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THE ROLE OF SPORTS PHYSIOLOGY IN SUPPORTING SPORTS ACHIEVEMENT OF SMPN 4 KANDIS STUDENTS

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Abstract

Exercise physiology is a branch of physiology that studies physiological changes that occur in the body during exercise. The purpose of this article is to find out the role of sports in supporting student sports achievement, especially at junior hight school 4 Kandis. The results in this article are in supporting achievements, regular and consistent exercise is very necessary to increase endurance and strength of the body's physical condition, but in doing exercises should not be excessive because it can cause overtraining. Based on several cases of matches that occurred at junior hight school 4 Kandis, it can be concluded that sports physiology greatly affects the achievement of students of junior hight school 4 Kandis.

Keywords: Sport Physiology, Student Achievement

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INTRODUCTION

One of the arenas where one can succeed and make the nation proud is in sports. A nation can achieve great fame and universal admiration through its sporting achievements. Sports in the current era have developed into a profession that can generate a large income. Therefore, optimal performance is highly demanded in sports. Science and technology are often utilized during sports competitions or during pre-competition training to obtain optimal results. One of the disciplines that is often used to improve the performance of players or athletes in order to achieve optimal achievements is physiology.

Exercise physiology is a subfield of physiology that studies physiological changes that occur in the body during exercise. Knowing the changes that occur in the body allows a person to build an exercise program to get optimal results according to what is desired.

Exercise physiology studies how exercise affects changes in the functioning of organs both temporary and sedentary. Exercise physiology describes in detail the changes in function caused by both acute exercise and chronic exercise, the purpose of which is to improve the physiological response to the intensity, duration, frequency of exercise, environmental situation, and physiological status of the individual. It is also worth looking at the nature of sports training from the point of view of Faal's science. Faal science is a science that studies the function or way of working of a structure, specifically the structure of biology. In humans, the biological structure is the physical along with all the tools of the body.

Viewed from the point of view of Faal Science, the essence of sports training is to improve the functional abilities of cells, which in itself means also improving the functional abilities of the individual (human) in question. Training must also be physiological, meaning that from a cell point of view, training should not cause the occurrence of homeostatic disorders that exceed physiological limits, and changes in the condition of homeostasis should be recovered within no more than 24 hours. Thus training in the following days is always based on physical condition (Firdaus, 2011).

DISCUSSION

Physiology and Sport

Physiology is the science that studies the faal, function or work of each body tissue or part of the body organ. The mechanisms and special properties of the human body are controlled involuntary or unconsciously, for example the onset of hunger that makes us look for food, the feeling of coldness that makes our body shiver. How the digestive system can digest and absorb food, the respiratory system can take oxygen and emit carbon dioxide in our bodies, all of these are the work systems of each organ that performs each of its functions in one physiological system (Sherwood in Lesmana, 2018).

From the point of view of the Faal Science of sports, Sport is a series of regular and planned physical movements that people perform consciously for their functional abilities according to the purpose of doing sports (Firdaus, 2011). According to Lesmana (2018) physiology is a science that studies how each component in the body works systematically and organized so that the body can carry out activities normally.

In the human body, physiological processes are a collection of several systems related to each other. This physiological process occurs systematically from one system to another or from one organ to another. The body's ability to carry out activities is also hampered, if physiological processes in the body are disturbed by a cause. It can be interpreted that the systems in our body that are supposed to function systematically and organized do not work properly. We must take good care of the organs of the body and the physiological components in our body to prevent this from happening, so that it can continue to function normally and prevent disruptions in the physiological processes of our body. One way to maintain the health of body organs is to exercise.

In general, exercise is defined as an activity that is useful for training one's body, not only physically but also spiritually. Exercise is a repetitive physical activity

with the aim of maintaining, improving and expressing fitness. Anatomic, physiological, metabolic, and psychological changes can result from physical activity. The combination of volume (length, distance, and reps), intensity (load and speed), and frequency of exercise determines how effective the physical activity is.

To get optimal benefits from the sports we do, the sports we do must be programmed and measurable. Programmatic means that the exercise is carried out regularly and continuously and measurably means that it is in accordance with the needs by considering the volume (duration, distance, and number of reps), intensity (load and speed) and frequency of the sport (Lesmana, 2018).

The Effect of Sport On Human Physiology

The body's response when doing sports training is a change in the function of body systems in the face of a given workload. The amount of response depends on the intensity of the workload provided. A workload with light intensity will cause a light change in body functions as well, on the contrary a workload with heavy intensity will cause a large change in body functions. However, if the intensity of the workload is too heavy, it will cause the body to not give a meaningful response which is usually called fatigue (Junaidi, 2020).

