

PHYSIOLOGY RESEARCHES AND INNOVATION

PROCEEDING OF SURABAYA INTERNATIONAL PHYSIOLOGY SEMINAR



Foreword

Assalamu 'alaikum Wr. Wb

Greetings,

Alhamdulillah robbil alamin. We finally finished article publication in proceeding of Surabaya International Physiology Seminar (SIPS). The proceeding was ISBN indexed entitled "**Physiology Researches and Innovation**". It consist of excluded articles that submitted to the Scitepress for Scopus indexing.

We highly appreciate to Indonesian Physiological Society (IAIFI) members for SIPS participation and article submission. Further, we hope that it will significantly contribute to the development of physiology researches and innovation in Indonesia. Please don't be hesitate for sugestion in order to make it better.

Wassalamu 'alaikum wr wb,

Warm regards,
Chairman of committee/ Head of Physiology Department

Dr. Bambang Purwanto, dr., M.Kes

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Difference of Frequency Effect Between Once A Week With Seven Times A Week Aerobic Exercise to Beta Endorphin Level of Male Laboratory Rat's Brain Tissue

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Keyword *Once a week aerobic physical exercise. seven times a week aerobic physical exercise, beta endorphin, brain tissue*

Abstract **Background:** Physical exercise not only promotes fitness but also increases brain performance and improves mood through increasing beta endorphin level in brain. It is unknown whether physical exercise's frequency affects the secretion of beta endorphin. The purpose of this research is to know the effect of aerobic physical exercise, divided into once a week and seven times a week group, to beta endorphin level of laboratory rats. **Method:** This research is a laboratory experimental research with Post Test Control, Group Design. This research's subjects are 27 male laboratory rats distributed to control group, once a week aerobic group, and seven times a week aerobic group. Physical exercise treatment was given by using treadmill for six weeks, with the speed set on 20m/minutes for 30 minutes. Beta endorphin level was measured using ELISA Kit for Rat Endorphin from ELABSCIENCE, followed by independent sample test. **Result:** There is an increase in the level of beta endorphin of male laboratory rats brain tissue of the once a week aerobic group compared to seven times a week and control groups (45,55 ± 7.03pg/ml vs 40.00 ± 10,61pg/ml vs 27,11 ± 10,46pg/ml). There is a significant difference (p < 0,05) in the mean of beta level between experimental groups with control group. However, There is no significant difference in the mean of beta endorphin level between once a week aerobic group with seven time aerobic group (p = 0,209). **Conclusion:** Both once a week and seven times a week aerobic physical exercises affect brain tissue's beta endorphin level. There is no significant difference of brain tissue's beta endorphin level's mean between the rats given different frequency of physical exercise treatment.

1. INTRODUCTION

Physical exercise stimulates beta endorphin secretion which causes happiness, reduces pain, causes addiction (motion addiction), and eliminating depression (Tilarso, 2008). Research by Effendi et al (2004) states that after chronic moderate physical exercise; there is an increase of beta endorphin up to 150-200%, while intensive physical exercise increases the beta endorphin level up to 300- 500%. Aside from that, physical exercise which has high intensity and 30-60 minutes duration also increases the beta endorphin plasma level.

A research by Siswantoyo (2010) also shows the increase of beta endorphin level 45 minutes after an exercise. This increase is higher compared to the result of measurement after 24 hours exercise. The same result is obtained by Hanachi et al (2012) research. which mentions that there is an increase of beta endorphin level after endurance physical exercise of the active and stay group. The increase of beta endorphin level of the active group is higher than that of stay group.

Various researches showed that physical exercise increases beta endorphin level. However, it is still relatively unknown whether the frequency

of physical exercisc also increases the beta endorphin level of brain tissue. This research purpose is to analyze the effect of frequency between once a week physical exercisc to seven times a week physical exercise to laboratory rat's brain tissue beta endorphin level.

2. RESEARCH METHOD

This research is a laboratory experimental exercise with Post Test Control Group Design. This research was done in Bio Science Research Laboratory Palembang on April 2017 until June 20177, and was given the ethical agreement by Sriwijaya University Medical Faculty Commission Ethics.No.56/kepkrsmhfkunsri/2017, date 13 Of April 2017.

Subject animals in this research were healthy male laboratory rats, aged 6 to 8 weeks with 60-80 gram weight span, distributed randomly into 3 groups, which are: Control group (P1) which did not get any aerobic physical treatment, Experimental group which was given aerobic physical treatment once a week for six weeks (P2); and Experimental group which was given physical exercise treatment seven times a week for 6 weeks (P3).

