

Research Article

Application Research on Functional Food for Improving Physical Fitness of Footballer

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Abstract: The physical fitness of footballer is an important factor for obtaining the good achievement, therefore it is necessary to improve the physical fitness of footballer based on advanced method. The functional food is an effective method for improving physical fitness of footballer. Firstly, the edible fungi functional food is analyzed. Secondly, the functional factors of functional food are discussed. Thirdly, the energy supply characteristic and main physical indexes of footballer are studied. Finally, the corresponding experiment is carried out using 30 footballers as subjects and results show that the functional food can improve the physical fitness of footballer effectively.

Keywords: Footballer, functional food, physical fitness

INTRODUCTION

The functional food can improve and regulate the function of human body and strength the human-machine-environment harmony, it can improve the physical fitness of footballer. The functional food has five conditions:

- It has definite health function.
- It concludes functional factor or effective component with definite chemical structure.
- The functional factor can exist in the food stably and it has certain shape and content.
- It passes through three stages of oral food.
- It is taken safely and is accepted by people.

The functional food can promote the body transforming to health status, the disease can be prevented and the health can be improved (Souza *et al.*, 2014).

The football has the following characteristics, quick offensive rhythm, fierce fighting and total football tactics, during the procession of match the footballer runs, reinforce and compete repeatedly and the good physical fitness storage should be processed for completing all kinds of skilled movements. During the procession of match, the physical decline of footballer will lead to falling of physical, mental, feeling, emotion, the mistake movements will increase and the higher technical and tactical levels cannot be played. The number of goals is most in end stage of football match, these phenomena shows that the physical fitness of footballer dropped significantly and mistakes increase, then the goal-scoring chances can be grasped by the opponent, therefore the physical level of footballer can be critical factor for obtaining the victory of match (Xiang, 2013).

Edible fungi functional food: With continuous increasing of functional food, the edible fungi food has been concerned by people for its advantages, such as safe, natural, nutritious. The edible fungi functional food has the following characteristics.

Nutrition: The edible fungi functional food concludes rich protein and average occupies 3.5-4% of wet weight, where concludes eight kinds of amino acids that is needed by human body, is the main source of vegetable proteins in 21st century and the content of fat and heat is relative low, fat concludes 72% of unsaturated fatty acid, which is important factor of health food. The edible fungi also concludes carbohydrate, cellulose, minerals, polysaccharide, three terpene compounds, its nutrition is very rich (Salgado *et al.*, 2012).

Functionality:

Polysaccharide: The fungus polysaccharide is high polymer generated by over ten monosaccharides as glucosidic bond connection, which is separated from fungus. The fungus polysaccharide can regulate the immunologic function of human body under the effect of leukomonocyte, macrophage, endothelial system, then the anti invasion ability of virus and bacteria can be improved.

Structure of polysaccharide: The polysaccharide structure of edible fungi comes from mycelium, fruiting bodies and fermentation liquid of fungus. The active ingredient of edible fungi polysaccharide structure has ramal β -(1-3)-D-dextran, these activity polysaccharide components have a common structure, that is the main chain is made up of β -(1-3)-D-connection glucosyl, the glucosyl connected though β -(1-6) distributes along main chain randomly and it shows comb-like structure.

The size of biological activity changes with fine structure and conformation difference of polysaccharide.

Micronutrient: The edible fungi functional food concludes rich micronutrients, such as selenium and germanium. The selenium is one of necessary micronutrient for human body, which is an indispensable part of glutathione peroxidase, this kind of enzyme can protect the biomembrane effectively. It is necessary to obtain enough selenium for footballer. The content of germanium in hyphostroma of edible fungi functional food is high and the content of germanium in glossy ganoderma is three to four times to that in ginseng. The germanium has the following functions: Health, prolong life, anti-aging, anti-tumor.

Free radical scavenger: The edible fungi functional food has the effect of deleting radical. The radical in human body can damage the normal cell and lead to the aging of body. And the radical can damage the disease resistance and shield ability of body, which bring out all kinds of diseases, therefore the edible fungi functional food can improve immunity of footballer.

METHODOLOGY

Functional factors of functional food:

Polyunsaturated fatty acid: The polyunsaturated fatty acid mainly concludes EPA (Eicosapentenoic Acid), DHA (Docosahexenoic Acid), γ -linolenic acid, linoleic acid, α -linolenic and AA (Arachidonic Acid) and so on. The main function is to reduce the cholesterol and blood pressure. EPA and DHA are not only the important component of cell for footballer, but also prevent and cure cardiovascular disease. DHA can improve the movement effect of footballer effectively (Muñoz *et al.*, 2013).

Peptide and protein: Polypeptides have the nutrient value of protein and have important regulating effect. These regulating effects relate to all physiological activities such as nervous system, digestive system, circulatory system and endocrine (Basanta *et al.*, 2014).

Functional oligosaccharide: The functional oligosaccharide is a kind of oligosaccharide that the number of monosaccharide ranges from 2 to 10, which has special physiological action and it has low calorific power and can improve intestinal colony structure. It concludes isomerization of lactose, fructooligosac sugar, GOS, the sugar, sugar oligosaccharide, soybean oligosaccharides. The main effect of oligosaccharide can generate benefit flora (Goetzke and Spiller, 2014).

