

## Research Article

### The Explanation of the Problems of Middle-distance Race Athletes' Nutritional Meals

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**Abstract:** In order to minimize the negative effects of high strength and speed endurance training, when training with monitoring, the nutrition of the athletes should also be paid attention to. Middle-distance race takes speed endurance as the predominantly physical ability project; the requirements of speed and speed endurance of athletes are relatively high. Nutrition and diet are the most important found for athletes to intake nutrients and maintain their physical fitness, which play an important role in training guarantee. The Nutrition and diet order to long-term impart the training effects and the rehabilitation. Advocating the reasonable meal nourishment is the development trend of middle-long-distance training abroad. Food safety is the first element of any food, middle-distance race athletes in nutritional meals arrangement should be focused on.

**Keywords:** Middle-distance race athlete, nutritional diet, nutritional strategy

#### INTRODUCTION

After the 90 s, the international have recognitions on middle-distance race. Who takes distance as a predominantly speed endurance fitness class project, requires the ability to athletes have run fast, good speed endurance and strong muscle strength. It has relatively high requirements on speed and speed endurance. Wang (2001) presented study in 2001 showed the strong possibility of the application of OA with various sources which has tonic effects to increase the physical strength and endurance (Wang, 2001). JING prompted increasing physical activity is a key element in the treatment of individuals who are obese and in the prevention of weight regain in those who have successfully lost weight (Jing and Cheng, 1998).

The main development of speed endurance is improving lactic acid (glycolysis), lactic acid can supply energy high in 30 to 40 sec, can maintain to 2 min, equivalent to run 200-800 m, speed endurance running period of the basic development is in the range. It also suggests that distance is a kind of strong projects. The excellent middle-distance race athletes in the world can take the distance practice shorter of competition strength than special distance for practice to develop the speed endurance, its physiological basis is to use the intensity a bit short of practice, athletes mainly energy is given priority to glycolysis, when the glycolysis of athletes enhanced, which in turn promoting the uplift of the level of ATP-CP metabolic system. Ultimately achieve the purpose of taking long for short. Movement in the modern track and field sports training load increasing, especially middle-long-distance, athletes organism fatigue has been deepened (Zheng, 1990).

According to the theory of sports training, if there were no training, there would not be fatigue, if there were no fatigue, there would not be performance improvement. But over fatigue instead lead to performance declined dramatically. Today all the middle-long-distance coaches put the athlete's training and recovery after matches in the first place.

Reasonable use of sports nutrition supplements, will promote the health of athletes, improve sports ability and not cause harm to the physical and mental health of athletes. In this study, the research on the effects of sports nutrition supplements to the movement ability to do a review report. Under the motion state, the body energy consumption increased, which makes the body material and energy metabolism activity increase and lead to sports consumption of energy in the process of growing. In order to maintain body heat balance the loss of body water, electrolyte loss will increase during the metabolic process of state and energy metabolism; A variety of metabolic enzyme activity also need to be further strengthened. Therefore, reasonable nutrition supplement, in the process of movement is good sports fatigue elimination and the recovery of the body movement ability.

In order to minimize the negative effects of high strength and speed endurance training, when training with monitoring, the nutrition of the middle-distance race athletes should also be paid attention to. The samples of 100 middle-distance race athletes are obtained and from these data, it indicate that weight loss during moderate caloric restriction is not altered by inclusion of aerobic endurance exercise, but diet in conjunction with training can induce remarkable

adaptations in aerobic capacity and muscular strength despite significant reductions in body mass.

## METHODOLOGY

### The theory basis of nutritional meals:

**Materials:** The main function of speed endurance project performance middle-long-distance training means performance in the deep stimulate on bodies, longing for measuring presumptive, improve the function of the body's reserves, its theoretical basis is that the human body for high intensity anaerobic endurance training, make its produce strong stress response, to mobilize the body's function of potential, resulting in a series of anti-hypoxia physiological reaction to improve exercise capacity. Therefore, through the speed endurance training can maximize the mining the potential of oxygen and acid resistance and resistance to bad environment ability. The high intensity of speed endurance training can also be some adverse influence on the human body and medical biology. Its negative effects mainly performance in the maladjustment of body caused by aerobic-anaerobic state transitions, Training load not suitable to be controlled; Strength, speed, quality easy to lose; Susceptible to fatigue, injuries, unfavorable recovery, etc. High intensity anaerobic endurance training in medical biology problems mainly includes the following aspects:

- Metabolism of the body to strengthen, increased energy consumption
- The symptoms of respiratory system show as breathing rate increasing quickly
- The symptoms of the circulatory system show as tachyarrhythmia, quiet and sports center nervous, high blood viscosity, oxygen transport ability
- Plant nerve disorder
- The symptoms of digestive system abdominal distention, diarrhea, loss of appetite, defecate number increase
- Nerve-endocrine dysfunction, synthetic hormone levels significantly decreased
- Decreased of immunity
- The increased formation of free radicals and the decreased of antioxidant ability, etc

In order to minimize the negative effect of high strength and speed endurance training, besides training with monitoring, at the same time should also pay attention to the nutrition of the athletes.

