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Research Article

Effect of Chinese Sports Nutrition Supplements on Physical Recovery and Improvement of Football Player Based on Fuzzy Clustering Algorithm

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Abstract: Chinese sports nutrition supplement is a auxiliary driving means of movement training and match and the application of it on physical recovery and improvement of football player is studied in depth. Firstly, the development situation of Chinese sports nutrition supplements is summarized. Secondly, Fuzzy clustering algorithm based on Monte Carlo T inspection is analyzed and main indexes are introduced, respectively. Thirdly, the experimental objective and method are set. Finally, the experimental results show that the Chinese sports nutrition supplement can be applied in the physical recovery and improvement of football player effectively.

Keywords: Chinese sports nutrition supplement, football player, fuzzy clustering algorithm, Monte Carlo T inspection, physical recovery and improvement

INTRODUCTION

The auxiliary driving means of movement training and match has been concerned by people. With the development of the sports medicine and sports science, the new recognition on the relationship between the nutritional supplement and athletic ability and healthy has appeared. Except for the training and genetic factors, the nutrition factor can affect the athletic potential of the football player. The modern professional training pursues the training with high density, high strength and long time. When the physical agility of the football player drops off rapidly, generally some nutrient substances can not be supplied completely through supplying the nutrition based on diet before the next training or match, therefore the special nutrition supplements are playing an increasingly important role, the effect of the nutrition supplements has been accepted by the sports science field. Using Chinese medicine as the nutrition supplement has been accepted at home and abroad widely. Chinese medicine can regulate and improve the physiological function of football player on the whole, relative to synthetic drugs and other biological agents. Chinese medicine can improve the immune ability, oxidation resistance and anti fatigue ability and it has not obvious side effect at the same time, it is different from the analeptic, which has wide application view and developing value (Stephens, 2010).

The physical agility of football player mainly concludes two aspects, which are speed and endurance. The football belongs to a comprehensive sport event integrating physical agility, technical ability and mental power, where the physical agility is the basis and premise of completing the combined tactics and technology and developing the training level comprehensively. In modern football match, the attack and defense conversion speed accelerates and the antagonism is also more and more intense. If the football players have not good physical agility, they have difficulty in winning the match. Chinese medicine with movement function can improve the athletic ability of the football player and prevent and cure the sport injury of the football players and relieve the fatigue of the football players and improve the training effect of the football players. It is feasible to study the physical recovery and improvement of football player based on Chinese sports nutrition supplements (Plotan *et al*., 2014).

Fuzzy clustering algorithm based on Monte Carlo T inspection: Fuzzy clustering algorithm can ensure the clustering results of statistical sample through calculating the optimal fuzzy membership degree and clustering center, which is simple and quick, it is fit for classification of many samples and therefore this method can be used in classified counting of data, the clustering results are obtained according to the following expression (Zhi *et al*., 2013):

$$\begin{cases} u_{ik} = (\sum_{j=1}^{c} \frac{d_{ik}}{d_{jk}})^{-\frac{2}{m-1}} \\ P_i = \frac{\sum_{k=1}^{n} (u_{ik})^m X_k}{\sum_{k=1}^{n} (u_{ik})^m} \end{cases} \quad (1)$$

where, u_{ik} denotes the membership degree of k th sample to i th mode, the fuzzy parameter is taken as 2, P_i is the clustering center of i th class, d_{ik} is the distance between i th sample X_k and i th clustering center P_i, the Euclidean distance formula is used in this research, which is expressed as follows:

$$d_{ik}^2 = \left\| X_k - P_i \right\| \tag{2}$$

Data randomness changes greatly and has high dimension, then the data space appears random distribution mode, the traditional inspection statistical quantity and inspection method can not inspect data correctly, therefore the proper statistical quantity should be constructed again. Let M denote the number of random sample point, $U^d(i)$ denotes the distance between the i th sample point and the closest mode X_p, $V^d(i)$ denotes the distance between mode X_p and the closest mode X_q. For a uncalibrated mode $X = [x_1, x_2, \cdots, x_n] \in R^d$, then the statistical quantity T is expressed as follows (Wang *et al*., 2013):

$$T = (\frac{1}{M}\sum_{i=1}^{M}\frac{U^d(i)}{U^d(i)+0.5V^d(i)} - 0.5)\sqrt{12M} \tag{3}$$