Phospholipid: The phospholipid is an important content of constructing cell membrane, which can

protect cell and transfer metabolite concentration. The edible phospholipid can repair the biomembrane damaged by radical, it can delay the body aging. The main varieties have lecithin, soybean lecithin, where the lecithin is the choline donor in acetylcholine and is also the constituent of brain cell, it can decide the information transformation speed. In addition, lecithin can promote the blood circulation, improve serum lipid and clear superoxide and reduce the content of cholesterol and neutral fat.

Ginsenoside: Ginsenoside is main active ingredient of ginseng. The ginseng can reinforce vital energy, reinforce the spleen to benefit the lung. The ginsenoside can improve external cytotoxicity of tumor infiltrating lymphocyte, which has the synergistic positive regulation for TIL cell.

Sulfocompound: The sulfocompound in garlic oil can inhibit tumor, which concludes $C_6H_{10}S_2O$, $C_6H_{10}NO_3S$ and $C_6H_{10}S_3$. The sulfocompound can improve the effect of macrophage in stomach and restrain growth of nitrate reducing bacteria.

Soy isoflavone: The soy isoflavone is secondary metabolite of soybean growth. The soy isoflavone has weak phytoestrogen and anti estrogenic effect. The physiologic function of it can prevent the osteoporosis, the soy isoflavone has antioxidant activity, which can inhibit aging of skin to skin cells.

Energy supply characteristic and main physical indexes of footballer:

Energy supply characteristic of footballer: The total distance of activities for footballer ranges from 8706-14274 m in a high level match, the number of rapid sprint is about 200, at same time the footballer should complete plenty of explosive actions, where walk occupies 26.3%, jog occupies 44.6%, rapid sprint occupies 18.9%. The direct source of energy is Adenosine Triphosphate (ATP), the final source of muscle activity energy is the aerobic oxidation of sugar and fat. ATP is supplied by three different energy, firstly is the phosphagen energy supplying system (ATP-CP), second is lactic acid primary energy supply system and aerobic oxidation system. During the procession of football, the concentration of lactic acid is shown in Table 1.

Main physical indexes of footballer:

Basal heart rate: The basal heart rate is used to measure the physical condition and training load intensity of footballer, when the footballer occurs exhaustion, the basal heart rate will speed up or slow down abruptly. When the basal heart rate shows a stable and gradual decline, the functional state of footballer is

Table 1: Blood lactate concentration of footballer after match

Time	Person-time	Avg. value/ (mmol/L)	Wave range/ (mmol/L)	2.22-6.1 mmol/L	
				Person-time/person	Proportion/%
First half	25	4.92±1.49	2.38-8.79	27	79.4
Second half	82	4.39±1.32	2.15-8.63	78	87.8

Avg.: Average

good and the load strength is proper. When the sports load increases, the basal heart rate will increase accordingly.

Vital capacity: Continuous vital capacity is obtained from the following procession, the vital capacity is measured five times continuously, the function ability of respiratory muscle is judged according to the changing trends of five times results, if the last is bigger than or identical to the former, then the respiratory function is strong and the physical condition is good. For the excellent footballer the vital capacity is over 5000 mL (Liang, 2014).

Hemoglobin: During the procession of adjustment period after plenty of movement for the footballer, the hemoglobin recovers from low to high, this period the footballer can feel good about oneself, the footballer can show good aerobic capacity, the hemoglobin value measured is 12-15 g/100 mL, the hematocrit value of red blood cell is about 45% and the physical condition is In the best period because the hemoglobin level of footballer is different, there is not an united normal value standard to evaluate the hemoglobin content of footballer, for different footballer, a long time observation should be carried out, then the optimal value of hemoglobin can be confirmed.

Blood urea: The movement training can make the protein metabolism of footballer keep a high level, therefore the quiet blood urea value of footballer is high. The bigger the amount of exercise is, the longer the run duration is, the more obvious the blood urea increases, the blood urea value will recover slower in next morning. If the blood urea value rises suddenly, the load capacity of footballer is not proper and the physical function will decline. If the blood urea value increases continuously, the physical function of footballer cannot be recovered and the footballer is in state of fatigue.

Blood lactic acid: The exercise intensity, training level and duration can affect the formation rate of blood lactic acid. Because the football match is a sport with high intensity, it has short time and high strength, the organism of footballer will deoxidize. The more lactic acid will generate in the muscle, therefore the footballer must has high level of lactate tolerance (Narizuka *et al.*, 2014).

Table 2: Related data of researching objects

	Experimental group	Controlling group
Average age/year	21.43±2.32	22.54±6.82
Average height/cm	173.42±8.42	173.82±6.23
Average weight/kg	63.42±7.32	64.12±4.72

Experiment and analysis:

Subjects: The researching objects are chosen from soccer team, 30 male football players are used as the researching objects and the training time of them is 3-4 years.