In the process of high strength and speed endurance training, heat and a variety of nutrients in dietary must meet the special needs of athletes, but also to maintain the reasonable proportion between the various nutrients and adequate quantity, avoid deficiency or excess nutrition. The middle-distance race athletes daily energy supply should be 3900-4900 kcal; 60+/-5 kcal/kg body

Table 1: Function proportion of three major nutrients of athletes

Project	Function proportion of three major nutrients (%)		
	Carbohydrate	Protein	Fat
Play A	48.90	21.60	29.50
Play B	57.10	15.70	27.20
Play C	50.80	19.30	29.90
Play D	49.70	18.80	31.70
Play E	52.70	17.40	29.90
Play F	53.00	20.10	26.90
Play G	52.90	21.00	26.10
Play H	49.80	22.30	27.90
Average value	51.86	19.52	26.63
Recommend value	55~65	12~15	25~30

weight. In the high strength and speed endurance training, athletes' dietary fat intake should be unfavorable overmuch; especially animal fats should be less. Carbohydrate should be rich in food. Three major nutrients in the diet structure of energy ratio should be: Carbohydrate accounted for 60-65%; Protein accounts for 13 to 15%. Fat accounted for 20 to 20%. At the same time, should also pay attention to the intake of vegetables and fruits, supply each should be up to 500 g/day. Table 1, we can come to an conclusion that there are unreasonable phenomenon among three major nutrients, the energy supply of protein prefers more, the energy supply of carbohydrate prefers less, the energy supply of protein appears normal.

The digestive system of speed endurance load has a certain reaction, according to the characteristics of the speed endurance training, shall establish a corresponding system of diet. In anaerobic endurance training, more meals a day (4-5) is given should be given first place to and the intake of dinners' should not be too much should also pay attention to. Speed endurance training, for some hard to digest food, (such as animal fats, Fried, Yan La, smoked food, etc.) must be restricted.

Dietary fiber has certain physiological significance to human body health, but during the speed endurance training, a lower intake of dietary fiber should not be too thick, should not be too much, it will affect the nutrient uptake and cause gastric bowel to bilge gas and abdominal discomfort, etc. During the speed endurance training, exercise on an empty stomach and full stomach should be banned. Having dinner after at least 50 min exercise, training again after at least 2 h a meal rest.

### Nutritional strategy project for middle-distance race athletes:

Middle-long-distance project is a cyclical endurance for endurance quality especially aerobic endurance has very high requirements. In addition, middle-distance race athletes project due to long-term intensive endurance training destruction caused an increase in plasma volume movement intensified, lost a lot of perspiration increase iron loss in training and inadequate intake of iron is easy to cause "motility anemia. In all the year round trainings, we should use

Table 2: Athletes' vitamin intake

Project	RE (mg)	VB <sub>1</sub> (mg)	VB <sub>2</sub> (mg)	VC (mg)	Niacin (mg)	VE (mg)
Play A	1096.1	1.40	2.40	71.60	37.70	28.30
Play B	649.1	1.80	2.10	188.90	36.70	16.10
Play C	294.7	0.90	1.40	116.70	33.60	20.40
Play D	414.5	1.70	2.40	140.90	40.00	32.60
Play E	556.8	1.20	2.60	87.20	43.10	18.20
Play F	632.1	0.80	2.80	100.30	34.00	20.00
Play G	435.6	1.00	2.00	96.70	33.20	19.50
Play H	398.7	1.30	1.70	110.60	35.60	21.20
Average value	559.7	1.25	2.18	114.14	36.74	22.03
Recommend value	1500	5~10	2~3	20~30	140	6~10

the right nutrition means, ensure the athletes' physical ability and prevent the happening of the "sports anemia.

