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Abstract

Purpose: 12 week- brisk walking exercise intervention at 50%-70% intensity was carried out in the study to examine the mean reduction on systolic and diastolic blood pressures of middle-aged mild-hypertensive population in Asaba, Nigeria.

Methodology: The study comprised of 42 male and female middle-aged (36-45years) individuals who recorded mild-hypertension. A control group-pre-test and post-test experimental design was used to randomly assign the individuals into treatment and control groups. Whereas, arithmetic mean and standard deviation were used to analyze the data according to the difference in mean scores.

Conclusion: In conclusion, 12-week brisk walking intervention showed a mean reduction on systolic blood pressure (SBP) and diastolic blood pressure (DBP) of middle-aged mild-hypertensive population. Precisely, the experiment indicated that those who did not partake in the exercise intervention (control group) showed an increase on SBP and a decrease on DBP and thereby indicating a relatively higher mean reduction of 12-week brisk-walking exercise on SBP of middle-aged mild-hypertensive population.

Recommendations: The study recommended that 50% -70% intensity of 12-week brisk-walking exercise may likely present a therapeutic intervention for people with mild-hypertension.

Key words: *Systolic blood pressure-SBP, Diastolic blood pressure-DBP, Blood pressure-BP*

INTRODUCTION.

There is a consciousness by people to engage in exercise for the prevention and management of health morbidities such as hypertension. Hypertension or high blood pressure is a cardiovascular disease that affects mainly middle-aged and elderly people. It is characterized by blood pressure (BP) and is measured in millimeters of mercury (mmHg) with a sphygmomanometer. The basic means for measuring BP includes the systolic blood pressure (SBP) or upper reading and diastolic blood pressure (DBP) or lower reading. According to the World Health Organization, WHO (2013), a person is hypertensive when the SBP and DBP are consistently elevated above an optimum BP of 120mmHg and 80mmHg respectively. Precisely, American heart association, American Heart Association, AHA (2017) revealed that those who show BP of SBP >130 mmHg and DBP > 80 mmHg are now hypertensive. Thereby, increasing the number of people with hypertension in the world.

Hypertension is categorized in three stages-mild, moderate and severe stages. According to AHA (2017) report, mild hypertension is anywhere between a systolic of 130mmHg and139mmHg or a diastolic between 80mmHg and 89mmHg respectively. In addition, moderate hypertension is anywhere between a systolic of 140mmHg and 159mmHg or a diastolic between 90mmHg and 99mmHg. Whereas, severe hypertension is anywhere between or higher than systolic 160 mmHg or diastolic of 100mmHg or higher.

Hypertension in middle- age is prominent and has been described as the most significant period for the onset of morbidities due to lower body metabolic rates and changing lifestyles, (AHA, 2011). Thus, the remedies for hypertension is by reducing certain body metabolic indices through modified lifestyles, exercise and pharmaceutical drugs (Gwotmut, Agbayin & Chinwah, 2016).

Researchers have spent decades developing treatments for hypertension. For instance, American college for Sport Medicine ACSM (2004) stressed that exercise is one of the best remedies around. Exercise has been described as the training of the body to improve its functions and also serves as an intervention for treating hypertension and arterial stiffness (Gwotmut, Agbayin & Chinwah, 2016). However, the extent of efficacy in the management of hypertension remains elucidated. Thus, it becomes imperative for exercise to be clearly defined in treating middle-aged hypertension. In this light, the study examined the reducing effects of 12-week brisk walking exercise at 50%-70% intensity on SBP and DBP of middle-aged mild hypertensive population.

