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Research Article

Research on the Characteristic of Energy Metabolism of Aerobics Sports and Reasonable Nutrition Supplement

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Abstract: The reasonable nutrition problem has received extensive attention. In this study, it takes the characteristics of aerobics sports as the breakthrough point, by analyzing the characteristics of energy metabolism of aerobics; it explains the composition of three large energy systems of energy metabolism, then discusses the nutritional requirements of Fitness Aerobics as well as the reasonable nutrition supplement measures.

Keywords: Aerobics sports, energy metabolism, nutrition supplement

INTRODUCTION

In recent years, with the improvement of living standard, China's aerobics sports has been widely spread with more and more high popularity. A lot of people who are in order to achieve weight loss and fitness to participate in the exercises in various clubs. In most schools in our country, aerobics sports has been included in the content of physical education as a teaching course. During the period of having fitness, it is a very focused issue for people to have reasonable nutritional supplements, diet structure, so as to avoid unreasonable diet and some diseases caused by blind weight loss disease, according to the characteristics of energy metabolism of aerobics exercise (Luke *et al*., 1997).

Aerobics is a kind of sports whose purpose is mainly aerobic metabolism, metabolic energy consumption in unit time is relatively small is its main characteristics (Swain *et al*., 1994). However, the total energy consumption of the body can consume large amounts of fat and water so as to complete the total amount of exercises, which must undergo the transformation of sugar and make fat supplemented. Therefore, before and after exercises, the calorie intake and calorie consumption must be "balanced". Because the time of aerobics movement is so long with a certain amount of load, which is performed with the accompaniment of music practice. This will help the brain cortex be in a highly excited state, thus the body have been in a long period of aerobic exercising state and the consumption of energy must be large.

MATERIALS AND METHODS

The characteristics of energy metabolism of aerobics sports: When human body is in the state of motion, the changes of matter and energy conversion are closely related, ATP is the direct energy of all activities of human body. Aerobics sports can complete all kinds of large amplitude of action with less intensity, long time, high frequency of muscle contraction. According to one set of aerobics exercises, the average heart rate is 138/min, the peak of the heart rate of the exercise is 162/min and the action of per second is 5.15 times and the general movement time is 60-120 min. Relevant tests show us that the exercise of practicing a set of aerobics is equivalent to the total oxygen demand of running 800 and 1500 m, whose oxygen debt is lower than that of running 800 and 1500 m. Moreover, the exercise is mainly aerobic energy. After starting the aerobics movement, the glycogen in muscle is consumes a lot, which can be replaced and added by blood sugar, but, with the practicing time is prolonged, blood sugar will also be consumed apparently (Montpetit *et al*., 1987).

In addition, combined with the changes of pyruvate, it can indict that during the process of having aerobics exercise, at the peak of the exercise, the amount of pyruvate is increased more significantly and it can generate lactic acid. It means that the oxidation may be lack temporarily and the hypoxia of sugar at the peak of exercise may be incomplete. Therefore, aerobics sports is an energy movement process with the energy consumption in form of sugar, non lactic acid, lactic acid as well as fat. Lactate threshold is the symbol for human body to increase intensity of work from the anaerobic energy supply to the aerobic energy supply, meanwhile, lactate threshold is often correspondingly represented by 4 mol/L, according to the measurement, after practicing a set of aerobics exercise, blood lactate content can be reached about 4 mol/L, which is equivalent to the extra long distance race. Therefore, aerobics fitness belongs to the aerobic metabolism, which can supply energy by sugar, fat and protein decomposition. In addition, when the

