

INFLUENCE OF HYDROTHERAPY ON FATIGUE RECOVERY IN SPORTS ATHLETES



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INFLUÊNCIA DA HIDROTERAPIA NA RECUPERAÇÃO DE FADIGA NOS ATLETAS ESPORTIVOS

INFLUENCIA DE LA HIDROTERAPIA EN LA RECUPERACIÓN DE LA FATIGA EN LOS DEPORTISTAS

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ABSTRACT

Objective: This paper explores whether the use of aquatic relaxation methods can effectively eliminate fatigue after high-intensity load training. **Methods:** Twenty athletes were invited to participate in the experimental aquatic relaxation-based test after a battery of strenuous exercise. The following markers were analyzed: blood urea, blood testosterone, hemoglobin, and cortisol. The data were collected before training, 30 minutes after the exercises, and the next day. **Results:** Sensible changes in the markers were observed. The fatigue manifested by sports training is closely related to several factors, such as sports training load, cardiac function, oxygen consumption, and metabolite accumulation. **Conclusions:** Aquatic relaxation can effectively relieve fatigue in athletes. Although there is a positive effect, traditional means should not be substituted. It is suggested that the coach combine relaxation methods according to each athlete's preference. **Level of evidence II; Therapeutic studies - investigation of treatment results.**

Keywords: Hydrotherapy; Muscle Fatigue; Public Health.

RESUMO

Objetivo: Este artigo explora se o uso de métodos de relaxamento aquático pode efetivamente eliminar a fadiga após o treinamento com carga de alta intensidade. **Métodos:** Vinte atletas foram convidados a participar do teste experimental baseado em relaxamento aquático após uma bateria de exercícios extenuantes. Os seguintes marcadores foram analisados: ureia sanguínea; testosterona no sangue, hemoglobina e cortisol. A coleta foi feita antes do treinamento, 30 minutos após os exercícios e no dia seguinte. **Resultados:** Foram observadas sensíveis alterações nos marcadores. A fadiga manifestada pelo treinamento esportivo está intimamente relacionada a vários fatores, como carga de treinamento esportivo, função cardíaca, consumo de oxigênio e acúmulo de metabólitos. **Conclusões:** O relaxamento aquático pode efetivamente aliviar a fadiga dos atletas. Embora exista um efeito positivo, os meios tradicionais não devem ser substituídos. Sugere-se que o treinador combine os métodos de relaxamento de acordo com a preferência de cada atleta. **Nível de evidência II; Estudos terapêuticos – investigação de resultados de tratamento.**

Descritores: Hidroterapia, Fadiga Muscular, Saúde Pública.

RESUMEN

Objetivo: Este trabajo explora si el uso de métodos de relajación acuática puede eliminar eficazmente la fatiga después de un entrenamiento de carga de alta intensidad. **Métodos:** Se invitó a veinte atletas a participar en la prueba experimental basada en la relajación acuática después de una batería de ejercicios extenuantes. Se analizaron los siguientes marcadores: urea en sangre; testosterona en sangre, hemoglobina y cortisol. La colecta se realizó antes del entrenamiento, 30 minutos después de los ejercicios y al día siguiente. **Resultados:** Se observaron alteraciones sensibles en los marcadores. La fatiga manifestada por el entrenamiento deportivo está estrechamente relacionada con varios factores, como la carga de entrenamiento deportivo, la función cardíaca, el consumo de oxígeno y la acumulación de metabólitos. **Conclusiones:** La relajación acuática puede aliviar eficazmente la fatiga en los deportistas. Aunque el efecto es positivo, los medios tradicionales no deben ser sustituidos. Se sugiere que el entrenador combine los métodos de relajación según la preferencia de cada atleta. **Nivel de evidencia II; Estudios terapéuticos – investigación de resultados de tratamiento.**

Descriptorios: Hidroterapia; Fatiga Muscular; Salud Pública.