Brisk Walking

Brisk walking is a simple aerobic exercise because it does not require too much oxygen to undertake. Bumgardener (2018) described brisk walking as exertion rather than speed and that for walking pace to be brisk, one need to be breathing harder than usual. Similarly, a brisk walking pace involves exerting at a moderately brisk intensity level in order to achieve cardiovascular benefits that increase overall endurance and lower risks of developing heart disease, obesity and stroke (Welch, 2017). According to Agadoni (2017) brisk walking can start in five minutes increments to acquaint the body and may gradually work up to 150 minutes weekly. Additionally, the author described brisk walking as a faster pace than everyday comfortable pace but slower than a speed or race walking, jogging or running pace. Bumgardener(2018) indicated that in order to know if one is walking at a brisk pace, there is need to take pulse throughout the walking period. This is in order to adjust the intensity levels and stay within the target heart rate zone. According to Agadoni (2017), the procedures for brisk-walking includes- standing straight and looking straight ahead whilst walking heel to toe on a soft surface.

Physiology of aerobic exercise on Hypertension

In general, aerobic exercise is safe and tolerated by most people including those with hypertension (Thompson, Franklin, Balady, Blaw & Corrado, 2007). However, prior to initiating aerobic exercise programme, Sherman and Stowasser (2009), stressed that patients should be medically evaluated to identify if exercise training may be hazardous. The American college for sport medicine ACSM (2010) described this as a stratification process of those embarking in exercise for treatment.

Regular aerobic has shown to manage hypertension even at low intensity of 50% V02 max (Sherman& Stowasser, 2008). In addition, aerobic training at low intensity reduces resting blood pressure during 24 hours ambulatory BP in normotensives and hypertensives (Whelton, Chin, Xin & He, 2002). The physiological response of aerobic exercise to hypertension can occur within only few sessions, whereas, the chronic adaptations are derived from accumulation of several bouts (Hamer,Taylor& Steptoe, 2006). This implies that aerobic exercise is likely to be effective in hypertensives over a consistent period. According to Cornelissen and Fagard (2005), an immediate reduction on BP following aerobic exercise has been termed ‘post-exercise hypotension’ and is agreed to be caused by reductions in vascular resistance. The authors explained that system vascular resistance helps to normalize long-term BP and blood volume in the body and are most the underlining mechanism. Another factor contributing to the decrease in vascular resistance during aerobic exercise is the increase in nitric oxide production for different sites of the body called vasodilatation. This is described as an increase in the diameter of blood vessels that results from the relaxation of smooth muscle within the walls of the vessels.

Aerobic exercise generally has proved to be more effective in people with mild-hypertension. Rahman and Salek (2009) stated that aerobic exercise has worked better for people with mild hypertension and moderate to severe hypertension should be mainly combined with exercise, lifestyle modification and pharmaceutical drugs. However, this should not suggest that mild hypertension is isolated from the combination of these factors in order to achieve positive results. According to Sjostrom, Peltonen and Wendell (2010), the reduction capacity of exercise on hypertensive BP may be attributed to many other factors. Although, ACSM (2010), concluded that people with mild hypertension can expect both SBP and DBP to fall an average of 10mmHg in response to regular aerobic exercise.

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Exercise blood pressure is influenced by age of an individual. It is suggestive that young and middle age people respond better to aerobic exercise than older to elderly people do due to some physiological age-related differences. Some of those differences explained are that older people tend to experience reduced arterial function and arterial stiffness. In addition, Houghton, Jones and Cassidy (2016), argued that vascular function and functional capacity decline with ageing. Furthermore, older people have an increased augmentation index, systemic vascular resistance and higher SBP which is suggestive of decrease in vascular function and arterial stiffness (Jakov & Ijevic, 2015) and they show reduced cardiac output and stroke volume under resting condition (Kaess, 2012). These differences suggest that aerobic exercise is more likely to be more effective in young and middle-age people because of their seeming age related physiological capacity.

The most consistent gender difference in cardiovascular responses to aerobic exercise is lower stroke volume of women during exercise (Toole, 2004) suggest that gender-specific differences in cardiac size/ mass and blood volume may be responsible for the smaller stroke volume at rest during exercise, as well as lower peak oxygen (V02 Max) in women than men of similar age. At the same absolute workload both gender and physical fitness affect the heart response to exercise. According to Gleim, Stachenfield, Coplan and Nicholes (2011), specifically, the increase in heart rate during exercise is greater in unfit women than men. The authors noted that at peak exercise, heart rate, blood pressure and arteriovenous oxygen are not significantly different between genders. Similarly, during exercise bout, cardiac output increases in direct proportion to the increase in oxygen uptake (Toole, 2004). Therefore, the mechanisms by which the cardiac output is increased during aerobic exercise may differ from men and women and the overall response of the cardiovascular system to exercise is similar in men and women (Purkiss & Huckell, 2005).

