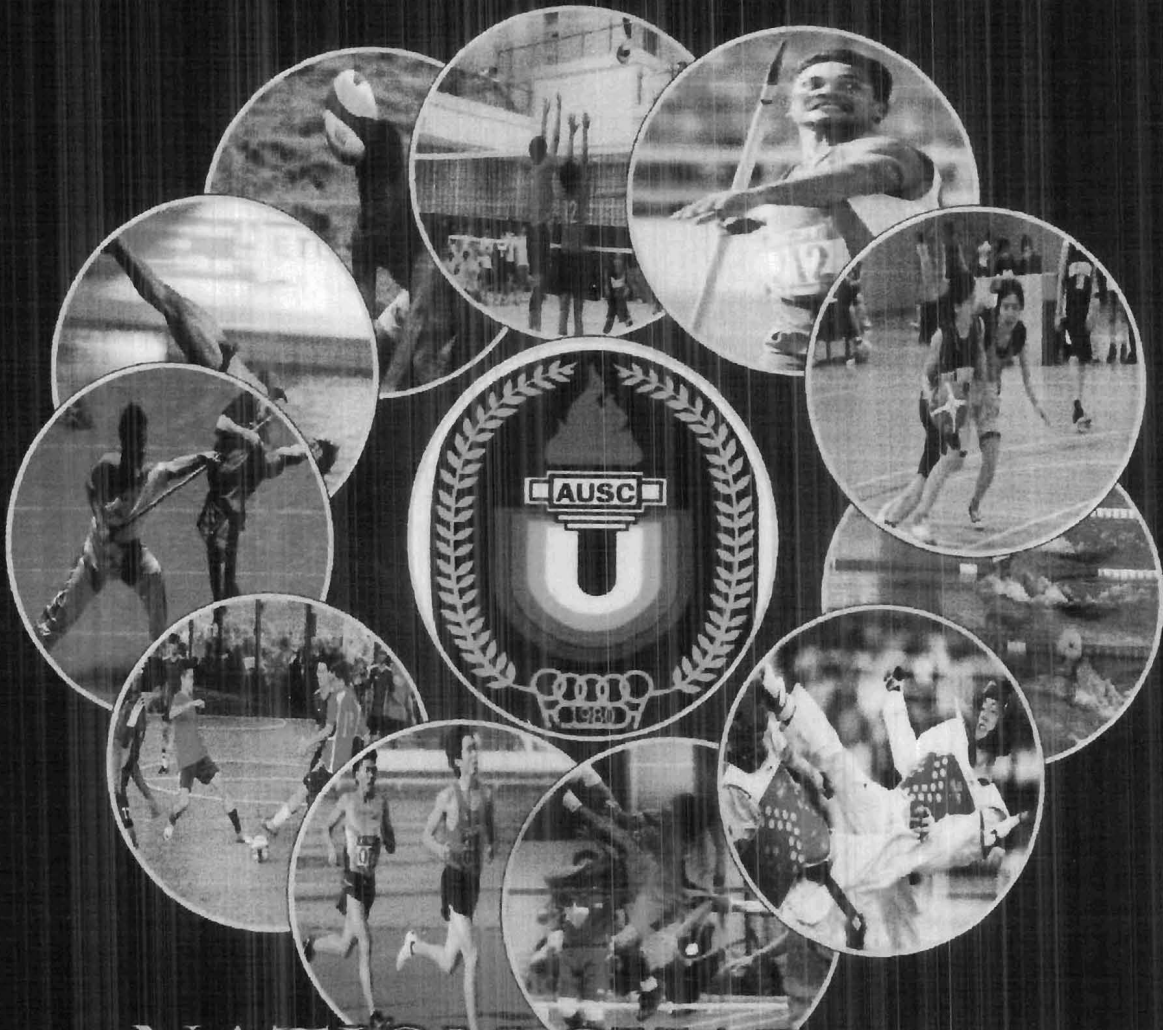


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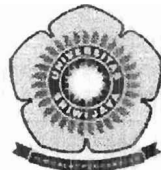
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2014