When the sample number $M \geq 10$, the sample satisfies the standard normal distribution $N(0,1)$, then the statistical inspection can be used for random distribution mode.

T inspection method based on Monte Carlo method can be carried out based on the following steps: M sample points are set up randomly in sample framework, then the statistical quantity T is calculated, if $T > T_a$, the times is recorded. Let $t = t+1$, the procession mentioned above is carried out N times. The final inspection value $s = t/N$ is obtained, finally judge whether $s \leq \alpha$, if the condition is satisfied, the mode can be considered as single peak mode, otherwise, the mode collection has the trend of subdivision.

The algorithm procession of analyzing the effect of Chinese sports nutrition supplements on physical recovery and improvement of football player is listed as follows (Maraziotis, 2012):

Step 1: Read the data sample of physical ability of football player and the characteristic quantity of n football players are calculated according to the following expression:

$$\begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ x_{n1} & x_{n2} & \cdots & x_{nm} \end{bmatrix} \tag{4}$$

where,

m = The number of characteristic quantity
n = The number of football players
x_{ij} = The j th characteristic quantity of i th football player

Step 2: The characteristic quantity is combined and normalized as sample space of original sample, let c = 0

Step 3: $c = c+1$.

Step 4: The clustering center matrix $P = [P_1, P_2, \ldots, P_c]$ and membership degree matrix are calculated and the clustering results are obtained, $Y = [y_1, y_2, \ldots, y_c]$, y_i is the statistical collection of i th class football players.

Step 5: The statistical quantity $\{T_1, T_2, \ldots, T_c\}$ is calculated when M = 10, the sample experiment is repeated 51 times, the final inspection value S_i is obtained according to Monte Carlo method.

Core physical agility and strength of football player: The core physical agility is a kind of physical ability concludes size of the strength, action stability and body balance reflected by relating abdominal muscles, back muscles and small muscles in body during the procession of movement. Good and bad of the core physical agility are affected by the core muscles and can be reflected by the core muscles finally. The core physical agility has an important effect on the movement of the people, which can be decided by the physiologic function of core muscles (An, 2014).

The core physical agility of the football players refers to the center position, abdominal muscles, back muscles and small muscles in the body showed by football players during the procession of training and match for achieving the predict technical action and strategies of the football team. The important indexes of football players are listed as follows:

Heart rate: The heart rate is the speed of heart throbbing, which is an important good and bad index of body function. For other indexes, the heart rate has the characteristics of simple and easy to operate and it is benefit for understanding the physical state of the football player and controlling the strength of the sports load and training level, the basic heart rate is morning pulse of the football players, which can be used to measure the physical state of the football player and the strength of the sports load and training. When the football players experience the physical fatigue or discomfort, the heart rate will speed up or slow down suddenly. The basic heart rate shows higher stabilization and decreases, gradually, the football players often have the good physical state and proper sports load. When the sports load increases, the basic

heart rate will rise and the general changing amplitude is not more than six times. The heart rate during the procession of training and match has something with the sports load, the sports load strength can be evaluated by measuring the heart rate.

Vital capacity: The vital capacity can reflect the respiratory function of body and there are two determination methods of vital capacity, which are continuous vital capacity determination and time vital capacity determination, respectively. The former method measure the vital capacity five times continuously and the function of the respiratory muscle can be evaluated based on changing trend of five times testing results. If the next result is bigger than the first result, which shows the respiratory function is good and the physical function is also good. Otherwise, the respiratory muscle is in the state of the fatigue and the physical function state is poor, or the fatigue of the football player is not recovered (Hou and Li, 2013).