**Reasonable dietary nutrition arrangement:** Among modern sports science, sports nutrition has become one of the important aspects, without strong nutrition material basis for security can't achieve anticipated goal, at the same time also can't guarantee the effect of training and the health of the body, this has become a consensus of sports science at present. The so-called nutrients, in addition to reasonable dietary supplements, also need to have the help of sports nutrition food. If athletes with a sports car, athletes' dietary nutrition compared to the high quality gasoline, sports nutrition food, is to join the engine of the propellants. As accelerant can make the engine produces the power, sports nutrition food can help athletes take more training volume and training intensity, after the training as soon as possible to eliminate fatigue, physical stamina quickly recover, make their exercise capacity can be in the game.

Reasonable nutrition can provide motion of appropriate energy material, to ensure good supply and utilization of energy material, the level of energy substances (glycogen) in the muscles also have direct relationship with the occurrence of sports injury. At the same time also can solve some special medical problems in sports training, such as weight control before the motility anemia and special sports nutrition of teenagers. Athletes consumes a lot of calories and fat in trainings, protein accounts for about 12~15% of the total heat energy material, fat accounts for about 30% and carbohydrates for 55~70%. In ensuring athletes meat, fish, poultry, egg, bean these high protein food, milk and milk products to absorb, should match healthy green food such as vegetables and fruits, cereals, rice flour and a moderate amount of grains), etc.

Not only to ensure that the nutrition balance and diversity, athletes also requires food concentration, volume weight as little as possible. In addition, arrange the distribution of the heat in food three meals a day according to the volume and duty; give full consideration to the athletes' digestive function of consumption and eating habits, etc., to ensure that athletes have abundant strength, to meet the competition and training better. Speed skater training has

characteristics of long duration, without intermittent and dynamic type, so athletes' diet should meet the following requirements: diet provides enough heat, recommended in meat meals outside increase 1~2 times, which has helped to improve sports ability, but should pay attention to consider that adds balance nutrition and nutrition density; Diet should provide sufficient protein, protein supply heat should reach 12~14% of total quantity of heat, should eat more red meat and milk. Diet should have the right amount of fat, fat can be 30~35% of total calories; Dietary carbohydrate calories in general should be 55% of the total heat energy, the intake should be increased to 60~70% before the training and in order to improve the level of muscle glycogen; Should provide iron-rich foods, promote the synthesis of hemoglobin; Right amount of water and electrolyte should be added before competitions or trainings and after the games and trainings should also be timely supplement; eating more food containing adequate vitamin B and C is also necessary.

Table 2, we can come to a conclusion that the intake of vitamin A and B<sub>1</sub> is insufficient, the intake of vitamin B<sub>2</sub> is less, the intake of vitamin C and E are abundant and attach the recommend value.

#### THE INFLUENCE OF VARIOUS NUTRIENTS ON ATHLETIC ABILITY IN SPORTS DRINKS

The application of sports drinks can improve the body metabolism and thermoregulation; promote sports training, competition and fitness. Correctly use scientific preparation of sports drinks can help it play a better role. Chemical composition of different types of sports drinks should consider different movement environment, exercise intensity, exercise duration. And among of them sugar, water, electrolyte are different sports drinks formula design considerations of the common problems. In the midst of modern sports science, sports nutrition has become one of the important aspects, without the guarantee of powerful nutrients basis it is unlikely to attach the anticipated targets, at the same time also can't guarantee the effects of training and the health of the body, it has become a consensus of sports science at present because of its nutrients are variety.

**Minerals:** The study found that the generation of reactive oxygen species derivatives in cells, cancer and cardiovascular disease are closely related with the body, when the body which has the function of antioxidant vitamin and mineral content is insufficient, the body loses its ability to fight reactive oxygen derivatives, increasing the probability of disease (Galan *et al.*, 2005). As the important component of hemoglobin, iron participates in the body oxygen transport. When hemoglobin concentrations decrease in body, people are more prone to fatigue. The female athletes who are during the period of reducing period of iron supplement 100 mg of iron daily, for six weeks, not only can make the iron deficiency in body condition improved, also can reduce the concentration of lactic acid in the blood, the maximum oxygen intake increases, muscle power obviously improve the ability to get (Brutsaert *et al.*, 2003). Compared with the athletes, the athletes rate is as high as 25%, of zinc deficiency in carbonic anhydrase and red blood cells in the consumption of oxygen and carbon dioxide discharge, zinc deficiency of athletes in continuous overload exercise, carbonic anhydrase activity affected, red blood cells in the use of oxygen and carbon dioxide discharge will be blocked, athletic ability reduce (Lukaski, 2005). The limit load exercise to the body's immune function is restrained, the study found that in training or after the training, in the body of magnesium transient or obvious lack of sex, will affect the normal immune function, but the exact mechanism remains to be further studies in Laires and Monteiro (2008).

