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**THE EFFECTS OF ELDERLY GYMNASTICS ON THE BLOOD GLUCOSE LEVEL  
IN THE ELDERLY WITH DIABETES MELLITUS TYPE 2**

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6  
**Abstract**

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The prevalence of diabetes mellitus type 2 occurs mostly in older adults. Physical fitness is highly needed to prevent and delay the degenerative and metabolic diseases, such as diabetes mellitus.

This research was purposed to analyze the effects of elderly gymnastics on the blood glucose level in the elderly suffering from diabetes mellitus type 2. The design of this research was experimental using only post-test design in which the treatment group was assigned to do gymnastics, whereas the control group received no treatment.

The results of analysis using Mann-Whitney test showed that there were no effects of elderly gymnastics on the post-test value of blood glucose level in which the value of Z test = -1.903 and  $p = 0.287 > 0.05$ .

In conclusion, this research finds no effects of elderly gymnastics on the blood glucose level of the elderly with diabetes mellitus type 2. This is possibly resulted from the medication program, food consumption, and psychological condition of the elderly.

**Key words:** diabetes mellitus type 2, gymnastics, blood glucose level

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**INTRODUCTION**

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Despite the mild clinical presentation of diabetes mellitus which usually shows no symptoms, it may develop more into chronic and progressive conditions which eventually cause acute and chronic complications. The chronic complications can cause both microvascular complications (such as diabetic retinopathy and nephropathy) and macrovascular complications, such as cardiovascular diseases, peripheral arterial diseases, and cerebrovascular diseases (Perkeni, 2011)

The prevalence of diabetes mellitus type 2 occurs mostly in older adults. Age relates to the body composition, obesity, and

behaviors which become the factors that increase the prevalence of DM at old age (Perkeni, 2011)

WHO (2012) predicted a significant increasing number of people suffering from diabetes mellitus in the following years. WHO predicted an increase of DM sufferers in Indonesia from 8.4 million in 2000 to approximately 21.3 million in 2030. In line with WHO, The International Diabetes Federation (IDF) predicted an increasing number of people with diabetes mellitus from 7.0 million in 2009 to 12.0 million in 2030. In spite of the difference in the prevalence of diabetes mellitus, both reports show an increasing number of people with diabetes mellitus two to three times in 2030. (Anggina, 2010)

The data obtained from Dinas Kesehatan Kota Surabaya show that in 2009 the number of people suffering from DM in

Surabaya is 16.365 people, and it went down to 15.509 people in 2010. Moreover, the preliminary data collected from Posyandu Lansia Anggrek Merpati Dukuh Menanggal (integrated health post) in Puskesmas Gayungan Surabaya (community health center) in October 2014 show that the number of elderly is 121 people. The result of examination of blood glucose level in the same month shows that of 37 elderly, 5 people experienced an increase of blood glucose level. This integrated health post carries out a program of elderly gymnastics scheduled once a week on every Saturday.

Lack of movement can cause an increasing risk of non-contagious diseases, such as obesity, diabetes mellitus, and heart disease. Physical exercise done well, correctly, measurably, and regularly will train the muscles and joints, and enhance blood circulation and oxygen in the body to optimize the body metabolism, make the body fresh, increase the body immunity, and insusceptible to diseases (Depkes RI, 2014).

Physical fitness is highly needed to prevent and delay the degenerative and metabolic diseases. Degenerative diseases occur when an individual reaches the aging process. Metabolic diseases are diseases that relate to the process of producing energy such as diabetes mellitus and hyperlipidemia. Daily physical activities and regular physical exercise (3-4 times a week for approximately 30 minutes) are the pillars of management for diabetes mellitus type 2. Besides maintaining the fitness, physical exercise can also decrease the body weight and repair the insulin sensitivity, so that it will repair the ability to control blood glucose. The recommended physical exercise deals with aerobic exercises, such as walking, cycling, jogging, and swimming (Physical exercise should be appropriate with age and physical fitness status) (Sumintarsih, 2006)

One of the physical exercises for the elderly is gymnastics. Elderly gymnastics is a light and easy exercise that needs no hard efforts to do it. The activities of this exercise

will maintain the body fitness and freshness, train bones to stay strong, optimize the heart functions, and eliminate the free radicals in the body (Perkeni, 2011).

## RESULTS AND DISCUSSION

### a. Results

The specific data comprising the data about elderly gymnastics, blood glucose level, and the effects of elderly gymnastics on blood glucose level in the elderly suffering from diabetes mellitus type 2 in Puskesmas Gayungan Surabaya

#### 7 Elderly gymnastics

Table 1 The frequency distribution of the respondents based on the characteristic of the correctness in following the gymnastics movements in Posyandu Lansia Anggrek Merpati Dukuh Menanggal Surabaya (n treatment = 16 and n control = 16)

No	Characteristic of following gymnastics movements	Frequency	Percentage (%)
1.	Treatment group		
	a. Correctly	16	100
	b. Incorrectly	0	0

Source: Primary data, August 2014

Table 1 showed that of 16 elderly in the treatment group, all of them (100%) followed elderly gymnastics correctly.

