THE EFFECTS OF BREATHING EXERCISES TO INCREASE IMMUNITY IN ELDERLY HEALTH

Siswantoyo[1]

ABSTRACT

Background: *this study aimed to demonstrate influence of breathing exercise to increase immunity in elderly. It was an experimental study with Randomized Group Pre–Posttest design. The intervension was given in 21 meetings.* ***Methods:*** *The populations were elder participants of Satria Nusantara breathing exercise. Samples were 15 men aged over 45 years, each group. The unit of analysis was blood taken from cubital vein. Glucometer was to determine blood sugar levels, whereas beta-endorphin and IgG used ELISA (enzyme linked immunosorbent assay), by indirect sandwitch. Data were read by Elisa Reader with a sensitivity of 95%. Data were analyzed descriptives and inferential statistics by SPSS software and further analysis using t-tests. Results showed that, IgG significantly increased, p = 0013. The mean increase of IgG was 33.266 ng/mL. For beta-endorphin. Results t-tests showed the significance of 0.000. The mean increase of endorphin was 3.922 ng/mL, and blood sugar levels showed a decrease after the breathing exercise. The decrease of blood sugar was significant of 0.000. The mean decrease in blood sugar levels was 28.9 mg/100ml.* ***Conclusion:*** *It can be concluded that regular, targeted and programmed breathing exercise over 21 meetings increased the production of IgG and beta endorphins, as well as decreasing blood sugar levels. Breathing exercise was alternative sports to improve immunity.*

Key words: *breathing exercise, immunity, elderly of health*

ABSTRAK

Penelitian ini bertujuan untuk menunjukkan pengaruh pernapasan latihan untuk meningkatkan kekebalan pada lansia. Ini adalah penelitian eksperimental dengan rancangan Acak Kelompok Pra-posttest. intervensi tersebut diberikan dalam 21 pertemuan. Populasi adalah peserta lansia dari latihan pernapasan Satria Nusantara. Sampel 15 pria berusia di atas 45 tahun, masing-masing kelompok. Unit analisis adalah darah yang diambil dari vena cubiti. Glucometer adalah untuk menentukan kadar gula darah, sedangkan beta-endorphin dan IgG menggunakan ELISA (enzyme linked immunosorbent assay), oleh sandwitch tidak langsung. Data dibaca oleh Elisa Reader dengan sensitivitas 95%. Data dianalisis secara deskriptif dan statistik inferensial oleh perangkat lunak SPSS dan analisis lebih lanjut menggunakan t-tes. Hasil penelitian menunjukkan bahwa, IgG meningkat secara signifikan, p = 0013. Peningkatan rata-rata IgG 33,266 ng/mL. Untuk beta-endorphin. Hasil t-test menunjukkan signifikansi sebesar 0,000. Peningkatan rata-rata endorphin adalah 3,922 ng/mL, dan kadar gula darah menunjukkan penurunan setelah latihan pernapasan. Penurunan gula darah sangat signifikan sebesar 0,000. Penurunan rata-rata kadar gula darah adalah 28,9 mg/100 ml. Kesimpulan: Dapat disimpulkan bahwa latihan pernapasan teratur, terarah dan diprogram lebih dari 21 pertemuan meningkatkan produksi IgG dan endorfin beta, serta kadar gula darah menurun. Latihan Pernapasan adalah olahraga alternatif untuk meningkatkan kekebalan.

Kata kunci: *latihan pernapasan, kekebalan, kesehatan pada usia lanjut*

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INTRODUCTION

In China, breathing exercises are widely used for respiratory therapy in various hospitals and rehabilitation centers. In Indonesia, there are many kinds of schools of martial arts and schools of respiratory arts, but uses for therapy maintenance and breathing exercises towards healthy, fresh life has not been optimally implemented yet. Breathing exercises can improve physical fitness and immunity (Suparto, 2002). Breathing exercises are efforts to decrease stressor hence and to increase the quality of human as managing stressors to maintain

[1] Sport Science Faculty, Yogyakarta State University
Correspondence: E-mail: harimurti_1932@yahoo.co.id

and even restore homeostasis (Maryanto, 1990). Physiologically, the conditions of body according to ages are different. In relation to the age, elders generally experience degeneration of the body organs. However, these can be enhanced by doing exercise, because the exercise would stimulate increase of hormone secretion. Although numerous benefits are described as above, but the influence of breathing exercise towards the increase of immunity on beta endorphin, Immunoglobulin G and the decreased in blood sugar level are still not clear.

