

PHYSIOLOGICAL MONITORING OF INTENSITY TRAINING IN FEMALE WRESTLERS



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MONITORAMENTO FISIOLÓGICO NO TREINO FÍSICO DE INTENSIDADE EM LUTADORAS FEMININAS

MONITOREO FISIOLÓGICO EN EL ENTRENAMIENTO FÍSICO DE INTENSIDAD EN LAS LUCHADORAS FEMENINAS

Guojian He¹ 
(Physical Education Professional)

Guanghui Liu² 
(Physical Education Professional)

Jinliang Zhao¹ 
(Physical Education Professional)

1. Hebei University of Economics and Business, Physical Education Department, Shijiazhuang, China.

2. Hebei Sport University, Department of Human Sports Science, Shijiazhuang, China.

Correspondence:

Guanghui Liu
Shijiazhuang, China. 050061.
GuanghuiLiu5@126.com

ABSTRACT

Introduction: Currently, female wrestling has become one of the potential advantages in the Olympic Games, which has also allowed the sport to receive more attention. Physiological monitoring in intense physical training in female wrestlers is still little explored despite its importance in training conduction. **Objective:** Explore special intensity physical training effects on female wrestlers through physiological monitoring. **Methods:** Literature search, expert interview, and an experimental method conducted a situation analysis on 2-month training for 8 female wrestling team athletes, specific contents also included: analysis of female wrestlers' body composition, changes in serum testosterone levels, and variations in cortisol levels. **Results:** During the two-month training period, the various athletes' physiological indicators underwent noticeable changes, remaining at the top of the normal range. Most of the athletes could adapt to the training load and intensity in this phase. Serum testosterone, cortisol, and hemoglobin levels in early athletes increased significantly. However, as training progresses, all indicators decrease, showing that the adaptability of the athlete's body is consolidated. The hemoglobin content increased in most of the athletes, showing that the athlete's own intensity of physical training was high. **Conclusion:** The above physiological indicators can reflect the physical function of the athletes, providing a theoretical basis for coaches to develop evidence-based training plans.

Evidence Level II; Therapeutic Studies - Investigating the result.

Keywords: Exercise Physical; Endurance; Exercise Trainings.

RESUMO

Introdução: Atualmente, a luta livre feminina tornou-se uma das vantagens potenciais dos Jogos Olímpicos, o que também permitiu que o esporte recebesse maior atenção. O monitoramento fisiológico no treino físico de intensidade em lutadoras femininas ainda é pouco explorado apesar da sua importância na condução do treinamento. **Objetivo:** Explora os efeitos do treinamento físico especial para a intensidade em lutadoras femininas através de monitoramento fisiológico. **Métodos:** Pesquisa literária, entrevista com especialistas e o método experimental levaram a uma análise da situação sobre o treinamento de 2 meses para 8 atletas da equipe de luta livre feminina, os conteúdos específicos incluíram: análise da composição corporal das lutadoras, alterações nos níveis séricos de testosterona e variações nos níveis de cortisol. **Resultados:** Durante o período de dois meses de treinamento, os vários indicadores fisiológicos das atletas sofreram alterações perceptíveis, permanecendo no limite alto da faixa normal. A maioria das atletas pode se adaptar à carga e intensidade do treinamento nesta fase. Os níveis de testosterona sérica, cortisol e hemoglobina nas atletas precoces aumentaram significativamente. Porém, à medida que o treinamento progride, todos os indicadores diminuem, mostrando que a adaptabilidade do corpo da atleta é consolidada. O conteúdo de hemoglobina aumentou na maioria das atletas, mostrando que o treino físico de intensidade da própria atleta foi elevado. **Conclusão:** Os indicadores fisiológicos acima podem refletir a função física das atletas, fornecendo uma base teórica para que os treinadores possam desenvolver planos de treinamento baseados em evidências.

Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.

Descritores: Exercício Físico; Resistência Física; Treinamento Físico.

