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Effect of progressive muscle relaxation therapy via video on blood sugar in type 2 diabetes patients

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Abstract

Background: Diabetes mellitus is a chronic metabolic disease characterized by high blood sugar levels. Indonesia ranks fifth globally in the number of people living with diabetes. If the condition is not well controlled, it increases the risk of diabetes-related deaths. One of the five diabetes control programs is physical exercise, including progressive muscle relaxation therapy, which involves gradually tensing and relaxing muscles to promote physical relaxation.
Methods: This study used a quasi-experimental design with pretest-posttest and control groups. A total of 62 respondents were selected through simple random sampling using the Spiner website and divided into two equal groups of 31 each. The research instrument was a glucometer, and a daily checklist questionnaire completed by the researcher evaluated the participants' exercise and medication adherence. Data were analyzed using paired t-tests and independent t-tests.
Result: The study found a significant reduction in blood sugar levels in the experimental group that performed progressive muscle relaxation therapy via video. The average decrease was 12.45 mg/dL, with a p-value of 0.000, indicating a strong effect.
Conclusion: Progressive muscle relaxation therapy delivered through video effectively lowers blood sugar levels in patients with type 2 diabetes mellitus. This therapy is recommended as a routine exercise method to help control blood sugar levels in diabetic patients.

Keywords: Progressive muscle relaxation; diabetes mellitus type 2; blood sugar level.

INTRODUCTION

Diabetes mellitus (DM) is a serious long-term (chronic) condition that occurs when there is an increase in blood glucose levels because the body cannot produce or enough of the hormone insulin, or cannot use the insulin it produces effectively (1).

According to the WHO, more than 346 million people worldwide have diabetes. This number will probably more than double without treatment by 2030 (2). In 2021, Indonesia became the seventh highest country for the highest prevalence of DM patients in the world with 19.47 million cases (3). Based on Indonesian Health Standard data 2023 Special Region of Yogyakarta (DIY) is one of the provinces in Indonesia with the second highest number of DM patients after DKI Jakarta. In 2023, the percentage of people with DM in DIY was 3.6%, higher than the national percentage of only 2.2% (4).

The risk factors for type 2 diabetes mellitus consist of two, namely factors that cannot be changed and factors that can be changed. Factors that can be changed are dietary factors, smoking habits, hypertension, obesity, physical activity, stress and others (5). According to Atmoko et al 2024 factors that affect blood sugar levels are age, gender, smoking, stress (6).

Risk factors that can be changed if left untreated will lead to uncontrolled sugar levels, so that diabetics are very at risk of causing acute and chronic complications, reducing the quality of life of patients, and the risk of death. Acute complications appear quickly such as hypoglycemia, while chronic complications consist of macrovascular and

microvascular problems. Microvascular complications include retinopathy, neuropathy, nephropathy and peripheral vascular disease, while macrovascular complications are atherosclerotic, such as heart disease, stroke and myocardial infarction (7).

Diabetes mellitus management consists of five pillars: education, diet planning, physical exercise, pharmacological treatment, and blood sugar checks (8). Physical exercise is a simple pillar that does not require expensive costs. Physical exercise is divided into three categories: light, moderate, and heavy. Heavy exercise requires more funds, time, and space. Moderate physical exercise requires slightly less funds, time, and space. Meanwhile, light exercise is the most effective and efficient exercise because it does not require a lot of funds, time, and space and can be done anywhere and anytime. Light physical exercise can be an alternative for people who want to do physical activities at home or in the office while working. One physical activity that can be done is light physical activity, namely progressive muscle relaxation therapy (9). To achieve optimal effects, physical exercise should be done once every 2 days or 3 times a week with a minimum duration of 15-30 minutes each day (10).

Progressive muscle relaxation exercises are a form of light physical exercise that can be used as complementary therapy. These exercises are simple and can be done efficiently at any time and place while working, making them the right choice (11). Progressive muscle relaxation is a relaxation technique that uses deep breathing exercises and a number of specific muscle contractions and relaxations (2). This progressive muscle relaxation leads the patient to differentiate the feelings experienced when the muscle group is relaxed compared to when the muscle is tense. Thus, it is expected that the client will be able to manage the body condition and blood sugar can be controlled (12).

