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## THE EFFECT OF HIGH-INTENSITY TRAINING ON BLOOD GLUCOSE LEVELS IN THE SMA NEGERI 5 PINRANG FOOTBALL TEAM

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KEYWORDS	ABSTRACT
exercise, high intensity, glucose levels, blood, football team.	This study aims to determine the effect of high-intensity exercise on blood glucose levels in the SMA Negeri 5 Pinrang football team. This type of research is Pre-Experiment. This type of research was carried out using the One-Group Pretest-Posttest design research plan. The population and sample in this study of football players from the SMA Negeri 5 Pinrang team were taken by random sampling, where samples were obtained from as many as 10 people. The data analysis techniques used are descriptive and inferential, using the SPSS system Version 16.00 with a significant level of 0.05. Based on the results of data analysis, this study obtained a decrease in post-test blood glucose levels (after giving physical activity), with an average (mean) = 89.90000, when compared to the average (mean) of the pre-test results (before physical activity) = 107.00000, where obtained t-count value = 45.791 With $p = 0.000$ , $p < 0.05 = 0.000 < 0.05$ . So there is a significant effect of high-intensity exercise on blood glucose levels in the football team of SMA Negeri 5 Pinrang.

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### INTRODUCTION

In sports, there are several sports, one of which is football. One of the games included in heavy-intensity activities is a soccer game where time is used, which is 2 x 45 minutes (Nirwandi, 2017). During this time, players must play with good technique and cooperation to score the ball against the goal to win (Nosa, 2013).

Discussing training in every soccer movement is inseparable from the need to provide maximum energy and energy. The power in question is sourced from ATP, aerobic and anaerobic energy. Much of the energy used for muscle work depends on the intensity, frequency, rhythm, and duration of the exercise. The energy required for an exercise activity or muscle contraction cannot be absorbed directly from the food eaten but is obtained from a compound called ATP (Adenosine Triphosphate) (Wiriawan & Kaharina, 2022). ATP is a source of energy that is directly used by muscles to contract (Sandi, 2019).

Football is a sport that requires energy from aerobic and anaerobic processes with almost balanced proportions and runs simultaneously in sports activities that are carried out with high intensity and require power quickly, such as when running to chase the ball, jumping movements, passing, and kicking the ball, the body's energy metabolism will run anaerobically through energy sources obtained from glycogen stores (T. A. Putri & Probosari, 2017).

The study found that physical activity with heavy intensity has benefits in lowering blood glucose compared to if done at low or moderate intensity (Simper et al., 2020). Reserach suggests that the intensity of physical activity has a significant relationship with decreased blood glucose.

Physical activity is a movement of the body due to the activity of the musculoskeletal system (Puspitasari & Ariyanto, 2021). Physical activity carried out in a structured and planned manner is

called physical exercise. In contrast, physical activity that is not structured and planned is called daily physical activity (Hadi, 2020).

According to research, soccer athletes use carbohydrates in the form of glucose as an energy source (Lestari et al., 2021). Glucose is the main energy source for muscle contraction during exercise, while glycogen is a form of glucose storage in the body (7,8).

Furthermore, research suggests that physical activity should be done at least three times a week because the effect of one exercise, as recommended, on insulin sensitivity can only last for 24 to 72 hours (E. L. Putri, 2017).

By doing physical activity, it will affect glucose levels in the blood. When the body's activity is high, the use of glucose by the muscles will also increase. Endogenous glucose synthesis will be increased to keep glucose levels in the blood balanced (Lubis & Kanzanabilla, 2021). According to research that the role of glucose in the human body is not only as fuel for metabolic processes and energy sources for brain work but also as a producer of energy during exercise (Lande et al., 2015).

Physical activity is one of the factors that can affect blood glucose levels in the human body. Heavy-intensity physical activity for 20 minutes can reduce blood glucose levels (Lande et al., 2015).

Glucose is a compound that can be a source of ATP aerobically or anaerobically. Anaerobically glucose is broken down without using oxygen, which is called anaerobic glycolysis of the lactic acid system. Aerobically glucose goes through a series of chemical reactions to produce ATP called aerobic glycolysis (Lesmana & Broto, 2018).

Based on the background provided above, this research aims to determine the effect of high-intensity training on blood glucose levels in the soccer team of SMA Negeri 5 Pinrang. Therefore, this study is beneficial for the general public to promote the advantages of regular physical activity and its impact on blood glucose levels. It can encourage more people to engage in sports and physical exercises to maintain their health and well-being.

## **METHOD**

This is a Pre-Experiment One-Group Pretest-Posttest design research (Arikunto, 2016).