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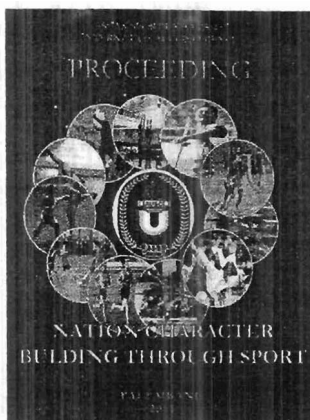


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FOREWORD

ASEAN SPORT UNIVERSITY COUNCIL

Once every two years, ASEAN University Sport Council holds an International conference on sport science in conjunction with ASEAN University Games.

The 2nd AUSC International Conference, titled “Nation Character Building through Sport”, will be held at Politeknik Sriwijaya in Palembang. It will deal with various topics on the sports agenda

The reasoning is that moral behavior is acquired through social interaction that occurs through sport and physical activity conducted in a collective. Whether or not sport has a positive impact on character-building in individual is highly dependent on the context of the program and the values promoted and developed.

In this respect, physical educators, coaches, trainers or community leaders have a determining influence on a young person’s sporting experience and on the degree of “character building” that can arise. Some research also indicates that physical activity outside of competitive sport may be more effective in promoting mutual understanding and empathy among young people.

2# AUSC International Conference (AUSCIC) then focuses in the issue about how sports could develop character of a nation.

AUSC President



Prof. Dr. Anuar bin Hasan

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Aerobic Exercise Program on Patients of Diabetes Mellitus

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Abstract

Diabetes mellitus is a chronic disease characterized by high blood sugar levels and metabolic disorders in general, if which is not controlled properly will cause various complications of both acute and chronic. Lead to an increased prevalence of diabetes mellitus associated with increased obesity and increasing physical activity. Management of diabetes mellitus aims to improve the quality of patients' life by means of education, therapy, nutrition, medical and pharmacological interventions. Exercise can lower blood glucose levels, besides that, it also helps to keep blood cholesterol levels remained normal. Exercise helps weight management in diabetics' mellitus that 90% of sufferer of diabetes mellitus type 2 generally gains overweight. Until now, there is nonstandard guideline regarding exercise intensity in exercise program which is suitable for people with diabetes mellitus. The problem is "How heavy exercise intensity should be done by people with type 2 diabetes mellitus in managing the disease". It is expected to underlie policy making in the field of health sports, including efforts to popularize the sport and to exercise your community. This is good to improve quality of human resources and quality of life and life expectancy, as currently degenerative diseases begin to shift infectious diseases.

Keywords: *Aerobic Exercise, Diabetes Mellitus*

INTRODUCTION

A person's health problem is mainly influenced by lifestyle, diet, work environment factors, exercise and stress. Lifestyle changes lead to an increased prevalence of degenerative diseases such as coronary heart disease, diabetes mellitus, obesity and high blood pressure. Diabetes mellitus (DM) is a chronic disease characterized by high blood sugar levels and metabolic disorders in general, if it is not controlled properly will lead to various complications, both acute and chronic.

Results of the WHO survey, patients with DM in Indonesia ranks 4th in the world and, according to the International Diabetes Federation (IDF) Indonesia is declared rank 3rd largest. In 2003, Indonesia still ranks to 5 under the United States, but in 2005 Indonesia became the third rank, even shifting Russian rank 3. It is estimated that in 2030 the number of people with diabetes in Indonesia has increased to approximately 21.3 million (Perkeni, 2012).

Control of blood glucose in diabetic patient is very important. Good diabetes control means keeping blood glucose levels within the normal range as well as people with no DM, so to avoid a state of hyperglycemia or hypoglycemia. Handling DM can be grouped into four pillars, namely education, meal planning, physical exercise and pharmacological interventions.

According Sumosardjono (1993), the need for insulin is reduced to 40% for doing sport exercises. With the muscle activity, the transport of glucose into muscle cells increases, so there is an exercise called the "Invisible insulin" or stealth insulin. Exercise has the effect of raising the permeability of the membrane, thereby decreasing insulin requirements. In the long term, exercise can lower blood glucose levels; in addition to that, it also helps to keep blood cholesterol

levels remained normal. Exercise also helps weight management in patients with diabetes mellitus in general 90% of people with diabetes mellitus noninsulin-dependent diabetes mellitus (NIDDM) has more weight.

