

## Research Article

### Sports Nutritive Food Mechanism Research Based on the Functional Factors

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**Abstract:** With the rapid development of sports science, nowadays the sports competition is becoming intenser day by day. Sports nutritive food plays an important role for athletes to promote their sports ability, timely relieve fatigue and rapidly recover physical fitness. On the basis of analyzing the composition and efficacies of sports nutritive food, this study further explores its mechanism of impacting athletes to provide some guidance for related practices and follow-up studies.

**Keywords:** Functional factors, mechanism, sports nutritive food

#### INTRODUCTION

With the continuous development of the economy, China's sports career has gained rapid development, the problem of athletes' serious energy consumption in daily training and during the race has aroused much attention of the society, especially of nutritionists, food scientists and relevant workers. They developed a variety of sports nutritive food to help athletes quickly replenish nutrients in the case of large consumption of physical strength. More importantly, the rapid development of competitive sports is making the human body get close to the limit. Sports nutritive food is essential for athletes and even for the development of sports. Dr. James Hickson once pointed out that "the nutrition issue will be one of the last areas of human sports."

In this case, if athletes want to achieve excellent results and create a breakthrough, they must work harder in training, even more than their physical burden. And then sports nutritive food for athletes will play an important role to ensure good nutrition. High-intensity sports training and frequent competition make competitive athletes quickly consume their physical strength and a healthy diet can ensure the basic guarantee of enough nutrition. However, this was not enough, athletes also need sports nutritive food to provide timely nutrition and make physical fitness fastly recover.

According to the assessment, in the developed industrialized countries, about 30% people are affected by the damage of food borne diseases every year, for example, in the United States, the number of food borne diseases that is occurred each year up to 76 million cases. While in the developing countries that the economic and technological level is relatively backward, the food safety problem is more prominent,

therefore, food safety has become an increasingly serious global problem. Therefore, based on the analysis of the composition and efficacies of sports nutritive food, this study further explores its mechanism of impacting athletes from the perspective of functional factors in order to provide some guidance for related practices and follow-up studies.

#### MATERIALS AND METHODS

**Sports nutritive food overview:** In recent years, the rapid development of sports nutritive food has aroused wide public concern in the society. However, currently, it has not yet been clearly defined in academia. To make a standard for relevant research in sports nutritive food, as well as its long-term development, the establishment of a unified sports nutritive food standard is particularly important.

In order to promote the healthy and rapid development of China's sports nutrition industry, some related research institutions try to establish the industry standard of sports nutritive foods. Sports nutritive food is defined as specially processed or concocted food or nutritional supplements by special formula to meet the physiological metabolic needs and some special nutrients of the athletes and manual workers to participate in physical exercise (Yang, 2006). Simply put, sports nutritive food is a kind of food added with specific concentrated and high purity nutrients in order to meet the special needs of exercise groups.

Currently, in academia, sports nutritive food is divided into three types, namely, sports food, sports drinks and sports supplements. With the growing number of sports group, sports nutritive food spending has significantly increased, as shown in Table 1.

In order to further demonstrate the sports nutrition food spending, Table 1 will be converted into a bar graph, as shown Fig. 1.

Table 1: Sports nutritive food spending in global market

| Spending types     | Year |      |      |
|--------------------|------|------|------|
|                    | 2007 | 2008 | 2013 |
| Sports food        | 12   | 15   | 25   |
| Sports drinks      | 272  | 312  | 918  |
| Sports supplements | 11   | 19   | 23   |

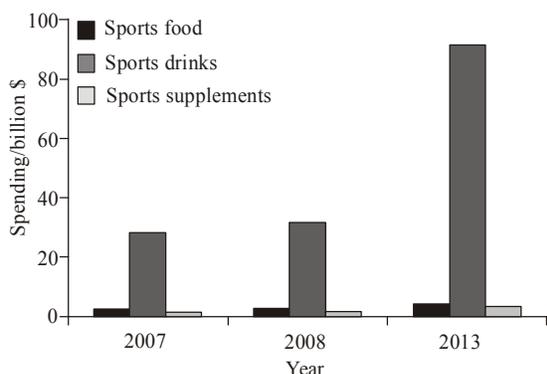


Fig. 1: Sports nutritive food spending in global market

Sports nutritive food spending in the global market gained a significant improvement, especially sports

drinks. In the domestic market, China's spending on sports nutritive food also increased significantly. In 2008, the total sales of sports nutritive food in China have been close to 5 billion Yuan. In 2009, the sales grew to nearly 6 billion Yuan with a 20% annual growth rate (Bai, 2013).

**Nutrient components and efficacies of sports nutritive food:** Researches shows that sports nutritive food can significantly improve the body's athletic ability (Grandjean, 1997). It is not only able to provide the necessary nutrients for the bodies of competitive athletes, but also can help them quickly recover strength in their high-intensity training and fierce competition. The powerful role of sports nutritive food benefits from its nutrient components, as well as the efficacies of these nutrients.

