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IOP Conf. Series: Journal of Physics: Conf. Series **1028** (2018) 012104 doi:10.1088/1742-6596/1028/1/012104

The effect of night futsal sport towards serum malondialdehyde (MDA) level of young adults

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Abstract. There are various factors which can influence serum malondialdehyde level as a marker of free radicals of young adults, and night futsal sport was predicted as one of factors which can influence it. The purpose of study was to examine the effect of night futsal sport towards serum malondialdehyde level of young adults. This study used experiment approach by using pretest and posttest control group design. The subjects were 19 individuals selected using purposive sampling technique. This research was conducted at Futsal Field Indoor Beex Makassar. Collecting data was measured at 9 pm and 11 pm (30 minutes before and after doing night futsal sport with duration of 2 x 20 minutes). Blood sampling as much as 3 ml for examination of serum malondialdehyde levels, the blood was analyzed at the Enzyme-Linked Immune Sorbent Assay Laboratory (ELISA) in Universitas Hasanuddin Hospital. The data were analyzed by inferential statistics which consisted of normality test and Wilcoxon test. The data analysis result showed that sig value (0,878) was bigger than (0,05), and based on the comparation of pre and post test data, it can be concluded that night futsal sport did not significantly infuence the serum malondialdehid level of the participant.

1. Introduction

Health is one of the main components for a person doing an activity. Healthy living can be done by sports/exercises. It is known that physical activity plays a critical role in enhancing growth and development in both childhood and adolescence. The healthy adaptations to repeated exercise are featured by increased muscle and bone mass, appropriate body fat composition, angio- and arteriogenesis, and increased number of mitochondria [1].

Today, Busyness that people have from the morning until late afternoon causes them to choose doing night sport. One of the most popular night sports today is futsal. Futsal (the official name for five-a-side indoor soccer) was introduced in 1930 with the aim of allowing football to be played in restricted spaces. Futsal is an intermittent sport that makes high physical, technical, and tactical demands on players. It is played on a court of 40620 m with goals of 362 m (the same as in handball). As in basketball, two 20-min periods are scheduled, and here there is an important distinction from football, in that like basketball, the clock is stopped for some events, which usually means that the game lasts 75 – 85% longer than the scheduled 40 min [2].

Physiologically, futsal sports can be one of means in enhancing the physiological function of the body in health maintenance efforts, fitness, quality of heart and lung components, agility, speed and strength [3][4].

The activity of the body is controlled by the nervous system and endocrine systems which work together. The nervous system controls and coordinates body activities that require quick and immediate response while the endocrine system regulates activities that are more concerned with endurance [4][5]. It is the same as exercise which affects the function of the respiratory, circulatory, neuromuscular and endocrine systems [6]

One of the effects that can happen to our body when exercising is the occurrence of oxidative stress or oxidative damage that can lead to cell damage or death. Oxidative stress can be caused by the presence of free radicals in the body [4].

There are various factors which can influence free radicals production in body. Night futsal sport is predicted as one of factors which can influence it. As we know, the night time is a biological clock to rest the body. Night time physiology, which is part of the circadian rhythm, is the best time for the body to repair cell and tissue damage from toxic free radicals produced as a by-product of metabolism during daytime activities [7]. The circadian (from Latin: circa, about; diem, day) clock is a highly conserved timing system, resonating physiological processes to 24-hour environmental cycles. Daily rhythms of natural light, environment temperature, and food availability set the pace of circadian clocks, which run in almost all mammalian cells [8]

Free radicals are reactive chemical species that can cause oxidation injury to the living beings by attacking the macromolecules like lipids, carbohydrates, proteins and nucleic acids. Free radicals are by-products of cellular activity that can damage other cells or cause undue stress to the body. The body naturally produces chemicals called free radicals that cause irreversible damage (oxidation) to cells. They do their damage insidiously, silently and invisibly. This damage is also called “oxidation” (loss of electrons). Free radical damage leads to loss of energy, disease, pain, aging and eventually death. Free radical compounds in the body can damage polyunsaturated fatty acids in cell membranes. [9].

Oxidation is viewed in general as a chemical process whereby electrons are removed from molecules, generating highly reactive free radicals, which include reactive oxygen species (ROS). Reactive species arise as natural by products of aerobic metabolism at rest and play a role in several signalling cascades of distinct physiological processes, including hagocytosis, vasorelaxation, and neutrophil function [10].