Breathing exercises as intended above are sports which rely on three main components which are integrated in the implementation, namely: 1) stance of motion exercise, 2) breathing rythms (inspiration/ draw breath - hold your breath - expiration, with a certain rhythm), 3) concentration (spiritual: *dhikr*). Breathing exercises in this study is the Satria Nusantara model. This breathing exercises are composed of nine levels, namely: 1) the pre-basic level, 2) the basic level, 3) the level of fine control, 4) the combined level, 5) the level on hard control, 6) the combined level on hard control, 7) the level on direction, 8) the level on one step, and 9) the level on meditation (Sumpeno, 2001; Suparto, 2002). At the primary level, time of breath holding in every motion, based on previous studies ranges from 37 to 52 seconds. Qvist, et al. (1993) mentioned that in the Korean *ama chacido dives*, the breath holding lasted in 30 seconds will put the levels of blood gases in the normal category, while holding breath in 32-95 seconds results in the arterial mean of PO_2 62 ± 14s. The normal blood gas is 97.4 (Comroe, 1962). Thus, the breathing exercises can be categorized as mild hypoxia. Hypoxia exercise will more powerfully stimulate as immunologic stress response compared with other exercise under normal conditions and hypoxia exercise also increase IL-6, neutrophils, NK cell activity, plasma TNF α, IL-10 and induce growth hormones and cortisol (Perdesen, 2002). Through regular practices, especially the concentration ones, our mind can be controlled, stable as well as raising the production of ACTH hormone (adrenocortico tropical hormone) and cortisol, which at certain levels can stimulate body immunity to produce immunoglobulin that plays the role of immunity (Putra, 1999).

Immunity was required to adapt live situations and environmental conditions. Our body has the ability to adapt to stimulating stressors. The stressors are various and can be derived from aspects of psychological, physiological, and physical activities. Breathing exercises are parts of stimuli in the form of physical activities. Physical activities can be ones categorized into two, namely aerobic and anaerobic. Basically, aerobic exercise are physical activities performed within a relatively long period with light intensity, and use primary energy sources of carbohydrates. Meanwhile anaerobic physical activities are performed within a relatively short period with maximum intensity, and using the main energy source of ATP-PC. From the view of physical activities based on oxygen consumption, there pop up a lot of variety of sports, usually called breathing exercises. Breathing exercises are identic to the "inner power." Sukamto (2003) stated that every man born has already bringing universal energy, and with physical exercises, breathing exercises, concentration, and physical exercises of *pangroso*, then the energy will be greater and greater. Doing a lot of exercises can influence personal life and can be used as martial arts, healing, healths condition, developing skills, and other psychic abilities. There are many types of respiratory-based exercises such as reiki, tai chi, self-healing, meditation and some other methods which use additional tools in the form of music that many people refer as the method of *grounding*. According Boutcher and Trenske (1990), it is revealed that listening to music during exercise will positively influence athletes.

Physical exercises on extremely excessive degree will cause unfavourable effects for bodies. The effects of over load of physical trainings on body resistance was observed in non athletes. Heavy physical exercise will lower IgA, the moderate load will lower activity of B lymphocytes, activities T-cell functions. Non athletes who and having a physical exercise program with the intensity of 60–70%, in the first week lower IgG and IgM. Total lymphocytes and the ratio of Th/Ts decrease the activity of NK cells (Setyawan, 1995). Negative effects mentioned above can be minimized if the degree at degree exercise is proper. Physical exercise with proper dosage can lead to adaptation process of the system levels, namely the nervous system, the hormone system, the cardio respiratory system, the metabolic system, the neuromusculoskeletal system, and the immune system (Fox, 1988; Vander, 1990; Setyawan, 1995). The concept of psychoneuroimmunology could explain

biological phenomena, whether pathobiology or physiobiology, through behaviour and immunological resistance, with intermediary neurotransmitter, neurohormonal, hormones and cytokines (Ader, 1991). The concept of psychoneuroimmunologic can be used to express physiobiology changes caused by breathing exercise.

