

EFFECTS OF INTERVAL TRAINING AND CONTINUOUS RUNNING ON THE LEUKOCYTE RESPONSE

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Abstract: *The purpose of this study was to determine whether there were differences in physical activity between training intervals and continuous runs on leukocyte responses in white rats (*Rattus norvegicus*). Experimental research with a posttest and control group design is employed in this study. For this study, we used 30 male white rats that were between 3 and 4 months old and weighed between 180 and 200 grammes. The experimental animal samples were randomly separated into three groups, and each group consisted of ten white rats. The first group was designated as the control group (C), while the other two groups were labelled as follows: without doing cardio on a treadmill: treatment group 1 (IT) was given a vigorous kind of Interval Training physical activity in the form of continuous running on a treadmill; treatment group 2 (CR) was given a moderately strenuous type of Continuous Jogging physical activity in the form of continuous running on a treadmill. According to the findings, the average number of leukocytes found in the control group was 11,778 cells/mm³, whereas the average number of leukocytes found in the group was 6,864 cells/mm³, and the average number of leukocytes found in the control group was 5,118 cells/mm³. Results showed that there was a statistically significant difference ($p=0.000$; $p<0.05$) in the average number of leukocytes between the two groups. he single paragraph of about 150-200 words, 250 words maximum, italic, 10pt, written in English.*

Keywords: *Continuous running, Interval Training, Leukocyte.*

INTRODUCTION

A sort of body movement known as physical activity or sport, which is carried out by the muscles in a controlled and repetitive manner, leading to an increase in the amount of energy that is used, with the ultimate goal of developing physical fitness. In order to spend energy, the human body must engage in physical activity, which entails the use of skeletal muscles and the locomotory system. Physical activity is a planned sequence of actions that includes aspects like how often you work out, how hard you work out, how long you work out, and what kind of exercise (Bompa, 2009).

Participating in regular physical activity has several positive effects on one's health, including a decreased risk of developing cardiovascular disease, cancer, and diabetes. Endurance is one of the most essential aspects of biomotor performance that can be improved by training. Endurance is the state or condition of being able to labour for an extended period of time without experiencing severe exhaustion. Endurance is usually strongly tied to the duration and intensity of exercise; the longer the duration of the exercise, the greater the intensity of work an athlete can perform, indicating that he has good endurance (Mc Ardle et al., 2010). Several forms of physical activity, such as Continuous Running and Interval Training, can be used to enhance endurance (Werner egt al., 2019).

Interval training is a type of exercise in which the intensity of the work or loading and the rest durations between sets of exercises varies (Kravitz, 2011). When it comes to building stamina and endurance, interval training is quite effective. Interval training is a type of physical activity characterised by the terms set, repetition, recuperation, and training distance. Continuous Run is a sort of exercise that is performed at a moderate intensity level. Long-distance running is another name for the style of exercise known as the continuous run, which consists of running without stopping for any amount of time during the workout. This is a form of running in which the participant does not stop running at a predetermined pace for a predetermined distance until the entire distance has been completed (Foss and Keteyian, 2006).

The immune system, namely the role that leukocytes play, is another factor that can affect endurance. One component of human blood cells called leukoit plays an important part in the function of the immune system. Leukoit is responsible for the production of white blood cells (Ganong, 2010; Sherwood, 2015). Leukocytes are able to provide a description of the level of health that is influenced by a number of internal factors, such as disease, age, sex, and hormones, in addition to several external

DOI:

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factors, such as the state of livestock activity, the feed given, stress, and the environment. Internal factors include disease, age, sex, and hormones, while external factors include the state of livestock activity, the feed (Guyton and Hall, 2008).

Previous research has demonstrated that one of the effects of physical activity is a reduction in the amount of leukocytes in the blood thereafter. This effect is seen most clearly after continuous running. However, his study results demonstrate that fast-type interval training does have an effect, albeit at a large level that cannot be rectified well in overweight and obese people (Chantal et al., 2017). Interval training patterns can be used as a kind of exercise in athletes, and previous research has shown that they can boost leukocyte response and lactate levels (Purnomo et al., 2012). Introduction provide an adequate background, context of the problems based on the literature review. State the objectives of the work, emphasize on the urgency, originality and contribution of the works. The current state of the research field should be reviewed carefully, and key publications cited. As far as possible, please keep the introduction comprehensible to scientists outside your particular field of research. Please highlight controversial and diverging hypotheses when necessary. Finally, briefly mention the main aim of the work and highlight the principal conclusions.

MATERIALS AND METHODS

1. Ethical approval

Animal Research Ethics Committees (AREC), University of North Sumatra (reference no. 0502/KEPH-FMIPA/2022) have given their blessing to conduct this study in accordance with the Declaration of Helsinki (World Medical Association, 2002).

2. Research Design

There was a randomised controlled trial with a posttest and a control group for this study.

