THE EFFECTIVENESS OF BRAIN GYMNASTICS ON REDUCING BLOOD SUGAR LEVELS IN PATIENTS WITH TYPE II DIABETES MELLITUS IN THE WORKING AREA OF THE PAMPANG HEALTH CENTER, MAKASSAR CITY

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Abstrak

Baground: Diabetes is a long-term disease, if ignored, diabetes complications can cause blood sugar levels in diabetics to be uncontrolled, so it can affect every part of the body. The impact of diabetes can be macrovascular and microvascular diseases such as heart disease, peripheral vascular disease, kidney failure, nerve damage, and blindness. **Objective**: The purpose of this study is to determine the effect of Brain Gym on blood sugar levels in people with type 2 diabetes at the Pampang Health Center, Makassar City .**Method:** This type of research uses a quantitative strategy with a type of pre-experimental examination with the design of the one group pre-test post-test design. Where blood sugar level measurement is carried out before and after Brain Gym. The population of the study sample was 111 people, with 30 people taken using purposive sampling technique. **Result:** Data analysis using the Willcoxon test with the results of the study showing the effect of brain gym on blood sugar levels in patients with type 2 diabetes mellitus with a p value of 0.000. **Conclusion:** It is recommended for the Pampang City Health Center Community to always provide counseling on diabetes mellitus and diabetes exercise instructors to pay more attention to diabetes sufferers by increasing the training time for diabetes sufferers in carrying out diabetes exercise activities**.**

Keywords **:** Brain Gym, Blood Sugar Levels, Type 2 Diabetes Mellitus

BACKGROUND

According to the World Health Organization (WHO), diabetes mellitus is a long-term disease caused by the inability of the pancreas to produce enough insulin, or the body's inability to produce enough insulin or the body's inability to produce enough. (Wulan Kristin, 2024). Diabetes Mellitus is a degenerative disease that causes disturbances in the body's metabolism. As a result of this disease, the pancreas is unable to produce the hormone insulin to meet the body's needs, so blood pressure increases (Misbah Nurjannah N. W. W. A., 2023) Diabetes is a disease in which the body has high glucose levels (hyperglycemia) because the body is unable to produce and use insulin. Where diabetes mellitis has 2 types, namely Type I and Type II. Type I DM can be caused due to insufficient insulin in the body whereas Type II DM is caused by the body's inability to use insulin effectively (Setiawan, 2021)

According to the International Diabetes Federation (IDF) on the number of diabetics in various countries, it identifies the 10 countries with the highest number of diabetics. The three countries with the highest number of diabetics, namely China, India, and the United States, have incidence rates of 116.4 million, 77 million, and 31 million sick, respectively, occupying the top three positions. Indonesia ranks fourth out of ten countries with Type 2 Diabetes Mellitus with a prevalence of 8.6 of the total population and is expected to increase by 8.4% to 21.3% million people from 2000 to 2030(Basri, M., Kistan, K., & Sukmawati, 2023)

South Sulawesi Province according to the results of Basic Health Research (Riskesdas) shows that the prevalence of diabetes mellitus based on a doctor's diagnosis is highest at the age of 65-74 years, which is 5.4% and with an increase in prevalence of 1.7%. Based on the results of the annual report of the South Sulawesi Provincial Health Office, it was found that there was an increase in cases of diabetes mellitus in Makassar City where in 2021 there were 4,530 cases recorded and in 2022 it increased by 11,619 cases with a difference of 7,089 cases (South Sulawesi Provincial Health Office, 2023). Based on data on people with Diabetes Mellitus in the working area of the Pampang Health Center in 2022 806 people, in 2023 999 people, and in 2024 from January to April 284 people (source of the 2024 Pampang City Health Center profile.)

Looking at the data above, the phenomenon of type 2 diabetes mellitus is still increasing. This is caused by several factors that can affect the increase in blood sugar levels, namely stress and lack of exercise. Therefore, considering that type 2 diabetes mellitus patients have difficulty controlling their blood sugar levels, this researcher is trying to control and prevent complications of diabetes mellitus by using the Brain Gym method. Brain Gym is an exercise that combines dynamic body movements, allowing the activation of both hemispheres of the brain in a balanced manner at the same time. This Brain Gym is not intended to replace the drug therapy that is often consumed by people with diabetes mellitus, but only helps to reduce stress. Because one of the factors that causes an increase in blood sugar is stress. Therefore, stress management in a person suffering from diabetes mellitus needs to be controlled by using complementary therapy. One of the complementary therapies that can be used is Brain Gym, where the purpose of brain gymnastics can provide a state of relaxation by reducing the release of adrenaline, which causes a person to experience increased stres(Saputra, 2023)