Hemoglobin: The hemoglobin index is mainly used to evaluate the athletic ability of the football players, the function state of the football player can be evaluated based on reflection of football players to the amount of exercise and exercise intensity in one to two weeks. The hemoglobin if the football players recover from low level to high level during the adjustment period after the football player carries an amount of exercises the football players feels good and the football player can reflect the good aerobic capacity and the hemoglobin value measured at this moment changes from 12 to 15 g/100 mL, the Hematocrit value of the red blood cell is about 45% and the physical function of the football player is in the good state. However, the hemoglobin value of male football player is lower than 12 g/100 mL and the hemoglobin value of female football player is lower than 10 g/100 mL, the football coach should consider the regulation of sports load and proper nutrition supplement. Because the hemoglobin value of football players are different and the hemoglobin content of the football player can not be evaluated based on the united normal standard. Therefore, the systematical and long time observation should be carried out for different football players and the optimal value of hemoglobin can be confirmed.

Blood urea: The blood urea is the metabolic end product of amidogen in the protein and amino acid molecules and is released into the blood through cyclic synthesis of ornithine in hepatic cell. The movement training of football player can make metabolizing of the protein of the football player keep a higher level, therefore the rest value of the blood urea for the football player is generally high. The changing amplitude of the blood urea is affected by the sports quantity greatly. The more the sports quantity is, the longer sports time is and the more obvious the blood urea increasing is and the slower the recovery of the blood urea value. If the blood urea increases suddenly, the football player can not adapt the sports load or the physical function of the football player decreases. If the blood urea increases continuously, the physical function of the football players can not be recovered and the football players are in the state of fatigue, at this moment the sports quantity of the football players should be regulated (Reeuwijk *et al*., 2014).

Blood lactate: The blood lactate is the result that the acetylformic acid that generated by muscle sugar metabolizing is restored into the lactic acid and then enter into the blood because of the inadequate oxygen. The sports strength, training level and lasting time and other factors can affect the generating rate of blood lactate directly. Because the football match is a sport with high strength, the loaded spots with short time and high strength can lead to the oxygen deficit of the body, the anaerobic metabolism becomes the main energy supplement system and many lactic acids can generate in the muscle, therefore the football player should has high lactate tolerance level. Because the football sport has the characteristics of more training content, more players participating in training, quick changes of time and space. When the value of lactic acid is used to monitor and evaluate the load strength, the interval time and place of collecting blood should be assigned reasonably. The time of collecting blood is not too long for ensuring the correctness of index (Effati *et al*., 2013).

EXPERIMENTAL OBJECTIVE AND METHOD

In order to analyze the effect of the Chinese medicine on the physical recovery and improvement of the football players, the corresponding experiment is carried out.

Experimental objective: Fifty football players are chosen as the experimental objectives to carry out the experiment and the basic situation of the football players are listed in Table 1.

Researching method: Training plan: the male and female football players are divided into two groups, respectively, which are experimental group and control

Table 1: Basic situation of the football players chosen

	Male football players	Female football players
Number	25	25
Old/year	19±1.5	18±1.2
Height/cm	172±10	167±14
sport career age/year	5±1.4	5±1.1

group. the football players in the experimental group take Chinese medicine and the football players in the control group does not take Chinese medicine, for the male football players and female football players, the experimental group concludes 15 football players and the control group concludes 10 football players.

The football players in every group enter the training together. The average training strength is about 80% maximum oxygen uptake levels, the training plan is listed as follows: the training time is 30 days, the training time of football players is 3 h in the morning and the training time of football players is 3.5 time in the afternoon.

