SERUM-HORMONAL VARIATIONS IN JUNIOR BASKETBALL PLAYERS UNDER INTENSIVE TRAINING

ALTERAÇÕES SÉRICO-HORMONAIS DE JOGADORES JUNIOR DE BASQUETEBOL EM TREINAMENTO INTENSIVO

ALTERACIONES SERO-HORMONALES DE JUGADORES DE BALONCESTO JUNIOR EN ENTRENAMIENTO INTENSIVO

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ABSTRACT

Introduction: Basketball is a long-duration, high-intensity ball game. High competition and athletic combat require athletes to perform at an excellent technical and tactical level. Therefore, studying physiological indicators related to serum-hormone levels of basketball players is an effective way to implement scientific physical monitoring of athletes. Objective: This paper aims to understand the intense training effect on hormone-related physiological indicators in young basketball players. Objective: This paper aims to understand the effect of intense training on physiological indicators related to serum-hormonal levels in young basketball players. Methods: Serum hormone indices of 11 healthy young players without organic or genetic diseases were compared before, 2, 4, and 24 hours after an intense training protocol. Results: Creatine and blood urea levels. After 24 hours, the levels were close to those found pre-workout. Conclusion: Basketball training can improve the anaerobic capacity of young players. There is a high correlation between changes in serum hormones in young people and their physical fitness. ***Evidence Level II; Therapeutic Studies - Investigating the result.***

Keywords: Exercise Training; Basketball; Athletes; Serum Protein.

RESUMO

Introdução: Basquetebol é um jogo de bola de longa duração e de alta intensidade. A competição acirrada e o combate esportivo exigem que os atletas tenham um bom nível técnico e tático. Portanto, estudar os indicadores fisiológicos relacionados ao hormônio sanguíneo dos jogadores de basquetebol é um meio eficaz para implementar o monitoramento físico científico dos atletas. Objetivo: Este artigo tem como objetivo entender o efeito do treinamento intenso sobre os indicadores fisiológicos relacionados ao hormônio nos jovens jogadores de basquetebol. Métodos: Índices hormonais séricos de 11 jovens jogadores saudáveis sem doenças orgânicas ou genéticas foram comparados antes, 2, 4 e 24 horas após um protocolo de treino intenso. Resultados: Os níveis de creatina e ureia sanguínea 2 horas após o exercício e 4 horas após o exercício foram maiores do que os anteriores ao treino. Após 24 horas, os níveis estavam próximos ao encontrado no pré-treino. Conclusão: O treinamento de basquetebol pode melhorar a capacidade anaeróbica dos jovens jogadores. Há uma alta correlação entre as mudanças nos hormônios séricos dos jovens e seu condicionamento físico. ***Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.***

***Descritores**: Treinamento Físico; Basquetebol; Atletas; Proteína Sérica.*

RESUMEN

Introducción: El baloncesto es un juego de pelota de larga duración y alta intensidad. La feroz competición y el combate deportivo exigen que los atletas tengan un buen nivel técnico y táctico. Por lo tanto, el estudio de los indicadores fisiológicos relacionados con los niveles de hormonas séricas de los jugadores de baloncesto es una forma eficaz de llevar a cabo un seguimiento físico científico de los deportistas. Objetivo: Este trabajo pretende conocer el efecto del entrenamiento intenso sobre los indicadores fisiológicos relacionados con el nivel sero-hormonal en jóvenes jugadores de baloncesto. Métodos: Se compararon los índices hormonales séricos de 11 jugadores jóvenes sanos sin enfermedades orgánicas o genéticas antes, 2, 4 y 24 horas después de un protocolo de entrenamiento intenso. Resultados: Los niveles de creatina y de urea en la sangre 2 horas después del ejercicio y 4 horas después del ejercicio eran más altos que antes del entrenamiento. Después de 24 horas, los niveles se acercaban a los encontrados en el pre-entrenamiento. Conclusión: El entrenamiento de baloncesto puede mejorar la capacidad anaeróbica de los jugadores jóvenes. Existe una alta correlación entre los cambios en las hormonas séricas de los jóvenes y su condición física. ***Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.***

***Descriptores**: Entrenamiento Físico; Baloncesto; Atletas; Proteínas Séricas.*

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INTRODUCTION

Basketball is a long-time, high-intensity, non-cyclical ball game. The fierce competition and strong antagonism determine that this event requires athletes to have a good technical and tactical level.[1] Stable psychological quality and excellent physical fitness and physical fitness is the fundamental guarantee for the final realization of the first two. During heavy-load training, we need to grasp the degree of adaptation of the body to the exercise load and the recovery of physical fitness.

