Australian Association for Exercise and Sports Science and Sports Medicine Australia

Position Statement on Exercise and Hypertension

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Summary Hypertension (high blood pressure; BP) is a leading contributor to premature death and disability from cardiovascular disease. Lifestyle modification that includes regular physical activity is often recommended to patients with hypertension as one of the first line treatments for lowering BP, as well as improving overall risk for cardiovascular events. It is recognised that allied health care professionals play an important role in helping patients to achieve BP control by influencing and reinforcing appropriate lifestyle behavior. The minimum amount of exercise that is recommended in patients with hypertension comprises a mix of moderate to vigorous aerobic (endurance) activity (up to 5 days/week) in addition to resistance (strength) training (on 2 or more non-consecutive days/week). However, due to the dose-response relationship between physical activity and health, exercise levels performed beyond the minimum recommendations are expected to confer additional health benefits. Vigorous exercise training is generally safe and well tolerated by most people, including those with hypertension, although some special considerations are required and these are discussed in this review.

Background

This document provides guidance on appropriate exercise intervention for the special needs of patients with high blood pressure (high BP; hypertension). While it is beyond the scope of this paper to review all available material relating to this subject, important publications have been highlighted for recommended reading (RR). For over 100 years, clinicians have used upper arm BP to define hypertension, assess associated risk and guide therapy. The two BP values recorded during each measurement represent the maximal pressure of the blood within the brachial artery during cardiac contraction (systolic BP; SBP) and the minimal pressure during relaxation (diastolic BP; DBP). These give an estimate of the BP occurring within other blood vessels in the body. Hypertension is one of the major potentially modifiable risk factors for cardiovascular disease and death.[1] Most of this risk results from structural damage to the heart (which is required to work harder as a pump in the face of high BP) and also the large and small blood vessels, and the organs they supply.

Approximately 29% of the Australian population have hypertension,[2] which is the most frequently managed problem by General Practitioners.[3] Although the aetiology is unknown, genetic factors are thought to play a role,[4] and a family history of hypertension is frequently encountered. Importantly, *hypertension is more likely to develop in people who are physically inactive*, overweight (BMI ≥30 kg/m2; waist circumference >102 cm [men] or >88 cm [women])[5] or who consume excess dietary sodium (>100 mmol/d or >2.4 g/d) or alcohol (>2 standard drinks/d [men]; >1 standard drink [women]).[6] Australian guidelines for the definitions and classifications of BP (which are similar to the European and United States guidelines) are shown in Table 1[7] and Mancia et al. (European Hypertension Guidelines; RR)[8] provide a comprehensive review of clinical considerations relating to the detection and management of hypertension.

Table 1 Definitions and classifications of blood pressure (BP) levels according to Australian guidelines[7].

Category	Systolic BP (mmHg)	Diastolic BP (mmHg)
Normal	<120	<80
High-normal	120–139	80–89
Grade 1 hypertension (mild)	140–159	90–99
Grade 2 hypertension (moderate)	160–179	100–109
Grade 3 hypertension (severe)	≥180	≥110
Isolated systolic hypertension	≥140	<90
Isolated systolic hypertension with widened pulse pressure[a]	≥160	≤70

Note: When an individual's systolic and diastolic BP falls into different categories, the patient is categorised according to the higher BP reading.

[a] High absolute risk for cardiovascular disease, if apparent in middle aged or elderly people with cardiovascular risk factors or associated clinical conditions. Reproduced with permission from the Heart Foundation.

Once hypertension has been diagnosed, a management plan is initiated by the treating clinician with the goal of reducing BP as well as overall cardiovascular risk.[7] This may involve the identification and, where possible, correction of ''curable'' forms of hypertension caused by a variety of endocrine conditions, but this applies to a minority of patients with hypertension. A fundamental, and in most cases the initial, ''tool'' to achieve a reduction in BP as well as cardiovascular risk is lifestyle modification (including regular physical activity, weight reduction, reduction in alcohol intake, smoking cessation and dietary modification), whether in conjunction with drug therapy or otherwise. Therapeutic lifestyle changes (including regular physical activity and restriction of sedentary activity, weight loss and dietary modification) are also recommended in children and adolescents with high BP. In this patient population the criteria for the diagnosis of hypertension are different to adults and are dependent on age, gender and height-specific normative values (RR).[9]

