

EFFECT OF PHYSICAL ACTIVITY ON HOMEOSTASIS IN PROFESSIONAL BASKETBALL PLAYERS ACCORDING TO GENDER DIFFERENCES



REVIEW ARTICLE
ARTIGO DE REVISÃO
ARTÍCULO DE REVISIÓN

EFEITO DA ATIVIDADE FÍSICA SOBRE A HOMEOSTASE DOS JOGADORES PROFISSIONAIS DE BASQUETEBOL, SEGUNDO AS DIFERENÇAS DE GÊNERO

EFFECTO DE LA ACTIVIDAD FÍSICA EN LA HOMEOSTASIS DE LOS JUGADORES PROFESIONALES DE BALONCESTO, SEGÚN LAS DIFERENCIAS DE GÉNERO

Wenpeng Cui¹ 
(Physical Education Professional)
Mykola Bezmilov² 
(Physical Education Professional)

1. Xichang University, Physical Education Institute, Xichang, China.
2. National University of Ukraine on Physical Education and Sport, Department of Innovation and Information Technologies in Physical Culture and Sports, Kyiv, Ukraine.

Correspondence:

Wenpeng Cui
Xichang University, Xichang, China.
w-cui@kaiost.cn

ABSTRACT

Introduction: One of the main problems of modern basketball physiology is maintaining high performance and improving its players' physical condition. Changes in the athlete's functional condition occur due to the transition of the physiological system from rest to stress, fatigue, and regeneration. **Objective:** Clarify the effect of physical activity on homeostasis in athletes according to gender differences. **Methods:** The methods of analysis and synthesis, comparative analysis, modeling, and logical analysis were applied. **Results:** Positive and negative factors of the influence of physical activity on elementary homeostasis of professional basketball players depending on gender differences were assigned; also, the principles of selection of physical activity content and the methodological bases of application for use in training programs of professional basketball players were characterized. **Conclusion:** The results of this study showed the need to control the elemental body homeostasis of basketball athletes and its changes in physical exertion conditions, considering personal characteristics and gender differences. **Evidence level II; Therapeutic studies - outcomes research.**

Keywords: Basketball; Risk Assessment Methodologies; Physical Education and Training.

RESUMO

Introdução: Um dos principais problemas da fisiologia do basquetebol moderno é manter o alto desempenho e melhorar a condição física de seus jogadores. As alterações na condição funcional do atleta ocorrem como resultado da transição do sistema fisiológico do repouso ao estresse e fadiga, e à regeneração. **Objetivo:** Elucidar o efeito da atividade física sobre a homeostase dos atletas, de acordo com as diferenças de gênero. **Métodos:** Foram aplicados os métodos de análise e síntese, análise comparativa, modelagem e análise lógica. **Resultados:** Foram atribuídos fatores positivos e negativos da influência da atividade física na homeostase elementar dos jogadores profissionais de basquetebol, dependendo das diferenças de gênero, também foram caracterizados os princípios de seleção do conteúdo da atividade física e as bases metodológicas da aplicação para utilização de programas de treinamento de jogadores profissionais de basquetebol. **Conclusão:** Os resultados deste estudo mostraram a necessidade de controlar a homeostase elementar corporal dos atletas de basquetebol, suas alterações nas condições de esforço físico, considerando as características pessoais e diferenças de gênero. **Evidência nível II; Estudos terapêuticos – pesquisa de resultados.**

Descritores: Basquetebol, Metodologias de Avaliação de Riscos, Educação Física e Treinamento.

