

Implementation of Local Music Wisdom in Progressive Muscle Relaxation Exercises and the Effect on Blood Sugar Levels in Patients with Type 2 DM

Ihsan Taufiq^a, Heni Apriyani^b, ^{a,b}Department of Nursing, Poltekkes Kemenkes Tanjung Karang, Sumatera, Indonesia, Email: ^aihsantaufiq@poltekkes-tjk.ac.id

Muscle relaxation exercises are carried out by first tensing muscles, followed by relaxing specific muscles and then focusing on the sensation of relaxing. This study was planned for implementation from June to November 2019. The objective of the study was to determine the effect of muscle relaxation exercises on blood sugar levels in patients with type 2 diabetes mellitus in the health centre in Kotabumi North Lampung region. This study uses a quasi-experimental design with a one-group post-test design. The population in this study are patients with type 2 diabetes mellitus in the health centre in the Kotabumi North Lampung region with consecutive sampling techniques, and is comprised of 40 respondents. Analysis of the relationship was conducted using a t-test. The null hypothesis (H₀) is that there was no influence between the wisdom of folk music in muscle relaxation exercise on blood sugar levels in people with type 2 diabetes mellitus in the health centre in the Kotabumi North Lampung region.

Keywords: *Local wisdom, music, PMR, Diabetes mellitus type 2.*

Introduction

Diabetes Mellitus (DM) is a chronic progressive disease characterised by the body's inability to metabolise carbohydrates, fats, and proteins, which cause hyperglycemia (elevated blood sugar levels) (Black, Joyce, Hawks, 2009; Manuntung, 2018).

DM has become a severe health problem, both in developed countries and in developing countries like Indonesia, because the incidence of the disease is increasing. In 2000, the World Health Organization (WHO) estimated the number of people with diabetes who were over 20 years of age amounted to 150 million people and declared that this will continue to grow by 2025 to 300 million people (Audria, Retnaningsih, and Tamrin, 2018; Suyono, 2009).

People with diabetes are 15 times at greater risk of becoming amputees compared to healthy individuals. In findings from several studies based on different populations, the prevalence of diabetic retinopathy showed a higher prevalence of 3% to 10% among patients with diabetes. The prevalence of blindness in people with diabetes has been reported in different studies and ranges from 0.4 to 1% (Arisma, Yunus, and Fanani, 2017). It has been shown that the general management of blood glucose levels is important in reducing the development of diabetic retinopathy. Several studies have shown that the rate of nephropathy may be reduced by long-term control through annual laboratory tests and appropriate treatment on microalbuminuria (Juwita & Febrina, 2018; Umpierre et al., 2011).

Persistent stress can cause stress responses such as the activation of the sympathetic nervous system and increased cortisol levels. Cortisol will increase the conversion of amino acids, lactate, and pyruvate in the liver into glucose through gluconeogenesis, which in turn will lead to an increase in blood sugar levels (Pertiwi, 2019).

Management of patients with DM includes five components: nutritional therapy, exercise, monitoring, pharmacology, and education (Suzanne, 2010). DM management guidelines include dietary planning, physical exercise, hypoglycemic drugs, education, and self-monitoring of glucose levels. During this time nursing care is done in the context of collaborative DM pharmacology where the nurse can provide nursing care independently in the context of non-pharmacological support (Dochterman & Bulechek, 2004). Some research suggests that non-pharmacological approaches are effective, such as physical exercise like walking (Aprina, Ihsan & Eka, 2018). Relaxation exercises are possible interventions for patients with diabetes mellitus. Relaxation is a form of mind-body therapy used in complementary and alternative therapies (CAM) (Black, & Hawks, 2009).

The public health centre at Kotabumi II had never conducted muscle relaxation exercises accompanied by folk music. This study was carried out in order to determine the effect of the implementation of local music wisdom with progressive muscle relaxation exercises on blood sugar levels in patients with type 2 diabetes in North Lampung regency health centre.

Methodology

This study design used pre-experiment and pre-post-test designs on one group with a progressive muscle relaxation exercise on patients with type 2 diabetes in order to determine

the efficacy of local music wisdom and progressive muscle relaxation in the blood sugar levels of type II diabetic patients. Research was conducted at the health centre in Kotabumi Kotabumi North Lampung region between June - November 2019.