From the results of the study (Indriati, 1990) said that there was an effect of physical exercise on the decrease in blood glucose levels, this was evidenced by a decrease in blood glucose levels by an average of 60.767 mg in the study he conducted on patients with type 1 and 2 diabetes mellitus. In people with type 2 diabetes mellitus, physical exercise has a major role in regulating blood glucose levels. In people with type 2 diabetes mellitus, insulin production is not disrupted, but because the response of receptors in cells to insulin (resistance) is still lacking, insulin cannot help transfer glucose into the cell. During exercise, the state of membrane permeability to glucose increases in contracted muscles so that insulin resistance decreases, in other words insulin sensitivity increases (Hidayat, 2017)

Brain Gym is effective in lowering anxiety levels in people with diabetes mellitus. Through the movements in Brain Gym, a person can become calmer and more relaxed, so that the organs of the body work better, and the oxygen supply increases. The parasympathetic nervous system will be activated by the body when a person is in a relaxed state, this makes the pulse, blood sugar and respiratory rate decrease. The parasympathetic nervous system will be activated by the body when a person is in a relaxed state, this makes the pulse, blood sugar and respiratory rate decrease. Therefore, to prevent uncontrolled increases in blood sugar levels, people with diabetes mellitus must be able to control stress (Arif Hendra Kusuma 2023)

METHODS

Research design is a strategy to answer questions using empirical use (Nasution et al., 2023). This type of research uses a quantitative strategy with a type of pre-experimental examination with the design of the one group pre-test post-test design. Where blood sugar level measurement is carried out before and after Brain Gym.

The inclusion criteria are the general characteristics of the research subjects of a target and affordable population to be studied, namely: Diabetic mellitus patients in the working area of the Pampang Health Center with a blood sugar level of > 200 mgdl with respondents aged 40-60 years.

The implementation of this study used a blood sugar level measuring device, an observation sheet used to record the respondent's name, gender, age, occupation, education, and the results of blood sugar level measurement, before and after the respondent was given brain gymnastics (Brain Gym). The blood sugar level meter is used to measure blood sugar levels, measurements are carried out twice before and after the respondent is given brain exercises (Brain Gym), the purpose is to find out the value of the respondent's blood sugar level before and after being given the brain gymnastics intervention (Brain Gym).

The implementation mechanism of Brain Gym will be carried out in the morning. This gymnastics will be carried out for 2 weeks where this brain gymnastics (Brain Gym) is carried out 1 time a week and will be carried out the following week with a duration of 45 minutes, after which the respondent is given a rest period for 5-10 minutes, then blood sugar levels are measured to see if there is a decrease in blood sugar levels after being given brain gymnastics (Brain Gym).

RESULTS AND DISCUSSION

1. Characteristics of respondents

In this section, the characteristics of the 30 respondents based on gender and age will be described as follows:

a) Gender.

Table 1, Distribution of Respondent Frequency Based on Respondent Gender Characteristics in the Working Area of the Pampang Health Center Makassar City

Gender	Frequency	Percentage (%)
Man	7	23,3
Woman	23	76,7
Total	**30**	**100.0**

Source: Primary Data June 2024

Based on Table, showing the frequency distribution based on the gender characteristics of the respondents, an overview of the results of the study was obtained that the most respondents were women, as many as 23 respondents (76.7%) and 7 respondents (23.3%) with

male gender.

b) Age

Table 2. Distribution of Respondent Frequency Based on Respondents' Age Characteristics in the Working Area of the Pampang Health Center Makassar City

Age	Frekuency	Percentage (%)
40-50 years	8	26.7
51-60 years	22	73.3
Total	30	100.0

Source: Primary Data June 2024

Based on the table showing the frequency distribution based on the age characteristics of the respondents, the results of the study showed that the most respondents were 51-60 years old as many as 22 respondents (73.3%) and the lowest age category was 40-50 years old as many as 8 respondents (26.7%).

c) Long Suffering from Type II Diabetes Mellitus

Table 3. Distribution of Respondent Frequency Based on Length of Suffering from Type II Diabetes Mellitus in Respondents in the Working Area of the Health Center Pampang, Makassar City

Long Suffering from Type Diabetes Mellitus II	Frekuency	Percentage (%)
< 3 years	6	20.0
>3 years	24	80.0
Total	30	100.0

Source: Primary Data June 2024

Based on Table 5.3 Showing the frequency distribution of respondents based on the length of suffering from type II diabetes mellitus, the results of the study showed that the most respondents were respondents who suffered from type II diabetes mellitus > 3 years, as many as 24 respondents (80.0%). And the long-term category of suffering from type II diabetes mellitus < 3 years as many as 6 respondents (20.0%).