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INTRODUCTION

Sports are the main form of physical exercise for human beings and have good fitness effects. However, it is gradually discovered that athletes are easily tired or injured in the process of sports.¹ Sports competition, in terms of substance and form, is a contest or confrontation between two or more individuals or groups on all levels of competition with specific

competition rules in order to achieve desired results and performance. When the body is fatigued, the physiological function will temporarily decline.² As long as relaxation is carried out through scientific and effective recovery methods and appropriate rest adjustment, the exercise level can be restored to the normal state. If fatigue cannot be eliminated in time and accumulated for a long time, it will develop into excessive

fatigue, causing pathological changes in some organs and tissues of the body, thus damaging the health of athletes.³ Water rehabilitation is to make full use of the natural characteristics of water and the physiological and biochemical basic knowledge of water movement to treat and train the training objects so as to shorten the rehabilitation treatment period. When moving in water, people will experience a feeling of near weightlessness, which can significantly reduce the load on those bearing joints.⁴ In recent years, aquatic aerobics, aquatic gymnastics and other aquatic recreational fitness activities have been carried out in many fitness venues at home and abroad, and have achieved good exercise and weight loss effects.⁵ For patients with sports injuries, land training to strengthen muscle strength is difficult. Especially for patients with low back pain, because of the increased pain, it is difficult to continue land exercises, and the situation of water rehabilitation exercises is very different.⁶ From the perspective of athletes' physical recovery, this article explores whether the use of water relaxation methods after high-intensity, large-volume training can quickly and effectively eliminate fatigue.

Characteristics and Functions of Water Relaxation Training

The treatment of sports injuries requires athletes to recover quickly and aims to maintain physical fitness as much as possible during treatment. The treatment of sports injuries requires athletes to recover quickly and aims to maintain physical fitness as much as possible during treatment.⁷ Aquatic rehabilitation is one of the effective rehabilitation methods, which can be used to treat sprains, strains, dislocations and fractures. In the water, due to the buoyancy, the supporting effect of muscles is reduced, and the muscles can be more relaxed, which helps to improve the effect of stretching shock. After injury or surgery, water rehabilitation exercise can make athletes recover faster than traditional physical therapy, thus reducing the recovery time. Training intensity, duration and frequency are the three influencing factors of physiological stimulation caused by exercise training. Exercise duration and frequency are easy to control, while intensity is difficult to control. Reasonable arrangement can optimize the effect of exercise training. During the water relaxation training, the diagnosis of sports fatigue is completed by the coaches and athletes in coordination. Selecting suitable, simple and easy methods to scientifically diagnose the occurrence and extent of athletes' fatigue is an important part of scientific training plan. Twenty athletes were invited to participate in the experimental test. The basic data of athletes are shown in Table 1.

Athletes should strictly abide by the prescribed work and rest system, pay attention to food hygiene, and create good sleep conditions to improve sleep quality. With the growth of age, due to the changes in form and function, some good exercise methods originally used on land have begun to produce side effects, even potential dangers. However, moving in the water can avoid unnecessary injuries. The buoyancy of the water enables people to not only ensure higher exercise intensity, but also prevent sports injuries caused by vibration and collision.

Functional exercise for injury prevention refers to the special protective exercise for the parts of the body that are prone to injury in order to prevent the sports injury in sports during the special training process. Reasonable arrangements for the content of the preparatory activities, the general preparatory activities and special preparatory activities will be reasonable convergence. The preparation activities are similar to the requirements of special technical movements, thus preventing the occurrence of sports injuries in special training. The system structure of special sports injury prevention method is shown in Figure 1.

Table 1. Basic data of athletes.

Gender	Number of people	Age	Height (cm)	Weight (kg)
Male	10	17±2.13	168±0.76	53±3.34
Female	10	17±1.64	159±0.69	46±2.17

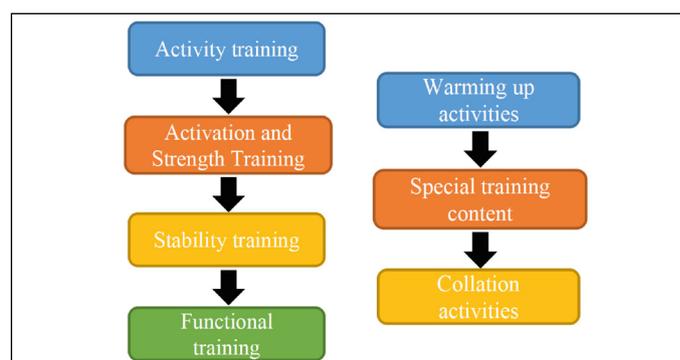


Figure 1. Special sports injury prevention method architecture.