### **Research Variables**

Research variables are the object of research or what is the point of attention of a study.

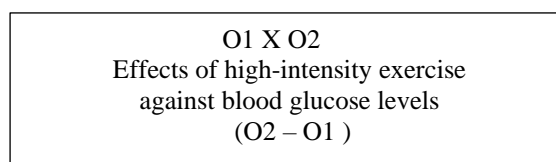
In this study, two variables are involved: independent and dependent variables. Both variables will be identified in the study as follows:

- a. Independent variables affect or cause changes or arise from dependent variables. In this study, the independent variable was high-intensity exercise.
- b. Dependent variables are variables that are affected or that are affected by the presence of independent variables. In this study, the independent variable is blood glucose levels.

### **Research Design**

Research design is a design or description of research implementation that will be used as a reference in research analysis steps. The research design is adjusted to the type of research, research objectives, variables involved and data analysis techniques used.

Research design is a design or description that is used as a reference in conducting a study. This research is a type of Pre-Experiment research (One-Group Pretest-Posttest design). The research design model used can be seen in the following picture:



**Figure 1. Research Design Model**

Source: Sugiyono, 2011

**Information:**

Or<sub>1</sub> = Assess glucose levels before exercise

Or<sub>2</sub> = Assess glucose levels after exercise

X = Activity Grant

**Population**

Each study's selected population is closely related to the research problem. The population is a generalized area consisting of objects/subjects with certain qualities and characteristics determined by the researcher to be studied and then draw conclusions (Suriani & Jailani, 2023). This study's population was all SMA Negeri 5 Pinrang football players. The population used in this study was 20 people.

**Sample**

A sample is a portion of the population that is the source of actual data in a study, meaning a portion of the population represents the entire population (Roflin & Liberty, 2021). Sampling techniques in this study use *probability sampling* techniques, namely sampling techniques where each member of the population has the same chance to be selected as a sample. In other words, all single population members have a non-zero chance. This technique involves random retrieval (shuffling) of a population. The number of samples to be studied in this study is 10 people from the SMA Negeri 5 Pinrang football team.

In data collection techniques, carried out by observation (observation), a planned procedure which, among others, includes seeing and recording the number and level of certain activities that have to do with the problem under study by measuring blood glucose.

Data analysis is a very important part of a study. Because with the data analysis, the hypothesis proposed can be tested for correctness, and then a conclusion can be drawn. The data obtained in this study was Blood Glucose Level data on the SMA Negeri 5 Pinrang football team, which was measured before and after training.

Data in the study were analyzed using:

1. Descriptive test

Descriptive analysis is intended to get an overview of research data to be able to interpret and give meaning to the initial blood glucose level measurement data (*pre-test*) and final blood glucose level measurement data (*post-test*)

2. Test data normality

Test Data normality is intended to obtain research data to interpret and give meaning to the initial blood glucose level measurement data (*pre-test*) and final blood glucose level measurement data (*post-test*) concerning the standard of normality ( $P > 0.05$ )

3. Uji T (T-Test)

The T-Test is intended to test the data taken on the sample.

The statistical tests mentioned above are processed in computer analysis techniques in the *SPSS (Statistical Product and service solutions)* program version 16.0.

## RESULT AND DISCUSSION

### Research Results

In this chapter, the presentation of the results of data analysis and discussion will be presented. The presentation of data analysis results includes descriptive and inferential statistical analysis. Then a discussion of the results of the analysis and its relation to the theory underlying this research is carried out to inform the interpretation of the results of the data analysis.

From empirical data obtained in the field in the form of test results and blood glucose measurements before and after high-intensity training in a 100-meter sprint, data tabulation was first held to facilitate further testing. The data analysis used in this study is inferential statistical techniques. Descriptive data analysis intended to get an overview of data includes average, standard deviation, variance, maximum data, minimum data, range, frequency table and graph.

Furthermore, testing of analysis requirements is carried out, namely the data normality test. To test the hypothesis, use a t-test to examine the effect of high-intensity exercise on blood glucose levels.

### Descriptive Analysis

Descriptive data analysis is intended to get an overview of research data. Descriptions of data are meant to be able to interpret and give meaning to the data.

#### Blood Glucose Levels Before and After Exercise

The next descriptive data is presented in the following table.