It is recognised that health care professionals other than doctors (i.e. Exercise Physiologists, Physiotherapists, Nurses) play an important role in the management of patients with hypertension by influencing and reinforcing appropriate lifestyle behaviours to achieve BP control (RR).[10] Positive lifestyle modification and, in some cases, medication to lower BP may be recommended in individuals who do not have hypertension, but have high-normal BP (as defined in Table 1) and are at high risk of or exhibit cardiovascular disease, diabetes or kidney disease. For example, the Dietary Approaches to Stop Hypertension (DASH) diet is a program designed to reduce BP (without medication), as well as other cardiovascular risk factors,[11] and is an excellent adjunct to specific exercise advice.

Role of exercise for prevention and treatment of hypertension

Aerobic exercise: Several large studies have shown regular aerobic exercise, or high levels of fitness (VO_2 max), to be protective against the future development of hypertension in men.[12–14] However, there are fewer studies and less prognostic information available in women. On the other hand, there is compelling evidence that dynamic aerobic training (even at relatively low intensity [e.g. 50% VO_2 max]) reduces resting BP[15–18] as well as light exercise BP and 24 h ambulatory BP in both normotensive and hypertensive individuals, irrespective of gender

(RR).[19,20] More significant reductions in BP are observed following exercise training in patients with high initial BP.[21] Importantly, each acute bout of dynamic exercise may reduce BP for a substantial portion of the daylight hours.[19]

On a population average, the reduction in SBP and DBP for patients with hypertension who undertake habitual aerobic exercise is approximately 7/6 mmHg.[16] These reductions are of major clinical significance because it has been estimated that a 5mmHg drop in SBP, on a population level, is associated with a reduction in all-cause mortality, death due to stroke and death due to coronary heart disease by 7%, 14% and 9%, respectively.[6] Thus, aerobic exercise is regarded as an important approach towards primary prevention and treatment of hypertension.[19]

Resistance exercise: Compared to aerobic exercise training, there is less evidence available and results are more conflicting on the chronic effect of resistance training on BP. However, the available data suggest that moderate intensity resistance training is not contraindicated in healthy adults[22] and strength training does not chronically increase BP.[21] Indeed, when progressive resistance exercises are performed according to American College of Sports Medicine guidelines (RR),[23,24] a small (≈3/3 mmHg) but significant decrease in BP may be achieved.[25] In general these guidelines recommend that dynamic resistance exercises be performed in a rhythmical fashion, through the full range of motion, at a moderate-to-slow and controlled speed with emphasis on eccentric (lengthening) contractions and maintenance of a normal breathing pattern (no breath holding).[23,24] Heavy weight lifting of an intensive, isometric nature has a pronounced pressor effect (BP raising) and should be avoided.[8]

Exercise prescription: recommendations

The exact type and amount of training required to optimally lower BP is unclear. However, the recommendations in Table 2, which are derived from the American College of Sports Medicine guidelines to promote and maintain adult health,[23,24] are predicted to result in a lowering of BP in patients with hypertension, based on extensive review of the literature.[19] It should be noted that, due to the dose—response relationship between physical activity and health, levels of exercise performed beyond the minimum recommendations are expected to provide greater health benefits.[24]

Special considerations

In general, vigorous aerobic exercise (i.e. ≥6 metabolic equivalents) is safe and well tolerated by most people including those with hypertension. On the other hand, the risk of exercise-induced adverse events is heightened in older people with coronary artery disease,[26] a condition often associated with hypertension. Therefore, prior to initiating an exercise program, older patients with hypertension (grade 1 hypertension and above, as per Table 1) should be medically evaluated to identify if exercise training may be hazardous (RR).[27] It is advisable that supervising Exercise Physiologists (or other health care professionals) routinely check the resting and exercise BP of patients with hypertension undergoing exercise training. The average of two consecutive BP readings (30 s apart) should be recorded during exercise, as is recommended under resting conditions.[7] Training should be postponed if resting BP is poorly controlled (e.g. ≥180mmHg or DBP ≥110 mmHg) and these people advised to visit their doctor as a matter of priority. Other special considerations include;

Competency in measuring BP: In order to accurately assess resting and exercise BP, Exercise Physiologists (and other health care professionals) need to undertake appropriate training and be aware of the correct techniques, as well as the numerous potential sources or error associated with measuring BP. Knowledge of the confounding influence of ''white coat hypertension'' (isolated clinic/office hypertension), ''masked hypertension'' (normal clinic BP with raised BP outside the clinic environment), circadian BP fluctuations, as well as the utility of home and 24 h ambulatory BP monitoring will also aid the proper assessment of BP (RR).[28—30] Further, incorrect cuff size is a common error which may lead to inappropriate diagnosis. It is important to note that if the cuff bladder is too small, BP will be overestimated, whereas if the cuff bladder is too large, BP will be underestimated.