In actual training, different athletes respond differently to the same training plan. Training intensity refers not only to the external load imposed on athletes by coaches in training classes, but also, more importantly, to the real physical response caused by external load on athletes' bodies. During heavy exercise training, excessive fat in the body is mobilized and free fatty acid in blood rises sharply. The contribution of work done by each joint to the work done by the lower limbs increases with external load. During the training, the contents of the training can be changed in time and scientifically, the training load can be adjusted, and the moving parts can be changed to rest, so as to accelerate the recovery of fatigue. Exercise in water is different from exercise on land. The muscles that move in water are omnidirectional. Muscles that exercise less at ordinary times such as trapezius, gluteus maximus and hamstring muscles can be exercised in water to help the balanced development of muscles.⁸ One of the causes of exercise fatigue is the consumption of energy materials in the body. Its recovery method is to make reasonable nutrition arrangements according to the nutritional characteristics of different sports items.

Influence of Water Relaxation Training on Fatigue Recovery of Athletes

During training, a large number of exciting impulses are transmitted to the corresponding nerve cells in the cerebral cortex, and the long-term exciting impulses of nerve cells lead to increased energy consumption. When it is consumed to a certain extent, the corresponding nerve cells will produce protective inhibition, resulting in central nerve innervation imbalance. The extensiveness of muscles has a great relationship with the range of joint movements. To develop flexibility and strengthen muscle extensiveness training is of great significance to increase the range of joint movements and prevent muscle strain. Due to the resistance of water, the movement speed in water is slower than that on land, so that the movement can reach the appropriate range and the body can be prevented from losing balance.

Functional recovery refers to the process that human body functions and energy substances return to and exceed the pre-load level from the state of temporary decline and reduction after load. Heart rate is selected to evaluate the fatigue degree of athletes. The changes of heart rate before and after training are shown in Tables 2 and 3.

Coaches should also understand the adaptability of athletes to training volume and training intensity more objectively and accurately through the detection of biochemical indicators. In this way, the training program can be adjusted in time and accurately. Table 4 shows the test results of athletes' indexes.

The property that a muscle can be stretched under the action of external force is called muscle stretchability. When we exercise, the muscles are constantly stretched back to their original length. In the water,

Table 2. Changes in heart rate before training.

Gender	Immediate	1min	2min	3min
Male	81.1	83.5	83.5	82.1
Female	78.5	81.2	79.4	80.7

Table 3. Changes in heart rate after training.

Gender	Immediate	1min	2min	3min
Male	80.7	174.2	138.5	123.6
Female	77.5	175.5	135.2	114.6

Table 4. Athlete's index test results.

Index	Before training 30min	Immediately after training	6:00 the next day
Blood urea (mmol / L)	5.58	8.43	5.75
Blood testosterone (ng / dL)	733.2	690.9	736.8
Hemoglobin (g / L)	161.14	132.4	157.4
Cortisol (mmol / L)	376.78	513.17	407.6

due to the effect of buoyancy, the supporting effect of the muscles is reduced, and the muscles can be more relaxed, which helps to improve the effect of stretching. When practicing in the water, the practitioner must use the muscles of the whole body to work hard to maintain body posture and balance. Fatigue manifested by sports training is closely related to various factors such as sports training load, heart function, oxygen consumption, and accumulation of metabolites. Each athlete has its own characteristics, so in the training class, you should choose a comprehensive training method and method that suits your individual characteristics. Interval time should be reasonably arranged in the training class, and the training methods and content should be changed frequently. The coach should consciously impart this knowledge to the athletes so that the training can be carried out normally and orderly.

CONCLUSIONS

Due to the different characteristics of sports, different sports often suffer from different parts of the injury. There are many kinds of rehabilitation methods in water. During the training, appropriate training methods should be selected according to the different injured parts to avoid the re-injury of the injured parts. Relaxation in water can effectively relieve athletes' fatigue. After training, coaches can relax in water for fatigue recovery. In the water, due to the buoyancy, the supporting effect of muscles is reduced, and the muscles can be more relaxed, which helps to improve the effect of stretching shock. In the actual training, different athletes respond differently to the same training plan. The training intensity not only refers to the external load that the coaches impose on the athletes in the training course, but also the real body response caused by the external load applied on the athletes' bodies. Although relaxation in water has a positive effect, it can not completely replace the traditional means of relaxation. It is suggested that the coach should combine the two relaxation methods according to the psychological state of the athletes and work out a more scientific relaxation plan. Every athlete has his own characteristics, so we should choose comprehensive training methods and methods which are suitable for personal characteristics. In the training course, the interval time should be arranged reasonably, and the training means and contents should be changed frequently.

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