**Table 1. Statistical descriptive analysis of athletes' blood glucose before and after exercise**

	Descriptive Statistics							
	N	Range	Min	Max	Sum	Mean	SD	Variance
Initial glucose	10	21.00	94.00	115.00	1070.00	107.0000	6.16441	38.000
Final glucose	10	19.00	79.00	98.00	899.00	89.9000	6.20842	38.544

From the table above can be obtained an overview of the initial test data as follows:

- 1) Blood glucose levels before exercising in the *Pre-Test* obtained an average value of 107.0000, a maximum value of 115.00, a minimum value of 94.00, a total number of 1070.00, a standard deviation of 6.16441 and a range of 21.00.
- 2) Blood glucose levels after doing exercise on the *Post-Test*, obtained an average value of 89.9000, a maximum value of 98.00, a minimum value of 79.00, a total number of 899.00, a standard deviation of 6.20842 and a range of 19.00

### Data normality test

One assumption that must be met for parametric statistics to be used is that the data follows a normal spread. If the test turns out to be normally distributed data, parametric statistical analysis has been fulfilled. To determine the blood glucose levels of both groups are normally distributed, testing was carried out using the Kolmogorov Smirnov Test. The results of the data normality test can be seen in the following table.

**Table 2. Normality Test Results**

Variable	Pre-Test				Post-Test		Information
	K-SR		P		K-SR	P	
Blood Glucose Levels exercise	0.591	0.877	0.539	0.934			Normal

Based on the table above, it can be obtained that data normality testing using the Smirnov Kolmogorov test shows the following results:

- 1) Data on blood glucose levels before exercise obtained  $P=0.877$  ( $P>0.05$ ). So this shows that the *Pre-Test data* on blood glucose levels before exercise follow a normal distribution or normal distribution.
- 2) Data on blood glucose levels after exercise obtained  $P = 0.934$  ( $P > 0.05$ ). So this shows that the *Post-Test data* on blood glucose levels after exercise follow a normal distribution or normal distribution.

### Data Analysis

The hypothesis proposed in this study needs to be tested and proven through empirical data obtained in the field through tests and measurements of the variables studied, then the data will be processed statistically. The test for this data analysis used is the T-test (T-Test).

The T-Test is intended to test data that has been taken on a sample

**Table 3. Results of Blood Glucose Data Analysis Before and After Exercise**

Variable	Time	Mean	Std. Deviation	T- Calculate	P-Value	Note
Blood Glucose Levels	Pre_Test	107.00000	6.16441	54.890	0.000	Significant
	Post-Test	89.90000	6.20842	45.791	0.000	Significant

From the calculation results in the data above, the t-count before the exercise was obtained at 54,890 with a value of  $P = 0.000$ . It turned out that  $p < 0.05$  and t-count after exercise obtained 45,791 with a value of  $p = 0.000$ . It turns out that  $p < 0.05$ ; hence, there is a significant difference in blood glucose levels before and after exercise. Judging from the mean obtained in the pre-test of 107.000000 while the post-test was 89.90000, the change was 17.1, meaning a decrease of 17.1.

### Research Discussion

The results of the analysis of blood glucose levels between the initial test and the final test against the dependent variable. For hypothesis testing, it needs to be studied further by providing an interpretation of the relationship between the results of the analysis achieved with the theories underlying the research. This explanation is needed to know the suitability of the theories put forward with the research results obtained. There is a significant influence of providing high-intensity training on blood glucose levels in the SMA Negeri 5 Pinrang football team. The results obtained when related to the underlying frame of mind and theories, basically this theory supports the underlying theory. Based on the hypothesis test in this study, it was found that the provision of exercise after the initial test affected blood glucose levels. This can be seen from the test results and measurement of blood glucose levels through a blood glucose test kit (*Easy Touch GCHb*).

Physical exercise with high intensity and in a short time (2-20 seconds), ATP production is dominated by the ATP-PC system so that blood glucose levels are relatively constant. Meanwhile, if the activity is more than 20 seconds, ATP production is dominated by anaerobic glycolysis. Anaerobic glycolysis is the main glycogen or glucose source so that blood glucose will decrease. At high-intensity activity longer than 45 seconds, ATP production comes from a combination of ATP-PC, anaerobic glycolysis and the aerobic system.

During high-intensity exercise, the energy source of muscle contraction is dominated by carbohydrates (glycogen or glucose) (JABIR, 2020). Intensive physical exercise for a short time, such as in sprints or short reps with short rest periods, the energy system is used aerobically. Therefore this physical exercise depends almost entirely on glucose and glycogen as energy sources.

### CONCLUSION

Based on data analysis and discussion, a decrease in post-test blood glucose levels was obtained after giving physical activity in the form of sprint running. High-intensity exercise significantly influences blood glucose levels in the SMA Negeri 5 Pinrang football team.

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