COMPARISON OF THE EFFECT OF AEROBIC AND CULTIVATION EXERCISE IN LOWERING BLOOD PRESSURE IN HYPERTENSIVE ELDERLY

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ABSTRACT

Background: The elderly are prone to hypertension (HT) because of a decrease in the elasticity of blood vessels, fat deposits in the vessel walls, stress, alcohol and salty food consumption, low consumption of fruit and vegetables, smoking, obesity, and lack of exercise. This study aimed to analyze the effectiveness differences between aerobic and cultivation exercise in lowering blood pressure (BP) in elderly with HT. **Methods:** This comparative study utilized pretest post-test design. There were 31 elderly with HT obtained by mean of purposive sampling. They took part as respondents and were divided into two groups. Physical gymnastic fitness (PGF) and Falun Dafa exercise (FDE) were compared as a mean of aerobic and cultivation exercise respectively, both were being independent variable. Systolic and diastolic BP were measured after three times of 30 minutes PGF and 30 minutes FDE in both groups. The instruments used were sphygmomanometer and observation sheet. Data were then analyzed by using descriptive statistic and Independent Sample T Test ($\alpha<.05$). Ethical clearance was issued. **Results:** There was a significant difference found in the post-test results of systolic and diastolic pressure between groups with p=.002 and p=.005 respectively, but there was no significant difference found between the effectiveness of PGF and FDE in lowering systolic and diastolic pressure with p=.403 and p=.809 respectively. **Conclusions:** PGF and FDE have similar effectiveness in lowering BP in hypertensive elderly. Energic PGF and relaxing FDE may be one of exercise choice for elderly with HT by relatively the same effectiveness in lowering BP.

Keywords: aerobic exercice, cultivation exercise, diastole, elderly, Falun Dafa exercise, physical gymnastic fitness, systole

BACKGROUND

Every human will face the stages of living that naturally begin from newborn, children, adults, to aged. The stages of aging will affect individual both biologically and psychologically. Becoming old means someone will experience a declined organ function so that the many problems will be existed, one of which is the problem of high blood pressure or hypertension (HT). HT is a symptom of cardiovascular degenerative diseases most experienced by the elderly, followed by joint disorders, cataracts, strokes, mental-emotional disorders, heart disease, and diabetes mellitus (Ministry of Health, 2013).

Data from the World Health Organization (WHO) in 2011 shows that one billion people in the world suffer from HT, and it will continue to increase sharply until then it was predicted in 2025 HT prevalence will be as many as 29% of adults worldwide (Ministry of Health, 2017). The incidence of HT in East Java in 2013 was 26.2% (Ministry of Health,

2013). According to Health Department of Surabaya (2014) HT prevalenve was 19.56% in 2014. HT surveys that have been conducted in Indonesia have concluded that the prevalence of HT in adult ranges from 5-10%, and this figure will be more than 20% in the age group of 50 years old and over (Darmojo, 2009). The data obtained in 2012 from Public Health Center of Ngagel Wonorejo in which the number of elderly as many as 685 people, the majority have HT. This fact proved that HT is very important health problem, therefore it must receive special and intensive attention.

Many factors influence the occurrence of HT in the elderly, where it can be linked to the aging process due to structural and functional changes in the vascular system. These changes include atherosclerosis, loss of elasticity of connective tissue, and a decrease in relaxation of vascular smooth muscle, which in turn decreases the ability of distention and stretching of blood vessels. In addition, baroreceptor sensitivity also changes with age and will increase sympathetic nerve activity (Kuswardhani, 2006). Thickening and widening of the wall are the main structural changes that occur in the large elastic arteries during aging.

HT is also influenced by changes in lifestyle, such as lack of exercise, stress, smoking and drinking alcohol, obesity, lack of consumption of fruits and vegetables, and high consumption of salt (Warnock & Textor, 2004). All of the above mentioned factors interact with each other so as to increase peripheral resistance and cardiac output resulted in HT.

