

Analysis of the Nutritional Needs of Sprinters During the Training Phase

Yi Huang^{1,*}

¹Jilin University - Lambton College, Changchun, Jilin, 130012, China

*Corresponding author's e-mail: huangyi980108@163.com

Abstract

Nutritional supplementation during the training phase has an essential impact on the training effect of athletes. A rational/scientific nutritional supplementation strategy can help athletes better adapt to the demands of training, it can also prevent potential injuries due to insufficient or unbalanced nutrition. At the same time, it helps to develop a rational dietary program so that athletes can recover more quickly after training. This paper will use the literature method to review the nutritional requirements of sprinters in the training phase to provide theoretical references for improving sprinters' competitive level. The results of the study are as follows: (1) Sprinting requires different types of energy supply according to different events. (2) Sprinting mainly focuses on speed and power; therefore, nutritional supplementation for sprinters needs to focus on nutrients related to lean body mass, strength, and explosive power (3) Protein-rich foods help enhance explosive and strength performance during exercise. And, to reduce body fat levels, avoid high-fat foods, and prioritize nutrient-dense foods. (4) Sprinters can optimize glycogen reserves in the muscles and liver by consuming cereals and root foods or cow's milk powder for glycogen supplementation. And, in consuming protein-based meals, it is essential to consume high-quality proteins. Also, during the training phase, the use of creatine supplements can enhance certain sprints and high-intensity training and increase the content and re-synthesis rate of creatine phosphate. Finally, attention needs to be paid to the intake of carbohydrates and trace elements such as selenium, zinc, and copper as a means of enhancing antioxidant power, eliminating peroxides, and guaranteeing the viability of red blood cells. Through the organization and study of the literature, it can be found that the intake of a certain kind of food cannot meet the nutritional needs of sprinting in the training stage, so we can use compound nutritional regulations to ensure the intake of a variety of nutrients. In addition, although the majority of athletes have the positive will and mentality to develop rational dietary behaviors, they may not be able to guide their own nutritional intake correctly, so correct nutritional knowledge can be integrated into athletes' daily training and life by means of lectures, brochures, and posters in order to strengthen the level of nutritional knowledge of athletes.

Keywords

Physical training, Sports nutrition, Sprinters, Energy intake, Nutritional supplementation.

1. INTRODUCTION

Nutritional supplementation during the training phase has an important impact on the training effect of athletes. A scientific and reasonable nutritional supplementation strategy can help athletes better adapt to the needs of training, improve the training effect, so as to improve

the athletes' performance and performance, and also prevent potential injuries due to nutritional deficiencies or imbalances, so as to minimize the risk of injuries during the training process. Proper nutritional supplementation strategy can also help to develop a scientific diet plan, athletes can increase calorie intake according to the training volume, and ensure nutritional balance, the intake of different kinds of food. This can help athletes fully recover after high-intensity training, reduce fatigue caused by exercise, and thus maintain efficient training quality. At the same time, a scientific diet can also prevent health problems caused by excess or deficiency of certain nutrients. Sprint athletes have high training intensity and high energy and nutritional requirements, so this paper will review the nutritional requirements of sprinters during the training phase. By analyzing the characteristics of energy metabolism in sprinting, we will discuss what nutrients sprinters should pay attention to during the training period and give scientific dietary advice to provide certain theoretical references for the improvement of sprinters' competitive level.

1.1. Background of domestic and international research

Domestic studies generally agree that sprinting programs have high demands on the neuromuscular system, and the nervous system is highly excited and easily fatigued during the exercise process. 100 m running requires strong explosive power, and 400 m running favors speed and endurance, and nutritional supplementation should meet neuromuscular nutritional requirements and energy consumption, while dietary attention should be paid to ensuring adequate vitamin nutrition and increasing alkaline foods to buffer the increase in lactic acid brought about by glycolysis [1]. Short-distance sports test explosive power, with high intensity, fast speed, and short time, and are cyclical speed and power type sports that mainly involve muscle work, requiring low body fat levels, and significant changes in respiratory and circulatory functions after exercise. Therefore, sprinting requires sufficient carbohydrates to maintain the energy needed for intense training. A high-protein diet, such as lean meats, eggs, low-fat dairy products, and legumes, is effective in increasing explosive power and strength. However, it is important to avoid high-fat foods to reduce body fat levels, and it is best to eat foods with high nutrient density to ensure a source of high nutrient-dense carbohydrates. Also, eat a balanced diet to ensure the availability of vitamins and micronutrients [2].