Like other foods, sports nutritive food also can provide essential nutrients for athletes, such as carbohydrates, fat, proteins, minerals, vitamins, etc. and their efficacies are shown in Table 2.

As can be seen from Table 2, sports nutritive food has many nutrients and all of them play a certain role in

Table 2: Basic nutrient components and efficacies of sports nutritive food

| Nutrient components | Efficacies                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Carbohydrates       | Carbohydrates are the main source of energy for the human body and are very important to maintain the body's movement. They also greatly impact on the rate of synthesis of Adenosine Triphosphate (ATP) and help prevent and delay the occurrence of fatigue.                                                                                                                      |
| Fat                 | Fat provides energy for the body to protect skins and internal organs, to maintain constant body temperature and constitute human tissue cells. It can promote the dissolution, absorption, utilization of fat-soluble vitamins and affect tissue function, supply essential fatty acids for the body and enhance the taste of food and satiety sense with the role of anti-hunger. |
| Proteins            | Protein is an important constituent of the body and can catalyze chemical reactions inside the body. It plays an important regulatory function of the body and also provides some energy for it.                                                                                                                                                                                    |
| Minerals            | Minerals constitute an important component of the body tissue to maintain body water and electrolyte balance in favor of keeping the excitement of nerves and muscle and the permeability of cell membrane and involving in human metabolism.                                                                                                                                       |
| Vitamins            | Although vitamins neither constitute a component of the body's tissues and cells nor produce energy, they play an important role in the body's regulation of metabolism. Different types of vitamin have their specific efficacies.                                                                                                                                                 |
| Amino acid          | Amino acids are also an important component of human tissue and compose various substances to supply the body heat and regulate the body immunity.                                                                                                                                                                                                                                  |

Table 3: Special nutrients and efficacies of sports nutritive food

| Types                  | Nutrient components                               | Efficacies                                                                                                                                                                                                                                                                                                                   |
|------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Carbohydrates          | Ribose                                            | Ribose is the starting molecule of ATP synthesis, an important part of nucleic acid and important raw materials of synthesizing energy in skeletal muscle and cardiac muscle and can improve the body's athletic ability.                                                                                                    |
|                        | 1, 6-Fructose Diphosphate (FDP)                   | 1, 6-Fructose Diphosphate (FDP) is the intermediate product of carbohydrate metabolism and quickly involved in glucose metabolism, synthesizing ATP, provides energy and regulates the key enzymes of glucose metabolism activities.                                                                                         |
|                        | Chitosan                                          | In anaerobic training, chitosan can enhance the body's athletic ability, promote the synthesis of glycogen, maintain blood pH stable and effectively alleviate human fatigue after the high-intensity training.                                                                                                              |
|                        | Creatine                                          | Creatine is not only able to promote muscle growth, but also shorten the rest time of issues. It is the main source of energy for muscle.                                                                                                                                                                                    |
| Protein and amino acid | Whey protein                                      | Whey protein can enhance the body's antioxidant capacity, improve work capacity and muscle endurance and effectively delay fatigue.                                                                                                                                                                                          |
|                        | Branched chain amino acid glutamine               | Branched chain amino acid can help to reduce muscle damage caused by training. Glutamine participates in protein synthesis and the storage, transport and detoxification of virulent ammonia and can delay fatigue and enhance the body's athletic ability.                                                                  |
|                        | Calcium Alpha-Ketoisocaproate (GAKIC) Antioxidant | GAKIC can slow down the decline of the average power of repetitive maximum training and delay fatigue in anaerobic exercise. Antioxidant can effectively eliminate the inactivation of certain enzymes during the movements of the human body, prevent the decline of muscle contraction force and alleviate sports fatigue. |

the athletes' bodies. But for athletes, equipped with carbohydrates, fats, proteins, minerals, vitamins and other essential nutrients, they need more other special nutrients, such as creatine and antioxidants. In addition, special sugars, proteins and amino acids also can help athletes increase fitness and have an important role in delaying fatigue. Detailed efficacies are described as follows.

Nutrients shown on Table 3, if being reasonably used, not only do not causes harm to the health of the athletes, but will improve the health and athletic ability of athletes (Chen and Cai, 2005). Thus, according to specific needs, we can change the type and dose of the composition of the sports nutritive food in order to achieve the effect of targeted nutrition for athletes.

### RESULTS AND DISCUSSION

**Mechanism of sports nutritive food:** The above analysis shows that sports nutritive food is composed of

many essential nutrients and some special compositions, can improve exercise capacity, promote anabolic muscle and accelerate the elimination of fatigue after training and help physical strength recover faster (Zhang *et al.*, 2006).

In order to clearly understand the nature of the role of nutrients within the human body, we can draw physiology mechanism maps of particular nutrients from the perspective of biochemistry, but due to too many nutrients and limited space, this study only draws the physiological mechanism map of 1, 6-Fructose Diphosphate (FDP), which is one important nutrient for the human body, as Fig. 2.

