



DIABETES EXERCISE AS AN ALTERNATIVE TO PREVENT DIABETES MELLITUS IN ADOLESCENTS

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Abstract: *Diabetes Mellitus (DM) has been an important problem, along with increasing obesity which is currently a cause of death. This service aims to create reliable pioneers in Diabetes Exercise (DE). These pioneers are provided with DE which can have direct implications in society. This DE is designed with 7 warm-up movements, 4 core movements, and 5 cool-down movements. Before carrying out the service, the subject is given material in the form of a video, then the service member takes a pretest score. After that, the teacher provides good and correct movement material to the subject by giving examples of each movement. Then the subjects were divided into small groups to learn diabetes exercise movements, at the end of the meeting a pretest score was taken to determine the subject's mastery of the movements. The final results showed that 41 subjects or 46.1% were in the good category.*

INTRODUCTION

The body's main energy is blood sugar or glucose, which can be obtained from foods such as rice, vegetables, and fruit, and in certain circumstances the body stores sugar as an energy reserve. Glucose is converted into energy assisted by the hormone insulin. If this process is disrupted, glucose levels can increase beyond normal limits. Excessive increases in glucose will result in hyperglycemia. This happens because the pancreas cannot produce insulin effectively, resulting in DM. DM has been an important problem for decades, with increasing obesity, which is now the seventh leading cause of death in the United States and worldwide (Glovaci et al., 2019). The World Health Organization (WHO) released that in the last 40 years, there has been a seven-fold increase in obesity sufferers (Bentham et al., 2017)(La Sala & Pontiroli, 2020).

DM can cause complications if you cannot manage your health after being exposed to DM. So it is recommended that prevention is better than cure, as well as adopting a healthy lifestyle, namely eating according to the body's needs and having an active lifestyle (Prabowo et al., 2021). The growing trend is a lifestyle that reduces Physical Activity (PA), increases calorie intake with lots of instant food and drinks, and decreases energy expenditure, all of which will influence the occurrence of overweight and obesity in children and adolescents (Lobstein & Jackson-Leach, 2016). This condition affects the increasing number of children



& adolescents who suffer from diabetes (Pastore et al., 2020).

Indonesia is a country that is in the top 10 DM sufferers in the world. In 2017, 10.3 million people suffered from DM, and in 2023 there will be 13% or 35 million of the 270 Indonesian people affected by DM and this will become even higher in 2045. Of children and adolescents under 15 years of age, 10-15% have a primary family history of diabetes (Neu et al., 2019). They have 3 times greater odds if the father is a diabetic, compared to if the mother suffers from diabetes.

Most DM sufferers cannot carry out normal activities, because they have to undergo lifelong treatment. However, the most important thing for DM sufferers is to maintain a healthy and balanced diet. Changing lifestyle and diet is one of the components that support the success of a healthy lifestyle, so it requires high motivation and compliance starting from yourself (Setyorini, 2017).

The above sometimes contradicts what DM sufferers do. Sometimes they get bored with their diet and this condition often occurs in diabetes sufferers who do not live a healthy lifestyle or do not take medication as recommended by their doctor. Based on this, it is offered to DM sufferers to undergo exercise according to each individual's needs and this time the service offers DE which are given to teenagers.

METHOD

The subjects in this service are students programming the gymnastics course 2 majoring in Department of Health Education and Recreation, Faculty of Sports and Health Sciences, Universitas Negeri Makassar Class of 2023, they were formed to become pioneers of DE around where they live. This DE is designed with 7 warm-up movements, 4 sets of core movements and 5 series of cool-down movements, each series of movements consists of 2 movements. For warm-up and cool-down, 1 series of movements is repeated 2 times and for core movements, 1 series of movements is repeated 4 times. They are also prepared to go directly into the community to lead DE. At the beginning of the meeting, a pretest was held, and all participants just followed the instructor's movements. After the pretest, the service subjects were given DE material, the instructor provided guidance on the correct movements separately for each movement and the subjects practiced them. Service subjects are also given material in the form of DE videos so that they can learn independently well. After four face-to-face meetings, the subjects did a posttest. This posttest was carried out without being guided by an instructor. The data obtained are the results of the pretest and posttest of the subject's ability to perform DE, and the data is in the form of descriptive statistics and frequency distribution. Data were analyzed using the SPSS program. This service begins with exploring the subject of service according to the characteristics desired by the implementer, then carrying out a pre-test, conducting face-to-face socialization four times, and providing exercise videos to each subject, as well as conducting a post-test.