RESUMEN

Introducción: Uno de los principales problemas de la fisiología del baloncesto moderno es mantener el alto rendimiento y mejorar la condición física de sus jugadores. Los cambios en la condición funcional del deportista se producen como resultado de la transición del sistema fisiológico del reposo al estrés y la fatiga, y a la regeneración. **Objetivo:** Dilucidar el efecto de la actividad física sobre la homeostasis en los deportistas, según las diferencias de género. **Métodos:** Se aplicaron los métodos de análisis y síntesis, análisis comparativo, modelización y análisis lógico. **Resultados:** Se asignaron los factores positivos y negativos de la influencia de la actividad física en la homeostasis elemental de los jugadores profesionales de baloncesto en función de las diferencias de género, también se caracterizaron los principios de selección del contenido de la actividad física y las bases metodológicas de aplicación para el uso de programas de entrenamiento para jugadores profesionales de baloncesto. **Conclusión:** Los resultados de este estudio mostraron la necesidad de controlar la homeostasis corporal elemental de los deportistas de baloncesto, sus cambios en condiciones de esfuerzo físico, considerando las características personales y las diferencias de género. **Nivel de evidencia II; Estudios terapéuticos - investigación de resultados.**

Descriptorios: Baloncesto; Metodologías de Evaluación de Riesgos; Educación y Entrenamiento Físico.



INTRODUCTION

One of the main problems of the physiology of modern basketball is maintaining high performance and improving the physical condition of basketball players. In the sports process, changes in the functional condition of the athlete's body occur as a result of the transition of physiological systems from one functional level to another: from rest to stress and fatigue, and then to regeneration. Obtaining a useful adaptive effect during training is accompanied by a change in the level of activity of regulatory processes and during the recovery period, all parameters that have changed as a result of the self-regulation process should return to the original ones.^{1,2}

The most important role is played by the autonomic nervous system. The basis for achieving sports results and their development are adaptation processes occurring in the body.³ The cardiovascular system is an indicator of the adaptive potentials of the body, the level of its function can be considered an earlier indicator reflecting the balance of the body with the environment. Physical exercises affect all parts of the cardiovascular system: the morphology of the heart and systemic hemodynamics, the condition of the vascular layer. As a result of stress regulation during training, a particular model is created, or rather an operating system, optimal functioning of the vascular system, the correct orientation of the training process.⁴

Currently, basic training shows that the successful solution of problems after recovery training after stress is impossible without developing and following methods of influencing the body as an additional component of exercises.⁵ After many sports that are characterised by high psychological stress, speed of movement, and the presence of complex movements, it is necessary to further study individual changes in the functional state of athletes and the possibilities of various purposes. Education, biological and psychological means and methods of their correction. The analysis of the scientific and methodological literature identified that the problem lies in the unsatisfactory development of the differentiated use of rehabilitation measures and contradictions are established in the use of methods of wellness fitness at competitions of basketball athletes. Further research is required to identify resistance to various methods of physical rejuvenation and insufficient scientific support for the preparation of athletes for competitive activities.⁶⁻⁸

MATERIALS AND METHODS

The methodological basis of the study was the current research on the training and rehabilitation of athletes (basketball players in particular).⁹⁻¹¹

The prevailing methods of logical cognition were applied, which will help to achieve the purpose, such as the method of analysis and synthesis, comparative analysis, modelling. The method of analysis was used as a way of thinking, which is associated with the analysis of the studied subject into its constituent components, which were analysed in the sections of the work provided. The synthesis method allowed to combine of previously separately analysed components of the study of the effect of physical activity on the elemental homeostasis of basketball athletes of different genders. This method allowed gaining an understanding of all the components in general to discover the main relationships that connect the pre-selected parts of the study.

The method of comparative analysis is used to compare two or more components of the entire study (phenomena, objects, ideas, and results). This method of analysis identified the advantages and disadvantages of the comparative classification of the effect of physical activity on the elemental homeostasis of professional basketball players. The methods of the position of scientific objectivity, systematisation, theoretical generalisation, and classification of all the results on the subject were carried out.

Since the research was conducted without human or animals, the Ethics Committee was not applied. In addition, informed consent was not applied.