According to the WHO, 50% of detected HT patients only half of it who received treatment, and only a quarter of it who could be treated well (Ministry of Health, 2009). HT can be treated pharmacologically by anti-hypertensive drugs or non-pharmacologically by lifestyle modification or a combination of both. However, pharmacological treatment will be better or will not have any meaning if it is not supported by non-pharmacological treatment (Palmer, 2007). Non-pharmacological treatment can include reducing obesity and excessive salt consumption, stopping alcohol, implementing healthy lifestyle by eating lots of fruits and vegetables, not smoking, exercising regularly, and reducing stress (Hananta & Freitag, 2011).

There are many types of exercise that could be done by elderly with HT for controlling their blood pressure (BP), such as aerobic and and cultivation exercise. Based on the study of Dupa (2016), one type of aerobic exercise that has been proven to be effective for lowering BP in elderly with mild HT is physical gymnastic fitness (PGF). The PGF was given 3 times a week for two weeks long with a duration of 30 minutes. Experiments on 27 elderly with HT obtained $p = .000$ for systolic and diastolic BP. On the other hand, the study of Manungkalit (2012) showed that one type of cultivation exercise that proved to be effective for lowering BP in elderly with mild HT was Falun Dafa Exercise (FDE). The FDE was given 3 times a week for 3 weeks with a duration of 50 minutes. Experiments on 15 elderly with HT obtained $p = .0001$ for systolic and diastolic BP. This study aimed to compare the effect of aerobic exercise represented by the PGF with cultivation exercise represented by FDE in lowering BP in elderly with mild HT.

METHODS

This comparative study utilized pre-experimental design. The population was 45 elderly with HT in the community of RW IV, Keputran Subdistrict, Tegal Sari District, Surabaya, and 100 elderly with HT in RW XII, Ngagel Rejo Subdistrict, Wonokromo District, Surabaya. Samples were taken by purposive sampling which consisted of 31 elderly

with HT who matched to sample's criteria: mild and primary HT (systolic pressure was 140-159 mmHg, diastolic pressure was 90 -99 mmHg), and female. Obtained samples then were divided into 2 groups: 16 elderly in the aerobic exercise group (PGF) named group 1, and 15 elderly in the cultivation exercise group (FDE) named group 2. Ethical clearance was issued by Faculty of Public Health, Universitas Airlangga; number of ethical certificate: 235/PANEC/LPPM/2011.

Data collection began with the licensing bureaucracy at the study sites in accordance to the procedures set. The PGF intervention was carried out at the elderly's community health clinic, while the FDE intervention was carried out in the community hall based on agreement. Prior to study intervention, respondents were given an explanation of the purpose and benefits of this study, then given an informed consent sheet to be signed as a sign of approval. One day before study intervention, the researchers conducted a pretest by measuring the respondent's BP. After that, PGF and FDE were given to group 1 (16 elderly) and 2 (15 elderly) respectively. Both types of exercise were given three times in one week long with duration of 30 minutes for each. After a week, the researchers conducted a post-test by measuring the respondent's BP again. All pretest and post-test results were recorded in an observation sheet.

The independent variables were PGF and FDE, while the dependent variables were systolic and diastolic BP. The instrument used was calibrated digital sphygmomanometer. All collected data then tested for normality and homogeneity. Hypothesis testing was conducted by Levene test ($\alpha < .05$). In case significant difference was found between groups then one sample T test will be conducted to determine which intervention was better in lowering BP.

RESULTS

There were 31 elderly with mild HT participated in this study. Table 1 below explains the demography characteristic of study respondents.

Table 1: Demography Characteristic

Characteristic	PGF Group (n=16)		FDE Group (n=15)	
	F	%	F	%
1. Age (y.o.)				
a. 55-60	0	0	10	66.7
b. 61-65	8	50	5	33.3
c. 66-70	6	37.5	0	0
d. > 70	2	12.5	0	0
2, Gender				
a. Female	16	100	12	80
b. Male	0	0	3	20
3. Duration of HT				
a. < 1 year	0	0	3	20
b. > 1 year	16	100	12	80
4. Family background of HT				
a. Present	9	56.25	5	33.3
b. None	7	43.75	6	40
c. Unsure	0	0	4	26.7

5. Consumption of salty food				
a. Rarely	16	100	3	20
b. Occasionaly	0	0	0	0
c. Frequently	0	0	12	80
6. Exercise habit				
a. Rarely	3	18.75	10	66.7
b. Sufficient	10	62.5	0	0
c. Regularly	3	18.75	5	33.3

In total, the majority of study respondents were 61-65 years old (41.94%), female (90.32%), diagnosed with HT for more than a year (90.32), had family background of HT (45.16%), rarely consume salty food (61.29%), and exercise rarely (41.94%).