According to the above physiological mechanism, 1, 6-Fructose Diphosphate (FDP) can significantly improve the athletes' athletic ability, thus enhance the training efficiency and improve the results of the competition. In the same way, other sorts of ingredients in sports nutritive food all can improve the health of athletes through a series of physiological mechanism.

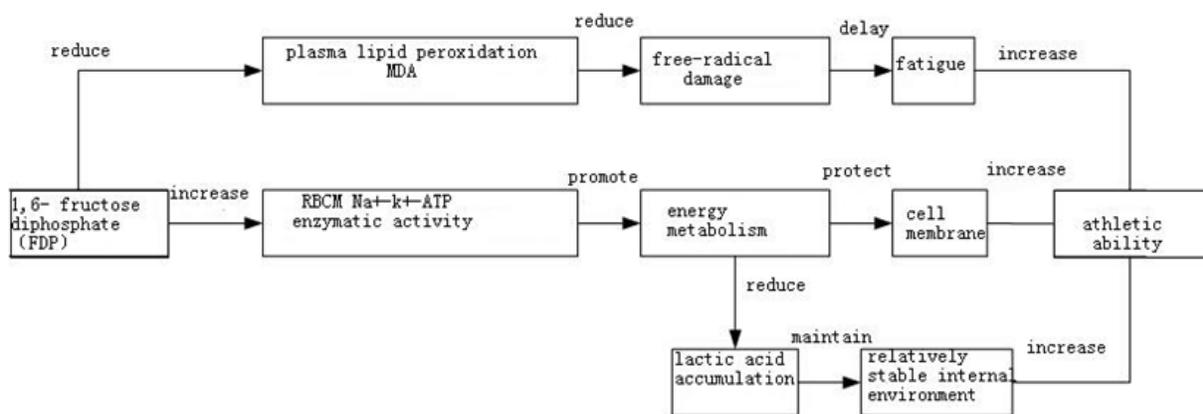


Fig. 2: The physiological mechanism map of 1, 6-Fructose Diphosphate (FDP)

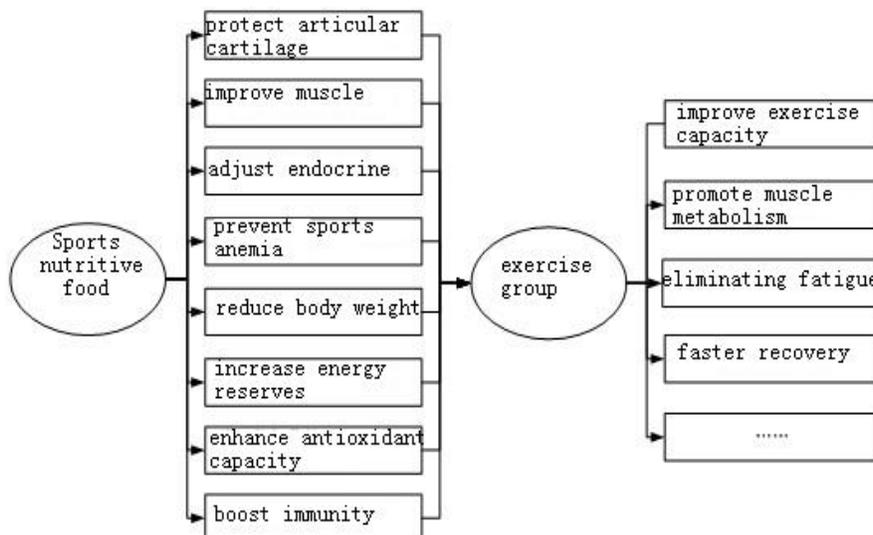


Fig. 3: Mechanism of sports nutritive food

It is some certain functional factors that make sports nutritive food be able to provide athletes with these effects (Lin *et al.*, 2011). These functional factors can influence specific sites of the athletes and further exert an effect on them. Its mechanism is shown in Fig. 3.

Figure 3 shows that sports nutritive food can provide athletes with various types of functional factors, such as the functional factors of protecting particular cartilage, of improving muscle and of increasing energy reserves. Each functional factor will be provided by specific nutrients. For example, vitamins and calcium can provide functional factors of protecting particular cartilage; creatine, vitamins and some minerals can provide functional factors of improving muscle; most carbohydrates and creatine can increase functional factors of increasing energy reserves.

Through certain biochemical reactions, functional factors in the human body targetedly provide the necessary nutrients for the body and in the context of protecting the health of athletes, these factors can significantly enhance their physical condition and improve their athletic performance.

### CONCLUSION

Currently, with the increasingly fierce competition in sports, athletes not only improve athletic performance through new training methods and increasing the amount of training, but also supply nutrients in scientific and reasonable method for the body and produce specific functional factors to improve

targeted exercise capacity, promote muscle metabolism, relieve sports fatigue and quickly recover physical strength. If an athlete cannot get timely and effective supply of nutrients, he not only will not recover soon from fatigue after training, but also bring physical damage due to overload training. Therefore, sports nutritive food is the material basis of athletes training and competition and has important implications for the development of sports.

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