In normal conditions, ROS is produced as a product of aerobic metabolism to form ATP in oxidation phosphorylation reactions in the electron transport chain in the mitochondria. Oxidation phosphorylation reactions require oxygen to react with hydrogen to form water, but about 4% to 5% of oxygen may turn into free radicals [11]. The two most prevalent ROS that can affect profoundly the lipids are mainly hydroxyl radical (HO·) and hydroperoxyl (HO·2). The hydroxyl radical (HO·) is a small, highly mobile, water-soluble, and chemically most reactive species of activated oxygen. This short-lived molecule can be produced from O2 in cell metabolism and under a variety of stress conditions [12]

One of markers of free radicals in the body is Malondialdehyde (MDA) which has been widely used for many years as a convenient biomarker for lipid peroxidation. Lipid peroxidation can be described generally as a process under which oxidants such as free radicals or non-radical species attack lipids containing carbon-carbon double bond(s), especially polyunsaturated fatty acids [12]. Physical exercise can induce the lipid peroxidation resulting in problems such as the inactivation of the enzymes of cell membranes, decrease of the immune system effectiveness, and the progression of chronic-degenerative diseases such as cancer and cardiovascular ilnesses [13].

Based on these assumptions, then this research was conducted to know the production of free radicals in the body. The purpose of the study was to examine the effect of night futsal sport towards serum malondialdehyde level of young adults.

2. Experimental details

2.1. Design of research

This study used experiment approach by using pretest and posttest control group design. There are two groups that performed the pretest and posttest measurements: an experimental group given futsal intervention and a control group not given futsal intervention.

2.2. Subject of research

The subjects were 20 individuals selected using purposive sampling technique with Inclusion criteria: adult in good health, male gender aged 18-24 years, not doing futsal at least two weeks before the study, whereas exclusion criteria: diet, consume drugs, have a history of chronic diseases, an active smoker, have a habit of staying up, actively consume carbonated beverages, and also drop out: having complaints during futsal and could not finish futsal. Then, the subjects were divided into futsal night intervention groups and night control groups.

2.3. Place of research

Blood sampling was performed at futsal Indoor Beex Makassar sports field and further blood was analyzed at the Enzyme-Linked Immune Sorbent Assay Laboratory (ELISA) in Universitas Hasanuddin Hospital.

2.4. Data collection

This study had begun with a short interview, requested informed consent from the subject, then examined the physiological characteristics and vital signs of the body that include age, weight, height, systolic pressure, diastolic pressure, and heart rate. Then, Blood sampling both night futsal intervention group and control group were performed at 9 pm and 11 pm (30 minutes before futsal and 30 minutes after futsal sport). Futsal done for 2 x 20 minutes. Blood sampling as much as 3 ml for examination of serum malondialdehyde levels.

2.5. Data Analysis

The data were analyzed by SPSS 22.0, to know the normality of data and the effect of Effect of Night Futsal Sport Towards Serum Malondialdehyde (MDA) Level.

3. Result and discussion

3.1. Result

Based on the inclusion criteria and exclusion criteria, then determined 20 respondents who become the subject of this research, but at the time of treatment there were 1 respondent dropped out with health reasons, so the subject of the research is 19 respondents. The table of respondents is shown on table 1.

Table 1. Respondents' characteristic.

Variable	Denomination	(n = 19)			Mean ± Std. Deviasi
		Min	Max	Median	
Age	Year	18	23	22.00	21.11 ± 1.29
Height	Kg	160	171	165.00	165.58 ± 3.39
Weight	Cm	44	84	51.00	56.05 ± 10.14
Systolic Blood Pressure	mm/Hg	105	135	120	120.53 ± 9.26
Diastolic Blood Pressure	mm/Hg	70	90	80	82.37 ± 6.74
Heart rate	bpm	53	88	70	70.21 ± 10.30

Table 1 shows the characteristics of 19 research subjects aged between 18 to 23 years with a median of 22 years, and mean ± standard deviation of 21.11 ± 1.29. The subject height ranged from

160 to 171 cm with a median of 165.5 cm and mean ± standard deviation of 165.58 ± 3.39. The weight of the subjects ranged from 44 to 84 kg with a median of 51 kg and mean ± standard deviation of 56.05 ± 10.14. The systolic blood pressure of the subjects ranged from 105 to 135 mmHg with median 120 mmHg and mean ± standard deviation of 120.53 ± 9.26 mmHg. Diastolic blood pressure of the subjects ranged from 70 to 90 mmHg with median 80 mmHg and mean ± standard deviation of 82.37 ± 6.74 mmHg. Heart rate ranges from 53 to 88 bpm with median 70 bpm and mean ± standard deviation of 70.21 ± 10.30 bpm.