Table 2: Systolic BP Between Groups

PGF (Group 1) n=16			FDE (group 2) n=15		
Pretest Mean	Post-test Mean	Delta	Pretest Mean	Post-test Mean	Delta
146.1	139.5	6.6	157.73	149.73	8.0

Table 2 shows that the average Delta was lower in PGF group. It seemed that FDE was slightly better in reducing systolic BP. The Delta in systolic BP from the two groups was then tested for homogeneity to determine the differences in effectiveness between both study interventions by using Levene test.

Table 3: Homogeneity Test of Systolic BP Delta

Levene Statistic	df1	df2	Sig.
3.365	1	29	.077

Table 3 shows that there was no significant difference found between groups. PGF and FDE have similar effectiveness in lowering systolic BP.

Table 4: Diastolic BP Between Groups

PGF (Group 1) n=16			FDE (group 2) n=15		
Pretest Mean	Post-test Mean	Delta	Pretest Mean	Post-test Mean	Delta
94.4	89	5.4	98.93	94.07	4.86

Table 4 shows that the average Delta was lower in FDE group. It seemed that PGF was slightly better in reducing diastolic BP. The Delta in diastolic BP from the two groups

was then tested for homogeneity to determine the differences in effectiveness between both study interventions by using Levene test.

Table 5: Homogeneity Test of Diastolic BP Delta

Levene Statistic	df1	df2	Sig.
2.886	1	29	.100

Table 5 shows that there was no significant difference found between groups. PGF and FDE have similar effectiveness in lowering diastolic BP.

DISCUSSION

Results showed that there was no significant difference found between the intervention of PGF and FDE in lowering systolic BP (p=.077) and diastolic BP (p=1.000). The Mean Delta difference between PGF and FDE was only 1.4 mmHg and .54 mmHg for systolic and diastolic BP respectively. FDE could lower systolic BP more than PGF, while FDE could lower diastolic BP more than PGF. The nature of diastolic BP is more stable than systolic BP. Benson & Pernoll (2009) stated that diastolic BP is more stable and slightly decreases with age due to myocardium thickening and difficult to stretch, so that when relaxation occurs the valve closure is not optimal. It seemed that FDE has a promising ability to reduce BP in general. FDE involves various relaxing and slow movements combine with breathing exercise and meditation (mind-body intervention), while PGF involves various active, energic, and fast movements contains breathing exercise also (bodily intervention only). Both PGF and FDE are beneficial for reducing BP in elderly with mild HT when each exercise was done regularly in theree times a week basis.

Exercise causes major changes in the circulatory and respiratory system where both occur together as a homeostatic response. Generally, exercise can improve blood vessel conditions. In an animal experiment, results showed that exercise can normalize the ratio of wall and lumen to arterioles in all muscles and increase the muscle venous density. Arterial HT decreases after exercise (Michelini, 2003). Regular exercise can reduce systolic and diastolic BP in people with mild levels of HT (Ridjab, 2005). For body fitness, aerobic exercise provides many benefits including increasing endurance of the heart, lungs, strengthening the muscles of the body, flexibility, and burning calories (Syahrini, et al., 2012).

Gymnastic is a part of aerobic exercise that is recommended for managing elderly with HT. Widianti & Atikah (2010) stated that doing gymnastic can help our body to stay fit and fresh because it trains our bones to remain strong, pushes our heart to work optimally, and helps to eliminate free radicals roamed in our body. One example of gymnastic is PGF. Movements of PGF is divided into 3 parts, namely: warming up, core movements, and cooling down. Each part involves a lot of movements based on specific instruction and a certain count. Mahardika et al. (2010) stated that PGF can stimulate the decrease of sympathetic nerve activity and increase the activity of parasympathetic nerves resulted in the decrease of adrenaline, norepinephrine and catecholamines secretion, as well as vasodilation

in the blood vessels resulted in smooth oxygen transport throughout the body, especially to the brain, so that the BP could decrease.

