

THE CHANGES IN THE LEVEL OF BETA ENDORPHIN, INTERSLEUKIN-2,  
INTERLEUKIN-4, INTERLEUKIN-6, IMUNOGLOBULIN AND CORTISOL HORMONE  
ON THE PRACTICES OF SATRIA NUSANTARA

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Abstract

The purpose of this research is to reveal the changes of immunity at breathing exercises. This is an experimental research study. This research used “randomized pretest-posttest control group design. The populations involved in this study were the students of MA Mu’alimin, Yogyakarta. The samples of this research were 15 students for each group. The unit analysis in this research was the blood taken from vena cubiti. In this research, there were dependent variables which involved the levels of IL 6, IL 4, IL 2, cortisol, Beta Endorphin, and IgG. The training programme was conducted in 7 weeks, 3 times per week, submaximal intensity, and 6 sets per session. This programme was conducted in the afternoon. The inspection of the laboratory variable used the ELISA method. The data were analyzed using descriptive and inferential statistic using SPSS for windows. This research also used statistical multivariate analysis and discriminant analysis.

The result showed that the data of samples’ characteristics after normality test was  $p > 0,05$ , normal, and homogeneous ( $p > 0,05$ ). The result of moderate variables (Table 5.2) included in normal span. The dependent variables after the normality test got  $p > 0,05$ , normal, and after the levene test got  $p > 0,05$ , homogeneous. The result of Manova Test was  $p: 0,000$  which implied that there were differences among the groups (Wilk Lambda  $p < 0,05$ ). At the matrix discriminant structure, it can be explained that the correlation between independent variables and the discriminant function formed with beta endorphin (0,501) had the strongest relation to the discriminant function, followed by interleukin 6 (0,367) while the other variables had less significant relation. Discriminator variables representing the function contributed to

every discriminator of modulation immunity were beta endorphin, interleukin 6 and interleukin 4. Hence, beta endorphin had the strongest contribution to the increase of body immunity compared with other variables.

Conclusion: Based on the result discussed above and the descriptive research reported by Suparto (2001) showed that breathing exercises could increase physical fitness and impenetrability of proven body manifestly. Breathing exercise increased beta endorphin, immunoglobulin G and interleukin 6, while interleukin 2 and interleukin 4 did not increase. Cortisol did not decrease significantly but there was an indication of the decrease of the level of cortisol. Immunity modulator which caused breathing exercise stressor got by 3 groups with strong contribution on the basis concept of psychoneuroimmunologic. Breathing exercise represented the stimuli of the limbic – hypothalamus – pituitary – adrenal (LHPA) tract which created immunomodulator process on the basis of physiobiology paradigm with the concept of psychoneuroimmunologic.

**Key words: breathing exercise, (body) immunity, modulation**

## INTRODUCTION

Tai Chi is broadly used for therapy in many hospitals and rehabilitation centres. Though there are many schools of self-defense and breathing arts in Indonesia, the use of breathing exercises for therapy and fit and health maintenance is not maximum yet. Breathing exercises are able to maintain physical fitness and improve body immunity (Suparto, 2001). Breathing exercises were developed in order to prevent stressor and promote human resource development. It is the effort to manage stressor and even change into homeostatis (Maryanto, 1990). Though there are many advantages as mentioned above, the development of body immunity through breathing exercises is not clear yet.

The breathing exercise exercises are the sports which include (1) step exercise, (2) breathing exercises (inspiration and expiration in certain rhythms), (3) concentration (spiritual: dhikr). Qvist (1993) states that holding breath in less than 30 seconds of blood gas is normal and holding breath in 32-95 seconds averagely PO<sub>2</sub> artery 62±14s. based on the previous research, the period of breath holding in each step is 37-52 seconds. Thus, the breath holding exercise is categorized as light hypoxia.

The concept of psychoneuroimmunology can explain the biology phenomena both physiology and patobiology in relation to the behavior and body immunity in immunology, through neurotransmitter, neurohormonal, hormone, and sitokin.

Generally, the objective of this research is to reveal the mechanism of the improvement of body immunity related to breathing exercise, especially to determine the increase of the levels of Interleukin-6 (IL-6), Interleukin-4 (IL-4), Interleukin-2 (IL-2), Immunoglobulin G (IgG) < beta endorphin and the decrease of cortisol level.

## **Method**

This is an experimental research study which is aimed at revealing the influence of breathing exercises towards the improvement of body immunity. This research involved measuring the levels of interleukin 6 (IL-6), interleukin 4 (IL-4), interleukin 2 (IL-2), beta endorphin, immunoglobulin (IgG) and cortisol, after being treated with breathing exercises. The research design used in this study was *the randomized pretest-posttest control group design*. This research