Tabel 2. The influence of night futsal to level of malondialdehyde serum.

Group	N	Median (min/maks)			P Value
		Pretest	Posttest	Change	
Futsal	10	0.56 (0.26/19.93)	0.57 (0.28/12.63)	-0.04 (-7.89/3.61)	0.878
Control	9	0.65 (0.00/60.64)	0.62 (0.00/51.42)	-0.02 (-9.22/0.35)	0.398

**Wilcoxon Test*

Table 2 shows changes in levels of malondialdehyde serum in the night futsal group and night control group. We used Wilcoxon test because the data was not normally distributed. The median value of serum malondialdehyde level pretest futsal intervention was 0.56 nmol / mL, while the median value posttest futsal intervention was 0.57 nmol / mL, as well as a median change value was -0.04 nmol / mL. Statistical test using Wilcoxon obtained p value was (0.878) > 0.05 which indicates no significant change in serum malondialdehyde levels before and after futsal intervention at night.

In the control group, median serum malondialdehyde level in pretest blood sampling was 0.65 nmol / mL, while for posttest blood taking was 0.62 nmol / mL, as well as a median change value of -0.02 nmol / L. Statistical test using Wilcoxon obtained p value (0.398) > 0.05 indicating that there was no significant change in serum malondialdehyde levels in the night control group with blood taking at 9 pm and 11 pm, as shown at figure 1:

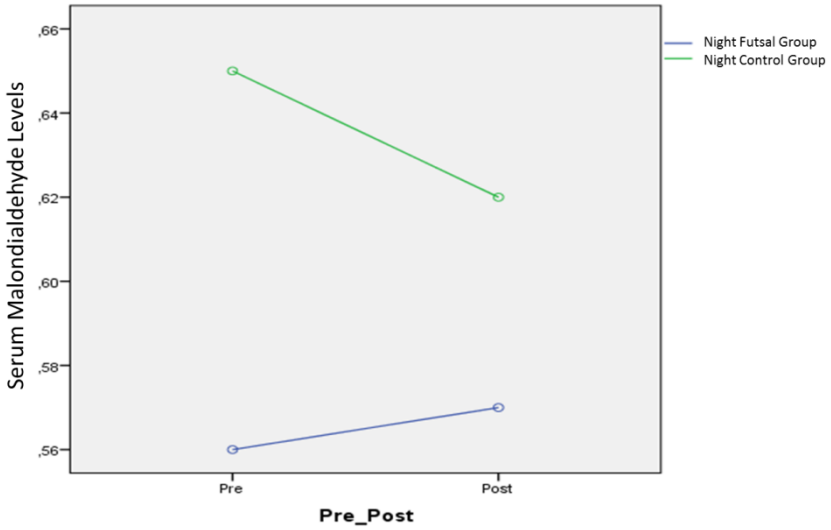

Figure 1. Linear graphs change serum malondialdehyde levels in the night futsal group and night control.

3.2. Discussion

This study aims to determine the level of malondialdehyde serum in night futsal groups and night control groups. Although the figure 1 shown increase of night futsal intervension group, the statistical test shown p (0.878)> 0.05 which means that there was no significant change in serum malondialdehyde levels in the evening futsal group.

The absence of significant changes in the night futsal group can be caused by the intensity, duration, and frequency of exercise. The intensity of the exercise is a workload or weight training that can provide changes to the body system. It is determined by measuring the amount of oxygen taken in by the body during exercise (oxygen uptake). Futsal used low to moderate intensity of exercise and performed with short duration (2 x20 minutes) [4] Low to moderate intensity exercise use fatty acids as their primary source of energy [14].

