RELATIONS OF BIOCHEMICAL PARAMETERS IN THE ENDURANCE AND PHYSICAL FITNESS OF SOCCER PLAYERS

RELAÇÕES DE PARÂMETROS BIOQUÍMICOS NA RESISTÊNCIA E APTIDÃO FÍSICA DOS JOGADORES DE FUTEBOL

RELACIONES DE LOS PARÁMETROS BIOQUÍMICOS EN LA RESISTENCIA Y LA APTITUD FÍSICA DE LOS FUTBOLISTAS

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ABSTRACT

Introduction: Many factors restrict the development of soccer technology. An athlete's body constitution, quality, and physical function are essential for achieving technical development. Objective: Analyze the relationship between biochemical parameters on sports endurance and the physical fitness of soccer players. Methods: Samples were collected from volunteer players 20 days before the game, during the adjustment period, and on the morning of the intensive game. Enzyme staining and immunofluorescence method were used for hemoglobin detection. Results: Male soccer players had an average Hb of 15.18 g/dl in pregame preparations and dropped to 13.97 g/dl in high-level games. These data were statistically significant (P<0.01). Conclusion: Cortisol in high-level soccer players rapidly produces several stressful substances in the body. The blood sugar content of participants from elite youth soccer teams in China is within the normal range. The research findings of this paper can provide a theoretical basis for the formulation of soccer training strategies. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Soccer; Athletes; Hemoglobins; Fitness Trackers.

RESUMO

Introdução: Muitos fatores restringem o desenvolvimento da tecnologia do futebol. Sendo a constituição corporal, a qualidade e a função física de um atleta suas garantias essenciais para a realização do desenvolvimento técnico. Objetivo: Analisar as relações dos parâmetros bioquímicos na resistência esportiva e na aptidão física dos jogadores de futebol. Métodos: Foram coletadas amostras de jogadores voluntários 20 dias antes do jogo, durante o período de ajuste durante o jogo, e na manhã do período de jogo intensivo. Foi utilizado o método de coloração enzimática e imunofluorescência para detecção de hemoglobina. Resultados: Os jogadores masculinos de futebol apresentaram uma média de Hb de 15,18 g/dl nos preparativos pré-jogo e caíram para 13,97 g/dl em jogos de alto nível. Esses dados foram estatisticamente significativos (P<0,01). Conclusão: O cortisol em jogadores de futebol de alto nível produz rapidamente diversas substâncias estressantes sob o organismo. O teor de açúcar no sangue dos participantes de times de futebol juvenil de elite da China está dentro da faixa de normalidade. As conclusões da pesquisa deste trabalho podem fornecer uma base teórica para a formulação de estratégias de treinamento de futebol. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Futebol; Atletas; Hemoglobinas; Monitores de Aptidão Física.*

RESUMEN

Introducción: Son muchos los factores que limitan el desarrollo de la tecnología del fútbol. Siendo la constitución corporal, la calidad y la función física de un atleta sus garantías esenciales para la realización del desarrollo técnico. Objetivo: Analizar la relación de los parámetros bioquímicos en la resistencia deportiva y la aptitud física de los futbolistas. Métodos: Se recogieron muestras de jugadores voluntarios 20 días antes del partido, durante el periodo de adaptación durante el partido y en la mañana del periodo de juego intensivo. Se utilizó el método de tinción enzimática e inmunofluorescencia para la detección de la hemoglobina. Resultados: Los jugadores de fútbol masculino mostraron una media de Hb de 15,18 g/dl en la preparación previa al partido y descendió a 13,97 g/dl en los partidos de alto nivel. Estos datos fueron estadísticamente significativos (P<0,01). Conclusión: El cortisol en los jugadores de fútbol de alto nivel produce rápidamente varias sustancias estresantes en el organismo. El contenido de azúcar en sangre de los participantes de los equipos de fútbol juvenil de élite en China está dentro de los límites normales. Los resultados de la investigación de este trabajo pueden proporcionar una base teórica para la formulación de estrategias de entrenamiento de fútbol. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Fútbol; Atletas; Hemoglobinas; Monitores de Ejercicio.*

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INTRODUCTION

A football player's physical condition and many other aspects will affect the player's technical ability. The techniques and strategies here are all cultivated. These skills rely on continuous learning and exercise, and physical fitness can change during training, but it will also change due to genetics.[1] Internationally, football competition intensifies day by day, and players' physical quality and physical function are necessary guarantees for football technology and the application of technology. This study used indicators such as hemoglobin, serum creatine kinase, testosterone, cortisol, and blood indicators. These indicators comprehensively test each item of the National Games.