The population in this study were patients with type 2 diabetes who were recorded in the registration book at the health centre of Kotabumi II and the health centre of Abung Kunang. Sastroasmoro (2010) and Dahlan (2008) state that in determining the number of samples to test two hypotheses on the proportion of the two groups in pairs, the following formula can be used:

$$N1 = N2 = \left[\frac{[Z\alpha + Z\beta] S}{X1 - X2} \right]^2$$

$Z\alpha$ = type I error 5% one-way hypothesis, $Z\alpha = 1,64$

$Z\beta$ = type II error 20%, then $Z\beta = 1,28$

S = standard deviation = 4 (preliminary study)

$X1 - X2$ = the minimum difference that is considered meaningful = 2 (clinical judgment).

The formula obtained by the number of respondents was 40 people. The inclusion criteria for respondents were patients with type 2 diabetes, using Oral Hypoglycemic Drugs (OHO), and who had signed informed consent. The criteria for exclusion of respondents was diabetic patients who experienced complications such as heart disorders, kidney disorders, liver disorders, who had severe anemia, and who experienced Diabetic Foot Ulcers (DFU).

Selection of the samples in this study was conducted using non-probability sampling and consecutive sampling (Sastroasmoro, 2010).

Blood sugar values were obtained from measurements carried out in two inspections, before and after the intervention in the intervention group. Assessment of blood sugar levels was carried out by nurses. An observation sheet and Standard Operating Procedures (SOP) were used to ensure correct implementation of the interventions. The study identified a population of patients with DM recorded in Puskesmas Kotabumi II. After obtaining a list of respondents that matched the criteria, researchers explained the process of the research and requested informed consent. Respondents were asked about their age, and duration of diabetes mellitus. An examination of the blood sugar levels of respondents was conducted before the intervention (I) and 2 weeks later (II). The intervention group also engaged in a muscle relaxation exercise program according to the SOP.

The treatment that was provided in the intervention group in this study was as follows: Ensure that the respondent understands the reasons for the relaxation exercises, as specified in the training program; reaffirm that the respondent has no contraindications to engaging in this exercise; the exercise time and location was made clear: 08.00 - 09.00, in the hall at Prodi Nursing Kotabumi; the respondent was asked to wear loose clothing; participants were seated

and then taught how to tense and relax their muscles; relaxation exercises were accompanied by music in the riverfront area (according to the SOP); the exercise program was conducted for 15-20 minutes, three times a week for a duration of 2 consecutive weeks, with assistance from researchers and the health centre staff.

Results

Table 1. Distribution of respondents by age, disease duration of DM, and GDP2 GDP1 value, type 2 diabetes patients in Health Centres in the Kotabumi region in 2019

No.	Variables	mean	SD	Min - Mak
a	Age (years)	59.38	7.60	42-72
b	long illness	7:30	5:02	1-20
c	The value of GDP to 1 (g / dl)	199.90	99.08	63-460
d	The value of GDP to 2 (g / dl)	160.95	72.12	84-389

Based on Table 1, the average age of the sample group was 59.38 years (SD = 7.60). The youngest person was 42 years, and the oldest was 72 years of age. The average length of time that they had been sick with DM was 1 year (SD = 5.02 years). The lowest DM disease duration was 1 year, while the longest duration with DM longest was 20 years. The average value of GDP to 1 was 199.95 g / dl (SD = 99.08). The value of GDP to its lowest-1 was 63, and the value of the 1st highest GDP was 460 g / dl. The average value of GDP-2 was 160.92 g / dl (SD = 72.12). The value of GDP for the 2nd lowest was 84, and the value of the 2nd highest GDP was 389 gr/dl.

Table 2 shows that most of the respondents were male. Table 3 shows that most respondents have a primary school education level (SD).