Sports activities will cause reactions from body organs in the form of self-adjustment efforts (adaptation). Humans move a lot as they go about their daily lives. Moving is one of the characteristics of life, so improving the quality of motion also improves the quality of life. Physical activity involves more than just physical movements, but in addition to doing movements must also think, so the cognitive aspect also works so that it will affect the cognitive aspect of a person who performs physical activity. Physical activity will cause movements to grow and develop as a result of which it directly adds to the improvement of a person's fitness. Sport is a strategy to promote the emergence of physiological processes and anatomical structures.

Exercise that is carried out regularly with a sufficient dose will cause the following changes:

1. Changes in the Bones

The bone or skeleton is the support of the vertebrate body. Without bones, surely our bodies cannot stand upright. Bones begin to form from infancy in the womb, lasting continuously until the second decade in a regular arrangement. Bone is a complex tissue consisting of cells and matrices (Lesmana, 2018).

The addition of enzyme activity in the bones will avoid bone loss, increasing bone density, strength, and size. As the muscles continue to tense and pull constantly, the surface of the bones will become stronger. Regular exercise can increase the thickening of cartilage in the joints, so it can be a dampener and protect bones and joints from potential injury hazards.

2. Changes in Muscles

Muscles are active locomotors that can move the body. The term "muscles" refers to the various fragments that make up the muscular system. Muscle cells have the ability to generate voltage and shorten, which is referred to as contraction, by moving certain intracellular components. Groups of muscle cells can work together to produce movement and work through a well-developed ability to contract.

With regular training the strength, flexibility, and endurance of the muscles will increase. This is due to the increase in the size of the muscle fibers and the increased system of energy supply in the muscles. In addition, changes in the muscles will favor the agility of movement and the speed of reaction, so that in many ways accidents can be avoided (Anggriawan, 2015).

Exercise has a considerable effect on the muscles used in the execution of exercises when performed consistently and systematically according to a well-designed program. By applying an exercise program that takes this principle into account, then the muscles will have the possibility to change or undergo adaptations. The body will adjust so that it has an influence on the muscles. Adaptations that occur as an effect of exercise on the muscles lead to the occurrence of changes in the anaerobic and aerobic systems.

3. Changes in the Heart

The heart functions as a pump that puts pressure on the blood to create the pressure gradient necessary to drain blood to the tissues. Although the heart is a single organ physically, its right and left parts work as two separate pumps. Thanks to these two separate pumps, the heart performs two different blood pumping processes known as pulmonary circulation and systemic circulation.

Regular exercise practice will make the heart bigger and stronger so that the capacity is also large and the pulsation is strong. Both of these things will increase the efficiency of the heart's work. With high work efficiency, the heart does not need to beat too often. In people who do not do sports, the heart rate averages 80 times per minute, while in people who do regular exercise, the heart rate averages 60 times per minute. Thus in one minute saved 20 pulsations, in one hour 1200 pulsations, and in one day 28,800 pulsations. These savings make the heart last, and can be expected to live longer with a high level of productivity (Anggriawan, 2015).

4. Changes in blood vessels

When performing sports, active vasodilation of muscle blood vessels occurs. This increase in the cross section of blood vessels will increase blood flow. The contraction and relaxation of skeletal muscles will alternately force blood to flow through the veins and return it to the heart. Increased blood flow during moderate-intensity exercise will cause an increase in systolic pressure in the first few minutes, usually increasing to 140 and 160 mm Hg. While diastolic pressure is relatively unchanged (Junaidi, 2020).

Regular exercise can result in reduced fat deposits and the addition of muscle contractions in the walls of blood vessels will strengthen the elasticity of blood vessels. High elasticity of blood vessels will make blood flow smoother and prevent hypertension. In addition to the increased elasticity of blood vessels, the density of small blood vessels (capillaries) will also increase. This mechanism of change can be used to overcome and prevent coronary heart disease. Smooth blood flow will also accelerate the removal of chemicals as combustion residues so that it can recover fatigue quickly.

5. Changes in the Lungs

The lungs are vital organs in the human body that function as respiration or respiratory organs connected to the circulatory system to circulate oxygen

throughout the body. The main function of the lungs is to exchange oxygen from the air with carbon dioxide from the blood as a result of the body's metabolism.

Regular exercise will increase the flexibility of the lungs, resulting in an increased ability to develop deflated. In addition, regular exercise will result in a more active (open) alveoli. Both of the factors mentioned above will result in an increase in the blood's ability to hold and deliver oxygen. Breathing becomes deeper with less frequency. Changes in the heart and blood vessels contribute to the delay of fatigue.