Each group consisted of nine randomly distributed rats, which bring the total sample needed for the research with three groups to 27 rats. Aerobic physical exercise was given through placing the subject rats on animal treadmill and move the treadmill with the speed set at 20m/minutes for 30 minutes continuously (Flora et al, 2016). On the last day of treatment, decapitation was executed to the rat after the exercise and the brain tissue was taken to measure the beta endorphin level.

2.1 Creating Brain Tissue Homogenate

Brain Tissue Homogenate was adoped from Flora et al (2016) research.

2.2 Endorphin Level Measurement

Endorphin level of brain tissue was measured through ELISA method using

ELISA Kit for Rat Endorphin from ELABSCIENCE.

3. DATA ANALYSIS

The data were analyzed using SPSS version 19 for Windows computerized system program with significance level 0,05. Independen Sumple T-Test was done to know the effect of physical exercise frequency to the beta endorphin level of each group

4. RESULT

The result of research showed that there is an increase in the mean of laboratory rat's brain tissue beta endorphin level of the once a weck acrobic physical exercise group ($45,55 \pm 7,03$) and seven times a week aerobic physical exercise groups ($40,00 \pm 10,61$) for six weeks compared to the control group ($27,11 \pm 10,46$). The highest beta endorphin level was achieved by the once a week aerobic physical exercise group (Table 1). There is a signilicant difference ($p < 0,05$) of mean of laboratory rat's beta endorphin level in brain tissue between once a week aerobic group with seven times a week aerobic group (Table 2).

Table 1. Mean of Brain Tissue's Beta

Group	n	Mean \pm SD (pg/ml)
Control	9	27.11 ± 10.46
1x Aerobic9		45.55 ± 7.03
7x Aerobic9		40.00 ± 10.61

Table 2. Mean Comparison of Brain Tissu's Beta Endorphin Level Of Control Group, 1x Aerobic Group, And 7x Aerobic Group.

Group	Mean \pm SD (pg/ml)	p*
Control	27.11 ± 10.46	0.000
1x Aerobic	45.55 ± 7.03	
Control	27.11 ± 10.46	0.020
7x Aerobic	40.00 ± 10.61	
1x Aerobic	45.55 ± 7.03	0.209
7x Aerobic	40.00 ± 10.61	

*p t-test

5. DISCUSSION

The research result showed that aerobic physical exercise increase Beta Endorphin level of brain tissue, with the highest beta endorphin level achieved by the once a week aerobic physical exercise group. This is because acute physical exercise causes greater physical stress than daily physical exercise. Physical stress affects beta endorphin release in brain tissue. According to Andrea (2006),

Physical exercise gives effect to the brain through several mechanisms including neurogenesis and endorphin release. Physical exercise affects the increase of beta endorphin concentration especially those related to the perception change of pain and mood. Opioid function during the exercise can be seen through the change of beta endorphin concentration depending on the intensity and duration of the physical exercise as compared to the other stress hormones.

Endorphin, in which the term comes from the word "endogenous" and "morphine", is produced when the body is in relaxed and calm state. Endorphin is produced in brain and vertebrae nervous system, consisting of protein molecules produced by nervous system and some of the body parts which coordinate with sedation receptor to reduce pain. Analgesic receptor was produced in the spinal cord (arrangement of vertebrae nervous system up to the tailbone) and the tip of nerve. The molecular structure of endorphin resembles morphine's although the chemical content is different. Endorphin functions to regulate stress, suppress pain, increase immunity, halt aging process, control appetite, reduce blood pressure, give reward system (giving happiness feeling) to the brain and mood (Yesie, 2010).

This result is similar to the result of Siswantoyo's (2010) research, which states that there is an increase of beta endorphin level 45 minutes after the exercise. The result of research by Rose (1985), explains that physical exercise with the duration 30 to 60 minutes affects plasma's beta endorphin level. This

increase of beta endorphin level is due to certain activity and condition, which makes subject insensitive to pain and feels much happier (euphoria). The research by Viru (2004) shows that in eight weeks aerobic physical exercise, there is an increase of beta endorphin level an hour after physical exercise. The same also occurred on the research by Nakao et al. (1978), in which after the aerobic physical exercise, there is an increase in basal plasma's beta endorphin 5.8-48.9 pg/ml.

In this research, the measurement of beta endorphin level was only done once, which is after the physical exercise, which makes the time when maximum increase of brain tissue's beta endorphin level unknown. Because of that, further research is needed.

6. CONCLUSION

Aerobic physical exercise which is done with once a week and seven times a week frequency for six weeks affects the secretion of brain tissue's beta endorphin level. There is a significant difference ($p < 0,05$) in the mean of laboratory rats' brain tissue's beta endorphin level between once a week aerobic physical exercise with the seven times a week aerobic physical exercise.

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