# HYPERTENSION

Hypertension is the clinical term used to describe a high blood pressure of 140/90 mmHg or higher (National Institute of Health 1997). It is such a health risk the World Health Organisation and International Society of Hypertension claim that 'one of the biggest challenges facing public health authorities and medical practitioners is the control of hypertension worldwide'. Blood pressure over 140/90 mmHg also accounts for 13% of deaths from CHD in people under 75 (Britton A, McPherson K, 2000), although this figure is probability and underestimated now[1].

95% of people with high BP have what's called primary or essential hypertension. This means that there is no single clear cause of it (BUPA 2002). This would seem to be simply related to genetic predisposition, with a positive family history being a large risk factor. Lifestyle factors, such as obesity, high alcohol intake, high salt intake and stress all play a part as well.

These factors all affect the process of atherosclerosis in which arteries become progressively narrower (increasing peripheral resistance, reducing their ability to dilate and increasing BP.

The heart experiences increased resistance and has to work harder (increased cardiac output). Increasing cardiac output will increase BP.

## SECONDARY HYPERTENSION

The other 5% of people with high BP have what's known as secondary hypertension. This means that it can be linked to a recognised and possibly reversible cause and may actually be a symptom of an underlying problem or disease. Secondary causes of hypertension include kidney disease, adrenal gland disease, narrowing of the aorta. Medications, such as oral contraceptive or steroids may also elevate BP.

Chronic pressure overload and microvascular damage are the ultimate causes of an increase in blood pressure.

*There are three elements that cause this disease:*

- Cardiac output
- Peripheral resistance
- Blood volume

## HAEMODYNAMIC RESPONSE TO EXERCISE

The heart, blood and vessels undergo changes in relation to increased activity and exercise. These changes can be affected in hypertensive individuals. The differences in haemodynamic responses between a healthy and hypertensive individual are highlighted in the table overleaf.

A hypertensive individual also has increased myocardial oxygen demand, placing a greater strain on the heart. In the long term left ventricular walls stiffen, lose elasticity and as a result suffer reduction in contractility and performance.

## COSTS OF HYPERTENSION

Hypertension is one of the most common worldwide diseases afflicting humans. Because of the associated morbidity and mortality and the cost to society, hypertension is an important public health challenge. Over the past several decades, extensive research, widespread patient education, and a concerted effort on the part of healthcare professionals have led to decreased mortality and morbidity rates from the multiple organ damage arising from years of untreated hypertension.

Hypertension affects about 2% of all adults in the UK. It is a leading risk factor for heart disease or strike and costs the UK NHS £1 billion pounds a year in medicines alone.

Treating hypertension more effectively with drugs[2] and helping patients to exercise could save the NHS over £10.5 million a year. Hypertension and associated diseases and events such as myocardial infarction, stroke and heart failure, incur costs in the form of drugs, interventions and 'care' costs, as well as 'indirect costs' such as lost productivity, so the overall costs for treating and not treating hypertension are enormous.

Approximately 50 million people in the United States are affected by hypertension. Substantial improvements have been made with regard to improving awareness and treatment of hypertension. However, approximately 30% of adults are still unaware of their hypertension; up to 40% of people with hypertension are not receiving treatment; and, of those treated, up to 67% do not have their blood pressure (BP) controlled to less than 140/90 mmHg.

Hypertension is the most important modifiable risk factor for coronary heart disease (the leading cause of death in North America), stroke (the third leading cause), congestive heart failure, end-stage renal disease, and peripheral vascular disease. Therefore, healthcare professionals must not only identify and treat patients with hypertension, but also promote a healthy lifestyle and preventive strategies through healthy diet and exercise to decrease the prevalence of hypertension in the general population.

## BENEFITS OF EXERCISE IN HYPERTENSION

*Exercise can have the following benefits:*

- Becoming more active can lower your systolic blood pressure by an average of 5 to 10 millimetres of mercury (mmHg). That's as good as some blood pressure medications. For some people, getting some exercise is enough to reduce the need for blood pressure medication. (Mayo Clinic 2010)
- Better weight control and decreased obesity (risk factors for hypertension)
- Improved psychological well being including reduced stress, depression and anxiety (stress is a risk factor for hypertension)