So,we need to implement scientific physical monitoring of athletes. This allows the coach to know the training and the players well.[2] This is also an aspect of scientific research serving sports training practice.

The foundation of basketball in China is relatively good, and various places pay more attention to the training of reserve forces.[3] However, scientific research in this area has not kept up. Scientific research for young athletes is still relatively weak. Therefore, this article intends to research the physiological and biochemical indexes of young male basketball players before and after heavy-load training. In this way, we discuss some problems of physical fitness monitoring for young athletes during heavy-load training.

METHOD

Experimental subjects

There are 11 male basketball players. The volunteers had no history of organic disease or genetic disease after health examination.

Experimental method

At 8 a.m., take quiet venous blood to measure hemoglobin (Hb), red blood cell count (RBC) and white blood cell (WBC), blood urea nitrogen (BUN), blood lactic acid (BLa), serum hormone testosterone (T) and cortisol (C), and serum the activity of enzymes CK and LDH. The maximum oxygen uptake was measured using the US 2900 gas metabolizer.[4] After performing warm-up activities on the treadmill for 5 minutes, stick electrodes and wear a mask to increase intensity. Finger blood was collected 3 to 5 minutes after exercise to measure the blood lactic acid value.

Optimization and Simulation of Youth Basketball Shooting Techniques

R represents different intensity shooting training stages and A represents a sample of shooting technique concentration changes collected in different historical training states.[5] Then use formula (1) to give the law of changes in shooting skills of teenagers at different training load stages

$$F_{i,T} = \frac{R}{\lambda} \times \varpi(\phi \times \alpha) \qquad (1)$$

ϖ represents the probability of a change in shooting technique after training. ϕ represents the mean value of quantitative changes in shooting techniques at different training load stages.[6] α represents the period when shooting technique training is more sensitive. δ represents the characteristics of changing factors that affect the level of shooting skills. ξ represents the adjustable coefficient of the shooting technique. Use formula (2) to give the influence of each training stage on the level of youth shooting skills

$$\theta(d,k) = \frac{(\delta \times \xi)}{[\Psi]^{\Phi}} \times \chi(j,k) * (M)_{(\partial)} \qquad (2)$$

$\chi(j,k)$ represents the ratio coefficient of shooting training level and technical improvement in different training stages. M represents the set of factors that have significantly changed shooting techniques. α represents the correlation between shooting skills and the physical state of adolescents. $\zeta(k,n)$ represents the improvement level of shooting skills before shooting training. h_j stands for the evaluation index of shooting technique content. $l(k,n)$ represents the improved level of shooting skills after training.[7] Utilize formula (3) to establish the principal model of training youth shooting dynamic system

$$X_{[k,l]} = \frac{\zeta(k,n)}{l(k,n)} h_j(\Pi) \times \sigma(j) \qquad (3)$$

$\sigma(j)$ represents the best proportional relationship between training and shooting skills and the energy balance of the body.

Statistical processing

All results are expressed as the mean ± standard deviation. And the T-test is performed before and after the control. $P<0.05$ is the significance level, $P<0.01$ is the high significance level.

RESULTS

Aerobic capacity of young male basketball players

The Hb of young male basketball players in this study was 15.39±0.89g/dl. RBC is 496.2±304,000/mm^3. WBC is 6189.1±11.265 million/mm^3. Their VO2max is 52.18±5.72ml/kg.min, but individual differences are relatively large.[8] This shows that the aerobic endurance level of athletes is high or low. The maximum heart rate is 193.3±6.8 beats/min, and the maximum lactate value is 11.86±2.93mmol/L. (Table 1)

Changes in blood lactic acid and blood urea nitrogen of adolescent male basketball players before and after heavy-load training

Immediately after heavy training and 24 hours later, it was significantly higher than at rest. It was more obvious after 24 hours, but it was not statistically significant. This may be related to its large standard deviation. On the other hand, it also shows that the recovery situation of each team member is different. This is similar to changes in C and serum enzymes.[9] It is more meaningful to assess the functional status of players than the quiet value of blood urea nitrogen immediately after exercise. Its objective existence reflects whether the fatigue of the athlete's body has been eliminated and whether the functional level has been restored. (Table 2)

Changes in serum hormone levels of adolescent male basketball players before and after heavy-load training

The T value of young male basketball players is 478.6±182.7ng/dl, which is quite different among individuals. This study shows that T does not change significantly after a high-intensity training (462.7±196.1ng/dl) and 24 hours after exercise (495.3±215.6ng/dl). On the one hand, the change of T is inseparable from long-term training with a specific load, so the impact of heavy load training on it is relatively limited.[10] On the other hand, large individual differences may also make the statistical results not significantly different.