METHOD

Research objects

The essential physical fitness of athletes is shown in Table 1 below. This project adopts the tracking test method. This test method is to perform a fasting venous blood test 20 days before the competition, during the adjustment period during the competition, and in the morning of the intensive competition period.[2] The research method uses an enzyme colorimeter to detect Hb and T. The researchers refer to relevant literature, which summarizes the coach's work experience and personal subjective feelings.

Table 1. Profile of the players.

n	Age	Height (cm)	Weight (kg)	Years of training (y)
12	29.04±4.4	199.65±4.42	84.92±5.87	7.7±2.6

Data Analysis

All indicators in this paper are expressed as x±sd. In this paper, SPSS10.0 statistical software was used for the statistical processing of data and paired t-test was passed.[3] In this paper, P<0.05 was regarded as a significant difference, and P<0.01 was regarded as a significant difference.

Research on Endurance Evaluation Criteria

x is the event space of the random variable probability distribution $M(x)$. If the probability distribution $N(x)$ is used for coding, how many bits are added to the coding length of each critical event (symbol) on average. We denote the KL distance by $D(M \| N)$, as in formula (1)

$$D(M \| N) = \sum_{x \in X} M(x) \log \frac{M(x)}{N(x)} \quad (1)$$

When $D(M \| N) = 0$, it means $M(x) = N(x)$, ie, the two distributions are precisely the same. $f(t) \in X$, then the problem can be formalized as formula (2)

$$\min_t F(t), \; s.t. \; f(t) \in X \quad (2)$$

Minimize the distance between the probability distribution of scores and the probability distribution of soccer scores under the constraint of $f(t) \in X$. In this way, the athlete's score with a longer endurance running time must be less than or equal to the score of the athlete with a shorter endurance running time.[4] The bound function $f(t)$ is monotonically decreasing.

There is no need for a code of ethics for this type of study.

RESULTS

The hemoglobin content of football players at different stages

It can be seen from Table 2 that the average Hb of male football players during pre-match preparations is 16.7 g/dl, but it drops to 15.37 g/dl in high-level competitions.[5] The data were statistically significant (P<0.01). There was a significant difference in Hb level at 116.07g/dl in the preparation before the competition (P<0.05). There was a significant difference between the intense competition period and the adjustment period (P<0.05). The average level in the blood can be divided into a decrease from the pre-match preparation stage to the competitive intensity stage, and there is a tendency to increase during the adjustment stage of the game.

Player's highest and lowest hemoglobin

It can be seen from Table 3 that the Hb of the competitor during the high-intensity competition was 18.15 g/dL. This is lower than Chinese sub-ideal Hb diagnostic criteria.

Comparative study of serum testosterone in players of different ages

It can be seen from Table 4 that the T value of male football players was 7.43 ng/ml during pre-match preparation and decreased to 5.96 ng/ml during high load, which was statistically significant (P<0.01). During exercise, the adjusted period increased again to 7.02 ng/mL. This was statistically significant compared with high-intensity exercise (P<0.01). There was no significant difference between the adjustment and pre-competition preparation phases.[6] The average blood testosterone level gradually decreased from the pre-match preparation stage to the competition intensity stage. Its adjustment phase to the game has increased.

DISCUSSION

The researchers found that the aerobic metabolic system can quickly replenish the creatine phosphate in the aerobic metabolic system, and these metabolisms can accelerate the synthesis of ATP. Aerobic metabolism is based on ordinary aerobic capacity, and these in vivo reactions can meet the specific physical fitness requirements of athletes.[7] The characteristics of football make its aerobic exercise different from the ordinary concept of aerobic endurance. Therefore, the training of exceptional aerobic fitness should not be based on traditional physical fitness methods or ordinary physical fitness evaluation methods. The degradation of CP is not dependent on oxygen,

Table 2. Mean serum concentrations in each stage.

Time	Pre-match preparation period	Competition Intensive Period	In-game adjustment period
Hb(g/dl)	16.7±0.89	15.37±0.43	16.07±0.11

Table 3. Minimum hemoglobin (g/dl) at each stage.

Hemoglobin content	Pre-match preparation period	Competition Intensive Period	In-game adjustment period
Maximum value	18.15	16.28	17.60
Minimum	15.29	14.74	13.31
mean	16.70	15.37	16.07

Table 4. The average content of serum testosterone in each period.

Time	Pre-match preparation period	Competition Intensive Period	In-game adjustment period
x±sd	7.43±1.3	5.96±1.2	7.02±1.28

but the transport of CP in this truck is carried out by oxygen. In the middle and low intermittent stages, the aerobic and energy systems continuously resynthesize CP. In Skype after Skype, CPs are constantly being dismantled and combined.