RESULTS

Homeostasis, which is achieved by the reactions of life, supports the important functions of each human body. The nervous system, endocrine glands, especially the hypothalamus, pituitary and peripheral systems of the brain, play a crucial role in maintaining and regulating homeostasis. Human health is determined by the amount and means of its adaptive resources. The more functional is the reserve, the fewer there are regulatory efforts.⁸

Some scientists who work upon the issues of physical fitness of athletes agree that the system of long-term training of athletes to maintain and improve health requires the use of technologies for diagnostics and treatment of mental state of the body to achieve the best form and movements.³ Timely diagnostics and correction of health disorders is especially important in the preparation of sports reserves, in which sports activities are formed in childhood and adolescence, the level of which, however, depends on the future expectations of the athlete, as well as on everything else and social development.

Physical training of basketball players is a long, multifaceted process aimed at developing and improving speed and strength, endurance, flexibility, joint mobility, and basketball skills. In this context, the coach needs to develop effective training plans with less physical and nervous expenses, with an increase in physical qualities and, as a result, athletic activity. These interdisciplinary training programmes are necessary for the development and improvement of physical performance consistently throughout sports activities. Therewith, programmes can interact in different ways, from cooperation if supported (positive result), to cooperation when one programme blocks another programme (negative transition). The reasons for the weakening of the immune system in athletes under the influence of varying degrees of severity have not been clarified.

On the one hand, it is widely believed that regular and purposeful training with moderate strength certainly strengthens the body. The courses are especially effective in the prevention of atherosclerosis, hypertension, obesity, chronic lung diseases, musculoskeletal system, etc. On the other hand, there are many publications about the negative impact of prolonged and strenuous exercises on the body of basketball athletes. More precisely, they manifest themselves in the weakening of the immune system, with colds and infectious diseases in basketball players after long workouts, with fatigue syndrome, as well as at the peak of physical exertion.

Elemental homeostasis is a particular form of the general homeostatic system of the body, violations of which affect the body's ability to adapt to any extreme circumstances. The adaptation of the human body is accompanied by a considerable reorganisation of metabolic processes, including nutritional ones. This leads to shifts in the basic homeostasis and a shortage of macro- and microelements, which leads to an increased need for the body.⁴

Homeostatic systems have the following properties:¹²

1. systemic instability;
2. striving for balance;
3. unpredictability.

One of the basic principles of basketball coaching is the cyclical training process of basketball players. The principle of the training cycle is the systematic repetition of individual exercises that allow creating a system of correct sports tasks, methods and tools necessary during the competitions of professional basketball players, regardless

of the gender of athletes. Each regular basketball cycle is a repetition of the previous one but differs from it by another subject, a partial change in methods and means of achieving the purpose, the size of the training load.⁵

The intensity of physical activity in professional basketball should be cyclical. Basketball supports the mobility of nervous processes in professional basketball players and improves analysis, especially visual. Due to the simple reaction, the speed increases, the ability to estimate the distance and field of view increases. For example, the best basketball players focus on the time and moment of movement, using such techniques as throwing the ball into the ring, low muscle frequency, and the amplitude of the electric potential. Deceptive movements of partners do not generate a biological current in the muscles, and poorly trained athletes have pronounced electrical activity, which indicates an approximate muscle tone.

Each biological control system is characterised by inertance, which differs in methods, subsystems, and elements. The latter, apparently, determines the reciprocity of arrest and recovery. In the physiological analysis of the inertia of biological constants, it is necessary to determine the specific weight of neurological and humoral control functions. After work, there is a clear improvement in mood regulation. When it comes to automated system management, the recovery process – is temporary. This parameter returns the value to the original value, it will change. This biological constant, an imbalance, cannot be normalised for a long time due to the nature of the slowdown. In the last stages of recovery, there is an increase in vegetative activity and energy metabolism, as well as redox processes necessary for biological education. This is because with a significant load and the duration of the balance between high and large energy, regeneration processes are disrupted, the ability to activate energy decreases.¹¹

DISCUSSION

The theory of adaptation from various studies of professional basketball players adaptation depending on gender differences, which show the development of adaptive restructuring in the athlete's body under stress from modern sports competitions, forms the basis of adaptation theory. Notably, the teaching methodology has undergone considerable changes over the past two decades.