According to some foreign literature, carbohydrate is an important fuel for exercise, and the intake of carbohydrate is influenced by the intensity of exercise, the purpose of the exercise, and the physical condition of the athlete (e.g., body weight, digestive ability). At this stage, there are specific and individualized recommendations for carbohydrate intake during the training phase, but carbohydrate intake should be balanced with fluid intake. Some experiments have demonstrated that solid foods and high levels of carbohydrates reduce fluid absorption, something that athletes need to consider when developing their nutritional strategies [3]. With the growing acceptance of veganism, a number of vegan-based nutrition strategies have begun to emerge. For omnivorous diets, vegan diets tend to be lower in calories, protein, fat, vitamin B12, n-3 fats, calcium and iodine, and other micronutrients, while being higher in carbohydrates, fiber, micronutrients, phytochemicals, and antioxidants. By strategizing and managing food choices with special attention to achieving energy, macronutrient and micronutrient recommendations, and appropriate supplementation, a vegan diet can satisfactorily meet the needs of most athletes [4].

2. SYNTHESIS OF RESEARCH

2.1. Energy Metabolism and Physiological Characteristics of Sprinting Sports

Sprinting is a speed sport, which requires athletes to have strong explosive power. As a kind of high-intensity extreme sport, the energy metabolic rate of the athlete during sprinting is very

high. Unlike long-distance running and other endurance sports which mainly rely on aerobic metabolism, the main source of energy in sprinting is the storage of adenosine triphosphate (ATP), phosphocreatine (CP), and myo-glycogen in the muscle cells. In short, distance running under 100 meters, the ATP-CP system is the only energy supply pathway; when the sprint distance is more than 200 meters, due to the limited storage of ATP and CP, it is necessary to activate the glycolytic pathway of glycogen to participate in the energy supply [1,5].

Sprinting is a short and intense exercise, which is high-intensity explosive work accomplished under the condition of extreme muscle hypoxia. In the process of sprinting, ATP and CP reserves in muscle cells will be depleted quickly, and at the same time activate glycolysis to generate lactic acid, and the accumulation of a large amount of lactic acid is an important factor leading to exercise fatigue. Therefore, reasonable nutritional supplementation plays an important role in slowing down the accumulation of lactic acid and improving the training effect and recovery status of sprinters [6].

2.2. Nutritional supplements

Sprinting mainly focuses on speed and power, and its performance mainly depends on the muscle contraction force and speed, as well as the reasonable alternation of muscle exertion and relaxation in the process of movement. As a kind of speed and strength program, sprinting has high requirements for athletes' muscle explosiveness and strength levels. Therefore, nutritional supplementation for sprinters should focus on nutrients related to lean body mass, strength, and explosiveness, mainly including whey protein, creatine, glutamine, branched-chain amino acids, and active peptides, etc. Specifically, whey protein, creatine, glutamine, branched-chain amino acids, and active peptides should be included in the nutritional supplementation for sprinters. Specifically, whey protein provides a rich source of amino acids that contribute to muscle protein synthesis; creatine supplementation directly increases muscle phosphocreatine reserves, which are important for explosive power; glutamine and branched-chain amino acids provide additional energy; and some active peptides have been shown to promote muscle cell growth.

By supplementing with the above-mentioned nutrients, it is possible to increase the muscular strength of sprinters and improve the ability of the muscles to generate power in a short period of time. This is especially important for sprinters. Proper nutritional supplementation can help them achieve higher muscle strength targets while maintaining a lower body fat percentage, thus improving performance. However, the dosage of nutritional supplements must be moderate, and possible side effects should be noted, otherwise, it will affect normal training [7].

2.3. Diet

Protein-rich foods, such as lean meats, eggs, low-fat dairy products, and beans, help to enhance explosive power and strength performance during exercise. Protein is a major component of muscle, and muscle protein breakdown accelerates during exercise. Failure to replenish protein in a timely manner may result in insufficient protein reserves, which may negatively affect the performance of muscle strength. Adequate protein intake can provide amino acids, participate in muscle protein regeneration and synthesis, and enhance the quality of muscle fibers, which is an important way to improve muscle strength. Athletes who consume protein-rich foods can significantly improve their explosive force index and weight-bearing capacity.

