



# Comparison of Cortisol Hormone Response To Night And Morning Futsal Activity In Ikami Malang Futsal Community

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**Abstract.** Previous studies have shown that cortisol levels are affected by circadian rhythms, in which its level in the morning is higher than at night. Cortisol levels also can be affected by stress including physical stress due to exercise. Little is known whether the futsal activities at night and morning affect the cortisol circadian rhythm. This study to compare the cortisol hormone response after night and morning futsal activity. This research was a cross-sectional study with a quasi-experimental design. The subjects of this study were 15 men aged 19–26 years. All were treated with 2x20 minutes of futsal game activity at night (10.00 pm) and during the day (07:00 am) with a 8-days treatment interval. After futsal activity, blood was drawn from the ante cubital vein to measure blood cortisol by elisa-spectrophotometry method. Wilcoxon signed rank test to analyze the night and morning blood cortisol, the data were not normally distributed. The average night time cortisol levels was 10.87 ng/ml while the morning was 40.85 ng/ml. Morning cortisol levels in 13 subjects were higher than at night, whereas two subjects were the opposite. The findings of this study indicate that futsal activity may not affect circadian rhythms. Further research required to study the effects of exercise on cortisol increases in morning and night.

**Keywords:** night futsal · morning futsal · cortisol

## 1 Introduction

Currently, human activities are decreasing, trend to be sedentary lives, the influence of the development of science and technology. Sedentary lifestyle is a major factor that increases the risk of cardiovascular disease, so it becomes a big problem and is growing in modern society [1]. Decreased physical activity has a role in increasing obesity [2].

A Canadian study, showed that for those who spend the most time sitting, are about 50% more likely to die than those who sit less [3]. Leaving sports that provide benefits for health and body function if done regularly [1]. Several studies have shown the benefits of exercise and no negative impact was found if it was carried out according to the type, intensity and time of exercise [4].

The factor of work demands makes it difficult to manage time, so only have the opportunity to exercise at night. Exercising at night is the opposite of the body's system.

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Humans are generally oriented during the day, working at night requires phase changes in the sleep or wake cycle and the circadian rhythms of other physiological systems [5].

Exercise is a stress stimulus for the human organism that affects the body's homeostatic mechanisms, depending on the type, duration, intensity and frequency of exercise [6]. Exercise can be considered a physical stressor, activating the hypothalamic-pituitary-adrenal axis, thus an increase in cortisol has been observed after prolonged exercise of at least moderate intensity [7]. Adrenocorticotrophic hormone (ACTH) from the Hypothalamus-Pituitary-Adrenal Axis (HPA axis) has been shown to increase with prolonged exercise by binding to high-affinity receptors of the adrenal cell membrane that result in cortisol synthesis [6].

Cortisol can be an indicator of stress levels that can cause several reactions [8]. Each type of body response in the form of stress, both physical stress and psychological stress can increase ACTH secretion which in turn can increase cortisol levels, a hormone released from the adrenal cortex in response to physical and psychological stress [9].

Previous research has shown that there is a cycle of cortisol levels where levels in the morning are higher than at night, but cortisol levels in addition to being influenced by circadian rhythms, cortisol levels can be affected by stress including stress due to exercise. It is not yet known whether futsal sports performed at night and in the morning can affect the circadian rhythm of cortisol levels. The purpose of this study was to determine the difference in cortisol hormone response after futsal activities at night and in the morning.

## 2 Method

This study is a cross over study design where the intervention carried out on the same group of people is exposed to two different interventions in two time periods. The research was carried out at the Futsal Champions Malang Field and where the cortisol hormone level was tested in the Physiology Laboratory of the Faculty of Medicine, Brawijaya University Malang.

The population in this study were all members of the futsal community IKAMI Malang, the sampling technique used in this study was purposive sampling, based on considerations made by the researchers themselves. All were treated with 2x20 minutes of futsal game activity at night (10.00 pm) and during the day (07:00 am) with a 8-days treatment interval. After futsal activity, blood was drawn from the ante cubital vein to measure blood cortisol by elisa-spectrophotometry method.

The data analysis technique used in this study is a hypothesis test carried out with a correlated two-sample T test using the help of SPSS 16.0 for Windows Evaluation Version, the Paired Sample T Test formula, assuming that the main requirement is that the research data is normally distributed. Meanwhile, if the data are not normally distributed, then use non-parametric analysis with the Wilcoxon Signed Rank test, because the subjects are the same group of people whose cortisol levels were measured twice. Normality test was carried out using Shapiro Wilk.

### 3 Result

The subjects in this study were 15 men aged between 19 and 26 years and actively participated in the exercise at least three times a week. Data obtained that the mean age of the subjects was  $21.6 \pm 1.95$  years.