"Import" breathing exercises are currently growing rapidly. In China and India have been long developed methods of exercises such as yoga, ayurveda, tai'chi, Qigong, reiki which are by meditation, relaxation, and concentration focusing on breathing, and that exercises are usually used for therapy. Doing *Tai'chiquan* exercise frequently increase T-lymphocytes (Xusheng et al, 1989). Irregular breathing exercise will cause negative effects on the body, such as pains in muscles, joints and other impacts. Based on the studies above, we need further evidence on breathing exercises. So far on the theory of psychoneuro-immunology, there are several paths associated with immunologic endurance. The pathways are through the growth hormone, ACTH, ß endorphin, prolactin and other hormones. But route that has frequently been used by researchers is the path of ACTH-Cortisol-immune responses. Thus, other channels still require a lot of evidences. Exercise in mild hypoxia conditions can stimulate increases in a variety of cytokines and provide stimuli as more powerful immunologic stress responses if compared with exercise in normal conditions (Perdesen, 2002). When the stress oxidative occurs, SOD enzymes and catalase inhibit ROS and induce the production of interleukin 6. ß endorphin will promote NK cell activities during chronic exercise with high intensity and long duration (Perdesen and Hofman, 2000). Interleukin-6 is produced in skeletal muscle in mice and humans during long training with high intensity (Febraio and Perdesen, 2002; Faldt, 2004).

Meditation in a certain time can lower cortisol level (Jevning, 1978). With levels of cortisol which are not so high, it will positively influence T-lymphocytes. Breathing exercise are usually done in a long duration, with regular, targeted, and programmed practices with a proper degree (intensity, duration, frequency and model of exercise), so it will achieve higher immune responses. The mechanism of increased body immunity will be discussed more clearly and detailed through psychoneuroimmunology exercise, which involve factors of mental condition (stressful) in the mechanism of immunity changes (Riley, 1981). Although there are a lot of empirical evidence about breathing exercises benefits disclosed above, but the mechanism of effect of breathing exercise toward increased immunity responses are still not clear and requires further studies. If such mechanisms can be revealed and explained, it means that indirect benefits on immunity can be found. From the background, the problem can be formulated as: Does breathing exercise affect the increase of body immunity (IgG, beta endorphin and decreased blood sugar levels) among of elders.

This study aimed to reveal the modulation of immunity in elders by breathing exercises. As indicators measured in this study were beta endorphin, immunoglobulin G (IgG), and blood sugar levels among elders. The hypothesis was that breathing exercises increase beta endorphin, IgG and lower blood sugar levels among elders.

METHODS

It was an experimental study. The study intended to reveal the influence of immune modulation on breathing exercises. Blood sugar, immunoglobulin (IgG), and beta endorphin levels were measured. The study design was to assure plan on how to collect, present, and analyze the data so efficiently and effectively managed (Zainudin, 2000). The design of the study was randomized group pre-posttest design.

The population were elders who attended breathing exercise in the LSP Satria Nusantara. Samples were selected from the population which fulfilled the criteria: males, aged above 45 years, willing and able to perform tasks in the study, willing to participate, and never conducted breathing exercise before. Exclusion criteria were non discipline during exercises, total attendance of less than 80%, having health problems and ordered to stop by doctors, and stating to resign from this study.

Determination of sample size was based on the same kind of study (Kuntoro, 2000). The number of samples for each group was 14.57 and rounded to 15 persons for each group.

The unit of analysis was laboratory analysis from blood taken from cubital vein. The Blood was taken twice, before intervension (for pre-test data) and after intervension for posttest data (one day after last exercise). The peripheral blood was based on facts

related to components which reflected to immunity and experienced circulation and recirculation (Setyawan, 1996). In addition, it was expected that results of the analysis were not affected by acute responses in final practices.