RESUMEN

Introducción: En la actualidad, la lucha femenina se ha convertido en una de las ventajas potenciales de los Juegos Olímpicos, lo que también ha permitido que este deporte reciba más atención. El seguimiento fisiológico en el entrenamiento físico de intensidad en las luchadoras es todavía poco explorado a pesar de su importancia en la conducción del entrenamiento. **Objetivo:** Explorar los efectos del entrenamiento físico especial para la intensidad en las luchadoras a través de la monitorización fisiológica. **Métodos:** La investigación bibliográfica, la entrevista a expertos y el método experimental condujeron a un análisis de situación sobre 2 meses de entrenamiento de 8 atletas del equipo femenino de lucha, los contenidos específicos incluían: análisis de la composición corporal de las luchadoras, cambios en los niveles séricos de testosterona y variaciones en los niveles de cortisol. **Resultados:** Durante los dos meses de entrenamiento, los diversos indicadores fisiológicos de los atletas sufrieron cambios notables, manteniéndose en el extremo superior del rango normal. La mayoría de los atletas pudieron adaptarse a la carga e intensidad del entrenamiento en esta fase. Los niveles de testosterona, cortisol y hemoglobina en suero de los primeros atletas aumentaron significativamente. Sin embargo, a medida que el entrenamiento avanza, todos



los indicadores disminuyen, lo que demuestra que la adaptabilidad del cuerpo del atleta se consolida. El contenido de hemoglobina aumentó en la mayoría de los atletas, lo que demuestra que el entrenamiento físico de intensidad propia fue alto. Conclusión: Los indicadores fisiológicos anteriores pueden reflejar la función física de los atletas, proporcionando una base teórica para que los entrenadores desarrollen planes de entrenamiento basados en pruebas. Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.

Descriptor: Ejercicio Físico; Resistencia Física; Entrenamiento Físico.

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INTRODUCTION

At present, women's wrestling has become one of the potential advantages of the Olympic Games, this also allows the sport to receive higher attention. As the rules of wrestling change in terms of time and number of games, it is not only necessary to re-plan the wrestlers in terms of technology and tactics, at the same time, this also puts forward higher requirements on the physical fitness of female athletes.^{1,2} For female wrestlers, it is difficult to decide the winner if the skill level is the same. With the continuous development of the times, traditional physical training is far from being able to meet the current development trend, this requires that during the physical training of wrestlers, incorporating functional strength training, so that athletes can achieve better results.³ Therefore, the author has an important training period before the 2020 Wrestling Team Games, wrestling coaches should combine theory with practice, select reasonable physiological indicators to monitor athletes, strictly control the training content and exercise intensity of each class, it is of great significance to the improvement of athletes' sports performance.⁴

METHOD

Research objects

6 athletes from the women's wrestling team as the research objects.

Research methods

Documentary data method

Through CNKI and Wanfang data, the keywords are "wrestling" and "physiology and biochemistry", collect relevant literature on serum testosterone, T/C, hemoglobin, cortisol, etc, provide a theoretical basis for this article.

Expert interview method

Confirm the rationality of the selected indicators to wrestling experts and team doctors, and record the content of the interview in detail.

Experimental method

Through the two-month training and monitoring of the Guangxi women's wrestling team athletes, a total of 5 tests were conducted, and compare and analyze its test data.

RESULTS

Analysis of body composition of wrestlers

The body composition content of wrestlers is closely related to their competitive ability, especially for wrestlers who need to be graded by weight, it is especially important to maintain a reasonable proportion of water, muscle and body fat, the body composition of female wrestlers is related to women's special menstrual period, during which a high degree of attention should be paid.^{5,6}

From Figure 1, it can be seen that, the water and muscle content of all athletes of the Guangxi Women's Wrestling Team are within the normal range, the percentage of normal adult body fat ranges from 12-16%, the percentage of body fat of wrestlers is generally lower than

normal, it's because wrestling is dominated by anaerobic metabolism, a game consumes more energy, in order to adapt to the intensity of the game, athletes usually train for about 5 hours a day, high-intensity training promotes the breakdown of fat; Secondly, wrestlers need to control their own weight to participate in the competition, and strictly control their diet and calorie intake, therefore, the body fat content of wrestlers is low.⁷