C immediately after heavy training (19.5±2.54ng/dl) has a highly significant difference from the quiet value (12.9±3.03ng/dl). However, after 24 hours (15.72±5.60ng/dl), it has returned to the normal level, and there is no significant difference. We know that C is an indicator

Table 1. Aerobic capacity of young male basketball players.

Test index	Numerical value
Hb(g/dl)	15.39±0.89
RBC (ten thousand/mm^3)	496.2±30.4
WBC (pcs/mm^3)	6189.1±1126.5
VO2max(ml/kg.min)	51.18±5.72
Maximum lactic acid value (mmol/L)	11.86±2.93
Maximum heart rate (beats/min)	193.3±6.8

Table 2. Changes in blood lactic acid and urea nitrogen of adolescent male basketball players before and after heavy-load training.

Test index	Quiet value	Immediately after exercise	24 hours after exercise
BLa(mmol/l)	2.95±0.64	8.46±2.53	2.85±0.72
BUN (mg%)	10.23±2.16	15.20±2.59	17.82±5.77

of the body's stress level. When the external stressor causes the body to produce a certain stress level, the level of C will increase to stimulate other stress systems.[11] This enables the body to adapt and resist external stimuli as quickly as possible and better protect itself. (Table 3)

Changes in serum enzyme activity of young male basketball players before and after heavy-load training

We can see from Table 4 that the change of serum CK immediately after exercise is higher than that of quiet, but there is no significant difference from the quiet value. However, when he woke up early the next day, 24 hours after exercise, there was a significant increase, which was a highly significant difference compared to quiet.[12] This can show that the change of CK has the characteristic of "delay." This change also shows that the exercise load designed in the experiment produced a certain stimulus to the athlete's body until the early morning of the second day. We can think that this delayed change of serum CK has a certain significance for monitoring large amounts of exercise. We also saw no significant change in serum LDH immediately after exercise and 24 hours after exercise compared to a rest. Still, the standard deviation of the test results was relatively large. From the comparison of the test results, the sensitivity of CK to training is higher than that of LDH. It is suggested that it can be selected and applied in sports training practice.

Table 3. Changes in blood lactic acid and urea nitrogen of adolescent male basketball players before and after heavy-load training.

Test index	Quiet value	Immediately after exercise	24 hours after exercise
T(ng/dl)	478.6±182.7	462.7±196.1	495.3±215.6
C(ng/dl)	12.9±3.03	19.5±2.54	15.72±5.60

Table 4. Changes in serum enzyme activity of adolescent male basketball players before and after heavy-load training (N=11).

Test index	Quiet value	Immediately after exercise	24 hours after exercise
CK(IU/L)	54.78±22.51	61.38±25.82	92.25±31.23
LDH(IU/L)	178.73±34.87	182.09±28.73	188.94±35.36

DISCUSSION

We see a certain gap between the players' lactic acid level and the maximum lactic acid value after heavy training. This is because the maximum lactic acid value is the lactic acid level 3 to 5 minutes after the maximum oxygen uptake is done. The training intensity cannot always be maintained at the maximum intensity.[13] The determination of training intensity is based on the player's maximum heart rate, which is also based on the player's maximum oxygen uptake. This is why the maximal oxygen uptake, lactate value, and heart rate must be measured before the big exercise training.

The role of CK is to catalyze the reversible conversion of high-energy phosphate bonds between adenosine triphosphate and creatine phosphate. Therefore, CK is one of the key enzymes of energy metabolism in skeletal muscle cells.[14] The research on the changes of serum enzymes in the recovery period after exercise is mainly reflected in the time and size of the peak serum enzymes after exercise. But this is closely related to exercise intensity, exercise time, exercise mode, and experimental subjects. The changes in untrained ones are more obvious than those with training, eccentric exercises have more obvious changes than centripetal exercises, and gravity exercises have more obvious changes than non-gravity exercises.

CONCLUSION

BLa can be used as a monitoring indicator of exercise intensity, but its differences are large. The individual differences in T-scores of young male basketball players are relatively large. At the same time, the change is not obvious after high-intensity training. The changes of C and BUN before and after high-intensity training are meaningful for monitoring physical fatigue. There were significant changes in serum CK activity before and after high-intensity training. CK changes are relatively sensitive.

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