# PHYSICAL FUNCTION CHARACTERISTICS OF SWIMMERS IN PRE-COMPETITION TRAINING

*CARACTERÍSTICAS DA FUNÇÃO FÍSICA DOS NADADORES EM TREINAMENTO PRÉ-COMPETIÇÃO*

*CARACTERÍSTICAS DE LA FUNCIÓN FÍSICA DE LOS NADADORES EN EL ENTRENAMIENTO PREVIO A LA COMPETICIÓN*

**Original Article**
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## ABSTRACT

Introduction: Swimming is a competitive athletic activity whose fundamental objective is to produce high-performance athletes capable of standing out worldwide. Aerobic balance directly affects the athletic performance of these professionals. Objective: Investigate the changes in the physical composition and functional characteristics of swimmers before the competition. The results can play an important guiding role in the training plan of the Chinese athletics team in the competition. Methods: To explore the relationship between swimmers of different ages, the athletes were trained, and their physiological and chemical changes were monitored before the competition. A statistical, mathematical method was used to analyze the data. Results: After exercise, the swimmers' hemoglobin, red blood cell count, hematocrit, creatine kinase, blood urea, and other indices had changed. The difference between the two groups was significant (P<0.05). Conclusion: The results showed that the swimmers' body function was stable before the competition with better exercise load capacity. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

**Keywords:** *Swimming; Sports; Competitive Behavior; Physical Training, Human; Athletes.*

## *RESUMO*

*Introdução: A natação é uma atividade atlética competitiva cujo objetivo fundamental é produzir atletas de alto rendimento capazes de destacarem-se mundialmente. O equilíbrio aeróbico afeta diretamente o desempenho atlético desses profissionais. Objetivo: Investigar as mudanças na composição física e nas características funcionais dos nadadores antes da competição. Os resultados podem desempenhar um importante papel de orientação no plano de treinamento da equipe de atletismo chinesa na competição. Métodos: Para explorar a relação entre nadadores de diferentes idades, os atletas foram treinados e suas alterações fisiológicas e químicas foram monitoradas antes da competição. Utilizou-se método matemático estatístico para analisar os dados. Resultados: Após exercício físico, a hemoglobina dos nadadores, contagem de glóbulos vermelhos, hematócrito, creatinaquinase, ureia no sangue e outros índices tiveram alterações. A diferença entre os dois grupos foi significativa (P<0,05). Conclusão: Os resultados mostraram que antes da competição, a função corporal dos nadadores foi estável com melhor capacidade de carga de exercício.* ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

***Descritores****: Natação; Esportes; Comportamento Competitivo; Condicionamento Físico Humano; Atletas.*

## *RESUMEN*

*Introducción: La natación es una actividad atlética competitiva cuyo objetivo fundamental es producir atletas de alto rendimiento capaces de destacarse a nivel mundial. El equilibrio aeróbico afecta directamente al rendimiento deportivo de estos profesionales. Objetivo: Investigar los cambios en la composición física y las características funcionales de los nadadores antes de la competición. Los resultados pueden desempeñar un importante papel de guía en el plan de entrenamiento del equipo de atletismo chino en la competición. Métodos: Para explorar la relación entre nadadores de diferentes edades, se entrenó a los atletas y se controlaron sus cambios fisiológicos y químicos antes de la competición. Para analizar los datos se utilizó el método matemático estadístico. Resultados: Tras el ejercicio, la hemoglobina, el recuento de glóbulos rojos, el hematocrito, la creatina quinasa, la urea en sangre y otros índices de los nadadores presentaron cambios. La diferencia entre los dos grupos fue significativa (P<0,05). Conclusión: Los resultados mostraron que antes de la competición, la función corporal de los nadadores era estable y con mejor capacidad de carga de ejercicio.* ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

***Descriptores:*** *Natación; Deportes; Conducta Competitiva; Acondicionamiento Físico Humano; Atletas.*



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## INTRODUCTION

In swimming competitions, the body is the main physical literacy, and its physical condition directly affects the sports performance of the athlete. Physical fitness is the most basic sports quality of an athlete's body. The content includes three aspects: form, function, and quality.[1] Game skills are multifaceted. An athlete's body undergoes a variety of mechanical changes. It would be too incomplete to look at it from the point of view of only one class. In physical education, pre-competition training is a very critical part. This sport can accurately understand the functional status of athletes and the level of exercise. The purpose of this paper is to analyze the physiological composition and functional characteristics of swimmers in pre-competition training.[2] The results can play a certain guiding role in the training plan and the formulation of the training plan of the Chinese track and field team in the competition.