Hypertensive heart disease: Chronically raised BP may result in left ventricular hypertrophy and diastolic or systolic heart failure, which places these individuals at higher risk of life threatening arrhythmias.[31] While aerobic exercise is usually clinically beneficial and apparently safe in these patients,[32] it is recommended that initial exercise sessions are medically supervised until the safety of the prescribed activity is established.[27]

Antihypertensive medication: Medications to lower BP do not preclude people participating in exercise programs.[33] However, beta blockers reduce maximal aerobic power and exercise heart rate. It may, therefore, be more appropriate to use rating of perceived exertion, rather than target heart rates to gauge the intensity of prescribed exercise. Beta blockers also may impair thermoregulation during exercise in warmer temperatures.[34] As a precaution, people taking these agents should be advised to limit the amount and intensity of exercise in hot weather, as well as to ensure appropriate hydration and clothing to aid cooling by evaporation.[19] Furthermore, diuretics reduce plasma volume and impair exercise capacity in the first few weeks of treatment.[35] The reduced plasma volume implies a need to ensure appropriate hydration during the initial phase of treatment in these patients.

The elderly (*>65 years*): An extended cool down period after physical activity is advised in older individuals because there is a greater chance of hypotension, syncope (fainting) or arrhythmias during the post-exercise recovery period.[27] Dehydration is also more likely to occur in older people taking diuretics. Therefore, fluid intake is recommended before, during and after exercise. People should also be made aware of the symptoms of dehydration (e.g. thirst, fatigue, loss of appetite, dizziness).[27]

Abrupt termination of exercise: Stopping exercise suddenly should be avoided as it may result in aprecipitous drop in SBP (and possible syncope). This occurs due to venous pooling and a delayed increase in peripheral vascular resistance designed to offset the acute reduction in cardiac output. Some antihypertensive agents (e.g. alpha blockers or calcium channel blockers) may exacerbate this effect.

Hypertensive response to exercise: An exaggerated BP during exercise (e.g. ≥210/105mmHg [men] or ≥190/105mmHg [women]) in people not yet regarded as hypertensive is associated with an increased risk of developing hypertension later in life.[36] These people should be advised to maintain regular screening visits to their doctor. If SBP rises >250mmHg and/or DBP >115mmHg during exercise, the training session should be terminated[27] and the person advised to visit their doctor, as this may indicate the need to adjust medical therapy.

Hypotensive response to exercise: An inadequate rise in SBP (<20—30 mmHg) or a drop in SBP with increasing intensity of exercise may indicate an aortic outflow obstruction, severe left ventricular dysfunction or myocardial ischemia. Exercise-induced hypotension may also occur during prolonged strenuous exercise, or if the patient is dehydrated or taking beta blocker medication. If SBP drops >10mmHg below resting levels, despite an increase in workload, exercise should be stopped and the patient advised to seek further medical advice.

Symptoms during exercise: Further medical assessment is required for people who complain of chest discomfort, palpitations or dyspnoea (breathlessness beyond normal expectations) associated with exercise,[35] as these symptoms may indicate underlying heart disease.

Automotive pollution: People should exercise away from busy roadways where the concentration of harmful pollutants may increase BP and exacerbate cardiovascular risk.[37] Exercising alongside quiet roads or in parks and recreation areas away from heavy traffic is recommended.

Summary

Elevated BP (hypertension) is one of the major modifiable risk factors for cardiovascular disease. Once an individual is diagnosed with hypertension, a goal of clinical therapy is to reduce BP as well as overall cardiovascular risk. In most cases, the first line treatment to reduce BP is initiation of lifestyle changes, of which regular aerobic exercise is a principal component. Exercise Physiologists, as well as other health care professionals, play an important role in helping to achieve BP control in patients with hypertension by reinforcing healthy lifestyle habits and prescribing appropriate exercise training.

Disclosures

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