

Regular Aerobic Exercise Can Be an Effective Intervention to Reduce Blood Pressure

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Sciences

Introduction

Cardiovascular disease (CVD) is the leading cause of death in Canada with more than 70,000 deaths in 2002 (Statistics Canada). The cause of CVD is complex; however, high blood pressure is a major predictor of future CVD (Ketelhut et al., 2004). In addition, high blood pressure has been associated with the potential development of stroke, congestive heart failure and renal failure (Ishikawa-Takata et al., 2003). With one-in-five Canadians affected by high blood pressure (Heart and Stroke Foundation of Alberta), it is imperative that some type of action be implemented. Fortunately, blood pressure is a modifiable risk factor that can be improved by exercise (Whelton et al. 2002).

Blood pressure can be classified by the following: Normal blood pressure is defined as systolic blood pressure less than 120mmHg and diastolic blood pressure less than 80mmHg. High blood pressure, otherwise known as hypertension can be defined as a chronically elevated high blood pressure with a systolic blood pressure greater than 140mmHg and/or a diastolic blood pressure greater than 90mmHg (Bacon et al., 2004). Other classifications include high normal or pre-hypertensive levels which are systolic blood pressure 120-139mmHg and/or diastolic blood pressure 80-89mmHg. Individuals with grade 1 hypertension would have pressures of 140-159mmHg over 90-99mmHg. Grade 2 hypertension would be values of 160-179mmHg over 100-109mmHg (Baster, 2005).

Hypertension can be and is successfully treated with antihypertensive medication (Ketelhut et al., 2004). Although blood pressure can be lowered with medication in the hypertensive individual, these medications are costly, may have side effects and are not effective for everyone

(Blumenthal et al., 2000). These adverse effects can impact quality of life and consequently non-pharmacological approaches to the treatment of hypertension are gaining more attention (Blumenthal et al., 2000).

The American College of Sports Medicine (ACSM) advocates lifestyle modifications as a means of controlling hypertension with exercise being a key component (ACSM, 2004). The ACSM (2004) states that “exercise programs that primarily involve endurance activity prevent the development of hypertension and lower blood pressure in adults with normal blood pressure and those with hypertension” (p.533). This article examines the literature to deduce if regular aerobic exercise can be an effective intervention to reduce blood pressure.

Summary of Selected Literature

Several studies (Blumenthal et al 2000; Ketelhut et al, 2004; Miller et al, 2002; Miyai et al, 2002; Miyatake et al, 2003; Tsai et al, 2004) have investigated the role of aerobic exercise in the prevention and control of hypertension. Tsai et al. (2004) evaluated the effects of regular endurance training on quality of life and blood pressure. Patients with mild to moderate hypertension were randomized to a moderate intensity aerobic exercise group training three sessions per week over ten weeks and a non exercising group. The exercise group exercised at 60-70% maximal heart rate reserve, an average of approximately 6-7 METS. The exercise program consisted of a 10 minute warm up, 30 minutes of treadmill walking/jogging and a 10 minute cool down. The study's data showed that endurance training induced a significant reduction of blood pressure in hypertensive patients (Table 1).

Miyatake et al. (2003) investigated the effectiveness of exercise on several CVD risk factors including blood pressure in overweight Japanese men. Twenty three out of forty three subjects were enrolled in a 10-month exercise program. The intensity of the exercise program was 50-65% heart rate max. In addition, participants were instructed to check daily steps and increase their daily walk at least 1000 steps above baseline. Blood pressure was measured every week and the average of every month was recorded. The results (Table 1) showed significant reductions in systolic and diastolic blood pressure after 10 months of exercise.