Similar mechanism was proposed by Divine (2006) and Aji (2015). Divine (2006) who stated that by doing PGF, the activity of sympathetic nervous system decreases so that the activity of parasympathetic nervous system increases; one of its effect is a decrease in BP. When doing PGF, CRH (cotricotropin releasing hormone) and ACTH (adrenocorticotropic) hormone secretion in the hypothalamus decreased so that the work of the sympathetic nerve decreases. It is resulted in the decrease of heart rate, blood vessel resistance, the pump function, vasodilation, so that the circulatory process is not inhibited and blood flow to the tissue is smoother. This resulted in a BP decrease.

Aji (2015) stated that gymnastics can lower BP because it can push the heart to work optimally; exercise for the heart can increase energy needs by cells, tissues and organs. These increases respiratory and skeletal muscle activity resulted in the increase of venous return. It then causes an increase in stroke volume that will immediately increase the cardiac output resulted in the moderate increase of arterial BP. After that, the phase will take a break first resulted in the reduction of respiratory and skeletal muscle activity and the decrease of sympathetic nerve activity and epinephrine secretion, but the parasympathetic nerve activity increases resulted in the decrease of heart rate & stroke volume, and venous arteriolar vasodilation. These all resulted in the decrease of cardiac output and total peripheral resistance, so that a decrease in BP occur.

Different mechanism was proposed by Utami (2006) who stated that gymnastics such as PGF can improve blood circulation. When doing PGF, there is an increase in cardiac output and redistribution of blood from inactive muscles to active muscles. PGF causes the increase of heart rate and stroke volume, so that cardiac output increases also. Regular PGF will cause baroreceptors at the peripheral nerve endings of the sensitized artery wall could obstruct the center of vasoconstrictor and stimulates vasodilation in the entire peripheral circulation system, so that blood flow becomes smoother. In this case, BP could returns back to normal value.

In the other hand, cultivation exercise is a set of high level exercise which involves training of mind and body beneficial for increasing health status in term of physical, moral, mental, and spiritual as well as reducing stress level to create a healthier and better person (Li, 2009). One example of cultivation exercise is FDE. FDE movements similar to gymnastic but combine with meditation; the rhythm is slower and the nature of movements are smoother. Movements of FDE is divided into 3 parts also, namely: concentrating, core movements, and meditation. FDE is more friendly with elderly who has various physical limitation compare to gymnastic or PGF because of the movements nature.

In the beginning of FDE (concentrating phase), BP will rise quite a lot, for example systolic pressure can rise up to 150-200 mmHg. Conversely, as soon as the exercise is complete or finish (after meditation), BP will drop down below normal and last for 30-120 minutes. This extreme decrease occurs because blood vessels experience dilation and relaxation. If FDE is done repeatedly / regularly, over time the decrease of BP can last for a long time (Radmarssy, 2007).

The benefits of FDE are reflected in body and soul cultivation. Body cultivation is in the form of 5 exercises that resemble gymnastics and meditation: 1) sitting motion by

alternating hands (in the concentration phase), 2) thousand hand stretching method (8 movements in the core phase), 3) standing on the Falun method (4 movements in the core phase), 4) the method of connecting the two poles (in the core phase), and 5) the sky circle of the Falun method (in the core phase). Its function is to process the body's potential, generate energy in the body, absorb the energy of the universe, and strengthen the system's mechanism of energy in the body, which means that BP is stable and reduce the risk of other diseases caused by HT, especially those related to heart, nerve, and kidney. Soul cultivation is calming the mind, avoiding stress by aligning itself with the characteristics of the universe, namely: genuine, good, and patient. The definition of the word "genuine" is true, straight and honest; "good" is virtue, helpful, and selfless; while "patient" is full of tolerance, emotional control, endurance, and being able to let go of attachments, which means that when everyone's mind is calm the blood vessels will experience relaxation, blood will flow smoothly, and BP will remain stable (Li, 2009; Combes, 2008).