"In the second half of the football match, the athletes' physical fitness had severe problems. This was due to insufficient CP supplementation in the high-energy phosphoric acid system and a lack of lactate and phosphorus supply in muscle tissue.[8] These deficiencies caused the recovery of CP in physical fitness and strength. The top priority. Football is like this. They were shooting vigorously, fighting hard, and breaking through quickly. ATP is the key to football. In addition, it is different from periodic sports such as long-distance running, cycling, and football, so quickly replenishing energy has become an item. The important aerobic function will be directly related to the effect of repetitive and challenging sports in football.

Heart rate and cardiopulmonary function are closely related. The training intensity of the athlete is generally based on the introductory heart rate, the rapid heart rate after training, and the heart rate during recovery. In the evaluation of sports performance, the study found that the more significant the difference between the heart rate after exercise and the heart rate during the recovery period, these changes all indicate that the athlete's recovery is higher and the cardiorespiratory function is higher better.

Plasma proteins

Studies have found that as the primary mediator of oxygen and carbon dioxide transport, hemoglobin plays a crucial role in its decomposition and regeneration during human movement. Heme is 90% of red blood cell protein, and its role is to transport CO2 and acid. The results showed that in physical training, Heme had the most apparent effect on physical fitness.[10] These factors increase Heme in the blood and can significantly improve the body's oxygenation and recovery. However, hemoglobin does not have to be high. Still, if it is high, it will increase the viscosity of the blood, increase the burden on the heart, affect the regular operation of the body and induce hemorrhagic coagulation. The results showed that the hemoglobin levels of the outstanding male players in China were between 120-160 g/L. The aerobic metabolism function of the human body is suitable for hemoglobin at 160 g/L, and the suitable red blood cell pressure multiplier is 0.45. The hemoglobin content of Chinese young elite athletes is higher than 140 g/L, and the hemoglobin is 152.6 g/L, which matches the 160 g/L currently recognized by the best athletes in the world. Aerobic metabolism is the most crucial energy source on the football field, and 98% of these energy sources are produced by aerobic metabolism.

Blood-Lactate urea

Blood urea is a substance that can reflect an athlete's exercise load and exercise intensity.[11] Blood urea in adults is between 1.8 mmol/L and 8.9 mmol/L. The substance contained in the blood is a substance contained in the blood called lactic acid. In this paper, blood urea, blood lactate, and other methods monitor the dynamic changes in motor function.

Triglycerides

Plasma glucocorticoid responds more sensitively to exercise. During exercise, its level will increase with the increase of exercise volume, thereby adjusting the body's adaptability to the external environment, which is not conducive to the rehabilitation after exercise. Changes in blood sugar levels are closely related to emotional stress, injury, fatigue, illness, and high-intensity training.[12] Glucocorticoids in serum are hormones that are rapidly produced when the body is under stress. The study found that the total blood sugar content of China's elite youth football teams was within the standard range of general elite athletes.

Plasma and testosterone are the main parameters that reflect the physical state of athletes. They are also the primary basis for guiding coaches to select materials and formulate and adjust training programs. In different environments, genes are important factors affecting testosterone in 78% of men and 91% of women. In addition, in the three periods of spring, summer, and spring, androgen production has a significant circadian rhythm. At the same time, the functional status and exercise load of the human body will also affect the human body.[13] The researchers found that the blood testosterone level of excellent Chinese male athletes is 9.5~35.0 nmol/L;

Hemoglobin and blood testosterone are biochemical parameters that detect human blood. The combination of hemoglobin, blood testosterone, and other physiological and chemical indicators can make up for the lag of hemoglobin and blood testosterone. The levels of serum testosterone and Heme in different groups of athletes are all normal, and there are individual differences. When the exercise intensity is high, the athlete's hemoglobin level is higher than the sub-ideal level, indicating that the athlete has the possibility of excessive fatigue and exercise-induced anemia. During the competition, the levels of hemoglobin and testosterone in the runners' blood are microscopic.

CONCLUSION

The football player's Hb value is in the ideal aerobic exercise stage in the stage of high exercise intensity. At lower values, athletes are prone to fatigue and exercise-induced anemia. The relationship between testosterone in the blood of the subjects of this paper and blood is relatively weak. Many factors restrict the development of football technology studied in this paper. The research on athletes' physical form, physical quality, and physical function is an essential basis and guarantee for realizing their technical and technical abilities, and the factors of physical durability of football players have been found.

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