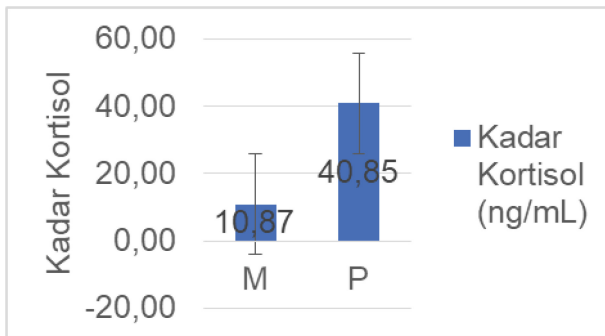
Based on the descriptive analysis in Table 1 and Fig. 1. it can be explained that when subjects futsal game activities at night have an average cortisol level of 10.87 ng/mL, while when subjects futsal game activities in the morning have an average cortisol level of 40.85 ng/mL.

Table 2 Cortisol value when the subject futsal game activities at night is  $0.860 > 0.05$ , so the data is normally distributed. While the value of cortisol when the subject is futsal game activity in the morning has a value of  $\text{Sig } 0.000 < 0.05$ , so that the cortisol data when the subject is futsal game activity in the morning is not normally distributed.

Table 3 Cortisol homogeneity test has a Sig value of  $0.003 < 0.05$ , so that the cortisol value data in this study came from inhomogeneous variants.

**Table 1.** Descriptive Analysis of Cortisol Hormone Level Data

Take Time	N	Mean	Std. Deviation	Std. Error	Minimum Value	Maximum Value
Night	15	10.87	5.2	1.3	1.50	20.17
Morning		40.85	37.1	9.5	15.65	156.82



**Fig. 1.** Cortisol Levels

**Table 2.** Normality Test Results

Take	Time	Shapiro-Wilk		
		Statistic	Df	Sig.
Cortisol Value	Night	.970	15	.860
	Morning	.681	15	.000

**Table 3.** Test of Homogeneity of Cortisol Hormone Level Data

Levene Statistic	df 1	df 2	Sig.
10.403	1	28	.003

**Table 4.** Wilcoxon Signed Rank Test Results

		N	Average Rank	Sum Rank
Morning - Night	Rank Negative	2a	2.00	4.00
	Rank Positive	13b	8.92	116.00
	Similar	0c		
	Total	15		

**Table 5.** Wilcoxon Signed Rank Test Results

		Morning-Night
Z		-3.181 <sup>b</sup>
Asymp. Sig. (2-tailed)		.001

Table 4 and Table 5 different test results Wilcoxon Signed Rank Test, shows that the value of sig  $0.001 < 0.05$ . These results indicate that there is a significant difference in cortisol values when subjects futsal game activities at night compared to when subjects futsal game activities in the morning, where morning cortisol levels are higher than at night.

## 4 Discussion

The purpose of this study was to determine the difference in cortisol values when the subjects futsal game activities at night with futsal game activities in the morning. In this study, there is a significant difference in the cortisol value when the subject is futsal game activities at night with when the subject is futsal game activities in the morning, where morning cortisol levels are higher than at night.

The findings from [10] which states that in the morning they have higher cortisol levels. The high level of cortisol when the subject futsal game activities in the morning is due to the fact that the morning is a circadian cycle where cortisol secretion levels are at the highest level. The circadian cycle affects the level of cortisol concentration [11]. Cortisol is a hormone with a circadian cycle, most studies looking at cortisol levels will follow a circadian cycle [1].

Morning psychological stress is influenced by circadian rhythms, changes in circadian rhythms due to changes in sleep hours [12]. Cortisol can be affected by several

factors such as lack of sleep, psychological stress and exercise, in addition to variations caused by circadian rhythms [13]. Lack of sleep is associated with increased cortisol levels [14].

The results of the interview found that many subjects slept late at night before data collection. Cortisol response to exercise depends on many factors such as intensity and duration of exercise, level of physical fitness, nutritional quality and even circadian rhythm [15].

The results of this study, the high cortisol levels when the subject futsal game activities in the morning compared to at night cannot be said to be bad and it cannot be concluded with certainty that physical activity affects the increase in cortisol levels, because in this study there are still many factors that affect the level of cortisol. Cortisol, such as circadian rhythm, sleep quality, psychological stress, nutrition, exercise patterns, body composition.

This study did not control the rest time, dietary patterns and physical activity of each subject that can affect high and low cortisol levels. This study also did not measure cortisol levels before futsal activity to see the effect of circadian rhythm. This study is limited to observing changes in cortisol levels in physical activity at night and in the morning, so it cannot recommend the right exercise time. So that further research is needed to determine the regulation of cortisol from various aspects that can affect it.

## 5 Conclusion

Based on the results of data analysis and discussion, it can be concluded that there is a significant difference in the cortisol value when the subject futsal game activities at night with when the subject futsal game activities in the morning. Cortisol levels when subjects futsal game activities in the morning are higher than when subjects futsal game activities at night in the futsal community of IKAMI Malang.

In further research related to cortisol levels, it is hoped that other factors that can influence it can be considered, so that the desired results can be obtained. Blood sampling can also pay attention to the right time considering that cortisol has a time span of changing levels.

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