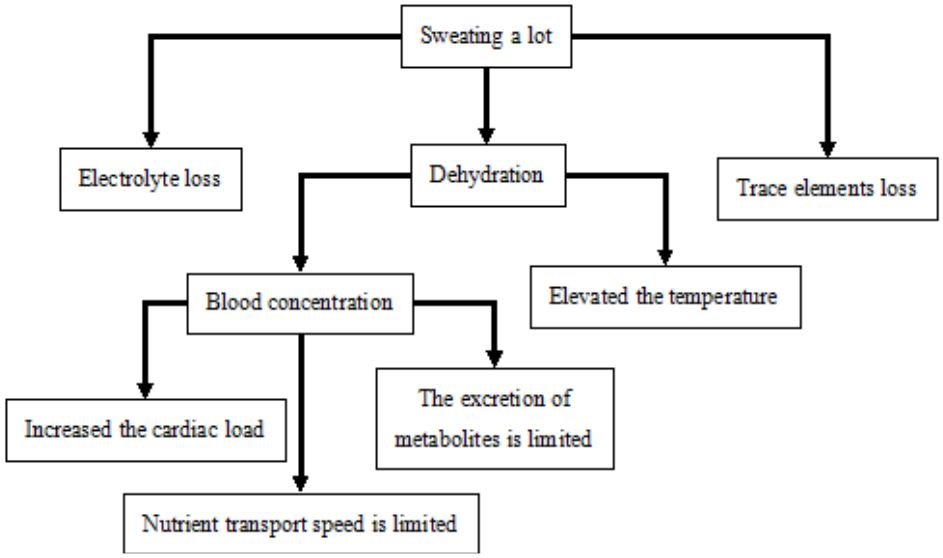

Fig. 1: The response caused by motion with sweating a lot

Table 1: Energy unity with four districts

District	Motion time	Main energy system
District 1	Less than 30 sec	APT-CP system
District 2	30 sec-1.5 min	APT-CP system and lactic acid system
District 3	1-3 min	Lactic acid can system and aerobic oxidation system
District 4	More than 3 min	Aerobic oxidation system

dehydration amount achieved to 2% of the body weight, it can affect the ability of motion; at this time, people will feel thirsty and they will reduce the amount of urine. When the dehydration amount accounted for 2~3% of the body weight, it can affect the movement time of the high intensity exercise, which can also make the motion ability dropped further. The response is as shown in Fig. 1.

The three major energy systems of consisting body energy metabolism: The motion of the body itself is a metabolic process with energy consumption, during the process of energy consumption and metabolism, it is mainly in the skeletal muscle, in the physiology of the body, the energy metabolism is completed by three systems, namely ATP-CP system, lactic acid energy system, aerobic oxidation system. ATP-CP system is a direct source of energy for muscular contraction, but the time of energy supply is short, the amount of energy is relatively small. While, lactic acid energy system is released by the anaerobic metabolism of sugar, fat and protein. During the process of metabolism, it will produce lactic acid that cause body to feel fatigue. With time increasing, sugar, fat and protein can be completely oxidized into H_2O and CO_2 and then with the process of APT synthesis, namely, the aerobic oxidation process. According to the data proposed in physiology, it can divide the body movement into four districts as one energy unity by the length of motion time. The energy unity is as shown in Table 1.

The nutrition requirements of aerobics sports: Exercise and nutrition are two essential factors to maintain the normal functions of human bodies, as well as the healthy development. In addition, aerobics sports is mainly based on the nutritional metabolism with little consumption of energy at one unit time, but the amount of the energy that is required is much more (Achten and Jeukendrup, 2003). When human body have movement, it will consume energy, if people only had exercises without nutrient intake and supplement, it will affect the regeneration of the cell and the repair of the body, who will have the feeling of fatigue and cause diseases.

In order to meet the aerobics movement to maintain hemoglobin and respiratory enzyme with higher level, in the meal, people must have abundant protein, iron, vitamin C and vitamin B2 in the diet; in order to ensure the energy metabolism that can be in a higher level, it needs to provide the body with more sugar, vitamin C and phosphorus camp substances and so on; moreover, it needs to reduce the burden of gastrointestinal, which also should guarantee the calories of food. The volume of feeding food must be reduced, who also should properly increase the content of fat in food, whose heat ratio can reach 30~35% of the total energy.

When the aerobics sportsmen have movement with strength, they should pay attention to the nutrition characteristics of strength exercises. The consumption of heat is much large and vitamin B2 and protein are in high demand, especially in the initial stage of fitness aerobics, people need to have plenty of protein to supplement. The amount of supplying protein can be increased to above 2 g for each 1 kg of the body weight,

especially the demand for high quality protein should not be less than 1/3, whose heat distribution ratio can reach about 18%.