On the other hand, Futsal performed in this study is a recreational sport which is performed only in the capacity to have fun or to exercise in leisure time not in the capacity of an official game, so it does not require a lot of energy. This suggests that the exercise does not require excessive oxygen consumption which can lead to excessive of free radicals in the path of metabolism in night time.
Generation of free radicals is influenced by differences in energy requirement, oxygen consumption, and mechanical loads on soft tissue during exercise [15].

Futsal is anaerobic-aerobic sports. First energy needed when playing futsal is anaerob. When anaerobic way, energy required comes from a process of phosphokreatin and lactic acid system, Phosforcreatin is an important energy store for ATP synthesis. Phosphocreatine (also called creatine phosphate) is another chemical compound that has a high-energy phosphate bond. ATP formed from glycolysis and oxidative phosphorylation reacts with creatine to form ADP and large amounts of phosphorylcholine. The combined amounts of cell ATP and cell phosphocreatine are called the phosphagen energy system.These together can provide maximal muscle power for 8 to 10 seconds. Thus, the energy from the phosphagen system is used for maximal short bursts of muscle power. During exercise, this reaction is reversed to maintain the production of ATP, which is a ready-to-use energy source for muscle contraction. During exercise, muscle calorie requirements are initially met by glycogenolysis in muscle and increased glucose uptake. Glycogen stored inside the muscle can be broken down into glucose and then used for energy.

During glycolysis, each molecule of glucose is broken down into a molecule of pyruvic acid, and energy is released to form four ATP molecules for each of the original glucose molecules. Usually, pyruvic acid will enter to the mitochondria of muscle cells and react with oxygen to form more ATP molecules. However, in the absence of sufficient oxygen to perform second stage glucose metabolism (oxidative stage), most of the pyruvic acid will then be converted into lactic acid that diffuses outward from muscle cells into the interstitial fluid of the blood. Therefore, many muscle glycogen turns to lactic acid. Another characteristic of the glycogen-lactic acid system is that it can form ATP molecules about 2.5 times as rapidly as can the oxidative mechanism of the mitochondria. Therefore, when large amounts of ATP are required for short to moderate periods of muscle contraction, this anaerobic glycolysis mechanism can be used as a rapid source of energy. It is, however, only about one half as rapid as the phosphagen system[16][17].

In addition, there was no significant change in serum malondialdehyde levels in the futsal group that may be caused by the presence of high antioxidant production which is able to inhibit the production of free radicals. Although antioxidants were not investigated in this study, but based on the study, it can be said that high levels of free radicals in the body can be shown by low antioxidant enzyme activity [6] The oxidative stress can be described as the imbalance among the formations of the reactive oxygen species and the antioxidant system, generating a potential oxidative damage to the structure of the cells. Antioxidants protect the cells from damage caused by these unstable molecules which produce free radicals. Antioxidant nutrients are naturally found in a varied diet of unprocessed grains, vegetables and fruit [13].

Some free radicals arise normally during metabolism. Sometimes the body’s immune system cells purposefully create them to neutralize viruses and bacteria. However, environmental factors such as

pollution, radiation, cigarette smoke and herbicides can also spawn free radicals. Normally, the body can handle free radicals, but if antioxidants are unavailable, or if the free-radical production becomes excessive, damage can occur. A particular importance is that free radical damage accumulates with age [9].

The occurrence of excessive metabolic reactions in the body will cause the formation of tensile forces between oxygen electrons, so that unpaired oxygen atoms will become free radicals that will attract electrons from other compounds. Oxygen is used for energy production through the electron. Same with night control group, although based on the figure 1 shown decrease of malondialdehyde serum levels in night control group but the statistical test is p (0.398)> 0.05 05 which indicated that there was no significant change in serum malondialdehyde levels in the night control group. This may be due to the lack of excessive activity in the control group and the small number of samples. It is like a theory that Night time physiology, which is part of the circadian rhythm, is the best time for the body to repair cell and tissue damage from toxic free radicals produced as a by-product of metabolism during daytime activities [7].

4. Conclusion

Based on the results of the study and discussion, it can be concluded that night futsal with low to moderate intensity and with duration of 2 x 20 minutes did not affect to malondialdehyde serum levels as free radicals marker. This is evidenced by no significant changes in the night futsal intervention and night control group.

Acknowledgments

Thanks to Futsal Indoor Beex Makassar sports field and Enzyme-Linked Immune Sorbent Assay Laboratory (ELISA) in Universitas Hasanuddin Hospital which gave me a permit to do research.

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