Independent variables were breathing exercise trainings. The training was conducted during 21 programmed and regularly meetings which combined physical activities, breathing and concentration, (motion + breath manners + concentration (spiritual; dhikr), which were conducted simultaneously.

Variables related to immune modulation were ones which could reflect the concept of psychoneuroimmunology. The dependent variables were the levels of blood sugar, beta-endorphin (β-end), and immunoglobulin G (IgG). Intervension composed the motion steps that consists of 10 movements. The breathing exercise training program was conducted in seven weeks beginning with the introduction phase, followed by training programs with the frequency of 3 times a week, intensity of sub-maximal, 6 sets/ session, and repetition of stances of 15 steps.

Gluchometer was to measure blood sugar levels, whereas beta-endorphin and IgG by ELISA (enzyme linked immunosorbent assay), conducted in *indirect sandwitch*. Elisa Reader 95% sensitivity.

Data were analyzed descriptives and inferential statistics with SPSS software. Further analysis was by t-tests.

RESULT AND DISCUSSION

From Table 1 showed result of t-test. It could determine change difference of each variable. The changes were seen in the table below.

Based on the analysis, it could be inferred that IgG significantly increased, p = 0013. The mean increase in IgG was 33.266 ng/ mL. The increase of IgG was caused by homeostasis abilities of the body. With regular, targeted, and programmed practices, the physical exercise could to stimulate the body to adapt towards positive direction (Eustress). Theoretically, in the first two weeks, the immunoglobulin which was dominant in the body to cope with physical stress in the form of IgM, and after 2 weeks of having the immunoglobulin would gradually switch to IgG. The Increase of IgG can be an indicator of the increase of immunity among participants of breathing exercises. There was study determining relationship between physical exercise and endurance (Mackinon, 1992). Physical exercises are good if regularly, targeted and programmed done with proper degree. Immunity is so sensitive to changes in degrees of physical exercises (Setyawan, 1995). Sensitivity changes in the parameters of immunity are caused by a mechanism of "stress" that existed at the expense of physical exercises (Shangold, 1983). Based in the condition, degrees of physical exercises should be considered as one form of response in the body system. Putra et al. (1992) reports on effect of physical exercises on changes in humoral response (IgG and IgM). With regular practice, especially the concentration, mental

Table 2. Data changes (Delta) of each variable

No	IgG	Endorphin	Blood sugar
1	5	3.87	-34
2	122.92	3.93	-44
3	20.83	3.95	-47
4	32.91	4.19	-20
5	7.92	3.94	-51
6	35.42	3.89	-25
7	33.75	3.81	-16
8	42.08	3.91	-7
9	5.83	4.16	-17
10	26	3.57	-28
average (delta)	33.266	3.922	-28.9

Table 1. Summary of the results of t-test analysis

	N	Minimum	Maximum	Mean	Std. Deviation	Sign
IGG_PRE	10	1388.50	1504.75	1471.4670	31.10959	
IGG_POST	10	1478.50	1522.25	1504.7330	14.28846	.013
END_PRE	10	16.29	16.96	16.6075	.19176	
END_POST	10	20.30	20.73	20.5288	.13056	.000
GD_PRE	10	109.00	146.00	130.1000	10.55620	
GD_POST	10	87.00	115.00	101.2000	9.04065	.000

can be more stable and generate hormones such as ACTH and cortisol at certain levels which stimulate the immune system to produce immunoglobulins that play roles in immunity. The stressor (physical trainings) increases concentrations of plasma ß endorphin and influence improvement of the function of B cells and T cells, as well as strengthening the immune system in humans (Haruyama, 2004).

On the other hand, it is determined that breathing is also able to stimulate the increase of endorphin. Based on the results of t-tests, the significance was 0.000. The mean increase in endorphin was 3.922 ng/mL. Endorphin provides fresh feeling on our body. In addition, endorphin can suppress pain, slow the aging and many other functions. By the increase of endorphins, the body freshness among participants of breathing exercise increases. Muscle contraction at the time doing breathing exercise requires supply of energy. The energy used for muscle contraction is derived from glucose. Endorphins effectively provide euphoria and the composition of endorphin consists of 31 amino acids. Endorphin is produced naturally in the body (the National Cancer Institute, an online, August 2004). The production of endorphins is stimulated by the hypothalamic neuropeptide, corticoliberine. The line of HPA axis plays an important role in the production of adrenocorticotropin and beta-endorphin (Vasillakopoulos T et al, 2004).