## Table - Differences in the haemodynamic responses to exercise

| Haemodynamic effects of exercise | | 'Normal' patient | | 'Hypertensive' patient |
|---|---|---|---|---|
| Acute Phase - initial exercise response | ↑ | Cardiac output | ↓ | Cardiac output |
| | ↓ | Peripheral resistance | ↑ | Peripheral resistance |
| | ↑ | Heart rate | ↑ | Heart rate |
| | ↑ | Systolic BP | ↑ | Systolic BP |
| | ✕ | Unchanged diastolic BP | ⇧ | Diastolic may elevate |
| Chronic Phase - response after regular exercise | | Normal left ventricular function and hypertrophy | | Pathological left ventricular hypertrophy |

## EXERCISE RECOMMENDATIONS FOR HYPERTENSION

It is necessary to understand that exercise recommendations are dependent upon the level of hypertension. 'High normal' and 'Stage 1' are provided with different recommendations to 'Stage 2 and Stage 3'. 'High normal' and 'Stage 1' are only advised to make lifestyle changes such as appropriate exercise, improving diet, reducing weight, moderating alcohol, stop smoking and decreasing stress. Whilst 'Stage 2 and 3' are advised to introduce lifestyle changes and take medication.

## ENDURANCE OR 'STAMINA' EXERCISE RECOMMENDATIONS FOR HYPERTENSION

Aerobic physical activity using large muscle groups in a rhythmical fashion is probably the most beneficial form of exercise. Systolic BP and diastolic BP can be lowered by approximately 6–10 mmHg with regular aerobic exercise for many previously sedentary men and women, regardless of age (McArdle et al 1996). Obvious activities would be brisk walking, jogging, cycling, or cross trainers. Rope skipping is also a good option that can be performed every day, requires little equipment, and is rhythmical and aerobic in nature and is recommended as primary modality for those with hypertension[3].

Exercise training at somewhat lower intensities (eg, 40–70% $VO_2$ max) appears to lower BP as much as, if not more than, exercise at higher intensities (Gordon, 1997).

*ACSM recommendations for hypertension (Stewart, 2000) are:*

| Endurance Exercise Recommendations for Hypertension | |
|---|---|
| **Frequency** | 3–5 times a week |
| **Intensity** | Aerobic exercise should be of at least moderate intensity<br>High normal and Stage 1 work at 50–85% $VO_2$ max, RPE 10–16<br>Stage 2 and 3 work at 40–70% $VO_2$ max, RPE 8–12 |
| **Time** | 20–60 minutes or bouts of at least 10 minutes accumulated to a total of at least 150 minutes/week |
| **Type** | Aerobic physical activity<br>   |

Roberts (1997) also suggests employing a longer warm up and cool down.

A meta-analysis of randomised controlled trials concluded that dynamic aerobic endurance training reduces resting systolic and diastolic blood pressures by 3.0/2.4 mmHg, and daytime ambulatory blood pressure by 3.3/3.5 mmHg[11]. The reduction in resting blood pressure was more pronounced in the hypertensive group (-6.9/-4.9 mmHg) than in the normotensive group (-1.9/-1.6 mmHg)[12]. Even moderate levels of exercise lowered blood pressure, and this type of exercise also reduced body weight, body fat and waist circumference. Dynamic resistance exercise can also decrease resting blood pressure by 3.5/3.2 mmHg[13].

## RESISTANCE TRAINING EXERCISE RECOMMENDATIONS FOR HYPERTENSION

With the exception of circuit weight training, chronic strength/resistance training has not consistently been shown to lower resting blood pressure. Therefore, whilst resistance training can have many benefits for such groups, **it is not recommended on its own as a means of decreasing blood pressure.**

| Resistance Training Exercise Recommendations for Hypertension | |
|---|---|
| **Frequency** | 2–3 times a week |
| **Intensity** | Form failure - 15–20 repetitions |
| **Time** | 1–2 sets per exercise,<br>8–10 exercises |
| **Type** | All major muscle groups, following a circuit type training format.<br>Select exercises that will not excessively raise BP.<br>Avoid isometric exercises.<br>Discourage over gripping if using weights.<br>Avoid heavy weights and sustained overhead activity.<br>Moderate intensity is more effective than high intensity |

Resistance exercise should involve the major muscle groups (legs, hips, chest, back, abdomen, shoulders, and arms). Either machine weights or free weights might be used while the former is likely the safest approach[4].