Table 2 Distribution of Respondents by Gender in Patients with Type 2 diabetes mellitus in the Kotabumi Regional Health Centre in 2019

Gender	Frequency	Percentage (%)
Male	11	27.50
Woman	29	72.50
Total	40	100

Table 3 Distribution of Respondents by Education Level in Patients with Type 2 diabetes mellitus in the Kotabumi Regional Health Centre in 2019

Level of education	Frequency	Percentage (%)
SD	19	47.50
SMP	3	7.50
High School	11	27.50
Bachelor	7	17.50
Total	40	100

Table 4 shows that there was a decline in the average value of GDP in the first measurement and the second measurement after a given PMR intervention. Statistical test results obtained $p = 0.000$ which concluded that there were differences in GDP between the first and second measurement values, or that there was a significant difference to the GDP value-1 and value-2 GDP to a given intervention after PMR. ($P = 0.000$; $\alpha = 0.05$).

Table 4 Analysis of the value of GDP of patients with type 2 diabetes after a PMR workout at the Health Centre in the Kotabumi region of North Lampung in 2019

variables	mean	SD	The mean difference 95% CI	T	df	n	<i>p value</i>
Nausea		99.0					
GDP1	199.90	8	20.35-57.54	4:23	39	40	0,000 *
GDP2	160.95	72.1					
		2					

*Significant at $\alpha 0.05$

The strength of the relationship between the two variables in this research was tested with the Pearson correlation test. Variables tested the strength of the relationship as a variable value of GDP to 2 and the confounding variables of respondents. The results of the Pearson correlation analysis was as follows: There was a relationship to gender with a value of GDP to 2 people with type 2 diabetes mellitus ($p = 0.014$); there was no relationship between the educational level of GDP 2nd value with type 2 diabetes patients ($p = 0.07$); there was no association between age and the value of GDP to 2 patients with type 2 diabetes mellitus ($p = 0.19$) and there was no long-standing relationship with the value of GDP with patients with type 2 diabetes ($p = 0.40$).

Discussion

Stress is a nonspecific human reaction to stimuli or stressors. Stressful responses are an adaptive reaction and are highly individual. Stressors are distinguished into three groups, namely physical/biological, psychological, and social stressors (Hartono, 2007). Stress affects

blood glucose levels due to increased production of stress hormones such as epinephrine, cortisol, glucagon, ACTH, corticosteroids, and thyroid (Suzanne, 2010).

Muscle relaxation is a set of movements which tightens and relaxes the muscles in the body one part at a time and induces a feeling of physical relaxation. Tightening movements followed by relaxation of the muscles are carried out progressively (Synder & Tracy, 2013).

Progressive muscle relaxation is a relaxation technique that is easy and simple and is now widely used. The procedure for muscle relaxation involves a two step process, namely by tensing a muscle group and then concentrating on relaxing the muscle, feeling the sensation of relaxing and the tension disappearing.

Progressive muscle relaxation was taught to patients with diabetes mellitus in order to improve relaxation and enhance their self-management capabilities. This exercise can help reduce muscle tension, stress, lowers blood pressure, increases tolerance to everyday activities, and enhances immunity so that functionality and quality of life is improved (Suzanne, 2010).

For optimum results, it is recommended that people perform progressive muscle relaxation exercises twice a day for a duration of 25-30 minutes. The training schedule usually takes one week. This relaxation exercise will produce results after three exercises (Greenberg, 2002).

Mahdavi, et al. (2013) have stated that music therapy offers a therapeutic method that is universal and is suitable for everyone due to its accessibility. Music therapy is processed through a person's hearing and subsequently channeled through the auditory nerve to the parts of the brain which process emotions (limbic system). According to Torres et al. (2016), in Geraldina (2017), music also provides relaxation via communications media through rhythm, musical listening, non-verbal cues, exploration, movement, and improvisation. Argstatter (2016), in Geraldina (2017) states that music application that contains elements of culture will be felt universally by listeners despite differing cultural backgrounds. This is important because music is open to interpretation and cannot be separated from emotion.

Synder & Tracy (2013) in Antoni (2013) describes progressive muscle relaxation (PMR) as a relaxation technique that tenses or tightens one particular muscle group at a time followed by a relaxation phase and a release of tension. Relaxation techniques have been widely and effectively used to control stress and anxiety.

Relaxation exercises can reduce pain or the perception of pain, relieve tension, reduce anxiety in response to stress, improve concentration, increase control of feelings, energise and enhance the quality of sleep, enhance the performance of physical activity and improve relationships.