**Water and electrolyte:** Due to the body's energy demand increased in the process of movement, energy metabolism, increased along with the body's heat production and heat loss at the same time. Due to the increased sweating, loss of water, electrolyte a lot, cause airframe dehydration and electrolyte imbalance. Dehydration in the movement of the immediate harm is a reduction in the blood, leading to change of blood volume reduction, decreased stroke, increased heart rate and blood flow to the peripheral (skin), thermoregulation ability decline. Dehydration effect on normal physiological function is to reduce the result of the movement ability and cause the reducing of physiological function. Through the sports drinks and reasonable supplement can make the body of water, electrolyte quickly to correct and improve exercise capacity. To achieve this goal, the body should be considered to fully absorb the water in the sports drinks and sports drinks in the reasonable supplement electrolyte.

**Sugar:** Sugar is the most economic and most important form of energy supply of the body, there are three forms in the body has: blood sugar and muscle glycogen, hepatic glycogen. The blood sugar and muscle glycogen is energy directly; provide energy for muscle contraction

under aerobic or anaerobic state. The sugar supplement of sports can provide energy for the body quickly. Through the sports drink intake is an important way of carbohydrate supplement which is the most effective way to carbohydrate supplement in the middle of the movement. Sports drinks have influence on the concentration of sugar absorption of sugar. Research shows that the sugar concentration is a major determinant of sports drinks osmotic concentration. Sugar concentration increases, the beverage has also increased the concentration of osmotic pressure, lowering the body to absorb water, therefore, sports drinks high sugar concentration can't (De Hon and Coumans, 2007). In addition, sports drinks can affect the sugar concentration in the beverage through the stomach, the speed of the low permeability beverages by stomach time faster and make the drinks into the blood stream speed faster, is good for the body's absorption (Liu *et al.*, 2006). Sports drinks can also affect the kinds of osmotic pressure of concentration and water absorption. Now believe that sports drinks should use glucose, sucrose, oligosaccharides, chain starch and so on. And oligosaccharides absorption rate is slower than the monosaccharaides, disaccharides, more conducive to prolong the supply of sugar in endurance sports. Sports drinks contain many kinds of sugar is beneficial to promote the absorption of water. Because when the osmotic pressure of the solution phase at the same time, contain a variety of transport sugar solution than just contain a can transport sugar produces more water absorption (Peng, 1998).

**Exercise drink:** Middle-long-distance project in the training of the athletes should pay attention to add the sugar. Sugar is the main energy material, is the main component of muscle glycogen synthesis, so carbohydrate supplement can guarantee the athlete in the whole training process with abundant energy and is also the foundation of sports nutrition supplement. Athletic training and exercise can cause sweating, sweating too much will lose a lot of water, electrolyte and other nutrients, the water will only cause more nutrients lost, or difficult to eliminate to appear premature fatigue. Professional sports drinks, will blend essential water, sugar, inorganic salt and a variety of vitamins together, can profit fourth. Fitness drinks are given priority to with oligosaccharides, match with glucose, sucrose and fructose; at the same time is moderate amount of electrolyte and vitamin; do not contain carbon dioxide gas, alcohol and caffeine; Low osmotic pressure and the suitable concentration of electrolytes, vitamin and sugar can be absorbed quickly. Before, during and after sports it should be noticed to add nutrition in time.

**Iron:** Hemoglobin is made up of red blood cells and iron. So in the case of exercise-induced anemia, should pay attention to supplement protein as same as iron. Bit iron; for example, use the EDTA complex iron, highly

Table 3: Athletes' mineral substance intake

Project	Ca (ug)	K (mg)	Mg (mg)	Fe (mg)	Zn (mg)
Play A	1240.20	4524.70	782.40	39.8	19.00
Play B	1020.80	4751.00	743.60	34.9	16.30
Play C	834.90	3831.20	590.70	27.7	15.00
Play D	919.10	4363.30	713.40	38.4	17.30
Play E	1000.30	4562.20	720.90	28.6	14.30
Play F	1130.20	4500.70	739.60	27.1	15.20
Play G	989.50	4653.40	721.70	33.5	19.60
Play H	1002.50	4300.90	710.80	30.8	20.70
Average value	1017.19	4434.68	715.39	30.8	17.22
Recommend value	1000-2000	3000-5000	400-500	20~25	20~25

effective absorption, no rust, no gastrointestinal irritation, not effect on other mineral elements absorption advantages. Bit iron can offer rich iron for the production of hemoglobin, generally within two weeks can rectify athletes' anemia symptoms, take effect quickly.

