight gain without compromising fetal growth, and hasten postpartum recovery. In addition, the psychological benefits of exercise are undeniable, and should be nurtured by all who care for pregnant women.

During the first trimester, major physiological changes are taking place, even though maternal body changes are few. During low-level exercise, blood pressure and pulse responses are not dramatically different from those in the non-pregnant woman, but fatigue may be noticed earlier during exercise. As early pregnancy progresses, blood volume expands and the uterus continues to enlarge. Weight gain is usually small but can range from zero to ten pounds. During this time, the fetus is undergoing its most important growth, including development of organs and limbs. For this reason, a proper balance of nutrition, hydration, exercise and rest assume great importance. It is important for the pregnant woman to avoid large increases in her body temperature during exercise. Fortunately, adequate hydration, regular exercise, and pregnancy all improve a woman's capacity to dissipate heat. The individual effects of these on heat dissipation appear to complement one another when combined. Thus, well hydrated, fit pregnant women regulate their core body temperatures more efficiently than sedentary people, and undergo less temperature variation during exercise. Loose fitting clothing and a cool environment are also important in protecting against heat stress. Other environmental conditions to consider are very high and very low air pressure. Exposure to the decreased oxygen of high altitudes, as well as the high pressures experienced during deep sea diving, should be avoided during pregnancy.

The second and third trimesters are accompanied by dramatic changes in a woman's body. Normal weight gain ranges between 22 and 35 pounds and is centered around the abdomen and pelvis, which alters both posture and the center of gravity. During this time, exercises requiring balance and agility may become more difficult due to the change in the pregnant

woman's weight distribution. The use of properly adjusted exercise equipment, a smooth floor surface, and/or aquatic exercises are extremely helpful. The extra caloric demands of pregnancy are extremely variable; no fixed equation accurately estimates the amount of increased caloric need. The best measure of sufficient caloric intake is adequate weight gain. Small, frequent meals and regular fluid intake throughout the day are most desirable in maintaining a steady flow of nutrients while minimizing the discomfort of exercising on a full stomach, and avoiding dehydration and low blood sugar. Pregnant, sedentary women commonly require approximately 3000 calories per day during the second and third trimesters to ensure adequate stores of nutrients. A physically active expectant mother would therefore have a higher caloric need, in order to compensate for calories burned off during strenuous exercise. For pregnant women who wish to exercise during pregnancy, the American College of Sports Medicine provides the following recommendations:

* **Safety**: As changes in weight distribution occur, balance and coordination may be affected. Exercise programs should be modified if they pose a significant risk of abdominal injury or fatigue as opposed to relaxation and an enhanced sense of well-being. Until more information is available, exercising in the supine or prone positions should be avoided after the first trimester.

* **Environment**: Temperature regulation is highly dependent on hydration and environmental conditions. Exercising pregnant women should ensure adequate fluid intake before, during and after exercise, wear loose-fitting clothing, and avoid high heat and humidity to protect against heat stress, especially during the first trimester.

* **Growth and Development**: The pregnant woman should monitor her level of exercise and adjust her dietary intake to ensure proper weight gain. If pregnancy is not progressing normally or if vaginal bleeding, membrane rupture, persistent pain or chronic fatigue are noted, exercise should be stopped until a medical evaluation has been completed. Also, if regular contractions occur more than 30 minutes after exercise, medical evaluation should be sought. This may signify pre-term labor.

* **Mode**: Weight-bearing and non-weight-bearing exercise are thought to be safe during pregnancy. Improved maternal fitness is a well-known benefit of non-weight-bearing exercise such as swimming and cycling. Weight bearing exercises are similarly beneficial as long as they are comfortable. Swimming and stationary cycling are excellent non-weight-bearing exercises, and may be recommended. Walking, jogging and low-impact aerobics programs are good choices when weight-bearing exercise is to be considered.
Heavy weightlifting, or similar activities that require straining, are to be discouraged. Bicycle riding, especially during the second and third trimesters, should be avoided because of changes in balance and the risk of falling. Exposure to the extremes of air pressure, such as in SCUBA diving and high altitude exercise in non-acclimatized women, should be avoided.

* **Intensity**: Pregnancy is probably not a time for serious competition. For women who are continuing their regular exercise regimen during pregnancy, exercise intensity should not exceed pre-pregnancy levels. The intensity of exercise should be regulated by how hard a woman believes she is working. Moderate to hard is quite safe for a woman who is accustomed to this level of exercise.

* **Exercise**: A healthy woman with a normal pregnancy may either continue her regular exercise regimen or begin a new exercise programme during pregnancy. For your particular exercise prescription and its duration, check with your physician.

Reprinted with permission of the American College of Sports Medicine, "Exercise During Pregnancy," August 2000, www.acsm.org.

Returning to Exercise After Giving Birth

Beginning an exercise programme or returning to exercise after you have given birth can improve your physical and mental wellbeing. However, many of the changes that take place to the body during pregnancy persist for 4 to 6 weeks after childbirth. Because of this, exercise routines after pregnancy should be resumed slowly and should be individualised. Most types of exercise can be continued or resumed in the postpartum period, however if you have had a cesarean birth, a difficult birth, or complications it may take a while longer to feel ready to start exercising[5].

Remember you should check with your doctor before starting any exercise programme, especially if your health status has recently changed or you have not exercised for the last 6 months.

If you didn't exercise during pregnancy, start with easy exercises and slowly build up to harder ones. If you exercised regularly throughout pregnancy, you have a head start. You should not try to resume your former pace right away, though. Walking is a good way to get back into shape. Brisk walks will prepare you for more vigorous exercise when you feel up to it[5].

There may be special postpartum exercise classes that you can join. Your doctor or nurse should be able to help you find good a good class, which is local to you. As you feel stronger, think about increasing your exercise intensity. Perform exercises that will meet your needs and always follow the safety guidelines and general exercise principles outlined in sections 2-8 of this document.

5 The American College of Obstetricians and Gynaecologists. Getting in Shape After Your Baby is Born. www.acog.org/publications/patient_education/bp131.cfm

Guidance on
Physical Training for Firefighters