Progressive muscle relaxation concentrates on tightening and relaxing various muscle groups sequentially. Progressive muscle relaxation therapy is useful for reducing peripheral resistance and increasing the elasticity of blood vessels due to vasodilation when stretching the muscles. When a person is in a relaxed and calm state, the sympathetic nervous system stimulates the hypothalamus to decrease the release of Corticotropin Releasing Hormone (CRH) (13). The adenohyophysis has decreased adrenocorticotropic hormone (ACHT) production, which is carried to the adrenal cortex through the bloodstream and can inhibit the release of cortisol hormone by the adrenal cortex. If there is a suppression process during the release of hormones such as epineprin, cortisol, glycagon, adrenocorticotropic hormone (ACHT), corticosteroids, and thyroid, insulin sensitivity will increase (14). The way to perform the progressive muscle relaxation technique is to tense each muscle group for more than 10-15 seconds until you feel the vibration in the muscle. Then, when the tension time is almost over, take a short breath and exhale to release the tension (15).

In a study conducted by Syaftri 2021 on the application of progressive muscle relaxation therapy in patients with diabetes mellitus, there was a decrease in blood sugar levels. However, the limitations of this study are that the intervention is only given 2 times in 4 days at the patient's home and is given directly without media, so that patients do not have an exercise guide after the study is complete. Efforts to prevent and control diabetes mellitus can be provided through various media such as print and electronic. However, according to research, the use of leaflets, booklets, and flip sheets is less effective in improving knowledge and skills. This is because printed media are more easily lost or damaged (16). Video is one of the effective electronic media that can be used as education and intervention in diabetes mellitus control. An attractive display accompanied by sound, can be used in the long term, making the information conveyed longer stored in memory which makes respondents satisfied (17). Based on Dewi & Maria's research (2023) on the effect of final education based on diet videos on the knowledge and skills of Type II DM patients,

there is a significant difference in providing final education through diet videos on knowledge and skills both before and after with a p-value of 0.000 (18).

Physical exercise is very necessary for the management of diabetes mellitus. Progressive muscle relaxation therapy exercise as one of the physical exercises that can be done anywhere and anytime is one of the exercises that must be given to patients with diabetes mellitus to prevent complications of diabetes mellitus. Therefore, this study is important so that the community can get education and can increase the knowledge and psychomotor of patients on the effect of progesive muscle relaxation therapy exercises through videos on reducing blood sugar levels in patients with type 2 diabetes mellitus.

METHOD

This research is a quantitative study using the Quasy-Experimental method using a pretest-posttest with control group design approach. In this study, the study population was patients who did routine control at the Puskesmas Mlati 2, Sleman, DI Yogyakarta and in accordance with the researcher's inclusion criteria, totaling 137 people. In this study, the researcher used probability sampling technique, namely simple random sampling. The study population consisted of 137 patients who were registered as members of the Prolanis program and underwent routine check-ups at the Puskesmas Mlati II. Using the Lemeshow formula, the sample size was determined to be 62. The sampling of 62 subjects began with sorting the pre-test blood sugar levels of the 137 respondents from the highest to the lowest. Then, the 62 selected respondents were divided into two groups at random using the spiner website, with each group consisting of 31 respondents.

At the start of the research, the experimental group will be given an intervention in the form of progressive muscle relaxation techniques by video three times a week for two weeks on Mondays, Wednesdays, and Fridays at the 4.00 p.m. Meanwhile, the control group will be given an intervention in the form of medication prescribed by a doctor. At the end of the research, the control group will also be given an intervention in the form of progressive muscle relaxation techniques via video at the same frequency with experiment control.

In the experiment group, patients sent photos to a WhatsApp group as proof that they had performed progressive muscle relaxation techniques via video, accompanied by an enumerator and checked off on a checklist. In the control group, which was given medication as prescribed by a doctor, respondents completed a checklist on the medication monitoring sheet. The follow-up provided after the study was to give all respondents a link to a progressive muscle relaxation therapy video for educational and intervention purposes for patients and their families. The video used is a video made by the researcher. This research has received an Ethical Clerance letter from the Poltekkes Kemenkes Yogyakarta with number No.DP.04.03/e-KEPK.2/193/2025.

RESULTS

The research data was taken from blood sugar level tests conducted twice, namely one day before the pre-intervention and one day after the end of the intervention. Based on the research intervention conducted on the experimental group and the control group, the following results were obtained::

1. Univariat Analysis

The characteristics of respondents in this study were seen based on general data, there were several factors including gender, age, BMI, routine medication and physical activity. Based on table 1, that the characteristics of respondents in the experimental group were almost entirely female, namely 29 respondents (93.5%), most of the respondents in the experimental group were 41-50 years old as many as 26 respondents (83.9%). Based on the characteristics of BMI and physical activity of respondents, the experimental group had normal BMI and did physical activity (100%). When viewed on the characteristics of respondents who routinely take medication,

most of the experimental group did not routinely take medication as many as 27 respondents (87.1%). Its detail see on table 1.