Physiology of exercise on SBP

SBP was considered inconsequential part of ageing. However, Franklin (2004) revealed that an age associated rise in SBP occurs as a consequence of systolic hypertension after middle-age. A rise in SBP affects a pre direction towards the onset of vascular events high lightening the importance of control. Campo, Segura and Ruilope (2002) explained that SBP is ranked as the most relevant component of BP for determining risk for cardiovascular and other events in hypertensive patients. According to the authors, despite its prognostic role, SBP remains more difficult to control difficult to control than DBP and most middle-age and older hypertensive patients fail to achieve recommended targets. Consequently, the lack of strict control of SBP in the more aged population lies in the physiology of hypertension.

Franklin (2004) argued that younger persons tend toward isolated diastolic blood pressure or combined systolic –diastolic hypertension, primarily driven by increased peripheral resistance and more effectively treated by antihypertensive medications; whereas, older people develop isolated systolic hypertension (ISH) associated with arterial stiffness that appears to be less amicable to current therapies. In addition, the author noted that diastolic pressure in hypertensive patients often rises as patients reach middle-age and subsequently declines, whereas systolic blood pressure consistently rises through the years. According to Campo, Segura & Ruilope

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(2002), the treatment approaches favoring control of DBP frequently result in residual high SBP, putting patients in residual high SBP and at a greater risk of vascular complications.

Exercise has shown to have both acute and chronic effects on BP. The typical BP response to an acute bout of aerobic exercise is gradual increase on SBP and a gradual decrease on DBP. Therapeutic interventions brought about the changes in autonomic nervous system and hormonal influences. Hence, this affects systolic pressure more than diastolic pressure (Rahman & Salek, 2009). During aerobic exercise there is an appropriate increase in BP that is primarily systolic. Cohen, Raymond and Townsend (2001) explained that it occurs due to an increase in cardiac output as well decrease in peripheral resistance due to vasodilatation in the exercising muscle. Consequently, the authors revealed that SBP rises with no change or even slightly reduction in DBP. However, systolic arterial blood pressure increases during exercise and stabilizes after 2-3 minutes of exercise of a given intensity (O' Brien &Pickering, 2002). Factors associated with an increase in SBP during exercise include an increase in sympathetic tone and decrease in aortic dispensability.

Gender differences in BP are detectable during adolescence and persist through adulthood through adulthood. Hence, men tend to have higher mean systolic and diastolic blood pressures than women. For instance, Campo, Segura & Ruilope (2002) established that overall mean arterial pressure is higher in both normotensive and hypertensive men and women.

Physiology of aerobic exercise on diastolic blood pressure

SBP is a measure of blood vessel pressure when your heart beats. Whereas, DBP is a measure of the pressure in the blood vessels between heart beats. It is expected that during exercise testing, SBP rises whilst DBP reduces or remains constant. However, an abnormal diastolic response represents a useful additional indicator of coronary artery disease (Ships, 2005).

During aerobic exercise, the normal blood pressure is to observe a progressive increase in SBP with no change or even a slight decrease in DBP. According to Arena and Arrowood (2007), this action is influenced by cardiac output and total peripheral vascular resistance decreases during transition from exercise to rest. Normally, during exercise, cardiac output increases and peripheral vascular resistance decreases in response to vasodilatation of resistant vessels within the skeletal muscles. According to August and Oparal (2000), unlike SBP, diastolic pressure reduces in brachial and central arteries during and after exercise.

It remains unclear how aerobic exercise affects DBP of gender, Collier (2008) found that resting diastolic blood pressure decreased in women whereas arterial stiffness increased in men after 4 weeks of resistance training. Furthermore, DBP has been an index for detectincardiovascular diseases. On the other hand, high diastolic pressure as a result of exercise has a potential protective effect against exercise-induced ischemia (Yoshimaya & Akioka, 2005) and thereby making high diastolic pressure a protective mechanism for heart disease.