In a broader sense, the term "adaptation" is presented as a graphical connection, an appropriate response to the complex hierarchy of an autonomous system of isolated environmental conditions and changes. To form a conscious fact about the adaptability of an object, in the authors' opinion, it would be more reasonable to use the terms "adaptability". Firstly, it is necessary to distinguish between the process and the actual concepts of adaptation, and secondly, adaptation should be determined in each particular case. From this definition, it can be concluded that all organisms, regardless of the adaptation process taking place in them, adapt every second. In fact, the complete adaptation of the human body to something, which can only be achieved by working with it for a long time during the adaptation period, is a relatively unstable working situation. The process of adaptation in the body can go in all directions, depending on the initial state of the body and the presence of changes in external and internal conditions. Moreover, it is completely wrong to interpret adaptation only as a positive process in the context of changing environmental conditions and even more so to assume that stressors have an effect. Individual changes can also be negative, including in sports. Coaches working with athletes should pay special attention to this.¹³

Regular physical activity affects the musculoskeletal system of basketball players. During exercise, the muscles release heat, to which the body reacts with a lot of sweating. During exercise, blood flow increases: blood supplies the muscles with oxygen and nutrients, which are broken down in vital processes and release energy. During exercise, the muscles become more open, the blood flow in the bloodstream increases considerably, which leads to increased metabolism. In response to exercise, it is the impact of the cerebral cortex that primarily controls the functions of the main systems: changes in the cardiovascular system, gas exchange, metabolism.

Under the influence of moderate exercise, the activity of blood cells increases, as well as the amount of haemoglobin and red blood cells. They improve the function and structure of internal organs, improve chemical processes and the movement of food through the intestines. The nervous system controls the joint work of muscles and internal organs since their effectiveness increases with targeted exercises. When muscles are inactive, their nutrition, size, elasticity, and strength decrease, they become weak and flaccid. Lack of physical activity (immobility) and passive lifestyle cause various painful and pathological changes in the human body.

Muscle function is closely related to internal organs. Scientists have established that this is due to the existence of neural connections. Thus, the sensitivity of the musculoskeletal system in the nerve centres is stimulated by an irritant that controls the work of internal organs. Consequently, activity varies depending on the adaptation to the needs of active muscles and the whole body, heart, lungs, kidneys. Physical exercises, in addition to normalising the reaction of the cardiovascular, respiratory, and other systems, increase a person's ability to adapt to weather factors in recovery, human resistance to various diseases, stress. Stamina increases. Using fitness exercises, sports games, tempering techniques.

In many diseases, the correct dose of exercise slows down the development of the pathological process and helps to quickly restore impaired activity. Thus, under the influence of physical exercise, it improves the structure and function of all human organs and systems, increases efficiency and strengthens health. Therewith, many morphological, biochemical, and physiological studies show that high physical activity contributes to considerable changes in the morphology and chemical structure of tissues and organs, which leads to significant changes in homeostasis (increased lactose, urea).

The body's reaction to intense physical activity varies depending on the physical condition of the basketball player at this stage, age, gender. It is important to remember that many sports workouts strongly affect all physiological processes, which often leads to overeating, often due to depression, malaise, inability to move. In such cases, it is necessary to change the content of the training, shorten the duration, switch to another sport, or even interrupt the training for a certain period of time. Walking, massage, multivitamin complexes are useful.