Carbohydrate should be 45~65%, fat should be 20~35%, while protein should be 10~35%, which is set for the energy ratio of aerobics movement. And the movement time should be in 60~120 min, which can make the body's glycogen be consumed, body's perspiration quantity is great, leading to the loss of water and electrolyte more seriously (Durant *et al*., 1992). Thus the sportsmen should add enough high sugar diet, inorganic salt, protein and so on, so as to help people restore the elimination of fatigue and physical fitness. Therefore, adequate and reasonable nutrition supplement is the basic guarantee for sportsmen to participate in the aerobics sports.

RESULTS AND DISCUSSION

The supplement of carbohydrate: During the movement process of aerobics, the concentration of sugar should be about 6%, when people have liquid supplement. After exercising, the supplement of glucose is beneficial to the recovery of muscle glycogen, the supplement of fructose is beneficial to the recovery of liver glycogen. Food intake should be based on high carbohydrate diet, meanwhile, the amount of sugar should be 45~65%. The kind of sugar had better be starch and polysaccharide, such as whole grains in the diet and gain products as well as dry fruits and fresh fruits.

The supplement of protein: Binding protein with proper training reasonably and effectively can change the nutrients of human bodies. At the initial stage of having aerobics fitness exercises, the body firstly used the oxidative decomposition with sugar supply, when the muscle glycogen was depleted, it is needed to fully supply protein. If the protein supply is not sufficient, there will be a decrease in hemoglobin and anemia which may cause the decline of physical function. In addition, protein can enhance the immune ability of body, the excitability of the nervous system can also be improved, the conditioned reflex activity can be strengthened, which can have good effect of reducing the fatigue of exercises. The amount of protein content in the diet should be 10~35%, after having long-term system aerobics exercises, people should increase the intake amount of the quality protein, which should be appropriate, when it is about 10% of the total energy consumption. According to the degree of the exercising intensity, the amount of protein should be 1.0~1.8 g for 1 kg of body's weight. Since the animal protein is of high nutritive value and contains many kinds of amino acids that is necessary for human, which is very easy to be absorbed, thus, people should eat more eggs and drink milk. At the same time, soybean is the best plant protein, which should be mixed with a variety of foods in the diet, in order to improve its physiological value; people should use the complementary role of the protein.

The supplement of fat: A large number of studies have shown us when human body is in the low intensity exercises for a long period of time, the major energy substance is fat. Aerobics exercise can promote the decomposition of fat, the main reason of which is the negative balance of body's heat movement resulted from the body with the participation in movement. Thus it can prompt the central nervous system to produce the stimulation for the fat consumption within the body, which can accelerate the decomposition of fatty acids. At the same time, when people have exercises, muscles can increase the utilization of free fatty acid. The reasonable arrangement of aerobics exercises in dietary nutrition, according to the percentage of total energy, the intake of fat should be 20~30%.

The supplement of body fluid: During the movement process of having aerobics, due to the large number of sweating, the body will cause a substantial loss of body fluid. Thus, sportsmen should pay special attention to fluid supplement before exercises and after exercises. There is one thing particular to be noted that is people should not drink until they feel thirsty and make replenishment, when the human body feels thirsty, the body's water loss has reached 3% of body weight. At this point the body is in a mild dehydration state, thus, the researching personnel of sports nutrition suggested to have supplementary with water replenishment for prevention and they advocated for a small number of water with many times; avoiding drinking water with great amount at one time. As we all know, drinking water in a short time with a large number of water can cause nausea and feel discomfort and increase urination, which will lead to affecting the exercise capacity. Supplementing body fluid should follow a principle with small amount at many times; during the process of having movement, people should avoid to supplement pure water only, but they should supplement water, sugar and electrolyte together. With the loss of water, the amount of electrolyte will lose a lot, however, simple replenishment with water will further aggravate the imbalance of body's electrolyte. Therefore, it is recommended to drink sports drinks, which are very ideal.

CONCLUSION

Proper nutrition is the basis to ensure the normal and effective movement. This study makes analysis on the characteristics of energy metabolism of the aerobics athletes, as well as the analysis on the main energy supply. Thus we can see, if the aerobics athletes want to

get good grades in the game, there must be an adequate supply of energy, which can provide energy for the body material chiefly through diet intake. Moreover, scientific and reasonable nutrition supplement can play an important role in improving performance and eliminating fatigue after competition, according to the characteristics of energy metabolism of the competitive aerobics sports, it is feasible to improve athletic performance through scientific and reasonable arrangement on diet.

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