The researching objects are divided into experimental group and controlling group randomly, the experimental group concludes 15 footballers and the controlling group also concludes 15 footballers. The related data of researching objects are shown in Table 2.

Researching method: During the procession of training, the footballers in two groups complete same training plan every day, they carry out training six times every week and the training time is 3 h every time. During the training period, the footballers in experimental group supply functional food, which concludes rich protein, amino acids, vitamins, carbohydrates and minerals. The footballer in controlling group supply equal amount of purified water and they do not supply any functional food, the experimental time is 12 weeks.

Testing indexes and method:

Maximum oxygen consumption: The maximum oxygen consumption is measured by 800-Ergometer cycle ergometer, the test begins after 5 min preparation actions, the original load of it is 100 W and it increases 50 W every 3 min and the test is over when the footballer exhausts, the total time, the exercise heart rate, the maximum oxygen consumption are measured, 3 mL venous blood is taken out 3 min after exercise, Heparin, centrifuge, Serum and cold test.

Routine blood test: The number of erythrocyte, hemoglobin concentration, hematocrit and mean corpuscular volume are measured by Symsex K-4500 hematology analyzer.

Blood lactate concentration: The blood lactate concentration is measured based on improved Barker-Summerson method.

Blood urea and creatine kinase: The content of blood urea is measured by microcolorimetry and creatine

Table 3: Blood constituent changing situation of footballer before and after training

	Controlling group		Experimental group	
	Before experiment	After experiment	Before experiment	After experiment
Hb/ (g/L)	135.30±2.32	130.10±1.86	135.40±4.63	139.80±3.78
RBC/ (10 ¹² /L)	4.83±0.45	4.53±0.36	4.72±0.27	5.35±0.68
Hct/ (%)	38.24±0.89	41.76±4.25	39.59±2.64	52.58±1.86
MVC/mL	74.29±5.94	81.54±6.87	76.53±2.06	75.91±1.84

Before experiment: p<0.05; After experiment: p>0.05

Table 4: Biochemical indicator of footballer in controlling and experimental groups before and after training

	Controlling group		Experimental group	
	Before experiment	After experiment	Before experiment	After experiment
Bla/ (mmol/L)	1.89±0.57	8.43±0.53	1.94±0.62	8.53±0.53
CK	298.32±68.12	354.92±47.28	295.48±36.91	328.76±54.28
BUN	6.82±1.34	7.04±0.79	6.32±0.73	6.72±0.69
Blood sugar/ (mmol/L)	5.72±0.84	5.28±0.74	5.32±0.73	5.58±0.63

kinase is measured by creatine kinase coupling kit method.

Data processing method: All data are analyzed based on t inspection, the obvious level is taken as 0.05. The basic steps of t inspection is listed as follows:

Step 1: Construct null hypothesis: $H_0 : \mu_1 = \mu_2$.

Step 2: Compute the value of t. The computing method is different for different kinds of problem:

- If the difference degree between the average value of small sample and total average value is judged, the corresponding formulation is expressed as follows:

$$T = \frac{\bar{X} - \mu_0}{\frac{S}{\sqrt{n-1}}} \quad (1)$$

- If the difference degree between average value of two groups of samples should be judged, the expression of t value is listed as follows:

$$T = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sum x_1^2 + \sum x_2^2}{n_1 + n_2 - 2} \times \frac{n_1 + n_2}{n_1 \times n_2}}} \quad (2)$$

Step 3: Search t value table according to freedom degree $d_f = n-1$, find out specified t value to carry out comparison.

Step 4: Compare computed t value and theoretical t value, judge the occurrence probability, then give the final judgment.

RESULTS AND DISCUSSION

Effect of functional food on the blood biochemical indexes of footballer: The blood constituent changing situation of footballer before and after training is shown in Table 3.

From Table 3, the Hb value of controlling group decreases before and after experiment, which the Hb value of experimental group keeps constant before and after experiment. RBC and MVC of controlling and experimental group have no obvious changes. The value of Hct improves obviously before and after experiment. These results show that the functional food can prevent the obvious decreasing of hemoglobin and keep the function of red blood cell.

The biochemical indicator of footballer in controlling and experimental groups before and after training is shown in Table 4.

From Table 4, the CK level increases and the BUN level increases before and after training for controlling group, the CK and BUN level have no obvious changes before and after training. According to the changing rules of Bla concentration, the functional food can improve aerobic capacity of skeletal muscle.

The physical fitness is an important part of competitive ability for footballer and therefore it is necessary to improve the physical fitness of footballer through effective measurement. The functional food concludes many active ingredients, which can regulate the physiological function of footballer. The functional food can improve the physical fitness of footballer effectively, then the good achievement of footballer can be obtained.

CONCLUSION

Functional food has good health function for footballer, which can be applied in improving the physical fitness of footballer. The functional food concludes dietary fiber, peptide and protein, functional oligosaccharide, selenium and soy isoflavone. The functional food can improve the immuno-competence of footballer and improve the physiological function of footballer. Experimental analysis shows that the functional food can improve the physical fitness of footballer effectively.

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