FDE could lower BP by various mechanisms: 1) the increase of nitrit oxide (NO) release, 2) the decrease of arterial stiffness, and 3) the increase of baroreceptor sensitivity and the decrease of sympathetic nerve activity (similar to PGF). NO causes vasodilation and is an antiaterosclerotic factor (Kaplan & Victor, 2006). Generally, exercise can increase NO production and release because it improves endothelial function. This may be due to an increase in recurrent blood flow that increases NO production. The release of NO followed by endothelial dependent vasorelaxation plays an important role in lowering BP (Kimura, et al., 2003). This will reduce the thickness of the blood vessel wall resulted in the reduction of arterial stiffness, and peripheral vascular resistance resulted in the decrease of blood vessel compliance, so that baroreceptor sensitivity will increase by increasing baroreflect bradycardia acutely. The end result is BP will decrease (Krieger, 1999).

PGF and FDE movements and characteristic are very different by nature, but results showed similar effectiveness in lowering BP in elderly with mild HT; various mechanisms could explain this effectiveness. It could be assumed that both exercises when it was done regularly will be beneficial for lowering BP. Therefore, whether the elderly with mild HT choose PGF or FDE to be one of their regular exercise, as long as they practice it routinely surely it will be beneficial for increasing their health status. FDE has more positive benefit than PGF, because it cultivates the mind through concentration and meditation practice in which these two aspects could not be found in PGF.

CONCLUSIONS

PGF and FDE have similar effectiveness in lowering BP in elderly with mild HT. Both exercises are effective for lowering BP when it was done three times a week by duration of 30 minutes regularly. Elderly may choose PGF or FDE based on personal preference or physical ability; PGF is suitable for active elderly with minimum physical limitation, while FDE is suitable for “weaker” elderly with various physical limitation. FDE is more recommended because of its positive benefit on mind cultivation which is unpresent in PGF.

DECLARATION

All authors have contributed equally to this research and publication (50:50). Regarding the initial research conception, 2nd author had the original idea then developed by

1st author. Regarding data collection process, 1st author was responsible for the data collection in FDE group, while 2nd author was responsible for supervising the data collection in PGF group. Regarding manuscript writing, 1st author wrote the paper in Bahasa Indonesia, while 2nd author translated the paper into English and give some addition in result, discussion, and conclusion sections. Both authors agreed to all statements written in this manuscript and prooved this publication.

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ETHICAL CONSIDERATION

Ethical clearance was issued by Ethical Committee of Faculty of Public Health, Universitas Airlangga, with certificate number: 235 / PANEC / LPPM / 2011. Prior to data collection, all respondents have agreed to research protocol or gave their consent. It was proved by signature in informed consent form.

CONSENT FOR PUBLICATION

All authors agreed to this publication. No conflict of interest assured. The copyright transfer agreement will be signed after the acceptance of this manuscript, or prior to "in press" process.

AVAILABILITY OF DATA AND MATERIALS

All data was confidential, it was kept by both researchers. We cannot share our data to public because of ethical issue. Only study results presented in this manuscript considered to be appropriate to share.

COMPETING INTEREST

Both authors declare no conflict of interest.

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REFERENCES

Aji, B., Pamungkas, W. (2015). *The Effect of Physical Gymnastic Fitness on Blood Pressure in Elderly with Hypertension in the Elderly's Community Health Clinic of Banaran and Playen Village, Gunung Kidul (in Bahasa Indonesia)*. Yogyakarta: STIKES Aisyiyah

Benson, R.C., Pernoll, M.L. (2009). *Handbook of Obstetry and Gynecology (in Bahasa Indonesia)*. Jakarta: EGC

Combes, K. (2008). *Falun Gong and Its Effect on Health (in Bahasa Indonesia)*. Retrieved from: http://www.kebijakanjernih.net/index.php?option=com_content&view=article&catid=50%3Abukti-ilmiah-kesehatan&id=28%3Afalun-gong-dan-efek-kesehatannya&Itemid=85

Darmojo, R.B. (2009). Theory of aging process. In Martono, H. & Pranarka, K. *Textbook of Gerontology (in Bahasa Indonesia), 4th Edition*. Jakarta: Faculty of Medicine, Universitas Indonesia

Divine, G.J. (2006). Exercise *Program: High Blood Pressure (in Bahasa Indonesia)*. Klaten: PT. Intan Sejati

Dupa, L.A. (2016). *The Influence of Physical Gymnastic Fitness of 2012 on Blood pressure in Female Elderly with Mild Hypertension in Elderly's Community Health Clinic of Keputran Subdistrict, Tegal Sari District, Surabaya (in Bahasa Indonesia)*. Surabaya: Faculty of Nursing, Widya Mandala Catholic University Surabaya

