

## APPEARANCE OF NEUTROPHIL-LYMPHOCYTE RATIO ON YOUNG ADULTS AFTER FUTSAL SPORT IN THE NIGHT

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### ABSTRACT

Exercise is the easy and cheapest effort that can be did to maintain health level and increase the immune system. The dense activity during the day makes people doing exercise at the night. Neutrophil-lymphocyte ratio (NLR) is a one of indicator that can be use to evaluate the inflammation process caused by exercise. This study aims to determine the appearance of neutrophil-lymphocyte ratio on young adult after futsal sport in the night. This research was a quasi experimental with the subjects were 10 young adults for intervention and control respectively that satisfy the inclusion criteria. Measurement of total leukocyte, count type of leukocyte and neutrophil-lymphocyte ratio were conducted before and after 2 x 20-minute futsal sport in the night. The data form each group were analysed statistically using the pair t-test. The results showed that there was significant change in the all indicators to intervention group, namely total leukocyte  $p = 0,01$  ( $p < 0,05$ ), neutrophil  $p = 0,01$  ( $p < 0,05$ ), lymphocyte  $p = 0,01$  ( $p < 0,05$ ), and NLR  $p = 0,01$  ( $p < 0,05$ ). The conclusion proved that exercise at the night can cause significant changes of neutrophil-lymphocyte ratio on young adult.

**Keywords:** neutrophil-lymphocyte ratio, night futsal, total leukocyte

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### 1. INTRODUCTION

People today are highly aware that exercise is one of ways to maintain a healthy stage. Besides being less cost and easy to do, doing sport appears to be the best way to increase the quality of health, to prevent from sickness exposure, and to improve the immune system (Giriwijoyo & Sidik, 2013). The effect of exercise on the immune system is a long-term effect, formed through a program of moderate intensity physical activity. In addition, the moderate intensity exercise is a physical activity that refers to a program designed to reduce the formation of free radicals (Harahap, 2008).

The immune system has a function in blocking and destroying abnormal cells, except foreign bodies, that tend to harm the body. The physiological efficiency of the system can be determined through certain indicators, one of which is the ratio of neutrophils to lymphocytes. The neutrophils to lymphocytes ratio (NLR) is an easy and practical biomarker to measure the systemic inflammatory status in the body such as the musculoskeletal system caused by physical activity (Chen, Liao, & Chou, 2017).

At present, the facts show that the existence of an unhealthy lifestyle due to globalization and modernization is a factor in the increasing number of non-infectious diseases (non-infectious) (Giriwijoyo & Sidik, 2013). Oxidative stress is the cause of a non-infectious disease that can cause damage to cell tissue, unlike infectious diseases that generally caused by bacteria or viruses (Price, 2012). On the health research report in 2013, non-transmitted diseases, such as diabetes mellitus, hypertension and stroke, recorded an increase in prevalence from 2007, taken from a total sample of 1,027,776 samples. The prevalence of hypertension increased from 7.6% to 9.5%.

Meanwhile, the prevalence of stroke increased from 8.3% in 2007, increased by 3.8% in 2013.5 Furthermore, in 2018, it was reported that the prevalence of non-infectious diseases such as diabetes mellitus increased by 1.6% and hypertension increased by 8.3% from the 2013 report (BPPK, 2018). Daily activities during the day done to fulfil the needs of life causes people to do workout in the night (Wahyuningsih, 2015). One of the moderate intensity sports that is commonly carried out in the night, especially by young adults, is futsal (Barbero, Victor, & Juan, 2008).

The physiological concept explains that at night, namely included in the circadian rhythm, is the right time for the body to heal damaged units of cells and body tissues caused by the accumulation of free radicals, a metabolic byproduct produced from activity during the day (Sherwood, 2011). Currently, the neutrophil to lymphocyte ratio (NLR) is a sensitive indicator and can be relied on for evaluating the systemic inflammatory status. This study aims to determine the neutrophil to lymphocyte ratio (NLR) in young adults after futsal exercise at night.

## 2. METHOD

This study applied a quasi-experimental design using a control group. The research was conducted in the indoor futsal field Bexx Adipura Makassar. Next, the process of blood analysis was carried out at the Clinical Pathology Laboratory of dr. Wahidin Sudirohusodo hospital, South Sulawesi. The respondents of this study were a population of young adults who met the inclusion criteria. This present paper used purposive sampling method, namely through certain considerations. Routine blood profile was carried out twice in both the intervention and control groups, namely before and after the intervention. The intervention was given in the form of futsal playing for 2 x 40 minutes with a 5-minute break every 40 minutes of a match.

Blood samples were collected from the median cubital vein, which was preceded by a disinfection process using 70% alcohol, carried out by trained personnel at dr. Wahidin Sudirohusodo hospital. The volume of blood samples taken using a holder and immediately inserted into the tube for each respondent, which is as much as 3 cc. The blood sample taken was then checked for the type of leukocyte count and the neutrophil to lymphocyte ratio (NLR).

Respondent characteristic data were described using univariate analysis and presented in the form of mean tables, standard deviation, minimum and maximum values. To determine the changes in the leukocyte counts and the neutrophil to lymphocyte ratio (NLR), bivariate analysis used an unpaired t-test if the data were normally distributed. However, the Wilcoxon test was used if the data were not normally distributed with a significance value of  $p < 0.05$  using the SPSS 24.0 analysis application.