Others have investigated the effects of diet and exercise on reducing blood pressure. Blumenthal et al. (2000) evaluated 133 sedentary overweight men and women. Subjects were randomly assigned to three groups: aerobic exercise only, behavioral weight management control group or a waiting list control group. Participants had unmedicated high normal blood pressure or grade 1 or 2 hypertension. The exercise group exercised three to four times a week at a level of 70-85% of their initial heart rate reserve. Exercise sessions consisted of a 10 minute warm up followed by 35 minutes cycling and walking and 10 minutes of cool-down exercises. The findings of this study indicate that exercise alone was effective in reducing blood pressure (Table 1), but the addition of a behavioral weight loss program enhanced this effect. Miller et al. (2002) found similar results in their study. Forty four hypertensive overweight adults were randomized to a lifestyle or a control group. The difference in this study is that participants were on a single medication to treat their blood pressure. The lifestyle group exercised with supervision three times per week at a moderate intensity (50-75% heart rate max). This group was also prescribed a hypocaloric version of the Dietary Approach to Stop Hypertension (DASH) diet. Exercise

alone was again effective in decreasing blood pressure (Table 1), but the inclusion of diet and exercise further enhance this effect.

Ishikawa-Takata, Ohta and Tanaka (2003) examined the dose-response relationship of exercise training and blood pressure. The dose-response relationship was determined by using an eight week intervention study involving 207 untreated individuals with grade 1 or 2 hypertension. Individuals were divided into five groups (sedentary control, 30-60 min/wk, 61-90 min/wk, 91-120 min/wk, and greater than 120 min/wk) based on duration and frequency per week of exercise. The exercise sessions consisted of a warm up, aerobic exercise followed by sit ups and stretching. The exercise intensity was standardized at 50% of estimated maximal oxygen consumption. The control group maintained their normal physical activity patterns. Results of the study showed that all four exercise groups had a significant reduction in both systolic and diastolic blood pressure (Table 1). The reduction in systolic blood pressure was greater in the 61 to 90 minutes per week group compared with the 30 to 60 minutes per week group. Further increases in exercise volume did not produce a greater reduction in systolic blood pressure. The degree to which diastolic blood pressure was reduced was not significantly different among the four groups. The researchers concluded that in previously sedentary subjects, clinically significant reductions in blood pressure can be achieved with relatively modest increases in physical activity above sedentary levels.

A study by Ketelhut, Franz and Scholze (2004) assessed the long-term effect of regular training on both blood pressures at rest and during exercise. Ten subjects with hypertension were studied to determine blood pressure response to long-term aerobic training. Blood pressure

measurements were taken at rest and during cycle ergometry (50-100W). The exercise program consisted of two outdoor training sessions per week, which consisted of walking and intermittent slow jogging. Individuals progressed to 60 minutes of long distance running two times per week. Heart rate was maintained at a target heart rate of 60-70% of age related maximum heart rate. After 18 months of training systolic blood pressure decreased by 6mmHg and diastolic blood pressure by 5mmHg. After 3 years of regular aerobic exercise systolic blood pressure decreased to a total of 16mmHg and diastolic blood pressure to 15mmHg. The researchers concluded that in hypertensive patients a moderate regular exercise program results in a continuous and long-term decrease in both systolic and diastolic pressure at rest and during exercise.

Clinical Implications

Aerobic exercise can be an effective means of controlling high blood pressure. Most people can safely begin a moderate intensity exercise program without extensive medical screening (Baster, 2005). The current guideline of participating in moderate intensity physical activity for a minimum of 30 minutes over most of the days of the week is sound advice. The review of the literature demonstrates that significant reductions in blood pressure are realized with moderate intensity exercise 90 minutes a week. The ACSM (2004) Guidelines for managing hypertension are:

Frequency: on most, preferably all, days of the week

Intensity: moderate intensity

Time: at least 30 minutes of continuous or accumulated physical activity per day

Type: primarily endurance physical activity

The benefits of aerobic exercise in the treatment of high blood pressure should encourage physicians to look at exercise as an alternative to pharmacological treatment or a complimentary

intervention combined with diet and medication. Physicians and exercise professionals need to work together to help individuals manage their hypertension. The exercise professional can have a role in the prescription and monitoring of the exercise program. The volume of exercise needed to reduce blood pressure is relatively small (Ishikawa-Takata et al., 2003). This can be encouraging news for the previously sedentary individual who may avoid physical activity because of the negative perception of the amount of work that is necessary for a health benefit. Adherence to the intervention program is a key element to success in achieving and maintaining the maximum benefit of exercise on blood pressure (Whelton et al., 2002).