#### 2) Blood glucose level

7 Table 2 The frequency distribution of the respondents based on the blood glucose level after performing elderly gymnastics in Posyandu lansia Anggrek Merpati Dukuh

Menanggal Surabaya (n treatment = 16 and n control = 16)

No	Blood glucose level (mg/dL)	Frequency	Percentage (%)
1.	Treatment group		
	a. $\geq 200$	16	100
	b. $< 200$	0	0
2.	Control group		
	a. $\geq 200$	16	100
	b. $< 200$	0	0

Source: Primary data, August 2014

Table 2 showed that after performing elderly gymnastics, the result of random examination of the blood glucose level possessed by all of the elderly (100%) was  $\geq 200$  mg/dL.

- 1  
3) The effects of elderly gymnastics on the blood glucose level after performing elderly gymnastics

Tabel 3 The result of analysis using Mann-Whitney test on the blood glucose level done randomly after performing elderly gymnastics to the treatment and control group

No.	Variable	Z	P
1.	Treatment group	-1,903	0,28
2.	Control group		7

Source: Primary data, August 2014

Table 3 showed the result of analysis using *Mann-Whitney* test on *post-test* variable of the blood glucose level done randomly to the treatment and control group in which the value of Z test = -1.903 and  $p = 0.287 > 0.05$ . It showed that there were no effects of the post test scores of the blood glucose level randomly done to the treatment and control group.

## b. Discussion

According to table 1, of 16 elderly in the treatment group, all of them (100%) followed elderly gymnastics movements correctly. In the frequency distribution based on sex, all of the respondents (100%) were females.

The female respondents dominate this study because Gerrich claimed as quoted by Hasnam (2001) that at the age of 40-70 years, diabetes mellitus tend to occur in females; yet at younger age, the frequency of diabetes mellitus is more commonly found in males. According to the theory of activity written in Stanley, Mickey & Beare, Patricia Gauntlett. (2007) argued that the successful way to enter aging process is to stay active. The importance of mental and physical activities, such as continuous exercise (gymnastics) can prevent loss and maintain the health for the rest of the human life. According to Kusmana, D. (2006), gymnastics is an exercise which can increase the blood circulation, increase the joint elasticity, and train the regulation of breathing. Therefore, exercise of gymnastics should become the consideration to be performed regularly. As the consequence, the elderly during aging process will stay happy and useful in any conditions.

The writer, as supported by the result of observation, argued that most of the elderly actively participated in elderly gymnastics were females. In fact, more female respondents suffered from diabetes mellitus than males because the females outnumbered the males in this gymnastics group.

Table 2 showed that of 16 elderly in the treatment and control group, all of the respondents (100%) had blood glucose level above normal; and after performing elderly gymnastics, the blood glucose level of the treatment group was still above normal. The increasing blood glucose level happening in the elderly is resulted from decreasing insulin secretion or insulin resistance which tends to increase at the age of above 65 years (Maya, 2011).

In this study, all of the respondents experienced an increasing blood glucose level above normal after performing elderly

gymnastics. The writer argued that it possibly happened because the elderly had the blood glucose random check soon after performing cooling down session without resting. Consequently, catecholamine hormone and growth hormone has not decreased yet. Other factors which are not analyzed in this study are the food consumption and the level of stress before performing elderly gymnastics. Those two factors also affect the level of blood glucose checked randomly.

The statistic test using Mann-Whitney test illustrated that the random examination of the blood glucose level in the treatment and control group showed no differences despite the difference on the increasing scores from the normal level in which the blood glucose level of the control group increased higher than the treatment group.

Guelfi KJ, et all. (2007) stated that exercising with moderate intensity for 30 minutes can decrease the blood glucose level more maximally than doing exercise with high intensity because the catecholamine and growth hormone increase higher when doing exercise with high intensity so that the blood glucose level increases. .

In this study, the result showed no decrease of the blood glucose level below normal because no examination of the blood glucose level was performed before doing elderly gymnastics. The blood glucose level which increases much above normal cannot be decreased by performing only one session of gymnastics because it needs medication.

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## CONCLUSION

Based on the results of analysis, this study concludes that there are no effects of elderly gymnastics on the blood glucose level in the elderly suffering from diabetes mellitus type 2 in Posyandu Lansia Anggrek Merpati Puskesmas Gayungan Surabaya.

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