used physio-biology paradigm and the concept used to observe the effect of physical exercises was psychoneuroimmunologic. The populations involved in this research were the students of MA Mu'alimin, Yogyakarta. The samples were taken from the populations which fulfilled inclusion criteria. Based on the calculation on the number of samples using the formula from Higgins and Kleinbaum (1985), it was determined that the number of the samples for each group were 15 students. The units of analysis in this research involved blood taken from vena cubiti. The taking of blood was done twice, before (pre-test) and after the treatment (posttest conducted 1 day after the treatment). The variables in this research were interleukin 6 (IL-6), interleukin 4 (IL-4), interleukin 2 (IL-2), beta endorphin, immunoglobulin (IgG) and the level of cortisol. The breathing exercise program was completed in 7 weeks starting with introduction and continued with the training program three times a week, with the intensity of sub-maximal 6 sets per session, 15 steps. This program was conducted to the treatment groups in the afternoon. The examination of IL-6, IL-4, IL-2, cortisol, beta endorphin, and IgG levels was conducted using the indirect sandwich ELISA (Enzyme Linked Immunosorbent Assay) method. Based on the objective of this research, the data analysis was done through descriptive and inferential statistic using SPSS for windows. Further, the data were analyzed using multi-variant statistic and discriminant analysis.

## FINDINGS AND DISCUSSION

Discriminant analysis was used for the variables of IL-6, IL-4, IL-2, cortisol, beta endorphin, and IgG. The objective of the analysis was to obtain strong divergent variables towards body immunity caused by breathing exercises (step + breath + concentration) which would be formed into the immune modulation pattern.

The findings of this research showed that the data of the characteristics of the samples after normality test were  $p > 0,05$ , normal and homogeneous ( $P > 0,05$ ). The result of the control variables (Table 5.2) was in normal range. Tables 5.3a and b showed that the levels of the variables were dependent. After the normality test, it was obtained  $p > 0,05$ , normal, and after Lavene's test it was obtained  $p > 0,05$ , homogeneous. The result of dependent variable test with manova was 0,000 of significance which implies that there were differences among the groups

(Wilk Lamda,  $P < 0,05$ ) (See Appendix 11). To observe the changes in immunity between the treatment group and the control group, see Table 5.5. Based on the discriminant analysis, it was obtained canonical correlation 0,755. The value of canonical correlation showed that there was high correlation among the variants. There was an explanation on the correlation among independent variables and the discriminant function formed through the discriminant matrix structure (see Appendix 11). It was found that the variable of endorphin (0,501) had the highest correlation to the discriminant function, followed by interleukin 6 (0,367), and other variables had less significant correlation. The discriminator variables which were the magnitude of contribution functions for each discriminator towards immunity modulation were beta endorphin, interleukin 6, and interleukin 4. Thus, beta endorphin had the highest contribution towards the improvement of body immunity compared to other variables.

Determining the concept of psychoneuroimmunology in this research study was expected to show the relation between physical stresses caused by the treatment of breathing exercise towards the response of immunological body immunity.

The result of manova test on the response of the secretion of IL 6, IL 4, IL 2, Cortisol, beta endorphin, and IgG on the effect of the treatment of breathing exercises showed that there was a significant difference ( $p < 0,05$ ). The most significant difference was showed by beta endorphin, followed by immunoglobulin and interleukin 6 (Table 5.5). Based on the result, factually the results of this research were reported by Suparto (2001) that breathing exercise could improve physical fitness and body immunity. In terms of the relation between the breathing exercise and body immunity could be in the form of physiobiologic exercise-psychoneuroimmunologic behavior through Limbic Hypothalamus Pituitary Adrenal (LHPA).

The treatment of breathing exercises improved the levels of beta endorphin, immunoglobulin G and Interleukin 6. However, there were no improvements in the levels of interleukin 2 and interleukin 4. There was also no significant decrease in the level of Cortisol even though the level of Cortisol in both the treatment group and the control group was reduced.

In relation to the response of body immunity caused by the stressor of breathing exercise, there were three groups which had high contribution based on the concept of psychoneuroimmunologic. The breathing exercise training was a stimuli on limbic –

hypothalamus – pituitary – adrenal (LHPA) tract which generated the process of immunomodulator based on physio-biology paradigm from psychoneuroimmunologic.

## CONCLUSION

The breathing exercise training of Satria Nusantara in 7 weeks with the frequency of 3 times a week improved the levels of beta endorphin, immunoglobulin G, and interleukin 6 while interleukin 2 and interleukin 4 did not improve. The level of Cortisol also did decrease significantly though there level reduced. Regular, directed, and programmed breathing exercises had positive effects on the improvement of body immunity.

From the indicator of immunity modulation based on the concept of psychoneuroimmunologic caused by stressor from breathing exercises, there were 3 divergent variables which were from the highest one beta endorphin, interleukin 6, and interleukin 4. By the improvement of the level of beta endorphin, it could be concluded that breathing exercises could give fresh, fit, and health feeling. On the other hand, the steps in breathing exercises could cause muscle skeletal contraction and the improvement of the level of interleukin 6. Interleukin 4 would stimulate plasma cells to produce immunoglobulin, which also included immunoglobulin G.

The stressor of breathing exercise with the combination of steps, breathing manners, and concentration stimulated the *limbic – hypothalamus – pituitary – adrenal* (LHPA) tract which created immunomodulator process based on the physiobiology paradigm with the concept of psychoneuroimmunologic. Thus, the breathing exercises could be one of the immunomodulators to improve body immunity.

Based on the above explanation, the breathing exercise training could be an alternative inexpensive, easy, and effective sport which can improve body immunity.

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