PMR is a method to help reduce muscle tension so that the body relaxes. Edmund Jacobson, in his 1938 book, explains that when muscle tension is significantly reduced, the chance appearances of disease can be reduced (Synder & Tracy, 2013).

Smeltzer & Bare (2002) and Ida (2019) stated that relaxation training aims to generate a response that can reduce stress. Thus, performing PMR for 30 minutes in a quiet, relaxed space with full concentration will provide results. The secretion of CRH (Corticotropin-Releasing Hormone) and ACTH (Adrenocorticotropic Hormone) in the hypothalamus is reduced. The second drop in hormone secretion causes sympathetic nerve activity to decrease so that the release of adrenaline and noradrenaline decreases, resulting in reduced heart rate, dilated blood vessels, decreased vascular resistance, and decreased cardiac pumping which reduces arterial blood pressure.

Music therapy is an intervention that is growing in popularity lately as a systematic intervention which helps clients improve their health using music experiences and relationships that act as a dynamic force of change (Geraldina, 2017).

Music therapy is carried out through a range of methods, including singing and playing instruments, writing songs, selection of songs, musical life reviews, as entertainment, guided imagery, improvisation, and dedicated music appreciation (Yinger, 2018).

The World Federation of Music Therapy describes music therapy as the professional use of music and its elements as an intervention in the areas of health, education, and everyday environments with individuals, groups, families, or communities that are trying to optimise their quality of life and improve their physical health, and social, communicative, emotional, intellectual, and spiritual well-being (Geraldina, 2017).

Music therapy is used to treat a variety of problems and reduce stress. It can also help reduce anxiety in patients undergoing treatment. Music is used as a broad-ranging medium to improve overall well-being (Weinberg & Joseph, 2017).

Furthermore, culture plays a role in music as an emotional response through non-verbal stimulation. All cultures have unique ways of responding to music along with different expressions of it. The study of the background of the creation of music is also closely related to the culture and aspects of social life. Meanwhile, there are still plenty of music therapy interventions, especially in Indonesia. The provision of music in the context of therapy did not focus on cultural factors that might be considered an important part of the process, one of which is that the music therapy provided for Indonesian clients uses western classical music (Geraldina, 2017).

Music cannot be separated from the emotions contained within it, and researchers using music to reduce stress and anxiety recognise that music involves emotions. Therefore, it seems that the use of western music needs to be taken into consideration and it must be recognised that this makes it difficult to adapt the modules of music therapy from the West and apply them directly to Indonesian clients. This is a consideration because it is difficult to ensure that clients will perceive the emotions in the music in the same way as might be expected (Geraldina, 2017).

According to the theory of emotion from Berlyne, when one listens to music, it is related to factors such as complexity, familiarity, and indulgence. The degree to which the voice sounds familiar in the music will determine whether the music is experienced as pleasant or not. The hedonic value will be lower when the music occurs in an entirely new hearing. The hedonistic value increases with increasing familiarity and will decline again if the music is unknown.

Listening to music affects and stimulates the autonomic nervous system. The autonomic nerve is divided into two, namely the sympathetic nervous system and the parasympathetic nervous system. If the individual is in a state of stress and tension, the sympathetic nervous system is employed, whereas if the individual is in a relaxed state, listening to music, the parasympathetic nervous system causes a decrease in blood pressure and heart rate, muscle tension is lowered so that the body becomes relaxed, glucose levels in the bloodstream fall, and there is decreased energy consumption (Fukui & Toyoshima, 2008; Fukui, 2003).

Breathing relaxation methods and listening to and enjoying music can induce and increase a state of relaxation. Music is able to affect a person's body and mind because it can modify brain waves, blood pressure, heart rate, and increase heart rate variability for the better (Trappe, 2012). Some studies have suggested that listening to music produces different effects in the body and mind, such as improved concentration, reduced stress, a state of relaxation, reduces cortisol and testosterone, facilitating neurogenesis, repair and regeneration of neurons (Fukui & Toyoshima, 2008; Fukui, 2003). Another of music's functions is that it entertains and stimulates positive emotions (Arya & Parle, 2011; Safaria, 2014).