Techniques of adaptation to movements are developed through continuous learning, which is an example of practical adaptation. Inadequate manifestations of adaptive reactions contribute to the development of the disease or the occurrence of disorders of the musculoskeletal system. Admittedly, a healthy athlete is treated better than athletes with chronic diseases. The latter indicates a weakening of adaptive reactions, and therefore the failure of adaptive techniques is often the result of excessive physical and psychological stress. Prolonged overloads and overeating during sports increase the risk of injury and traumatic diseases in athletes. That is why it is very important to identify possible causes of pathology as soon as possible.¹⁴

CONCLUSIONS

For the diagnostics of fatigue, the choice of effective means and methods of recovery of professional basketball players of different genders, it is important to study the features of adaptive changes in the functional state of athletes during the training period. In this regard, this study analyses the character of changes in the practical training of women's and men's professional basketball teams in the training process. The process of playing basketball is full of many special techniques that require technical and tactical skills, and together with the competitiveness arouses great interest among game participants. The game necessarily involves various muscle groups to perform complex maneuverable movements, running and jumping, which guarantees the full development of the athlete in the game.

Many exercises, such as exercises of certain movements, make a considerable contribution to the overall development of a person's physical condition, as well as contribute to strengthening health. Successful basketball practice creates favourable conditions not only for the development of the athlete's physical strength. Playing ball, a person fully develops the coordination of motor activity, and must also be constant with a large number of throws, jumps, passes and movements, even after a long workout on breathing equipment. Basketball movements benefit the body, for example, during the hours of play, so that the organs work in the secretion zones and the gastrointestinal tract.

All authors declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: Each author made significant individual contributions to this manuscript. WC: writing and revision; MB: methodology and analysis of the data.

REFERENCES

1. Fomin SG, Likhachev OE, Ganiev RG. Features of reserve athletes training in foreign professional basketball. *Theory Pract Physical Educ.* 2015;9:94-6.
2. Tsiatsos T, Douka S, Politopoulos N, Stylianidis P. Massive open online course for basketball injury prevention strategies (BIPS). *Adv Intellig Syst Comp.* 2018;725:612-22.
3. Baseggio M, Murray M, Wu D. Genome-wide association study suggests an independent genetic basis of zinc and cadmium concentrations in fresh sweet corn kernels. *G3: Genes, Genomes, Genetics.* 2021;11(8):jkab186.
4. Kloc M, Tomanek M, Cieśliński W. Social media and the value of contracts based on the example. *J Phys Educ Sport.* 2020;20(416):3063-9.
5. Balkrishna A, Rustagi Y, Bhattacharya K, Varshney A. Application of zebrafish model in the suppression of drug-induced cardiac hypertrophy by traditional Indian medicine *Yogendra Ras.* *Biomolecules.* 2020;10(4):600.
6. Jia L. Professional Basketball Club Training Management Based on the Big Data Thinking Method. *Agro Food Ind Hi-Tech.* 2017;28(1):2012-7.
7. Yang S, Li C. Comprehensive fuzzy evaluation and its application in China's basketball referees. *Ecology.* 2019;28(107):2843-6.
8. Haiming L, Jianying L. Traditional acupuncture and massage for physical fitness recovery in professional basketball players' high intensity training. *Agro Food Ind Hi-Tech.* 2017;28(1):2790-4.
9. Abubakari F, Nkrumah PN, Fernando DR. Incidence of Hyperaccumulation and Tissue-Level Distribution of Manganese, Cobalt, And Zinc in the Genus *Gossia* (Myrtaceae). *Metallomics: Integr Biometal Sci.* 2021;13(4):mfab008.
10. Van Der Slikke R, Berger M, Bregman D, Veeger D. Push characteristics in wheelchair court sport sprinting. *Proced Eng.* 2016;147:730-4.
11. Zhi G. Application of fuzzy comprehensive assessment method to result assessment of basketball professional courses in physical academies. *Adv Mater Res.* 2018;718-720:507-11.
12. Kayhan VO, Watkins A. Predicting the point spread in professional basketball in real time: a data snapshot approach. *J Bus Analyt.* 2019;2(1):63-73.
13. Hoover DL, Killian CB, Tinius RA. Predictive validity of a functional movement screen in professional basketball players. *Medicine (Lithuania).* 2020;56(12):1-12.
14. Xia V, Jain K, Krishna A, Brinton CG. A network-driven methodology for sports ranking and prediction. USA: Baltimore; 2018.