Resistance exercise performed should be alternating between upper-body and lower-body works to allow for adequate rest between exercises. Some examples of resistance exercise include chest press, shoulder press, triceps extension, biceps curl, pull-down (upper back), lower-back extension, abdominal crunch/curl-up, quadriceps extension or leg press, leg curls (hamstrings), and calf raise.

## FLEXIBILITY RECOMMENDATIONS FOR HYPERTENSION

Follow the usual recommendations for flexibility training (adapted from the ACSM 2000).

| Flexibility Exercise Recommendations for Hypertension | |
|---|---|
| Frequency | 2–3 times a week |
| Intensity | To a position of mild discomfort |
| Time | 10–15 seconds per hold for maintenance<br>10–15 seconds repeated with 6–8 second contractions for development<br>3–4 repetitions for each stretch |
| Type | Aerobic physical activity |

Ensure the patient breathes normally at all times.

## CHEST FLEXIBILITY

This exercise, which stretches the chest muscles, is also good for your posture.

You can do this stretch while standing or sitting in a sturdy, armless chair.

Keep your feet flat on the floor, shoulder - width apart. Hold arms to your sides at shoulder height, with palms facing forward. Slowly move your arms back, while squeezing your shoulder blades together. Stop when you feel a stretch or slight discomfort. Hold the position for 10–30 seconds. Repeat at least 3–5 times.

## ADDITIONAL LIFESTYLE RECOMMENDATIONS

"Inactivity pervades the country. It affects more people in England than the combined total of those who smoke, misuse alcohol or are obese". Sir Liam Donaldson, Chief Medical Officer, 15 March 2010. Therefore all health professionals are able to provide additional lifestyle advice when conducting a patient review, advising on exercise referral, or advising on National exercise guidelines to patients.

The National Institute for Health has also developed the DASH lifestyle (www.nhlbi.nih.gov/health/health-topics/topics/dash/) advice for reducing hypertension:

| Lifestyle Modifications to Manage Hypertension (DASH guidelines 2010) | | |
|---|---|---|
| Modification | Recommendation | Approx reduction in SBP |
| Weight reduction | Maintain body weight (BMI) 18.5–24.9 k | 5–20 mmHg/10 kg weight loss |
| Adopt DASH eating plan | Consume a diet rich in fruits, vegetables, and low fat dairy products with a reduced content of saturated and total fat | 8–14 mmHg |
| Dietary sodium reduction | Reduce dietary sodium intake (< 2.4 g of sodium or < 6 g of sodium chloride per day) | 2–8 mmHg |
| Exercise | Regular aerobic physical activity (at least 30 min per day, most days of the week or 150 min/week | 4–9 mmHg |
| Moderate alcohol intake | **Men** should drink no more than 21 units of alcohol per week (and no more than 4 units in any one day) **Women** should drink no more than 14 units of alcohol per week (and no more than 3 units in any one day) | 2–4 mmHg |

Healthcare professionals when reviewing medicines can provide this additional lifestyle advice to help patients on medication, having compliance issues or side effects from medicines to reduce their blood pressure through exercise and following the guidelines in the Table above. In fact, just the average reduction in implementing all of the above lifestyle factors could result in better hypertensive control in conjunction with medication by almost **35 mmHg**. This will enable hypertensive patients to reduce their blood pressures and resultant cardiovascular risks.

In general, fitness professionals who regularly exercise patients on beta blockers agree that exercise undertaken at 30 beats per minute above the pre exercise heart rate will generally provide an effective training stimulus.

Aerobic exercise in the outdoors is an ideal exercise programme to help reduce hypertension.

Beta blocker medication may reduce exercise performance in some individuals. Side effects are not reported by everyone but many individuals will report feeling 'slowed down', general fatigue or 'heavy legs'. Because most antihypertensive drugs work by vasodilating systemic arteries, hypotension during or after exercise is common, especially when the leg muscles or other large muscle groups are involved so patients should be advised to avoid sudden changes in position to avoid postural hypotension and to keep feet moving throughout the exercise session and introducing an adequate cool down period will prevent hypotensive episodes.

## SPECIAL PRECAUTIONS FOR HYPERTENSIVE PATIENTS

Patients with hypertension and other diseases such as diabetes, or CHD should be evaluated carefully prior to exercise. High-intensity resistance training should not be initiated for persons without prior exposure to more moderate resistance exercise independently of age, health status, or fitness level[10]. Therefore, patients with hypertension should consult a primary care practitioner prior to any substantive increase in physical activity, particularly vigorous-intensity activity.