Research into the influence of Progressive Muscle Relaxation (PMR) on blood sugar levels of patients with diabetes mellitus type 2 in hospital Raden Mattaher shows the impact of PMR to significantly lower blood sugar levels of patients with type 2 diabetes. There was no relationship found between age, gender, comorbidities and a prior history of DM with a decrease in blood sugar levels (Mashudi, 2011).

Other research on the effect of relaxation and decreased blood sugar levels in patients with type 2 diabetes mellitus, in a hospital in Tasikmalaya, indicated that relaxation can lower blood sugar levels in patients with DM (Kuswandi, Sitorus, and Gayatri, 2008).

When a person is experiencing stress, the sympathetic nervous system is activated which signals the adrenal medulla to release epinephrine and norepinephrine into the bloodstream. The system is activated if the adrenal cortex hypothalamus secretes Corticotrophic Releasing Hormone (CRH), a chemical that works on the pituitary gland located just below the hypothalamus. The pituitary gland then secretes hormones Adrenocorticotrophic Hormone (ACTH), which is carried through the bloodstream to the adrenal cortex. The hormone ACTH then stimulates the release of a group of hormones, including cortisol, which regulates blood sugar levels. ACTH also signals other endocrine glands to release around 30 hormones (Ida, 2019).

Relaxation exercises aim to produce a response that will reduce the stress response (Smeltzer and Bare, 2008). PMR can reduce anxiety, oxygen consumption of the body, metabolic rate, respiratory rate, muscle tension, systolic blood pressure, and diastolic, premature ventricular contraction along with increased alpha wave brains (Snyder & Lindquist, 2010, Essa, et al., 2017, Rosdiana & Cahyanti, 2019). PMR exercise lowers stress hormones (epinephrine, norepinephrine and cortisol) and will lower blood sugar levels.

PMR involves mechanisms which are associated with physiological factors that produce hyperglycemia. PMR will activate the parasympathetic nervous system, which is then forwarded to the hypothalamus. Furthermore, the hypothalamus reduces the stimulation of neuron-neurosecretory to release the hormone CRH (Corticotropin-Releasing Hormone) to the anterior pituitary, thus inhibiting the release of the anterior pituitary hormone ACTH (Adrenocorticotrophic Hormone) into circulation. Barriers will inhibit the release of ACTH stimulation of the adrenal cortex to secrete glucocorticoids (cortisol) and hormone-producing adrenal medulla catecholamine, mainly epinephrine and norepinephrine (Greenberg, 2002; Antoni, 2013).

One of the risk factors for diabetes mellitus is gender. There were differences between men and women in the percentage of patients with diabetes mellitus. The percentage of men with diabetes was as much as 5.1%, while in women it was 5.8%. Various studies have found that more women suffer from diabetes mellitus than men. It is associated with physical activity, where women are less physically active than men (Rudi, 2017).

The difference between the genders also characterises the prevalence of type 2 diabetes. Overall, the global prevalence of diabetes is higher in men, but there are more women with diabetes than men. The gender difference in the prevalence of diabetes depends on the stages of reproductive life; there are more diabetic males before the onset of puberty. At the same time, there are more women who develop diabetes after menopause and in older age. The lack of oestrogen predisposes women to the risk of developing diabetes type 2. A lack of testosterone predisposes men to the risk of developing type 2 diabetes (Mauvais-jarvis & Orleans, 2019).

Conclusion

The average age in the study was 59.38 years (SD = 7.60). The youngest was 42 years old, and the oldest was 72. The average length of time sick with DM was 1 year (SD = 5.02 years), the average value of GDP to-1 was 199.95 g/dl (SD = 99.08), the average value of GDP-2 was 160.92 g / dl (SD = 72.12). There was a significant difference in the value of the first and second measurements of GDP after the intervention using PMR ($p = 0.000$; $\alpha = 0.05$) in patients with type 2 diabetes mellitus in the health centre in North Lampung region Kotabumi.

Nurses have a responsibility to conduct surveillance and motivate patients with type 2 diabetes to perform PMR properly in order to control blood sugar and prevent complications from diabetes. The results of this study can be used as a source of information for students in nursing to facilitate the development of the science of nursing, in particular, with respect tonon-pharmacological management for lowering blood sugar values in DM using a progressive muscle relaxation training method (PMR) combined with local music therapy.

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