d) Consumption of Type II Diabetes Mellitus Medication

Table 4. Distribution of Respondent Frequency Based on Consumption of Type II Diabetes Mellitus Medication in Respondents in the Working Area of the Health Center Pampang, Makassar City

Consumption of Type II Diabetes Mellitus Medication	Frekuency	Persentage (%)
Yes	28	93.3
No	2	6.7
Total	30	100.0

Source: Primary Data June 2024

Based on showing the frequency distribution of respondents based on the consumption of type II diabetes mellitus drugs, an overview of the results of the study was obtained that 28 respondents (93.3%) took type II diabetes mellitus drugs and 2 respondents (6.7%) did not consume type II diabetes mellitus drugs

2. Univariate Analysis

Table 5. Distribution of Respondent Frequency Based on Blood Sugar Levels Before and After Being Given Brain Gym to Type 2 Diabetes Mellitus Patients in the Working Area of the Pampang Health Center, Makassar City

Variable	Means	Standar Deviasi	Min-Max
Blood Sugar Levels			
Pre Test	180.90	41.338	110 – 200
Pos Test	144.90	39,227	96 -209

From the table above, it can be seen that blood sugar levels decreased before and after exercise for diabetics. This can be seen from the average blood sugar level before exercise of 180.90 mg/dl, while the average blood sugar level after exercise is 144.90 mg/dl.

3. Bivariate Analysis

Bivariate analysis explains the difference in blood glucose reduction by knowing blood glucose levels before and after 2 weeks of diabetic exercise treatment. In this study, bivariate analysis was carried out using the Wilcoxon test because the statistical test of the t-test (paired t-test) sample or the difference test of two dependent mean did not meet the assumption of normality.. The statistical test for the entire analysis was analyzed at a significance level of 95% or alpha 0.05. The analysis of each variable in this study can be seen in the table below.

Variable	Number of Observations	*Mean Rum*	*Sum of Ranks*	*CI 95%*	*P Value*
Blood Sugar Levels	18	11,11	200.00	0,00 – 0,139	0,000
Negatif Rank	2	5.00	10,00		
Positif Rank					

Based on Table 4.2 above, the negative rank or the value of the second variable (post-test) is lower than the value of the first variable (pre-test), the number of observations is 18 observations, mean 11.11, then the value will be: 200, then the rank or positive value of the second variable (post-test) is higher than the value of the first variable (pre-test)), While the number of observations is 2 observations with a mean of 5 and a mean of 10. The data analyzed the difference in blood glucose levels in type 2 diabetic patients before and after brain gym, and also showed that there was an effect between brain gym on blood glucose reduction in type 2 diabetic patients. The results of the statistical test obtained a p-value of 0.000 so that it can be concluded that there is an influence on the blood sugar levels of type 2 diabetic patients before and after brain gym.

CONCLUSION

Based on the results of the blood sugar distribution in this study, it can be concluded that there is a difference in the average blood sugar level before and after 2 weeks of doing brain gym. This is the result of statistical analysis of changes in blood sugar levels from the first week of brain gym to the second week after brain gym through testing conducted on diabetic brain gym participants. The average blood sugar level before the examination was 180.90 with a standard deviation of 41.338, and the average blood sugar level after the examination was 144.90 with a standard deviation of 39.227.

The results of the analysis of the wilcoxon test in negative ranks or posttest values were lower than the pretest values as many as 18 observations with a mean value of 11.11 and an average number of 200, while positive ranks or posttest scores were higher than the pretest values in 2 observations with a mean value of 5 and an average number of 10. The data illustrates the difference in blood sugar levels of type 2 diabetes mellitus patients before and after diabetic exercise, and also shows the influence of brain gym on the decrease in blood sugar levels of type 2 diabetes mellitus patients. From the results of the statistical test, a p value of 0.000 was obtained, so it can be concluded that there is an effect on the blood sugar levels

of type 2 diabetes mellitus patients before and after the brain gym.

Research conducted by Pooji Indriani, Heru Supriyatni, Agus Santoso and colleagues found that exercise and aerobic exercise lowered blood sugar levels in type 2 diabetic patients at the Pampang Health Center in Makassar City were proven to have a lowering effect.

Blood sugar is the end product and is the main source of energy for living organisms whose use is controlled by insulin. Generally, blood sugar levels stay within narrow limits throughout the day of 4-8 mmol/l (70-150 mg/dL). This level increases after meals and is usually at its lowest level in the morning, before meals. In patients with diabetes mellitus is the most prominent disease caused by a failure to regulate blood sugar levels, in addition to glucose, it also finds other types of sugars such as fructose and galactose. In type 2 diabetes mellitus is not insulin-dependent, exercise (diabetic gymnastics) is very good for controlling blood sugar levels so as to inhibit the risk of diseases that arise from complications of diabetes mellitus.

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