Chinese medicine and placebo: The compound Chinese medicine used in this experiment concludes ginseng, atractylodis, pseudo-ginseng, schizandra, red flower Chinese yam and barbados aloe, which is made as capsule and granule, the placebo uses hawthorn capsules.

Chinese medicine delivery forms and dosage: The Chinese medicine is taken after mixing it with warm water, once each morning and evening every day. One package each time for the granule and two capsules each time and the full course of treatment is 30 days.

Collecting method of blood sample: The football players should be on an empty stomach during the procession of collecting blood and the blood is collected from 8:30 to 9:30 in the morning. All football players are drawn 6 mL venous blood before training and every biochemical indicators are measured, the same venous blood is drawn in three days after the training and the every biochemical indicators are also measured.

Statistical analysis: All data is expressed by average number±standard deviation and every index carries four times different obvious inspection (t inspection), the condition $p<0.05$ denotes that the difference has obvious significant meaning.

RESULTS AND DISCUSSION

Every indexes of experimental and control groups before training are shown in Table 2. And every indexes of experimental and control groups after training are shown in Table 3.

After training, every index of every group has the increasing trend and the four times difference is no significant and the heart rate and vital capacity of experimental and controlling group has significant difference, which is close to the obvious level of difference according to the statistical analysis ($p<0.01$). The differences of hemoglobin, blood urea and blood lactate in experimental and controlling groups is significant ($p<0.05$).

The Chinese sports supplements are mainly the forms of drugs and there are many oral liquids. In the traditional forms of drugs, the doses of some medicines are big and are inconvenient and the decoction method of them is complex. The external Chinese traditional medicine is applied in the treating the sports injure are made through ground and the end product on sale has not been found in the market. Therefore the movement function of dosage forms of traditional Chinese medicine and its processing means should be combined with the modern science. A new form of drugs should be developed and a lot of convenient and quick effective forms of drugs should be accepted by football players. In addition, the formula of the existing most Chinese supplement is Chinese traditional medicine, which has the special advantages in improving the athletic ability, however some Chinese contents are very complex and is difficult be checked and long use will lead to some adverse reactions, therefore the Chinese sports nutrition supplement should be developed from the angle of ensuring the safety of the product and developing the new resources.

Table 2: Every indexes of experimental and control groups before training

Item	Male football players		Female football players	
	Experimental group	Controlling group	Experimental group	Controlling group
Heart rate/(time/min)	189.4±12.3	176.2±10.4	165.3±10.5	158.3±9.36
Vital capacity/(mL)	45344±542.5	46682±502.6	34316±326.1	36227±452.2
Hemoglobin/(g/100 mL)	16.03±0.72	17.36±0.62	12.53±0.84	14.28±0.59
Blood urea/(mmol/L)	6.99±1.26	5.62±1.05	4.82±0.94	3.61±0.88
Blood lactate(mmol/L)	12.82±1.05	14.37±1.48	3.18±0.47	5.27±0.33

Table 3: Every indexes of experimental and control groups after training

Item	Male football players		Female football players	
	Experimental group	Controlling group	Experimental group	Controlling group
Heart rate/(time/min)	195.2±11.5	184.9±9.8	178.2±12.6	163.7±10.02
Vital capacity/(mL)	46261±562.5	47730±542.2	36182±364.7	38419±466.3
Hemoglobin/(g/100 mL)	16.11±0.84	18.29±0.77	14.68±0.99	16.32±0.77
Blood urea/(mmol/L)	7.62±1.33	6.48±1.27	5.91±1.12	4.18±0.92
Blood lactate(mmol/L)	14.95±1.26	16.83±1.59	4.27±0.76	6.58±0.46

CONCLUSION

At present, some excellent achievements relating to the Chinese sports nutrition supplement have been obtained. The statistical analysis is carried out based on fuzzy clustering algorithm based on Monte Carlo T inspection. The Chinese sports nutrition supplement can improve the athletic ability of the football player and improve the immunity of the body and therefore it has wide developing view.

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