Analysis of changes in serum testosterone of wrestlers

As can be seen from Table 1, serum testosterone is regulated by the hypothalamic-pituitary-gonadal axis, secreted by the gonads and adrenal glands, the range of normal human serum testosterone content is between 20-100ng/dl. Serum testosterone can be used to reflect the exercise load of athletes during a 2-month training cycle, it can also be used to evaluate athletes' recovery ability. The changes in serum testosterone of female wrestlers at 2 months were more obvious, most athletes' serum testosterone is rising in the early stage, in the later period, it declined, but the decline was relatively small, shows that most wrestlers can adapt to the training load, however, individual athletes suddenly increased their serum testosterone levels at the beginning of June, but it dropped significantly in the later period, athletes may be caused by sports fatigue or the athlete's own factors, can not fully adapt to the training load at this stage.⁸

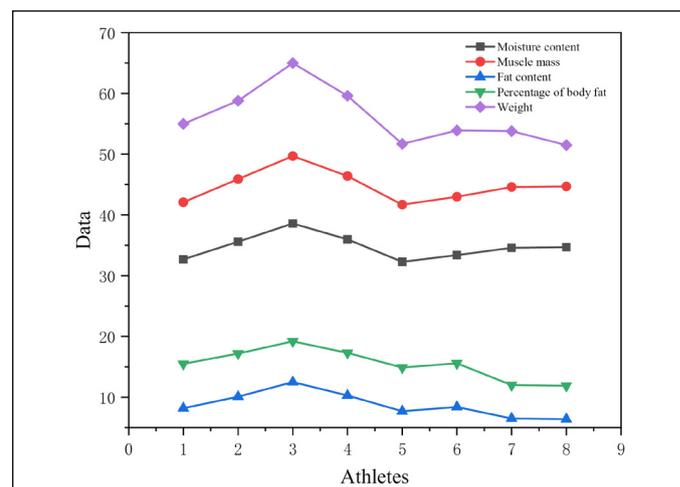


Figure 1. Analysis of body composition of women's wrestling team athletes.

Table 1. Analysis of serum testosterone of women's wrestling team athletes.

Athlete	May 5	May 15	June 5	June 25	July 5	Average value
Number 1	44.05	46.41	71.47	62.34	64.43	57.83
Number 2			33.77	63.4		48.585
Number 3	44.13	47.13	46.33	41.32	33.13	42.442
Number 4	37.34	46.24	42.73	34.72	42.2	42.082
Number 5		41.46	64.23	66.4	42.1	55.736
Number 6		26.23	47.36	17.09		30.0425
Number 7		23.44	34.74	30.33	32.16	28.162
Number 8		61.26	44.74	36.66	24.69	41.476

Analysis of changes in cortisol of wrestlers

Cortisol content is measured by Beckman ACCESS2 automatic immunoassay analyzer, cortisol is a stress hormone, it is an important hormone to promote the body's catabolism, during exercise, a large amount of cortisol hormone is secreted, promote physiological metabolism to produce energy to meet the needs of training.

As can be seen from Table 2, the changes in cortisol levels of most athletes belong to the state of rising-lowering-increasing, is a normal physiological response of the body, is the performance of adapting to the amount of exercise, show that the exercise load in training is appropriate; Among them, the cortisol of 3 athletes is constantly rising, it is to meet the energy needs of the body under heavy load training; Among them, athlete No. 6 had the highest value of cortisol in June, indicates that the athlete did not recover from fatigue, have been doing heavy exercises, resulting in high levels of cortisol, coaches need to draw a high degree of attention, quickly adjust the training plan; Long-term sports training stress increases the body's cortisol secretion, formation of exercise adaptation, it helps to ensure the energy needs of exercise, cortisol recovers slowly and is at a high level during the recovery period after exercise, it shows that it is unable to adapt to the training intensity at this stage, and the body function is also reduced; There are 2 athletes whose cortisol content has been decreasing, it shows that the athlete's ability to bear the load is poor, coaches need to pay great attention to the excessive recovery time period, adjust the athlete's training load in time.⁹

Analysis of changes in T/C of wrestlers

Since blood cortisol secretion is affected by many factors, in sports practice, therefore, the ratio of serum testosterone (T) to blood cortisol (C) is generally used for evaluation, it can better reflect the condition of the body.