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Methodology

A control – group pre-test-post-test experimental design and arithmetic mean and standard deviation were used to analyze the study. The study was carried out at Asaba, Nigeria. A total of 42 male and female between the ages of 36-45 years with recorded mild-hypertension of between SBP of 130mmHg-139mmHg SBP and DBP of 85mmHg-89mmHg as indicated by AHA (2017) participated in the study.

The treatment and control groups of the study were randomly selected and assigned based on the lower and higher limits of their mild- hypertension blood pressure. Thus, the treatment group of the study consisted of 27 male and female (11 male, 16 female) whose hypertension BP fell between SBP 130mmHg and DBP 85mmHg -89mmHg. On the other hand, the control group consisted of 15 male and female (10 male, 5 female) whose mild- hypertension BP fell between SBP 130mmHg-134mmHg and DBP 80mmHg-84mmHg. The treatment group of the study were exposed to a routine brisk walking exercise for 150 minutes a week for 12-weeks at 50%-70% intensity, whereas, the control group were not exposed to the exercise protocol.

Findings

Table 1. Mean and standard deviation of SBP scores at pre-test and post-test of treatment and control groups.

	Pre-test			**Post-test**			**Mean Difference**
Group	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	
Treatment group	20	133.50	3.36	20	128.55	5.48	-4.95
Control group	13	134.31	3.33	13	135.69	7.09	1.38

Table 1 shows that the SBP mean pre-test and post-test scores of the treatment group are 133.50 and 128.55 respectively. Whilst the SBP mean pre-test and post-test scores of control group are 134.31 and 135.69 respectively. Thus the mean difference between the treatment and control groups are -4.95 and 1.38 respectively. This implies that the treatment group showed a reduction on SBP whereas the control group showed an increase on SBP.

Table 2. Mean and standard deviation of DBP scores at pre-test and post-test.

	Pre-test			**Post-test**			**Mean Difference**
Group	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	
Treatment group	20	86.30	1.45	20	78.70	5.47	-7.60
Control group	13	86.54	1.45	13	79.15	6.39	- 7.39

Table 2 shows that the pre-test and post-test mean DBP scores of the treatment group are 86.30 and 78.70 respectively. Whilst those of control group are 86.54 and 79.15 respectively. The mean difference between the treatment and control groups are -7.60 and -7.39 respectively. These suggest that the treatment group showed a -7.60 reduction on DBP while the control group showed a -7.39 reduction on DBP.

Discussion

Middle aged mild-hypertensive population showed a reduction on SBP as a result of 12 week-brisk walking exercise as compared to the control group. However, this result was contrary to Cohen and Townsend (2001), who stated that aerobic exercise raises cardiac output and leads to constant rise on SBP after exercise. On the other hand, the result of the study revealed a steady rise on SBP of the control group who were not exposed to the exercise protocol and this showed a similar pattern with Franklin (2014), who revealed that SBP rises consistently through the middle-age years of hypertensive people.

Middle aged mild-hypertensive population in the study showed a reduction on DBP of the treatment group as a result of the exercise protocol. Similarly, the control group showed a reduction on DBP even though they were not exposed to the exercise protocol. According to August and Opral (2000), the reduction recorded on DBP from exercise might be as a result of reduction in brachial and central arteries. Additionally, Cohen and Townsend (2001) explained that during exercise cardiac output increases and peripheral vascular resistance vessels within exercise skeletal muscle.

Conclusion

12 week- brisk walking exercise showed reductions on SBP and DBP of middle aged-mild-hypertensive population. However, it showed a more relative reduction on SBP of the middle-aged hypertensive population.

Recommendations

1) 12 week-brisk walking exercise may be carried out at 50%-70% intensity in middle aged people with mild hypertension.

2) 12 week-brisk walking exercise at 50% -70% intensity may likely reduce SBP of middle-aged people with mild hypertension.

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