

## **HYPERTENSION and EXERCISE**

Blood pressure is the force of the blood pushing against the walls of the arteries. The heart beats about 60-75 times each minute, and the blood pressure is at its greatest when the heart contracts, pumping blood into the arteries. This is called systolic blood pressure. When the heart is resting briefly between beats, the blood pressure falls, termed diastolic blood pressure.

The rationale for the proposition that physical activity (or fitness) will help prevent hypertension is based on the cardiovascular responses to exercise and the adaptations of this system to training. To understand these it is important to remember two things: First, the most fundamental equation in vascular physiology:

Mean arterial blood pressure = cardiac output x total peripheral resistance

and second, that regulation of arterial blood pressure is the most important homeostatic mechanism in man. During endurance exercise with the body's large muscles the cardiac output increases several-fold. Vasodilation of the arterioles in the exercising muscle causes a decrease in total peripheral resistance which, in turn, attenuates the rise in blood pressure which would otherwise follow from the increased cardiac output. During recovery from exercise cardiac output quickly falls back to the resting level but the vasodilation, and thus the decrease in total peripheral resistance, persists for some hours. According to the equation above, blood pressure will be lower after exercise.

Bearing in mind the length of the post-exercise effect, someone who regularly and frequently engages in endurance exercise may well spend most of their lives in a state of 'post-exercise hypotension'. (It is important to note that these responses are typical of endurance exercise. During resistance exercise blood pressure increases sharply, mainly because the high tension generated in muscle temporarily occludes the blood vessels in muscle, increasing resistance and thus blood pressure. This is the main reason why sedentary people should increase their activity through endurance exercise before attempting sports or exercises which involve resistance work.)

Another mechanism which may lead to a decrease in blood pressure with increased activity is a decrease in sympathetic activity. Whole-body resting sympathetic 'tone' is reduced with training, with a decrease in the plasma catecholamine response to standardized exercise. It is also possible that training may modify the baroreceptor reflex. Thus, exercise is an effective non-pharmacological means of lowering blood pressure and is advocated by the World Hypertension League.

The blood pressure lowering effects of a single session of exercise in healthy people have already been described over. This phenomenon is evident also in patients with hypertension. For example, researchers used 24-hour ambulatory monitoring to compare blood pressure after 45 minutes of endurance exercise with values during a day without exercise (14). Blood pressure was reduced for the first 16 hours between 6/5 and 13/5mmHg and over the 24-hour period by an average of 7.4/3.6mmHg. Also exercise is as effective in lowering blood pressure in elderly patients as those in middle age.

Blair et al. (4) found that hypertensive men who were more fit had lower death rates compared with less fit men. Between 1970 and 1981, these authors tested 1832 men who reported a history of hypertension but were otherwise healthy. Mortality surveillance was conducted on the group through 1985. The inverse relation between fitness and all-cause mortality held even after investigators adjusted for the influence of age, serum cholesterol, resting

systolic BP, body mass index, current smoking, and length of follow-up. Most studies show a beneficial effect of exercise on CHD risk factors, even if the exercise is not enough to increase fitness level or decrease body weight. Studies on both adults and children have consistently shown that physical activity and fitness are linked to a more favourable blood pressure level, compared to an inactive lifestyle (1). In one study of 8283 male recreational runners, those running more than 50 miles a week, compared to less than 10 miles a week, showed a 50% reduction in prevalence of hypertension and a 50% reduction in the use of medications to lower blood pressure (12). A study of nearly 5000 Dutch women showed that blood pressure was lowest in those spending the most time exercising in various sports (12).

### **Some of the Considerations an Exercise Physiologist looks at when creating an Exercise plan for a person with Hypertension includes:**

-alpha 1-Blockers, alpha 2- Blockers, calcium channel blockers, and vasodilators may provoke postexertion hypotension so emphasis is on a gradual cool-down period following the exercise session.

-Do not exercise if resting systolic BP > 200 mm Hg or diastolic BP > 110 mm Hg

-Avoid Valsalva maneuvers during resistance training

-Resistance training is not recommended as the primary form of exercise training for hypertensive individuals, but should be combined with aerobic training. Resistance training regimens should incorporate lower resistance with higher repetitions.

-Beta- Blockers and diuretics may impair thermoregulation during exercise in hot and/or humid environments. Hypertensive patients taking these medications should be well informed about signs and symptoms of heat intolerance, along with prudent modifications in the exercise routine to prevent heat illness.

-Individuals with more marked elevations in BP (i.e., >160/100) should add endurance exercise training to their treatment regimen only after initiating pharmacologic therapy (3). Exercise may reduce their BP further and, thus, allow them to decrease their anti-hypertensive medications and attenuate their risk for premature mortality.

### **Lifestyle Modifications to Prevent Mortality**

Hypertension is often referred to as the “silent killer”, because most patients do not have specific symptoms related to their high blood pressure. A meta-analysis of nine studies, involving 420 000 individuals, revealed that prolonged increases in usual diastolic BP of 5 and 10 mm Hg were associated with at least 34% and 56% increases in stroke risk and with at least 21% and 37% increases in coronary heart disease (CHD) risk, respectively (8).

Using data from the large-scale MRFIT study, researchers have documented that cardiovascular and stroke mortality increases progressively with incremental increases in blood pressure from the optimal level of less than 120/80 mm Hg (11, 13). Even a small decrease in the population’s average blood pressure can lead to a substantial decrease in CVD risk. For example, it has been estimated that a 2 mm Hg shift downwards in the overall systolic blood pressure might reduce the annual mortality from stroke by 6% and from coronary heart disease by 4% (11).

The goal of hypertension prevention and management is to reduce morbidity and mortality by the least intrusive means possible. Persons with systolic blood pressure 120 to 139 mm Hg and/or diastolic blood pressure of 80 to 89 mm Hg are classified pre-hypertensive and should also engage in lifestyle modifications to prevent cardiovascular disease. Regular physical activity and weight control are at the core of current recommendations for both the primary prevention and treatment of high blood pressure. The table below presents lifestyle modifications recommended alone, or in combination with pharmacologic treatment by JNC7(10).

**TABLE. Lifestyle Modifications to Manage Hypertension\***

<b>Modification</b>	<b>Recommendation</b>	<b>Approx. SBP Reduction (range)</b>
Weight reduction	Maintain normal body weight (BMI 18.5-24.9)	5-20 mm Hg per 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 fat	8-14 mm Hg( ).
Dietary sodium restriction	Reduce dietary sodium to no more than 100 mmol per day (2.4g sodium or 6g sodium chloride)	2-8 mm Hg( ).
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week)	4-9 mm Hg( ).
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks (1 oz or 30 ml ethanol; e.g., 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) per day in most men and no more than one drink per day in woman and lighter-weight persons	2-4 mm Hg( ).

\*See Reference (10)

Abbreviations: DASH, Dietary Approaches to Stop Hypertension; BMI, body mass index; SBP, systolic blood pressure; g, gram; oz, ounce.

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