Beta endorphin will be produced during exercise in a long duration. With the supramaximal intensity of 90% VO2 max substantially increases concentrations of beta endorphin, and can be found in people who performed these activities. Exercise may activate endogenous opioid system depending on the intensity of exercise. Over the threshold intensity exercise causes an Increase in the blood levels of beta-endorphin. High intensity exercise with the duration of 30-60 minutes is enough to raise the levels of beta-endorphin. In the women, after having exercise in 8 weeks, the response to beta-endorphin increases in the first hour after exercise (Viru, 2004). Basal plasma beta endorphin is 8.5 -48.9 pg / ml (Nakao et al. (1978). The normal levels of serum beta-endorphin is 10-35 pg / ml (Mannheim B, on-line, 2006). In the year 1980, it was first reported that physical exercise causes the changes of endorphin levels in the blood. It is said that physical training may activate the opioid system and stimulates the production of peptides regularly (Viru A and Tendzegolskis, 2004). Beta-endorphin increase the production of interleukin 4 (IL-4) and also increase the expression of B cells (Van Den Bergh P et al, 1993).

In this study, blood sugar was also one of indicators. Results of analysis showed that blood sugar levels decreased after breathing exercises. The decrease of blood sugar levels had significance at 0.000. The mean decrease in blood sugar levels was 28.9 mg/100ml. Overall, the impact of intervension on breathing exercise was the achievement of freshness of body, increase of IgG, and decrease of blood sugar levels. The three indicators also represented indirectly that the perpetrator immunity increased breathing better.

The results above could explain that through psychoneuroimmunology on breathing exercise s composed of concentration, physical activity and breathing manner could increase immunity. The relationship between the nervous and immune systems is described by Bloom and Kupfer (1995) through the following picture. The response of the nervous system can be reflected through neurohormonal secretion. The example of the nervous and hormonal flow system is the hypothalamus – pituitary – adrenal (Bloom FE, *et al.*, 1995). Thus, both physical and psychological aspects can cause biological activity of the body, including the response of the body immunity (Setyawan, 1995).

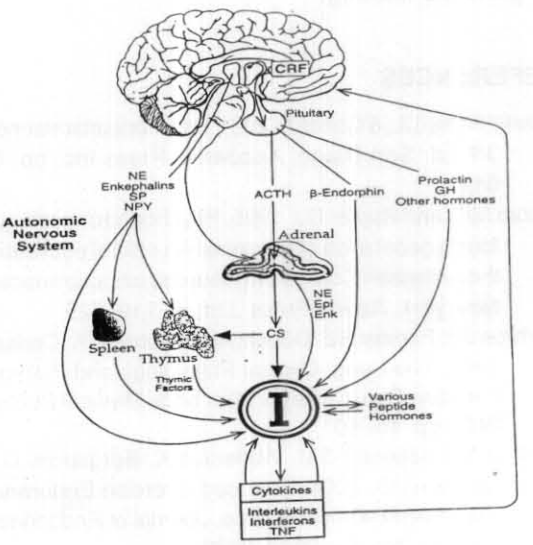

Figure 1. The interaction between brain, endocrine and immune system components. Bloom and Kupfer (1995)

The response degree of physical exercises can be observed on the body immune system (Setyawan, 1995). Robertson (1981) and Kumae (1987) once stated that the body immunity can be described in the blood. The picture of body immunity in blood can be a reflection of physical health.

CONCLUSION AND SUGGESTIONS

Conclusion

Breathing exercises which was done on a regular basis, targeted and programmed over 21 meetings could increase the secretion of IgG, endorphins and decrease blood sugar among elderly. Breathing exercises can be used as an alternative, cheap and easy sport to improve immunity.