Conclusions

High blood pressure is a major risk factor for cardiovascular disease (ACSM, 2004; Whelton et al., 2002). In all of the studies reviewed, aerobic exercise was an effective intervention in the treatment of high blood pressure. Pharmacological intervention has been a successful method of treating hypertension, but this treatment is expensive and is not effective for everyone (Blumenthal et al., 2000; Whelton et al., 2002). Ketelhut et al., (2004) suggest that regular aerobic exercise can have a beneficial effect in the management of hypertension that is comparable to that of drug therapy. Even a small decrease in the population's average blood pressure could decrease the incidence of cardiovascular disease (Halbert et al.1997; Whelton et al., 2002). Regular exercise has an important role to play in the control and prevention of high blood pressure. This reinforces the importance of promoting regular physical activity as an important health improvement strategy.

Table 1

Study (Year)	Intensity	Duration	Length of Study	(mmHg) Change in Systolic Blood Pressure	(mmHg) Change in Diastolic Blood Pressure
Blumenthal et al (2000)	70-80% of HRR	35 Minutes 3 to 4 times per week	6 Months	-4.4	-4.3
Miller et al (2002)	40-60% HRR	30 to 45 Minutes 3 times per week	9 Weeks	-9.5	-5.3
Miyatake et al (2003)	40-55% HRR	Weekly	10 Months	-5.1	-4.0
Takata et al (2003)	55% of HRR	30 to 60 Minutes per week	8 Weeks	-7.0	-5.0
Takata et al (2003)	55% of HRR	61 to 90 Minutes per week	8 Weeks	-11.0	-7.0
Takata et al (2003)	55% of HRR	91 to 120 Minutes per week	8 Weeks	-12.0	-6.0
Takata et al (2003)	55% of HRR	>120 Minutes per week	8 Weeks	-13.0	-5.0
Tsai et al (2004)	70-80% of HRR	90 Minutes per week	10 Weeks	-13.1	-6.3

Questions

1. Control of hypertension can be achieved through which of the following:
 - a. Exercise
 - b. Diet
 - c. Medication
 - d. All of the above
2. ACSM guidelines recommend high intensity aerobic exercise for control of hypertension.
 - a. True
 - b. False
3. Hypertension is the number one risk factor for the development of:
 - a. Cancer
 - b. Heart disease
 - c. Stroke

- d. Diabetes
4. A blood pressure of 118/78 would be classified as normal.
 - a. True
 - b. False
 5. An individual with grade 2 hypertension would have a systolic pressure in the range of:
 - a. 160-179mmHg
 - b. 120-139mmHg
 - c. 140-159mmHg
 - d. 110-119mmHg
 6. Following current physical activity guideline recommendations will have a positive effect on lowering blood pressure in hypertensive individuals.
 - a. True
 - b. False
 7. Extensive medical screening is necessary before hypertensive individuals begin a moderate intensity exercise program.
 - a. True
 - b. False
 8. Exercising individuals with hypertension can
 - a. Increase their need for medication
 - b. Eliminate their need for medication
 - c. Improve quality of life
 - d. Decrease quality of life
 9. The exercise professional has a role to play in the treatment of hypertension.
 - a. True
 - b. False
 10. An individual comes to see you on referral from her physician. She has been told that exercise should be the first step in an attempt to control her increasing blood pressure. What would be an effective starting intensity for aerobic exercise to achieve this goal?
 - a. 35% of heart rate reserve(HRR)
 - b. 45% HRR
 - c. 85% HRR
 - d. 90% HRR