Table 1. Frequency Distribution of Respondent Characteristics

	Experimental Group (n=31)		Control Group (n=31)	
Characteristics	***f***	**%**	***f***	**%**
Gender				
1. Female	29	93,5	23	77,4
2. Male	2	6,5	7	22,6
Age				
1. 20-30 years old	3	9,7	1	3,2
2. 31-40 years old	2	6,5	3	9,7
3. 41-50 years	26	83,9	27	87,1
BMI				
1. Underweight				
2. Normal	31	100	31	100
3. Obese				
Physical activity				
1. Yes	31	100	31	100
2. No				
Take medicine regularly				
1. Yes	4	12,9	6	19,4
2. No	27	87,1	25	80,6

Based on table 2, shows blood sugar levels in people with type 2 diabetes mellitus who have progressive muscle relaxation therapy through video before doing progressive muscle relaxation therapy through video ranges from 143-253 mg/dL with a standard deviation of 26,889 and a mean of 183.71 mg/dL. After the intervention of progressive muscle relaxation therapy through video, blood sugar levels ranged from 137-227 mg/dL with a standard deviation of 24.593 and a mean of 171.26 mg/dL. Its detail see on table 2.

Before conducting the influence test, the data was processed by assessing the normality data using Shapiro Wilk. The results of the data normality test showed a normal distribution with a p-value >0.05, so the influence test used a t-test.

Table 2. Distribution of Blood Sugar Level Data (n= 31)

	Mean	SD	Min-Max
pretest	183.71	26.889	143-253
posttest	171.26	24.593	137-227

2. Bivariat Analysis

The difference in blood sugar levels in the progressive muscle relaxation therapy intervention group through video before and after the intervention obtained the results of normally distributed data. Paired T Test was used to determine the difference in blood sugar levels before and after the progressive muscle relaxation therapy intervention.

Based on Table 3, it is known that in the experimental group that was given progressive muscle relaxation therapy through video, there was a decrease in blood sugar levels after being given progressive muscle relaxation therapy intervention through video. Based on statistical calculations using the Paired T Test method, the average value of the decrease in blood sugar levels was 12.452 mg/dL with a standard deviation of 9.110 and a p-value (Sig. 2 tails) of 0.000, where $p < 0.05$, it can be concluded that there was a significant effect before and after the progressive muscle relaxation therapy intervention via video.

Meanwhile, the control group, which only consumed medication prescribed by a doctor, experienced an increase with an average of -0.548 and a p-value of 0.698, which means that the medication had no effect on lowering blood sugar levels in the control group. Details can be seen in Table 3.

Table 3. Effect test with Paired t Test Experiment Group (n=31)

Group	Variabel	Mean	SD	p value[α]
Experiment	Pre-post	12.452	9.110	0.000[*]
Control	Pre-post	-0.548	7.805	0.698

[α]) paired t test

[*]) level of significant 0,05

Based on the data from the pre-post test difference, an independent t-test was

conducted to determine the difference in blood sugar levels between people with type 2 diabetes who were given progressive muscle relaxation therapy through video and people with type 2 diabetes who were given conventional therapy. The p-value was 0.000 (<0.05), which means that there is a difference between the experimental group that received progressive muscle relaxation therapy through video and the control group that took medication. Details can be seen in Table 4.

Table 4. Independent T Test Difference Pre-Post test Group Experimental and control (n1=n2=31)

Group	Mean	SD	p value[a]
Experiment	12.452	9.110	0.000*
Control	-55	7.805	

DISCUSSION

Based on the results of the research that has been obtained, the researcher discusses systematically the results of univariate analysis consisting of the characteristics of respondents and bivariate analysis by linking theories and research that has been done previously studied on the Effect of Progressive Muscle Relaxation Therapy Through Video on Decreasing Blood Sugar Levels of Type 2 Diabetes Mellitus Patients at Puskesmas Mlati 2.