Energy Exercises

Energy is simply defined as the capacity or ability to carry out work. There are several forms of energy known today, namely kinetic energy, potential energy, mechanical energy, chemical energy, thermal energy, and electrical energy (Hermawan, 2021).

Each type of energy has the ability to change its shape. Sunlight is a source of energy, which plants need to convert it into chemical energy in the form of carbohydrates, proteins and fats. When people eat those energy sources (carbohydrates, proteins, and fats), their bodies will produce energy that is then stored in the body. This energy is used by the body as fuel for physical activity or stored for later use. Adenosine triphosphate (ATP) is the name of the type of energy that the body uses and is considered ready-made energy. ATP is referred to as an energy unit because it can be used to create calories.

One calorie is the amount of heat required to raise the temperature from 1 gram of water equal to 1o C. One kilocalorie (kcal) is the sum of 1,000 calories. The unit most often used in describing the energy content of food and energy requirements in various physical activities (Hermawan, 2021).

The energy used during sports or training is known as the predominant energy system. Fox in Lesmana (2011) explained that in some sports anaerobic and aerobic energy are both used for the formation of ATP, but there is a difference in percentage or called the predominant energy system. Sports that use anaerobic energy are sports in which the anaerobic energy system is more dominant. Typically, anaerobic exercise includes the characteristics of high exercise intensity, frequency of rapid movements, relatively short distances, and short duration of exercise. For example, athletics in the 100- to 800-meter dash still relies on anaerobic energy systems. In contrast, low-intensity exercises, slow-motion repetitions, much longer training distances, and longer exercise durations are usually characteristics of exercises that support aerobic energy systems. For example, aerobics is more dominant in branches of running heights 5000 meters and above.

As an illustration, Mc Ardle in Lesmana (2011) explains that in determining the predominant energy system is as follows:

1. ATP system, the activity time is 0 - 4 seconds, the form of activity is in the form of power and power. The types of activities in the sport are high jumping, tennis services, and so on.
2. ATP-PC system, the activity time is 0-10 seconds, the form of activity is in the form of power. The type of activity in the sport is in the form of sprinting and so on.

3. ATP-PC and Lactic Acid system, the activity time is 0 - 1.5 minutes, the form of activity is anaerobic power. The types of activities in sports are sprinting, 200-meter run, and so on.
4. Aerobic System, the activity time is more than 8 minutes, the form of activity is aerobic endurance. The type of sports activities is in the form of running marathons and so on

Determining the best type of training to improve the athlete's performance depends largely on understanding the predominant energy system of the sport. For example, sports with anaerobic predominant energy, a form of exercise is prioritized to increase anaerobic capacity. It is possible to assess the main energy systems in sports by the type of physical activity that predominates and how long the exercise lasts. By knowing the predominant energy system in sports, it makes it easier to compile training programs in order to achieve maximum achievements.

Physical Exercise

Physical exercise is a systematic sports activity that continues to be carried out repeatedly using the principle of adding weights so as to produce the development of functional and psychological human properties that help a person to achieve predetermined goals. A person can achieve several goals through physical exertion. In his physiological terminology, a person pursues the goal of making up the system organism system and the functioning of the organism in order to maximize his achievements and sports appearance.

Sports practice is a process that uses the idea of adding weight in carrying out the exercise process that is carried out repeatedly. The principle of adding the load in question is a gradual increase in load intended to increase the efficiency of the body's faal. Since not every person has the same weight, then this principle is applied depending on the circumstances of each individual. The body will work better if it exercises properly. The type of exercise, the intensity of exercise, the frequency, the length of exercise, and the basic principles of physical exercise all have a significant impact on improving the quality of exercise.

1. Types of Exercises

Certain types of exercises have a certain body impact as well. Aerobic exercise predominantly increases the athlete's concentration of oxidative enzymes, myoglobin, mitochondrial cell size and quantity, gycogen stores of muscles, and aerobic capacity of the body. In contrast, anaerobic exercise is more dominant in increasing the anaerobic capacity of athletes, the ATP-PC energy system, and anaerobic glycolysis. Slow twitch fiber muscles can grow in increasing numbers and sizes during aerobic exercise, while fast twitch fiber can grow in increasing numbers and sizes during anaerobic exercise.

2. Training Intensity

The intensity of exercise is assigned specifically to each individual according to the physical capacity which in its implementation requires continuous supervision in order for the intensity of the exercise to actually reach the programmed intensity. Exercise intensity can be expressed in absolute units (example: watts) or expressed in relative form (for example to the maximum heart rate frequency, METs, VO2 max or RPE / Rating of Perceived Exertion) (Jette in Anggriawan, 2015).