## METHOD

### Research objects

Twenty swimmers were used as experimental subjects. Among these people, there are ten men and ten men each. There were significant differences in various physiological function parameters such as age, height, and weight.[3]

### Research methods

This trial requires a physical fitness test within four weeks of the race. The indicators measured in this paper include hemoglobin, red blood cell count, white blood cell count, hematocrit, creatine kinase (CK), blood urea (BUN), serum testosterone (T), etc. Take the test once a week.[4]

### Image extraction of motion poses

Based on the fusion technology of regional distribution, the edge contour features of swimmers in the whole training process are studied. Therefore, this paper can obtain a complete set of distributions of the whole trained pixels:

$$F = \frac{\partial \phi(x,y)}{\partial t(\theta,\lambda)} \mu \frac{\theta_i^{right} + \lambda_i \theta_i^{left}}{\theta_i^{right} - \lambda_i \theta_i^{left}} \quad (1)$$

Where $\partial,\phi$ represents the voxel distribution parameter. $\lambda_i$ B represents the spatial distribution set vector. $\theta_i^{right}$, $\theta_i^{left}$ It represents the allocation of a three-dimensional pixel. A set vector represents a space. The correlation of different motion videos in different spatial scales is described. Its expression is:

$$\theta_i^{right} = \int_{-\infty}^{+\infty} \frac{\lambda_i (y-x)}{\left| f(y) - f(x) \right|^2} dx \quad (2)$$

$$\theta_i^{left} = \int_{-\infty}^{+\infty} \frac{\lambda_i (y-x)}{\left| f(y) - f(x) \right| + \left| f(y) + f(x) \right|} dx \quad (3)$$

Suppose a two-dimensional image is $I(x, y)$. Suppose a flat picture is. This paper uses the difference of Gaussian function DOG to obtain a monitoring image acquisition mode based on DOG:

$$G(x,y,\sigma) = \frac{1}{2\pi\sigma^2} + \sqrt{\left| \left(x^2 + y^2\right) - \left(x^2 - y^2\right) \right|^2} \quad (4)$$

In. $\sigma$ It is a proportional space-time coefficient.

### Mathematics and Statistics

In this paper, the data obtained from the test are calculated and screened by conventional statistical methods.[5] Raw data are stored and databased by Microsoft Excel. Mathematical statistics use SPSS11. 5 Statistical software performs statistical processing on the obtained test data.[6]

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

## RESULTS

The changes in hemoglobin, red blood cell count, and hematocrit index of Chinese elite male and female swimmers are basically the same. Three weeks, two weeks, and one week before the competition gradually reduced to the end of the training, generally maintaining a high training level.[7] There was a big difference between the last time and the previous four weeks ($P<0.05$). In the blood of male swimmers, the hemoglobin level in the blood reached 170.61 grams per liter 3 weeks before the competition.[8] The minimum measurement two weeks before the race is 157.26 g/l. Measured one week before exercise was 164.13 g/L. Female swimmers had the highest blood levels in the three weeks before the competition. The measured result was 147.32 g/L. The minimum measurement two weeks before the race was 133.97 g/L. Within one week of the race, the measurement was 143.06 g/L. (Table 1)

There are differences in the blood and creatine kinase index of Chinese elite male and female swimmers during training. However, that hasn't changed much. The male swimmers scored 242.4.33 mmol/L in the four weeks before the competition. The minimum standard one week before the competition is 216.98 mmol/L.[9] Female athletes have the best results within two weeks of the start of the competition. The measurement result was 162.18 mmol/L, which was the lowest point in the first week of the competition, and the measurement result was 152.01 mmol/L. The results of serum creatine kinase assays in male and female athletes in the week before competition were similar to those during training.

There was also a certain difference in the blood urea index between male and female swimmers during training.[10] Not much has changed. All data are within a normal range. Within three weeks of competition, the blood pressure of male athletes was 6.76 mmol/L. Four weeks before the game is the lowest point. The measurement was 6.18 mmol/L.[11] The value measured one week before the competition was 6.36 moles per liter. Female athletes reached their highest levels within three weeks of competition, measuring 6.06 mmol/L. Within one week of the competition, the measurement was 5.81 mmol/L. Male and female swimmers had lower blood urea measurements one week before competition than during training. During the entire training period, the blood and

**Table 1.** Six results of blood cells.

| | | Four weeks before the game | Three weeks before the game | Two weeks before the game | One week before the game |
|---|---|---|---|---|---|
| Hb(g/L) | Male | 159.91±9.78 | 170.61±11.91 | 157.26±12.07 | 164.13±9.88 |
| | Female | 140.31±8.56 | 147.32±8.55 | 133.97±9 | 143.06±13.08 |
| RBC (10*12) | Male | 5.64±0.44 | 6.05±0.35 | 5.58±0.57 | 5.76±0.41 |
| | Female | 5.18±0.59 | 5.34±0.48 | 4.75±0.51 | 5.16±0.61 |
| HCT | Male | 42.69±3.52 | 46.19±2.66 | 42.31±3.28 | 44.11±3.22 |
| | Female | 39.61±4.7 | 40.55±2.16 | 35.84±2.59 | 39.15±3.43 |
| CK (mmol/L) | Male | 242.4±112.53 | 222.28±84.46 | 233.41±58.66 | 216.98±81.97 |
| | Female | 159.72±65.96 | 156.69±55.42 | 162.18±47.61 | 152.01±46.3 |
| BUN (mmol/L) | Male | 6.18±1.02 | 6.41±1.03 | 6.76±0.83 | 6.36±0.68 |
| | Female | 5.95±1.55 | 5.98±1.23 | 6.06±1.29 | 5.81±1.36 |
| T(nmol/l) | Male | 695.16±214.7 | 693.89±236.74 | 634.87±281.22 | 657.43±160.82 |
| | Female | 32.55±14.02 | 50.18±28.41 | 38.17±18.94 | 44.65±16.07 |

hormone indexes of male swimmers did not change significantly. During the training period of female swimmers, the values of blood and hormones did not fluctuate too much.[12]