3. Subject

The rat samples used in the experiment were divided at random into three groups, and there were 10 rats in each group. The first group was assigned the letter C to denote its status as the control group, while the other two groups were given the following names: without engaging in cardiovascular exercise on a treadmill: The first treatment group (IT) was given an intense form of interval training in the form of continuous running on a treadmill. The second treatment group (CR) was given a moderately strenuous form of continuous jogging in the form of continuous running on a treadmill.

4. Experimentation with rats using a treadmill

Acclimatization was performed on the rats for one week prior to their participation in the treadmill test. This involved both adaptation to the habitat of the rats as well as adaptation to the treadmill. The control group (C) did not engage in any treadmill exercise. The treatment group 1 (IT) was provided with a vigorous type of interval training physical activity in the form of running on a treadmill at a running speed of 30 metres per minute, for a total of 15 repetition sessions, with a duration of 30 seconds per session with interspersed rest for 1 minute, for a total of 22 minutes, frequency 3 times a week for 2 weeks; treatment group 2 (CR): provided a strenuous type of Continuous Jogging physical activity in the form of running on a treadmill at a running speed of 24-33 metres per minute for a duration of 30 minutes, with a frequency of three times a week for a period of two weeks (Zein et al, 2017). After that, a sample of the rat's blood was extracted from its tail and analysed using a hematoanalyzer to look for leukocytes.

RESULTS AND DISCUSSION

According to the findings shown in table 1, the average number of leukocytes found in the control group was 11,778 cells/mm³, whereas the average number of leukocytes found in the group was 6,864 cells/mm³, and the average number of leukocytes found in the control group was 5,118 cells/mm³. According to the examination of the data, there was a noteworthy distinction between the average number of leukocytes found in each of the groups, specifically $p=0.000$; $p<0.05$.

Table 1. The average leukocytes in the group

Variable	C group mean±Sd	IT group mean±Sd	CR group mean±Sd	p
Leucocytes (sel/mm ³)	11.778±2.54	6.864±1.52	5.118±2.36	0.000

Note: Sd: standard deviaton; C: control group; IT: interval training group;
CR: continous running group

According to additional analysis using the Bonferroni test (table 2), there was a significant difference in the average decrease in leukocytes between the control group and the interval training group ($p=0.000$; $p<0.05$) and the control group and the continuous run group ($p=0.000$; $p<0.05$). The decrease in the average number of leukocytes was not significantly different between the interval training and continuous run groups ($p=0.33$; $p>0.05$).

Table 2. Post Hoc Test

	Group	Mean Difference	Sig.
Control	IT	4.91*	.000
	CR	6.66*	.000
IT	Control	-4.91*	.000
	CR	1.75	.337
CR	Control	-6.66*	.000
	IT	-1.75	.337

Note: Sd: standard deviaton;C: control group; IT: interval training group;
CR: continous running group

The results of this investigation revealed a reduction in leukocytes in mice who underwent continuous or intermittent treadmill exercise. The quantity of leukocytes decreases as a result of intensive physical exercise, such as fast interval training and heavy continuous run. Regular physical activity improves health and fitness, however intense physical activity might promote immune system issues and fast weariness.

A non-specific physiological response to the stress that occurs is a decrease in the number of leukocytes, which is caused by physical activity. This decrease in the number of leukocytes stimulates changes in physiological conditions, and if the stress continues for an extended period of time, it results in a decrease in the efficiency of the immune system. The abrupt surge in hormone and cell synthesis will lead to instability in a variety of bodily functions. Stress also caused a dramatic increase in the number of cells known as leukocytes (Jamurtas et al., 2018).

The increased of oxygen consumption in active tissues during vigorous exercise is a major contributor to the enhanced free radical production that occurs during and after exercise. Oxidative phosphorylation in mitochondria converts some of the oxygen we breathe into hydrogen and oxygen and water. A very small percentage of the oxygen, between 2% and 5%, has the potential to break away from the electron transport chain and be transformed into free radicals, which then result in ROS (Cooper et a., 2016). Because of these settings, oxidative stress will develop, which is characterised by an imbalance between free radicals and antioxidants and is brought on by an increase in the amount of oxygen that is consumed during breathing (Lemos et al., 2011).

After 10 weeks of physical activity, the research that was carried out by Leeuwenburgh and Heinecke (2001) was able to successfully prove that physical activity in rats aimed at endurance will increase antioxidants and antioxidant enzymes in skeletal and cardiac muscles. This was demonstrated by the fact that the rats were given physical exercise. After ten weeks of regular physical activity, it was shown that glutathione levels in active muscles increased by 33%, glutathione peroxidase activity increased by 62%, and superoxide dismutase levels increased by 27%.

CONCLUSION

The reduction in the average number of leukocytes was significantly different between the control group, the group that did interval training, and the group that ran continuously. This difference was statistically significant. However, there was not a significant difference between the Interval Training and Continuous Run groups in terms of the average decrease in the number of leukocytes.

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