3. Exercise Frequency

Exercise frequency is the amount of exercise repetition generally expressed in weeks. As a benchmark for determining the frequency of exercise by way of paying attention to the fitness condition of the athlete. In general, the frequency of exercise three times a week can increase the physical fitness component of the healthy category, and four to five times a week can improve physical fitness for achievement sports. Another consideration for determining the frequency of exercise is to pay attention to the light weight of the exercise being programmed (Bompa in HB, Bafirman, 2013).

4. Length of Exercise

Length of exercise has a reciprocal correlation with exercise intensity. The exercises performed should be longer if the intensity of the exercises is low. On the other hand, if the intensity of the exercise is high, then the training session should be short. It is recommended to have a short training session, but this session must have dense activities so that it can support the formation of the components that are the purpose of the exercise.

5. Basic Principles of Physical Exercise

In compiling an exercise program, the factor that must also be considered is the basic principles of physical exercise. The basic principles referred to are the principle of overload, the principle of increased load, the principle of specificity, the principle of individualization, the principle of recovering origin, and the principle of returning origin (HB, Bafirman, 2013).

a. The principle of overload is a very basic principle. The concept of enacting this principle of overload is because it is believed that the faal of the body can adapt to the stimulus it receives. The purpose of applying this principle is to optimize the functional abilities of the body, which further manifests the desired optimal performance.
b. The principle of increased load is the addition of the load carried out from one training day to the next. The form of this load collector can be in the form of increasing frequency, length of training, sets, or reps. In detail this principle is described as a staircase system.
c. The principle of specificity is the principle of exercises to meet certain goals. The target in question is specific to a particular muscle group, specific to a series of movement patterns, specific to the predominant energy system and so on.
d. The individual principle is dotted with the concept of no individual being the same. Each individual has different characteristics of other individuals. This difference can be physical as well as psychic. Although the application of this principle is considered difficult, achieving optimal achievements must still be implemented. In this case, it requires the willingness of the coaches to create an exercise program of an individual nature. The practice of implementing an exercise program for a group of athletes should be abandoned immediately
e. The principle of recovering origin is a principle that views that the faal of the body needs a period of rest. This rest period is necessary to restore the condition of the body as before. Recovery of energy reserves, cleaning of lactic acid accumulations, restoration of oxygen reserves, and repair of

damaged tissues are a series of events that occur at rest. This form of activity during recovery between exercises can be done with passive or active rest.

f. The principle of return to origin is a principle that views that the improvement of physical quality as a result of quality training, will return to the most basic level, if the exercise is not carried out in the long term and continuously. If the training load can be increased continuously, there will be an increase in the physical fitness component to a certain extent.

Overtraining

Overtraining is a pathological state of exercise. In addition to the consequences of training errors, things that accelerate the occurrence of overtraining include; irregular lifestyle, unhealthy social environment, and unfit health conditions (HB, Bafirman, 2013). Overtraining is a physical condition caused by lack of rest during the post-training recovery period. Overtraining also results in psychological syndromes, those who experience it due to training load have a tendency to become anxious and confused quickly, while those who experience overtraining due to aerobic activity can experience depression. When a person consistently engages in hard training continuously but does not see an improvement in their training performance, this is one of the typical indications of overtraining. Usually, this reduced performance is accompanied by changes in sports motivation and signs of impaired functioning of the body's biochemical and physiological processes.

Overtraining is the result of excessive doses or intensity of exercise that causes the symptoms of overtraining. These symptoms of overtraining are essentially the result of homeostasis disorders. The symptoms of overtraining are insomnia (insomnia), headaches, difficulty concentrating (concentrating), decreased arousal and motive, lethargy, fatigue and weakness so that they are prone to injury, fatigue from 24 hours, anorexia (nausea), impaired digestive function, diarrhea, weight loss, thirst and drinking a lot at night, decreased blood pressure and orthostatic occurrence, the pulse of rest increased greater than 10 beats, The pulse against the standard of exercise is greatly increased, the limbs feel heavy, the dose of exercise is inexhaustible, muscle and joint pain, prone to allergies and infections, slow wound healing, hemolysis increases so that anemia can occur.