As can be seen from Table 3, when the serum testosterone content is at a higher level, blood cortisol should be maintained at a moderate level within the range of personal changes, keep the T/C ratio within the normal range, athletes have better ability to complete metabolism. The T/C ratio of most athletes is maintained at a high level, and the athlete's 2-month T/C ratio has a small change, show that the athlete has the ability to withstand the exercise load, its metabolic level is in

good condition; Among them, the T/C value of 2 athletes dropped by 20%, and there was no upward trend, indicating that the exercise load at this stage was relatively large.

DISCUSSION

In the process of training female wrestlers, the traditional training method is relatively high-intensity and load-bearing, and the training method is also very simple, paying more attention to the training of a single muscle or a certain part of the organization, only perform partial body training. And functional strength training, pay more attention to the precise control ability of the neuromuscular system, and the enhancement of the stability of the deep muscles in the core area, in the process of any movement, the body constantly switches between the four states of stability, instability, balance, and imbalance, through the theory of human kinematic chain, conduct multi-directional, multi-dimensional and holistic training, continuously strengthen its own sports chain, the interconnection and transformation between a certain link and different parts, in this way, the output efficiency is continuously improved.

The sport of wrestling, as athletes need to engage in physical confrontation during sports, it is inevitable that various injuries will occur. In the process of physical training, athletes have been in a state of high-load and high-intensity exercise for a long time, this will lead to the body in the training process, acute injury, etc. occur.¹⁰ If damage occurs, then it will have a negative impact on the athlete's exercise effect, it may even lead to the continuous shortening of athletes' sports years. Functional strength training, mainly through various screenings of athletes' functional movements, in order to find out the problems in itself, and develop targeted functional strength training, continuously optimize the human movement pattern, avoid athletes from greater injuries during exercise. So, in the process of athlete training, according to the actual situation of the athlete's own body, for targeted training, in this way, the athletes can be better avoided during the exercise, there are various sports injuries.

CONCLUSION

Judging from the changes in athletes' cortisol content over the past two months, most athletes can adapt to the intensity of exercise, the cortisol content of some athletes has been at a high level, it shows that the athlete has not recovered from fatigue and has decreased function. Judging from the changes in the athletes' T/C values over the past two months, the metabolism of most athletes is in good condition, the ability of individual athletes to bear the load is poor. The protein content of all women's wrestlers is in the shape of a "rugby", the protein content of most athletes is in the middle, some athletes have higher and lower protein content. The average white blood cell is on the rise, white blood cells act as a barrier to human immunity, exercise can stimulate the body's immune enhancement, the average values of erythrocytes and hematocrit are in a decreasing state. From physiological indicators such as urea nitrogen and CK value, it can be known that, most athletes can adapt to the intensity of exercise.

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Table 2. Cortisol analysis table of women's wrestling team athletes.

Athlete	May 5	May 16	June 6	June 26	July 6	Average value
Number 1	647.48	370.87	640.68	443.34	676.34	555.742
Number 2			449.27	404.46		426.865
Number 3	444.66	376.49	600.24	381.84	448.03	450.252
Number 4	444.23	398.16	488.20	399.44	401.29	426.264
Number 5		411.97	624.40	444.28	344.28	456.2325
Number 6		464.44	484.89	433.70		461.01
Number 7		460.73	378.37	469.14	474.01	445.5625
Number 8		393.74	610.73	463.74	417.63	471.46

Table 3. Analysis of T/C content of women's wrestling team athletes.

Athlete	May 5	May 15	April 5	June 25	July 5	Average value
Number 1	3.01	4.90	3.52	3.14	2.82	3.478
Number 2			2.08	3.44		2.76
Number 3	2.86	3.48	2.60	2.99	1.94	2.774
Number 4	2.32	3.14	4.48	2.48	2.91	3.066
Number 5		4.12	2.94	3.32	4.94	3.83
Number 6		1.63	2.70	1.09		1.807
Number 7		1.44	2.64	1.83	1.87	1.945
Number 8		3.40	2.63	2.17	1.74	2.485

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