### 3. RESULTS

The total respondents participated in this study until the end were 20 young adult males, namely 10 respondents as the intervention group and 10 respondents as controls with an age range between 18-24 years. The characteristics of respondents are shown in Table 1.

**Table 1. Characteristics of Respondents**

Variable	Mean (s.d.)	Min	Max
Height (cm)	165,4 (3,4)	160	171
Weight (kg)	56,1 (9,9)	44	84
Respiratory rate (times/minute)	19,6 (3,6)	16	28
Body temperature ( <sup>0</sup> C)	36,4 (0,4)	35,7	37,2
Pulse (times/minute)	68,9 (9,7)	48	88
Systole pressure (mmHg)	120,0 (9,3)	105	135
Diastole pressure (mmHg)	82,3 (6,6)	70	90
Heart rate (times/minute)	70,8 (10,4)	53	88

Changes in the type of leukocyte count and the neutrophil to lymphocyte ratio (NLR) in the intervention group after night futsal, each of which showed significant results, namely

leukocytes  $p = 0.01$  ( $p < 0,05$ ), neutrophils  $p = 0.01$  ( $p < 0.05$ ), lymphocytes  $p = 0.01$  ( $p < 0.05$ ), and NLR  $p = 0.01$  ( $p < 0.05$ ).

**Table 2. Bivariate Analysis of Neutrophil to Lymphocyte Ratio (NLR)**

		Mean (s.d.) before intervention	Mean (s.d.) after intervention	<i>p</i>
IG	Leukocytes (%)	79,1 (9,7)	93,9 (27,4)	0,01
	Neutrophil (%)	43,6 (7,2)	64,6 (27,8)	0,01
	Lymphocytes (%)	26,9 (4,8)	21,1 (6,5)	0,01
	RNL	16,7 (3,9)	36,3 (30,6)	0,01
CG	Leukocytes (%)	92,9 (14,6)	99,2 (15,3)	0,23
	Neutrophil (%)	43,5 (10,4)	57,2 (20,9)	0,07
	Lymphocytes (%)	34,4 (8,7)	28,6 (8,0)	0,37
	RNL	13,5 (5,3)	22,6 (13,2)	0,37

IG: Intervention Group, CG: Control Group, NLR: Neutrophil-Lymphocyte Ratio.

#### 4. DISCUSSION

Exercise is one of the factors that can make changes to biological indicators of the body immune system. In this research, the total leukocytes increased after futsal sports at night. The effect of the sport can cause the changes in the total of leukocytes. Moderate-intensity exercise increases the leukocyte count, but low-intensity exercise does not (Abdossaleh, Ahmadi, & Karimi, 2014). The total of leukocyte raises after exercise both during the day and the night because during exercise the mobilization of leukocytes occurs from lymph vessels which are blood reserves into the blood vessels. As a result, the concentration of leukocytes in the blood vessels increases significantly (Shahidi, Yahya, & Ahmad, 2012).

This study also depicts an increase in the percentage of the neutrophil count. Based on normal circadian rhythms, cortisol secretion is low at night, but can increase if the body performs moderate to heavy physical activity (Sherwood, 2011). Damage to muscle tissue due to exercise can lead to an increase in glucocorticoid hormone groups such as cortisol. The increase in cortisol then causes oxidative stress triggering the production of neutrophils that raise in blood circulation (O'Connor, O'Holloran, & Shanahan, 2000). The results of this study are in line with a study reported that neutrophils increased after 60 minutes of physical activity, jogging on a treadmill.

In this study also analyzed changes in the lymphocyte count indicator after futsal sports at night. However, these results differ from those reported in previous studies, stated that after physical activity, the lymphocyte count decreased significantly due to the mechanism of redistribution of lymphocytes to other parts of the body (Walsh, Gleeson, & Stephard, 2011). In addition, research conducted on jogging on a treadmill for 60 minutes also shows a decrease in the lymphocyte count (Green, Rowbottom, & Mackinnon, 2001).

Besides that, a significant change in the neutrophil to lymphocyte ratio (NLR) was obtained before and after futsal exercise at night. Changes in this indicator were gained from research using taekwondo athletes as well, in which there was an increase in the neutrophil to lymphocyte ratio (NLR) after training for ten weeks (Chen, Liao, & Chou, 2017). This present study on the effect of night exercise on the ratio of neutrophils to lymphocytes is a study that provides the latest evidence, namely a significant difference in the ratio neutrophils to lymphocytes between before and after night futsal. Furthermore, previous research related to the effect of exercise on immune status, namely exercise intervention at 8:00 p.m., has been carried out, but did not analyze the neutrophil to lymphocyte ratio of the respondent group (Erdemir, 2013). Inflammation is a physiological response to recruit biological resources to the location of damaged tissue and facilitate the repair process, which is an adaptation of exercise to the sport response (Chen, Liao, & Chou, 2017).

#### 5. CONCLUSION

Night futsal sport results significant changes in the neutrophil to lymphocyte ratio (NLR) in young adults.

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