Sports activities, in addition to benefit people with diabetes, also have risks. Some of the risks encountered are among others; hypoglycemia or hyperglycemia during and after exercising hard. Although doctors recommend that people with diabetes have to exercise, but it is not known exactly how the intensity of exercise should be done. According Sumosardjono (1993), less exercise is not so beneficial for people with diabetes, while if it is done over dose will cause complaints. The dose of exercise includes the components of the intensity, duration and frequency. For the purposes of health and fitness, exercise is recommended with a minimum duration of 30 minutes and a minimum frequency of three times a week, while the intensity depends on the complaints.

DISCUSSION

Patients with Diabetes Mellitus

According to Perkeni (2012), changes in lifestyle and urbanization seem to be an important cause of diabetes. Based on the data (Balitbangkes Depkes RI 2008) in 2007, it showed that the prevalence of diabetes for over 15 years of age who live in urban areas by 5.7%. National prevalence of diabetes of 1.1% with the highest prevalence in West Kalimantan (11.1%) and the lowest in Papua (1.7%) and West Sumatra province is one of the 17 provinces which have prevalence rates above the national prevalence is equal 4.1%. According Hilmawati (2013), as the supervisor of outpatient treatment plants M. Jamil Hospital in Padang said Dr M. Jamil if there are more than 100 diabetic patients who undergo outpatient at Dr M. Jamil. Regular visits are usually conducted every Tuesday and Saturday. Regular visits and exercises every week at M. Jamil Hospital held section in subpart endocrine disease.

Increased prevalence of diabetes type 2 according to (Powers, 2010) in addition to the factors of obesity, decreased physical activity, is as a result of industrialization which also plays a role. Likewise, according to (Ziesenitz, et al., 2012) lack of physical activity is one of the risk factors that indirectly affect the development of diabetes mellitus type 2. In the management of type 2 diabetes according to (Perkeni, 2012) generally aims to improve the quality of life of diabetes and in its management include four pillars: education, medical nutrition therapy, physical exercise, and pharmacologic interventions.

According to Sharkey (2003) diabetes that is not dependent on insulin NIDDM resists insulin, and due to obesity, lack of physical activity is part of the problem. Insulin-fighting cells cannot receive glucose, so glucose levels rise and the body secretes more insulin, which tends to raise blood pressure. Obesity and high blood lipid levels were seen pushing resistance to insulin, whereas sports activity improves insulin sensitivity and glucose to the muscle movements that work. Organized activities are a potent NIDDM treatment, and for patients, it eliminates the need for insulin replacement. According to (Colberg, et al., 2010), physical

exercise plays a major role in the prevention and control of diabetes type 2 and accompanying complications.

Practice on Aerobic Exercise

Sports or physical exercise is an integral part of efforts to improve health status and fitness. A person with low physical activity (*sedentary*) has a higher risk of various health problems. Physical exercise plays a role in sports other than promoted and preventive efforts, it is also important in the therapy and rehabilitation programs of various kinds of health problems. In practice, the exercise program has rules that must be observed that the purpose of the sport can be optimally achieved with minimal side effects injury.

Physical exercise can make a difference in all functions of the body system. The changes that occurred during the lasting exercise are called *Response*, whereas changes that occur due to regular practice and programmed in accordance with the principles of exercise are called *Adaptation*. The occurrence of physiological changes due to physical exercise, with regard to energy use by muscle, forms and methods as well as the principles of exercise performed (Brooks and Fahey, 1985).

Physical exercise program / exercise aims to increase physical endurance (fitness) and improve health by lowering the risk factors for health problems. In order to achieve these objectives, the exercise program should be done with intensity, duration (time), frequency, type and exact progression (Sharkey, 2003). Ideally, exercise training program is designed specifically and individually by taking into account a variety of things such as physical capacity, health status, and age and exercise goals. For example: exercise program for people with low physical capacity should begin with the intensity, duration and frequency is low (Mazzeo, 2001).