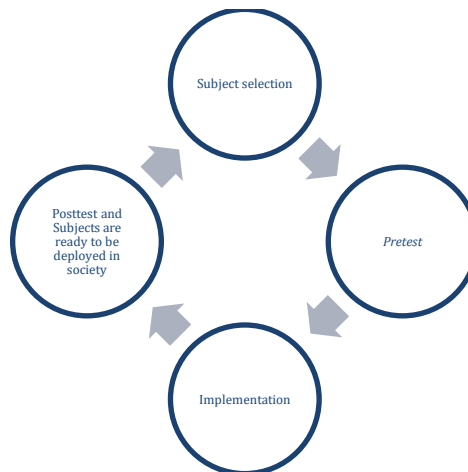


Figure 1. Implementation Diagram

RESULT

Subjects are selected based on categories determined by the community service team. The following is the frequency distribution of service subjects based on gender.

Table 1. Frequency Distribution of DE Subjects

Gender	Amount	%
Man	51	57.3
Woman	38	42.7
Total	89	100

Based on table 1, it can be seen that the number of male subjects was 51 people or 57.3% and female subjects were 38 people or 42.7%.

Table 2. Descriptive Statistics of DE

	N	Range	Min	Max	Sum	Mean	SD	Variant
Pretest	89	9	56	65	5355	60.17	2.74	7.48
Posttest	89	16	75	91	7469	82.92	5.21	27.12

Table 2 depicts descriptive statistics with a total of N or subjects as many as 89 people, for the pretest the range or value range is 9 points, the minimum value is 56, the maximum value is 65, the sum or total is 5355, the mean or middle value is 60.17, the standard deviation is 2.74 and the variance is 7.48. while for the post-test, range of 16, minimum score of 75, maximum score of 91, a sum 7469, a mean 82.92, a standard deviation of 5.21 and a variance 27.12.

Table 3. Frequency Distribution of DE

Category		Frequency	%
Very poor	$X \leq 75.05$	7	7.8
Poor	$75.05 < X \leq 80.31$	20	22.5
Moderate	$80.31 < X \leq 85.53$	17	19.1
Good	$85.53 < X \leq 90.74$	41	46.1
Very good	$90.74 \leq X$	4	4.5
Total		89	100

Table 3 shows 7 people or 7.8% in the very poor category, 20 people, or 22.5% in the poor category, 17 people, or 19.1% in the moderate category, 41 people, or 46.1% in the good



category, and 4 people or 4.5% in the very good category.

DISCUSSION

One of the chronic diseases that attacks children is diabetes (Gregory et al., 2022). Several studies state that there has been an increase in type 1 and 2 diabetes in children since the Covid-19 pandemic (Schmitt et al., 2022). Diabetes treatment in children and adolescents is different from treatment in adults. The main consideration is the growth and development of the children they face, as well as the management of type 1 and type 2 diabetes (Diabetes Care, 2020).

DM is one of the factors in the development of Cardiovascular Disease (CD), which is the biggest cause of death for DM sufferers (Glovaci et al., 2019). Much evidence shows that there are high-risk factors for CD in children and adolescents with diabetes (Jones et al., 2019). Diabetes doubles the risk of developing CD and quadruples the risk of dying from cardiovascular disease at a young age (Svane et al., 2021). Apart from that, obesity is also a factor in increasing mortality (Lindberg et al., 2020). The onset of CD caused by hyperglycemia is not seen in the short term in children and adolescents. This is caused by the higher regeneration of endothelial progenitor cells compared to adults. However, in the long term, diabetes still affects the sufferer's condition, making them susceptible to CD in the future (Pastore et al., 2020).

The most important thing is to prevent diabetes from occurring and even if that happens, you must focus on treating diabetes and comorbidities that cause obesity, including living a healthy life, whether it be diet or PA, as well as avoiding stress, smoking and alcohol. Lifestyle interventions can reduce DM significantly, therefore, to prevent DM in obese sufferers, the most important thing is to prevent metabolic disease and cardiovascular complications (La Sala & Pontiroli, 2020).

Several factors influence diabetes (Imelda, 2019) the first is age, the second is gender, the third is heredity, the fourth is diet and the fifth is PA. Several PA, especially exercise, can control blood sugar. When the body does a number of PA, blood sugar will also be burned to be used as energy, so the amount of blood sugar will decrease and the need for insulin will also decrease. In individuals who are sedentary, the food substances consumed cannot be properly burned and used as energy, but will only be stored as fat and sugar in the body. One study in Finland stated that exercising 4 hours a week or 35 minutes a day can reduce the risk of diabetes by up to 80% without needing to lose weight.

Based on several research results above, DE can help a person to carry out PA well and DE can be used as an alternative to reduce the level of CD, which will have an effect on the level of prevention of DM.

CONCLUSION

DE is an alternative PA that can train the cardiovascular system so that it can burn blood sugar into energy, so that the amount of blood sugar will be reduced in the body. And carried out at least 3 times a week with an accumulated time duration of 150 minutes per week.

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