Based on table 1, most of the respondents were female, and aged 41-50 years. This is in line with the research of Mirna et al., (2021) which states that there is a relationship between gender and type 2 diabetes mellitus, which shows that women have a 1.5 times greater risk of having type 2 diabetes mellitus than men. The results of this study are also in line with the research of Pratiwi et al., (2022) which shows that there is an association between age and the incidence of Type 2 DM (p = 0.000) with an AOR value = 4.058; 95% CI = 2.409-6.837. This means that people with productive age have a 4 times greater risk of developing Type 2 DM (19). Degenerative factors will risk causing glucose intolerance and will impair the body's capacity to manage glucose, people over 45 years old have a higher risk of developing type 2 diabetes mellitus than people under 45 years old (20).

According to Rohmatulloh et al., (2024), women are more at risk of developing diabetes because women experience hormonal changes that occur due to menstruation, which causes weight gain in some parts of the body. Estrogen and progesterone hormones are shown to increase the body's insulin response. Estrogen and progesterone levels drop after menopause, as does the body's ability to respond to insulin. Another influencing factor is that women's body weight is generally not optimal, which can reduce the sensitivity of the insulin response. This is why women are more prone to diabetes than men (21).

Smeltzer and Bare (in Simamora et al., 2020) state that type 2 diabetes is the most common type experienced by people with diabetes mellitus, and is mostly experienced by adults aged > 40 years. Rohmatulloh et al., (2024) said that at the age of > 40 years a person often begins to lose body function quickly. With age, a person's body and metabolism will slow down, especially the metabolic function of the pancreas. Decreased pancreatic metabolism increases the risk of insulin resistance and type 2 diabetes mellitus as it impacts blood sugar levels (21).

Based on table 3, there is a significant decrease in blood sugar levels after the intervention of progressive muscle relaxation therapy through video with a duration of 15 minutes, for 2 weeks, 3 times a week with an average of 12.45 mg/dL and p value 0.000.

This study is also in line with research conducted by Tamara et al. (2023), which shows the effect of video media on the care of patients with diabetes mellitus with a p-value of 0.000. Video media makes the care process more practical, efficient, and can be viewed repeatedly until the family and patients memorize and understand the care of patients with diabetes. This study is also in line with research conducted by Marlena (2020), which shows that there is a decrease in blood sugar levels after progressive muscle relaxation intervention, with an average blood glucose level after progressive muscle relaxation

therapy in patients with diabetes mellitus of 196.30 mg/dl with a standard deviation of 4.398 (22.23).

Based on Table 4, it was found that there was a difference between the experimental and control groups. This is in line with the research by Supriyatini et al. (2023), which shows that there is a difference in blood sugar levels in people with type 2 diabetes mellitus in the group given progressive muscle relaxation therapy of 24.33 mg/dL and with an independent t-test, a p-value of 0.000 was obtained. This is because progressive muscle relaxation therapy, as a form of physical exercise that is one of the pillars of diabetes control, plays an important role in lowering blood sugar levels. This exercise causes blood vessels to dilate, thereby improving blood circulation and suppressing hormones that increase blood sugar levels.

This means that progressive muscle relaxation therapy through video can be used as a complementary therapy to light physical exercise to lower and maintain stable blood sugar levels in patients with type 2 diabetes mellitus. The movements in progressive muscle relaxation therapy through video can increase glucose demand by activating muscle movement so that glucose in the blood is used as energy. Active muscles influence insulin circulation by increasing nitric oxide production and dilating blood vessels, thereby facilitating glucose entry into cells. This is because active muscles also increase insulin receptor sensitivity, leading to a 7- to 20-fold increase in glucose uptake. The video used as a research medium is an electronic audiovisual medium containing sound and moving images, making it easier for patients to perform progressive muscle relaxation therapy exercises and repeat them if they forget the movements.

Progressive muscle relaxation can reduce blood glucose levels in diabetics because it provides a state of relaxation. In this condition, nerve impulses on the afferent pathways to the brain change from activation to inhibition, which causes a feeling of physical and mental calm, such as a decrease in heart rate and a decrease in the body's metabolic rate, which prevents an increase in blood glucose levels.

Based on interviews with 15 random respondents, respondents said that progressive muscle relaxation therapy video media is easy to do, flexible to do where and when, and makes progressive muscle relaxation therapy exercises easier to follow and understand than being taught directly, because each individual can listen on their respective android. If taught directly, respondents cannot practice independently, and sometimes forget the sequence or movements in therapy.

CONCLUSIONS

There is a significant effect of progressive muscle relaxation therapy through video on reducing blood sugar levels in patients with type 2 diabetes mellitus with an average decrease of 12.45 with a p value of 0.000, and there is a significant difference between the experimental group given progressive muscle relaxation therapy through video and the control group which is only given routine medication with a p value of 0.000.

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