Additionally, to help reduce body fat, avoid consuming large amounts of high-fat foods and instead choose nutrient-dense foods to ensure that you get a high nutrient density of carbohydrates. Excessive intake of saturated fats may lead to increased body fat percentage, which is not conducive to maintaining optimal physical condition in athletes. A better practice is to reduce the intake of animal fats and choose more unsaturated fat sources such as vegetable

oils, which can provide essential fatty acids while controlling the total fat intake. At the same time, grains, vegetables, and fruits should be the main food, with a moderate increase in the intake of carbohydrates, carbohydrates can provide energy for aerobic exercise, choose nutrient-rich whole grains, but also to obtain more vitamins, minerals, and other micronutrients beneficial to athletes [2].

2.4. Nutrient supply

During the training phase, sprinters need to supplement their physical exertion through a reasonable diet. Specifically, carbohydrates can be obtained by consuming cereals and roots and tubers, or by drinking cow's milk powder, which can provide glycogen for the muscles and liver, optimize glycogen reserves, and ensure the stability of blood glucose during training and competition, as well as the energy requirements for sprinting. At the same time, athletes also need to consume good quality protein, especially vegetable protein from soy and its products, because training leads to an increase in muscle mass, which requires protein to synthesize substances such as myoglobin and hemoglobin. High-volume training also increases the excretion of urea, which is needed to repair tissues. In addition, the use of creatine supplements in moderation can enhance sprinting and high-intensity training. Creatine supplementation increases the level of creatine phosphate in muscle cells, providing more energy for the synthesis of adenosine triphosphate. It also increases the rate of re-synthesis of creatine phosphate, so that at the beginning of each sprint, the amount of creatine phosphate in the muscle cells increases, thus improving exercise capacity. It is also important to match the dosage of the supplement with the duration of the intervals between exercises, as this will have a direct impact on subsequent performance during the race. Sprinters also need to pay attention to carbohydrate intake, as well as supplementation with trace elements such as selenium, zinc, and copper. These elements can enhance the body's antioxidant capacity and maintain the health of red blood cells. For example, selenium is an important antioxidant element that enhances peroxidase activity; copper is related to oxidative stress; and zinc deficiency increases the production of free radicals.

In general, the diet of sprinters during training should be nutritionally balanced and targeted to supplement carbohydrates, high-quality proteins, creatine, and antioxidant micronutrients in order to meet the nutritional needs brought about by the increase in training intensity, so as to achieve the purpose of enhancing physical fitness and improving athletic ability [6].

3. CONCLUSIONS OF THE RESEARCH

By summarizing the literature, it can be found that the intake of a certain food alone cannot meet the nutritional requirements of sprinting in the training phase, so a complex nutritional regulation can be used to ensure that a variety of nutrient intake, such as at different times of the day, respectively, the intake of the appropriate amount of supplemental protein, muscle building, anti-fatigue class of food or sports supplements, in order to ensure that adequate nutritional intake. Nutrition. In addition, athletes' knowledge of nutrition determines nutritional attitudes and behaviors.

Nowadays, although the vast majority of athletes have the positive will and mindset to form rational dietary behaviors, they may not be able to guide their nutritional intake correctly, therefore, correct nutritional knowledge can be integrated into athletes' daily training and life by means of lectures, manuals, and posters as a way to strengthen the level of nutritional knowledge of athletes.

4. CONCLUSION

In general, this article systematically describes the nutritional requirements of sprinters during the training phase by means of a literature review. Firstly, this article analyzed the energy metabolism characteristics of sprinting, i.e., unlike long-distance running and other endurance events, sprinting mainly relies on the ATP-CP system and glycolysis in myocytes for energy supply. Secondly, this article summarizes the nutritional supplementation strategies for sprinters, including whey protein, creatine, amino acids, and other nutrients that can enhance muscle strength and explosive power. This article also suggests that sprinters should consume more protein-rich foods, control fat intake, and obtain sufficient carbohydrates from grains. Finally, the article concluded that sprinters should focus on the supplementation of carbohydrates, proteins, trace elements, and other nutrients during the training period, and emphasized the importance of complex regulation and continuous supplementation. Through scientific nutritional supply, the energy demand of sprinters during the training period can be met to achieve the purpose of enhancing physical fitness and improving athletic performance and to make athletes realize the importance of rational nutritional dietary behaviors by integrating correct nutritional knowledge into all aspects of athletes' daily training and life. The purpose of this article is to provide some theoretical references on nutrition for guiding sprinters to improve their competitive level during the training phase and to make some contributions to the improvement of sprinting in China as far as we can.

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