**Lycopene:** Lycopene is a powerful antioxidant, vitamin E is it 100 times the antioxidant capacity. Taking the lycopene can improve the body's antioxidant capacity, protection membrane; prevent the damage of red blood cells, thereby maintaining the role of red blood cell concentration. In addition, intense exercise prone to all kinds of sports injury, some sports injury is closely related to the middle-long-distance project itself, middle-long-distance with professional and technical project movement characteristic. Especially after sports skeletal muscle cells injury is very serious, a lot of methyl-guanidine acetic acid kinase from muscle cells released into the blood, increased the content of serum methyl-guanidine acetic acid kinase, cause early exercise fatigue. If we can protect the muscle cell membrane, improve the toughness of the cell membrane, can effectively prevent the occurrence of these problems. Activities the role of sugar that is, its main component 1, 6 diphosphate-fructose can provide energy for the thin membrane directly, also can directly through the cell membrane, reduce the damaging effects of free radicals on the cell membrane. So athletes enter the preparation stage of training for the whole year, added activity of sugar is very necessary in advance, in order to maintain the body cell membrane integrity in a timely and effective manner (Luo, 1995). Winter training is an important stage of preparation, the athletes how winter training effect directly affect the status of athletes after special performance and competition period, so the nutrition of winter training work must be thoughtful, coaches and athletes deserves attention.

Table 3, we can come to a conclusion that the intake of mineral substances don't appear to be much different from recommend value. Among them the intake of Zn is a little less. On the whole, foods can fulfillment athletes' requirements of mineral substances in the daily diet.

## RESULTS AND DISCUSSION

Agent is an advanced computing, if we compare with the traditional numerical analysis method. It not only provides modeling methods, but also gives solution of the problem. In particular, agent-oriented system may deal with complex interactions between environment and the robot. Now more and more people think that the intelligence of robot is increased in these interactions. The reasonable nutrition is one of the important factors on promoting sport ability of athletes, although nutrition is no substitute for training, but the nutrition and other auxiliary hand sections combined with training, which will be beneficial to the improvement of the sports ability, therefore, research and rational diet and nutritional status of athletes to guide the reasonable arrangement of meals, athletes to guarantee reasonable nutrition, athletes have important theoretical and practical significance.

## CONCLUSION

As we can see, food safety is the first element of any food, is the guiding principle of the middle-distance race athletes diet and selecting and purchasing the food the first choice of standards. In 2008 the World Health Organization (WHO) published in the "guideline to strengthen national security plan" will be food safety interpreted as: On food production and consumption according to its original purpose without a guarantee, making consumers suffer about food safety or food safety in our country, is still a lack of a clear and unified definition. In competitive sports sense, food safety should be refers to food without any microscopic organism may harm of athletes, chemical pollutants and radioactive elements. But to any food ingredients, although they are beneficial to athletes body composition or its toxicity is extremely low. If you eat too many or improper conditions, it is likely to cause harm to health. For example, excessive salt intake can result in poisoning, drinking too much damage liver, stomach, fasting eat tomato to gastric calculus, for most athletes safe milk will cause allergic diarrhea. That is to say, the chemicals in the food, whether natural or added,

its security is relative, a food safety or not, depends not only on the processing, storage, edible methods is reasonable, edible quantity whether appropriate, also depends on the athlete's own internal conditions. Athletes only acquire dietary nutrition from ordinary daily diets is not enough; so as to meet the needs of high intensity training and competition extra special nutrients must be added. Sports nutrition supplements to alleviate sports fatigue and improve exercise capacity play a very important role.

Absolute food security is not simple for all the players can achieve in all conditions. For any components may cause damage in food in scientific tests, the study shows that to determine whether this component will accept for athletes, accordingly to formulate the corresponding standards, a process known as food safety evaluation. These components including normal food ingredients, additives, environmental contaminants, pesticides, transferred to the food packaging materials in the composition, natural toxins, mycotoxins and any other possible suspicious substance was found in food. Reasonable prandial collocation, physiological and biochemical monitoring, can improve the physical fitness athletes, eliminate fatigue have very good effect. In addition, the integrated application of the above recovery method also can effectively eliminate the exercise fatigue, helps to improve performance. We believe that along with the continuous development of sports nutrition, combined with scientific training, sports will also go up to a new stage.

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