Sports Physiology in Supporting Sports Achievement of Students of Junior High School 4 Kandis

To improve sports performance, it is necessary to pay attention to the energy used to run exercises. During the exercise, there are several important things, including the amount of exercise, intensity and frequency that must be met. Some observations, there are still many athletes who train with insufficient and sufficient doses, especially the intensity dose does not reach the training zone. As a result, achievements are difficult to develop, even if the frequency of training is enough, even more. If you want to get high achievements, it is necessary to train by fulfilling these three kinds of doses, so as not to waste a lot of time and costs on training because the role of exercise physiology can help improve athlete achievement. The

following are the results of observations of sports physiology of SMPN 4 Kandis students in improving sports achievement.

1. Daniel Tambah, 1st Boxing in Regent Cup Bengkalis 2015

Daniel Tambah won 1st place in the Bupati Cup Bengkalis in 2015. Daniel's success is certainly accompanied by a good and regular training process. In addition to doing exercises to increase muscle mass, Daniel juge stays well rested and takes time for self-recovery. In addition, he also goes on a healthy diet for boxers to improve his performance. The exercises that Daniel did to improve his achievements in the field of boxing were as follows:

a. Leg exercises by running for 30 minutes – 1 hour. This activity is carried out to warm up the body and train breathing for endurance.
b. Muscle warm-up is done for 30 minutes with some muscle exercises, besides that you also have time to rest in each set to prevent overtraining.
b. Punch with punching bags and speed bags for 30 minutes. It aims to improve quick hitting by helping with strength, time, endurance, hand speed, and hand and eye coordination.
c. Strength training and physical condition training for 30 minutes to 2 hours to increase the mass and strength of abdominal muscles, thigh muscles, leg muscles, arm muscles, by means of lifting weights and squats.
d. Training the abdominal muscles and stretching is carried out for 30 minutes. Training the abdominal muscles will shape the body and also burn calories. Stretching will help speed up post-workout recovery.

With regular training according to the schedule that has been compiled, Daniel has great muscle strength, optimal punch speed, strong endurance so that he is able to optimize his performance in achieving achievements in exercising. In addition, adequate rest also helps Daniel increase his endurance so as to avoid overtraining. It can be concluded that the physiology of exercise affects student achievement.

2. 4th Place in Women's Volleyball at the Junior High School Level in 2020

The game of volleyball is one of the major ball sports that is much loved by men and women. In the game of volleyball, it must have some basic techniques for players to master, such as serve, passing, smash, and block. In addition to mastering the basic techniques of the volleyball game, players are also required to have a good physical condition. The basic components of physical condition include endurance, strength, explosiveness, speed, agility, flexibility, balance, and coordination. In the junior high school volleyball match in 2020, the women's volleyball team of junior high school 4 Kandis was only able to win 4th place. This is due to several factors, namely:

a. Not all personnel on the team perform regular physical training when training before the game is held. So that affects the physical toughness during the match.
b. During the match, there was one of the personnel on the team who had a weak physical condition due to overtraining during training.
c. Insufficient and irregular warm-ups caused one of the players to suffer an injury during the match resulting in decreased performance.

Based on the above factors, it can be concluded that regular and consistent training and adequate rest affect the player's performance in the match.

3. Yolanda Sinaga Athletics (Sprint, Long Jump, and Shot put) O2SN 2019

Athletic sports such as sprinting, long jump, and shot put are sports that must have good physical endurance. To support achievements in this sport, regular and consistent training is needed by creating an exercise program. The exercises that are usually carried out by athletes in this sport are:

a. Heating, can be done by jogging and jumping rope, static heating, and dynamic heating.
b. Core Exercises, can be done with singgle leg romanian deadlift, leg curl sliding, pushing hips raised shoulders, donkey kicks, raising side-lying hips, rioting calf troops, burpees, sit up jump and reach.Setiap melakukan sesi latihan inti, harus diselingi dengan istirahat setiap sesinya agar terhindar dari *overtraining*.
c. Cooling, done to help speed up post-workout recovery.
d. Coaching point

The above exercises must be done consistently to maximize performance during the match. However, due to time constraints, Yolanda rarely conducts a gradual and regular training program, resulting in weak physical endurance and failing to qualify for O2SN matches. Based on this, it is clear that practice affects student achievement.

CONCLUSION

Exercise physiology is a branch of science that describes in detail the changes in function caused by single exercises as well as exercises performed repeatedly, the purpose of which is to improve the physiological response to the intensity, duration, frequency of exercise, environmental situation and physiological status of the individual. To support achievements, regular and consistent exercise is very necessary to increase endurance and strength of the body's physical condition, but in doing exercises should not be excessive because it can cause overtraining. Based on several cases of matches that occurred at junior high school 4 Kandis above, it can be concluded that sports physiology greatly affects the achievements of students of junior high school 4 Kandis.

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