In practice, a training program is not a program that is rigid. Every time it is necessary to adjust, considering physiological response to training varies with each other or even varies from time to time. In principle, the primary goal in conducting the training program is to help a person to increase their physical activity level gradually. The programming of physical exercise not solely be based on the knowledge (science) but it must also be seen as an art, which combines various aspects that can produce the most accurate program (Andersen, 1999).

Aerobic exercise

The process of aerobic energy metabolism is the metabolic process that requires the presence of oxygen (O₂) so that the process can be run perfectly to produce ATP. At the time of exercise, the body's energy reserves, which are stored carbohydrates (glucose, muscle and liver glycogen) and fat deposits in the form of triglycerides, may contribute to the rate of aerobic energy production in the body. But depending on the intensity of exercise, the energy savings can provide different amount of contribution. To regenerate ATP, three energy savings will be used by the body, they are stored carbohydrates (glucose, glycogen), fats and proteins. Among these three, carbohydrates and fat deposits are the main source of energy during exercise.

In the long-standing practice, whether the intensity is at or near sub-maximal, sufficient oxygen is demanded during exercise. It means for resintesa ATP system is the aerobic system, and the main fuel is fat in addition to carbohydrates. Except at the beginning of the exercise when the body is not able to meet the need of oxygen, the anaerobic glycolysis system is also a bit of a role. Aerobic energy metabolism can provide energy to the body for a long period of time. Sports activities such as walking, medium and long-distance running, cycling is a sport that tends to be done with low intensity, while the long-time dominant will use aerobic metabolism to generate energy.

Training Program

According to Sharkey (2003) in the determination of an exercise program, a few things that should be set include exercise intensity, duration (time) of exercise, frequency of exercise, type of exercise and proper exercise progressions.

Intensity of Exercise

The intensity of the exercise is to show how heavy or severity of exercise performed. The intensity of exercise specifically assigned to each individual according to the physical capacity of its implementation requires constant supervision so that the intensity of the exercises actually achieves the programmed intensity. The intensity of the workout can be expressed in absolute units (e.g. watts) and expressed in relative form (e.g. to the maximum heart rate, METs, VO₂ max and RPE/*Rating of Perceived Exertion*) (Jette, 1999).

The intensity of exercise among others can be determined based on the frequency of the heart rate. If it is not affected by extreme environmental conditions, and the psychological state of the disease, there is a relatively linear relationship between heart rate during exercise with exercise intensity. The method which is commonly used is to use the number of resting heart rate plus a percentage of the difference between maximum heart rate with a pulse frequency of breaks. Maximum heart rate is obtained from the formula $220 - \text{age}$. For example: Male age 35 years, with a resting pulse rate 68 beats per minute, with a target of 80% VO₂ max exercise, the maximum heart rate = $220 - 35 = 185$ while the target pulse = $68 + 0.8 (185 - 68) = 162$ times per minute. (Feigenbaum, 1999).

According Sumosardjono (1993), to determine the exercise intensity based on the pulse must be adapted to the purpose of the exercise, such as: (1) the intensity of exercise to increase endurance should be 70% - 85% of maximum heart rate (DNM). DNM is the maximum heart rate which is calculated by: $\text{DNM} = 220 - \text{Age}$. (2) To burn fat with a lighter intensity is 60-70% DNM Example: People with the age of 40 years will have $\text{DNM} = 220 - 40 = 180$. To burn fat a person must exercise the pulse reaches: $60\% \times 180 = 108$ s / d $70\% \times 180 = 126$.

Duration of exercise

The duration of time is needed to improve the functional capacity of the body. The duration time which is performed is inversely proportional to the intensity of the exercise. Exercise with high intensity and short duration of exercise raises the body's response to the same exercise with low intensity and long duration.

Exercise for 5 to 10 minutes with an intensity of 90% of the body can improve the functional capacity of the cardiovascular work. Nevertheless, workout with high intensity and short duration are not applicable to most people, so it is advisable to carry out the exercise program with moderate intensity and longer duration (Kraemer, 2004). The program is recommended because it has a low risk of injury and potential for total output resulted in a high calorie.

