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THE EFFECT OF 70% VO_2 MAX RUNNING EFFORT COMBINED WITH MODERATE MUSCLE EXERCISE TOWARD BLOOD GLUCOSE LEVELS OF THE HEALTHY STUDENT AT MEDICAL FACULTY OF UDAYANA UNIVERSITY

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Abstract: **the prevalence of diabetes mellitus in the world keeps increasing. One of the main trigers of diabates mellitus is obesity. Obesity can be avoided by doing physical exercise dan managing diet. Nevertheless there wasn't manny studies that explain the extent to wich exercise can affect blood glucose levels. The purpose of this study is to prove that physical exercise can be used to control blood glucose levels. The design of this study is four weeks quasi-experimental group comparison pre-test and post-test with macthing sampling method. The subject of this study are 20 male and 30 female. The data obtained by measurement were body weight, height, and fasting blood glucose. While the data about physical activity and calori intake were obtained by questionaires. The data obtaned by questonaires will be stratified as controled variable on control by analyze. The analysis result found that data is normaly distributed and homogen. The result of independent t-test shows that there is significant difference between mean fasting blood glucose**

Keywords: **diabetic, healty, blood sugar levels, physical exercise.**

I. INTRODUCTION

Nowadays the prevalence of non-communicable diseases is quite high. One of them is Diabetes Mellitus (DM), which is defined as a decreasing ability to regulate glucose as an energy source.(1) The American Diabetes Association classifies Diabetes mellitus into 2 types, Type 1 (Insulin-dependent) and Type 2 (Non-insulin-dependent).(2) Based on epidemiological studies conducted by the Indonesian Ministry of Health in 2014 showed nearly 80% of the prevalence of diabetes mellitus was type 2 diabetes mellitus / Non-insulin-dependent. In addition, data from the Health Research and Development Agency of Indonesia in 2018 also showed an increase in the proportion of Diabetes mellitus in people aged> 15 significant.(3) Based on these data, it can be seen that an unhealthy lifestyle is the main trigger for non-communicable diseases, especially type 2 diabetes mellitus. Supported by a study conducted by Agrawal in 2017 which states that people who are classified as obese have a higher risk of suffering from diabetes mellitus compared to normal people.(4) One effort to maintain weight is a healthy lifestyle in the form of regular and adequate exercise.

Based on a study conducted by Keating et al.(5) , exercise with moderate intensity was with efforts to reach 50% -70% of the maximum heart rate of high intensity reaching 70% -85% of the maximum heart rate. Seeing the prevalence that keep increasing, we want to prove the effect of physical exercise on fasting blood glucose levels to prevent type 2 diabetes mellitus.

II. MATERIAL AND METHODS

A. Subject and Experimental Procedure

This study is a quasi-experimental group comparison pre-test and post-test with matching sample method.

Our study was approved by Research Ethical Committee of Udayana University, Bali, Indonesia.

Sample that has been used in this research is twenty healty male and thirty healty female with the age between 18 to 20 years old, assigned into two groups, each group consisting of 10 male and 20 female. The control group, subject those who are not treated by 70% VO_2 max running effort combined with moderate muscle exercise. While the experimental group, subject those who are treated by 70% VO_2 max running effort combined with moderate muscle exercise. Thats means 3000 meters run, 30 push-up, 30 sit-up for one day, three times a week for four weeks.

All subjects are take fasting glucose test for pre-test and they should answer some questionaires. Both group followed-up and monitor every day. For control group, make sure they not change their life style. While for experimental group, monitoring their every sesion of exercise and we brought them some water. On the fifth week, all subject take fasting glucose test for post-test.

B. Statistical Analysis

Data were analysed using the SPSS program for windows. The result were presented as percentage and mean ± SD. The normality of the data distribution was confirmed using the Saphiro-Wilk tes. While the homogeneity of the data was confirmed using Levene's test. In the end, data were analysed by Independent t-test, and the result were considered statistically significant at $p < 0.05$.

III. RESULT AND DISCUSSION

A. Result

The result of the measurement of fasting blood glucose, body mass indeks, and body weight in both group are presented in Table 1.

Table 1: Measurement of Fasting Blood Glucose (FBG), Body Mass Indeks (BMI), and Body Weight (BW)

Group	Test	FBG (mg/dl)	BMI (kg/m^2)	BW (kg)
Experimental	Pre	89,12±5,55	21,39±3,27	58,88±11,65
	Post	84,48±4,47	20,93±3,40	57,04±11,70
Control	Pre	85,88±571	21,35±3,11	57,72±11,69
	Post	86,44±6,60	21,35±3,17	57,72±11,79

***Value = Mean±SD**

The blood glucose levels in subject that are treated by 70% VO_2 max running effort combined with moderate muscle exercise are significantly more decreased compared to group that are not treated with moderate intensity running $p = 0.001$.

Table 2: Result of Independent t-Test (Change of mean FBG Group expermental vs control)

Parameter	Experimental (mg/dl)	Control (mg/dl)
FBG1 - FBG2	4,64±2,97	-0,56±4,60

* **Value = Mean±SD**
* **p value = 0,001**
* **FBG1 = pre-test**
* **FBG2 = post-tes**

B. Discussion

Table.2 showed that in the control group the mean blood glucose level increased slightly. whereas in the study group there was a decrease in the mean blood glucose of 4.64 mg / dl, so that a significant effect was obtained from the treatment of physical training on the measurement value of fasting blood glucose in the Faculty of Medicine of Udayana University students, with a value of p = 0.001.

This study is in line with the study by Jadidi et al.(6) This study conducted in 2013 in Iran stated that aerobic and resistance exercise improved blood glucose control with a value of p = (α <0.05). This study also compared the effect of physical exercise on insulin sensitivity. The group used was an aerobic, resistance and combination group. The duration of the study was carried out for 7 weeks. The subjects of this study were healthy women aged 20-35 years. while this study uses relatively younger subjects than Jadidi's study. The parameters used are fasting blood glucose levels to compare the effect of physical exercise habits. The researcher also calculated the character of the subjects based on BMI and gender through matching methods. control by analyze is used for confounding variables that are difficult to control such as daily caloric intake and level of physical activity. For the significance of the effect of the treatment of physical training on blood glucose levels can be seen through, Confident Interval (CI) and P-value.

Other studies that have similar results were carried out by Sandvei et al.(7) The results of a 2012 study in Norway showed that sprinting at intervals was more effective in lowering blood glucose levels than running with longer duration with moderate intensity. The study design used was a parallel design, where the subjects of the study were not diabetic and young adults. The parameters measured were fasting blood glucose, blood glucose 2 hours after the load of 75 grams of oral glucose (post-prandial) and plasma insulin levels. In this study it was found, increasing insulin sensitivity in both groups and fasting blood glucose or post-prandial blood glucose were under the curve, with p = <(0.05) compared to before doing physical exercise indicating that there was a significant decrease in blood glucose due to need physical activity according to the description of the researcher.

IV. CONCLUSION

It was concluded that 70% VO_2 max running effort combined with moderate muscle exercise had a positive influence for controlling blood glucose. This can be seen from the results of the significance values of the Independent t-test that has been carried out. In addition, the mean fasting blood glucose of subject who are not treated by 70% VO_2 max running effort combined with moderate muscle exercise was lower than the control group.

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