Hananta, Y., Freitag, H. (2011). *Early Detection and Prevention of Hypertension and Stroke (in Bahasa Indonesia).* Yogyakarta: Media Pressindo

Health Department of Surabaya. (2014). *The Big Ten of Disease Cases in Surabaya in The Year of 2014 (in Bahasa Indonesia)*. Surabaya: Health Department

Kaplan, N.M., Victor, R.G. (2006). *Kaplan's Clinical Hypertension, 9th Edition*. Philadelphia: Lippincott Williams & Wilkins

Kimura, T., Yokoyama, T., Matsumura, Y., Yoshiike, N., Date, C., Muramatsu, M., Tanaka, H. (2003). NOS3 Genotype Dependent Correlation Between Blood Pressure and Physical Activity, p.354-360. *Hypertension, 41(2)*: 355-360

Krieger, E.M., Brum, P.C., Negrao, C.E., (1999). *State-of-the-art lecture: influence of exercise training on neurogenic control of blood pressure in spontaneously hypertensive rats.* Hypertension, 34(4 Pt. 2): 720-723

Kuswardhani, T. (2006). Management of hypertension in the elderly (in Bahasa Indonesia). *Journal of Internal Medicine (135-140)*. Denpasar: Faculty of Medicine, Universitas Udayana

Li, H. (2009). *Falun Gong (in Bahasa Indonesia)*. Jakarta: PT. Sinar Era Baru

Mahardika, J., Joni, H., Abu, B. (2010). *The Effect of Elderly Gymnastic on Blood Pressure (in Bahasa Indonesia).* Surakarta: Universitas Muhammadyah

Manungkalit, M. (2012). *The Effect of Cultivation Exercise (Falun Dafa) in Controlling Blood Pressure in Hypertensive Elderly, in Community of RW XII, Ngagel rejo Subdistrict, Surabaya (in Bahasa Indonesia)*. Surabaya: Faculty of Nursing, Universitas Airlangga

Michelini, L.C., Melo, R.M., Martinho, E. (2003). Training Induced, Pressure Lowering Effect in SHR: wide effects on circulatory profile of exercised and nonexercised muscles. *Hypertension, 42(4):* 851-857

Ministry of Health. (2017). *Most Hypertensive Patients Do Not Realize It (in Bahasa Indonesia)*. Retrieved from: http://www.depkes.go.id/article/view/17051800002/sebagian-besar-penderita-hipertensi-tidak-menyadarinya.html

Ministry of Health. (2013). *Basic Health Research of 2013 (in Bahasa Indonesia)*. Jakarta: Department of Research and Development

Ministry of Health. (2009). *Hypertension: Main Factor of Cardiovascular Disease (in Bahasa Indonesia)*. Retrieved from: http://www.depkes.go.id/index.php/berita/press-release/157-hipertensi-faktor-risiko-utama-penyakit-kardiovaskular.html

Palmer, A. (2007). *High Blood Pressure (in Bahasa Indonesia)*. Jakarta: PT. Gelora Aksara Pratama

Radmarssy. (2007). *Reduce Hypertension with Aerobics (in Bahasa Indonesia)*. Retrieved from: http://radmarssy.wordpress.com/2007/02/25/meredam-hipertensi-dengan-aerobik/

Utami, H. (2006). *Exercise for A Healthy Heart (in Bahasa Indoensia)*. Jakarta: Faculty of Medicine, Universitas Indonesia

Ridjab, D.A. (2005). *The Effect of Physical Activity on Blood Pressure (in Bahasa Indonesia)*. Jakarta: Atmajaya Catholic University

Syahrini, E.N., Susanto, H.s., Udiyono, A. (2012). Primary Hypertension Risk Factor in Public Health Center of Tlogosari Kulon, Semarang (in Bahasa Indonesia). *Journal of Public Health, 1(2):* 315-325

Warnock, D.G., Textor, S.C. (2002). Hypertension. *American Journal of Kidney Diseases,* pp: 369-375

Widianti., Atikah. (2010). *Exercise of Health (in Bahasa Indonesia)*. Yogyakarta: Muha Medika