For people who are familiar with low activity, the recommended duration is 20 to 30 minutes with intensity (40 to 60% of functional capacity). Adjustment of the duration and intensity of exercise based on the individual's physiological response to exercise, health status and purpose of the exercise (e.g., weight loss). In general, the duration of the early phase of the exercise, a person began his best, plus slowly, can be gradually increased from 20 minutes to 45 minutes (Syarkey, 2003).

Frequency of exercise

Exercise frequency indicates how many times per week exercise was conducted. The frequency of exercise depends on the duration and intensity of exercise. The frequency of exercises that can be done up to five times a week depends on the type of exercise, physical state and the purpose of the exercise (Kraemer et al, 2004). According to Bowers (1992), exercise three times a week is able to develop endurance, strength and flexibility, to improve aerobic endurance enough 15-60 minutes continuously, and 6-8 weeks of training had a significant effect.

Phase of Exercise

Each training session consists of three phases: (1) warm up for 5 to 10 minutes, (2) core exercises for 15 to 60 minutes, and (3) relaxation for 5-10 minutes. Judging from physiology, heating is physical activity which is done physiologically to increase body's temperature or muscles due to a gradual increase in metabolism (Sharkey, 2003). Heating is designed to increase the metabolic rate by 1 METs that were gradually increased until the target level on core exercises (Steady State). Core exercises can be done in continuous and discontinuous that includes aerobic activity and it involves large muscles and increases heart rate. Cooling exercise includes exercises that help in lowering the body's adaptation to exercise capacity until the exercise is stopped. This exercise is good for restoring circulation of the body slowly. Blood flow which is initially mainly distributed in the muscles is gradually diverted anyway so that it is evenly throughout the body (Kraemer et al., 2004).

Suryanto's research (2009) suggested, through regular diabetes Gymnastics can be used as a diabetes treatment program especially type II diabetes, and should follow the instructions that have been defined, namely (1) training program, (2) The portion of the exercise, and (3) Exercise feet. In addition to following the instructions, people still follow other instructions for the success in following the DM exercises. Research Utomo (2011) suggested that factors related to the successful management of type 2 diabetes is knowledge, regularity of exercise, diet and medication adherence. Factors that influence the successful management of type 2 diabetes is exercise regularity.

According to Sheri (2010), exercise plays a major role in the prevention and control of insulin resistance, pre-diabetes, diabetes type 2, and diabetes-related health complications. Aerobic exercise training and weight training can improve insulin's action, which can help with the management of blood glucose levels, lipids, blood pressure, and risk of cardiovascular disease, mortality, and quality of life. Exercise should be done regularly and it should be controlled in order to obtain optimum benefit to alleviate the effects of DM complaint.

According to (Twigg, et al., 2007; Manaf, 2010; Pour & Dagogo-Jack, 2011), the state of pre-diabetes, is a picture of someone who is with the state of *Impaired Glucose Tolerance (IGT)* or *Impaired Fasting state Glucose (IFG)*. IGT was defined when the plasma glucose level >140 mg/dL (7.8 mmol / L) but <200 mg/dL (11.1 mmol/L) and IFG was defined if the fasting plasma glucose concentration ≥ 100 mg/dL (5.6 mmol/L) but less than 126 mg/dL (7.8 mmol/L) and studies have shown people with pre-diabetes in the past 10 years will develop into type 2 diabetes and increase the risk of cardiovascular disease and macrovascular, also increase risk of death rate.

CONCLUSION

Doing aerobic exercise in a form of movements, the intensity of the movements, duration movements, frequency of exercise in accordance with the principles of a more appropriate exercise would provide benefit for people with diabetes mellitus, so that the decline in fasting blood glucose levels and two hours after eating, decreased levels of cholesterol and triglycerides, and a decrease in HbA1c according to the standard treatment of diabetes. In addition, it is necessary to design a program for the intake of the nutritional needs for people with diabetes which is nutritious, balanced and varied.

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