## DISCUSSION

In practice, before the game, it is a very challenging job. During this period, the overall fitness level of the athlete decreased significantly during pre-competition practice, while the intensity of the exercise was highlighted. It improves the quality of training for students. In practice, before the game, the coach needs to pay enough attention to the change of the load. At the same time, it is necessary to monitor the biochemical indicators of athletes. This article can know the physiological state and etiology of athletes from the changes in biochemical parameters. To guide athletes to develop targeted and planned pre-competition training to ensure that athletes can normally compete during the competition. The development of an athlete's body shape, function, and sports quality is the main factor affecting the degree of physical development. These three elements are both independent and interacting. The level of each element will have a certain impact on the overall level of the body. Sports quality is an external manifestation of physical health. The human function is the prerequisite and basis for the development of sports quality. Therefore, the physical condition monitoring of athletes should focus on body shape, function, and exercise quality.

### Heme and erythrocyte index in blood

Heme is a red blood cell that contains iron. Its main physiological function is to transport oxygen and CO2 and act as a corrosion inhibitor. It plays an important role in pH regulation in the human body. The hemoglobin level in an athlete's blood is an important factor in determining his exercise level. It is particularly meaningful for the special abilities of endurance athletes. By detecting the hemoglobin in the blood in the serum, it can help athletes to grasp the nutritional status, adaptability to the load, and the functional status of the body. During high-intensity training, the amount of heme in an athlete's blood decreases. This is an early discomfort in the body. When the body adapts to a certain amount of exercise, the hemoglobin in its blood will return to a higher than normal level. This is the result of improved physical function and increased exercise capacity. At this time, the performance of athletes is generally better. When you exercise excessively, the hemoglobin in your blood continues to decrease. Most athletes do not perform very well when the hemoglobin in the blood is less than 10%. When the hemoglobin in your blood decreases by 20%, your athletic performance can be greatly reduced. Testing the hemoglobin in an athlete's blood prior to competition can help them better understand how the body functions and regulates exercise.[13]

The survey found that in the early stage of training, the pressure of training is not great. The physical condition of the athlete is also slowly adjusting. The change in characteristics of hemoglobin, red blood cell count, and hematocrit index of Chinese swimmers also showed an upward trend in the early training period. In the middle of training, the level of the athlete's blood will be significantly reduced. During training, the concentration of heme in the blood is the highest. 2 weeks before the game and one week before the game generally maintained a high level of training.

### Plasma and urate in plasma

Changes in plasma creatine kinase levels can be used to assess the body's tolerance to physical activity and adaptation to exercise load. During training, the coach can adjust the size of the exercise load through the concentration of plasma creatine kinase. In this way, the coach can better understand the stress that the athlete is under during training. This index is generally combined with heme in the blood. During the competition, the content of heme increased gradually, and the content of sarcokinase showed a decreasing trend. Instead, the trainer must adjust the training load.

Plasma creatine kinase did not change much in high-level swimmers during training. The main body of swimming is water sports or some running and physical exercises on land. The increase in sarcokinase activity was not significant in exercise tests performed every Monday. It involves much less exercise than some intensities of physical activity. Due to the different training plans of athletes before the competition, the measurement results of muscle acid kinase will also have some differences. The results showed that the athletes had better protein synthesis before the competition. Response to exercise loads is also better.

### Hormone determination in plasma

In general, hormones in plasma are an important indicator of a person's body's synthesis and metabolism. This is a major measure of an athlete's fatigue and game condition. Long-term high-intensity physical activity leads to lower hormone levels in the body. Too little hormone content in the body will cause the body's anabolic capacity to decline, thus affecting the body's recovery. During the training period, although the blood and hormone indexes of elite male swimmers changed, the changes were small. Female swimmers are at their best hormonal function in the week before the competition.

## CONCLUSION

Athletes have better oxygen delivery performance than other athletes before competition. Athletes have better exercise load capacity. Blood levels of creatine kinase were low throughout the training period and did not fluctuate much over the course of the week. Before the competition, the athlete's skeletal muscle metabolic function is in good condition. The results of blood urea measurements in each period will not change much. Athletes have better protein synthesis before the competition. There were no significant fluctuations in hormone levels in the blood of male athletes. Hormone function in male athletes is not well regulated prior to competition. The fluctuations of hormones in the blood of female athletes are relatively large. Its hormonal function is at a good level.


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**ERRATUM**

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