Suggestions

Based on the results above, there are suggestions as follows

1. Further investigation to people who suffer from diabetes mellitus is needed.
2. Other research must be conducted by using control groups and more numbers of samples.
3. Measurements with more variables should be done so that it represents indicator of immunity.
4. Breathing exercise can be alternate to maintenance health, with specific programme and dosage (time/weeks, duration, type of methods, with basic principle training).

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ENHANCEMENT OF TUBERCULOSIS KNOWLEDGE AFTER SOCIALIZATION ON TUBERCULOSIS AND INFUSUM SAMBILOTO AS SUPPORTING TUBERCULOSIS TREATMENT AMONG PARTICIPANTS IN TAMBAK ASRI, SURABAYA

Sulistiawati, Djohar Nuswantoro, Atika

ABSTRACT

Background: *Tuberculosis (TB) was a chronic infection disease which needs long time treatment. Successful treatment of TB depend on patient's immunity status and behaviour on taking multi drugs therapy routinely. Knowledge of TB and how to do treatment successfully is important for TB patients and their families. Families of TB patient are key persons who observe directly when patient take the TB drug as PMO (Taking drug Observer/ Pengawas Minum Obat).* ***Methods:*** *Therefore this activity aims to increase knowledge of TB patients and their families concerning about TB, socialize about infusum Sambiloto as supporting treatment of TB. Participants of this activity were TB patients which were doing treatment in Dupak Public Health Center, Families of TB patients which were observing TB patients took the TB drugs and also health cadres of Dupak Public Health Center. Total participants were 54 persons. Method of this activity were Presentation, Discussion dan Demonstration.* ***Result:*** *Result of this activity were: The participants' Pre test result shows that half of the participants had good their knowledge about Tuberculosis. By using Wilcoxon Signed ranks test, there were significant different knowledge about TB among participants between pre and post of Socialization (p: 0.00), By using Sprearman test, there were no correlation between formal education level and level of Participant's knowledge about TB pre and post of Socialization. Socialization about Infusum Sambiloto as supplement therapy of TB is likely accepted by participants.*

Key words: *tuberculosis, sambiloto infusum, knowledge*

ABSTRAK

Tuberkulosis (TBC) adalah penyakit infeksi kronis yang memerlukan perawatan lama. Keberhasilan pengobatan TBC tergantung pada status kekebalan pasien dan perilaku terapi multi obat secara rutin. Pengetahuan tentang TB dan bagaimana keberhasilan melakukan pengobatan sangat penting bagi pasien TB dan keluarga mereka. Keluarga pasien TB adalah orang kunci yang mengamati secara langsung ketika pasien mengambil obat TB sebagai PMO (mengambil obat Observer/Pengawas Minum Obat). Oleh karena itu kegiatan ini bertujuan untuk meningkatkan pengetahuan pasien TB dan keluarga mereka mengenai tentang TB, sosialisasi tentang infusum sambiloto sebagai penunjang pengobatan TB. Peserta kegiatan ini adalah pasien TB yang melakukan pengobatan di Puskesmas Dupak, Keluarga pasien TB yang mengamati pasien TB mengambil obat TB dan kader kesehatan juga dari Puskesmas Dupak. Jumlah total peserta adalah 54 orang. Metode kegiatan ini adalah Presentasi, Diskusi dan Demonstrasi. Hasil kegiatan ini adalah: Hasil uji Pra para peserta menunjukkan bahwa separuh dari peserta memiliki pengetahuan yang baik mereka tentang Tuberkulosis. Dengan menggunakan uji Wilcoxon Signed peringkat, ada perbedaan yang bermakna pengetahuan tentang TB di antara peserta antara pra dan pasca Sosialisasi (p: 0,00). Dengan menggunakan uji Spearman, tidak ada korelasi antara tingkat pendidikan formal dan tingkat pengetahuan Peserta tentang TB pra dan pasca Sosialisasi. Sosialisasi tentang Infusum sambiloto sebagai suplemen terapi TB sepertinya diterima oleh peserta.

Kata kunci: *tuberkulosa, infusum sambiloto, pengetahuan*

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* Lecturer Faculty of Public Health, Universitas Airlangga
Correspondence: E-mail: sulistwt@hotmail.com