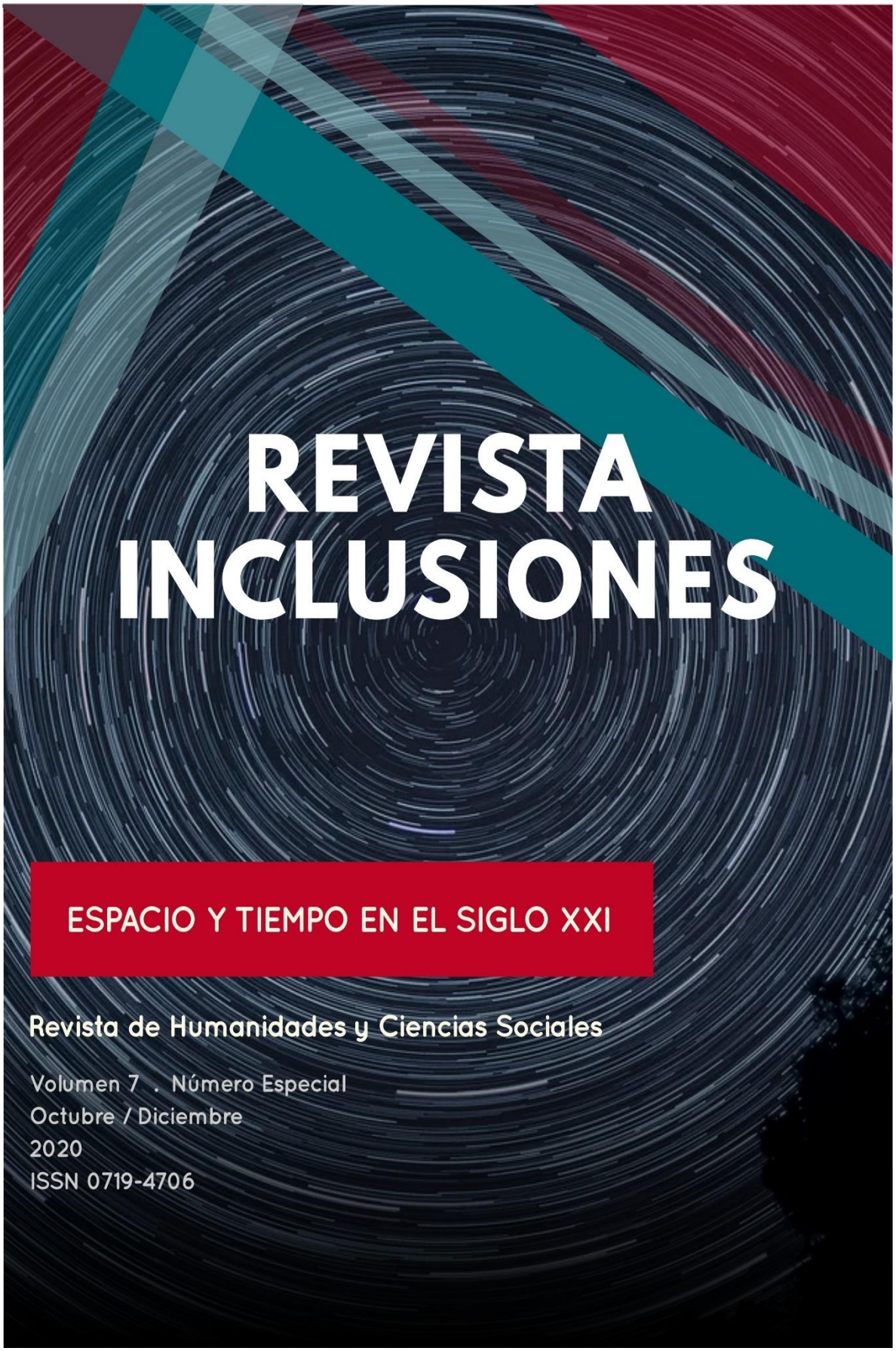
REVISTA
INCLUSIONES
ESPACIO Y TIEMPO EN EL SIGLO XXI
Revista de Humanidades y Ciencias Sociales
Volumen 7 . Número Especial
Octubre / Diciembre
2020
ISSN 0719-4706

REVISTA
INCLUSIONES M.R.
REVISTA DE HUMANIDADES
Y CIENCIAS SOCIALES

CUADERNOS DE SOFÍA
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CUADERNOS DE SOFÍA EDITORIAL

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Indización, Repositorios y Bases de Datos Académicas

Revista Inclusiones, se encuentra indizada en:

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REVISTA INCLUSIONES M.R.
REVISTA DE HUMANIDADES Y CIENCIAS SOCIALES

CUADERNOS DE SOFÍA EDITORIAL

ISSN 0719-4706 - Volumen 7 / Número Especial / Octubre – Diciembre 2020 pp. 127-136

THE IMPACT OF PHYSICAL EXERCISES ON CHANGES IN THE FUNCTIONAL STATE OF THE HUMAN BODY AND POSTURE

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Fecha de Recepción: 11 de junio de 2020 – **Fecha Revisión**: 19 de junio de 2020

Fecha de Aceptación: 21 septiembre de 2020 – **Fecha de Publicación**: 01 de octubre de 2020

Abstract

Physical exercises are still considered a powerful stimulant of all physiological processes in the human body. As a result, dosed physical activity is a targeted stimulant for all life processes in the body. This effect of regular exercises is related to their optimising effect on all body systems and organs. Using various types of physical activity, it is possible to regulate morpho-functional parameters of the body to optimise its physical condition. This is entirely true in terms of the effect on posture. This parameter is very important because it reflects the features of the vertical position of the spine in the development of adaptive reactions in the body, ensuring that the body maintains its vertical posture. Redistribution of physical activity on different parts of the spine under the influence of exercise corrects posture through selective training of body muscles and straightening of the spine. Optimising the tone of the back muscles leads to visible positive changes in the

configuration of the spine, ultimately optimising posture. Physical exercises of people with postural disorders should always be aimed at preventing their progress and correcting existing spinal curves. This is best achieved in weight-bearing exercises.

Keywords

Posture – Spine – Muscle activity – Physical exercises – Health

Para Citar este Artículo:

Maskayeva, Tatyana Yurevna; Shmeleva, Svetlana Vasilievna; Zolotova, Maria Yurevna; Vakulenko, Antonina Nikolaevna; Logachev, Nikita Vyacheslavovich y Vorobeva, Nadezhda Viktorovna. The impact of physical exercises on changes in the functional state of the human body and posture. Revista Inclusiones Vol: 7 num Especial (2020): 127-136.

Introduction

Posture is a complex indicator of the functional state of the body[1]. Its disorders are caused by a variety of factors and indicate the appearance of a problem in the body. Removal of these causes is the basis for posture correction to prevent its deterioration[2]. It has been established that such measurements should be aimed at the systematic development and strengthening of the torso musculature and improving the cardiovascular and respiratory systems[3]. Beautiful posture can also be achieved through the systematic prevention of diseases of the internal organs and spine. A health-oriented physical culture, which strengthens back muscles, is considered very effective in this regard[4]. Currently, technology in promoting physical activity and health has been seriously improved. It combines the process of using physical education for health purposes with the science that develops methods for building physical activity and health process[5].

In recent years, a wide range of modern exercises, often with weight-bearing complexes, have begun to be introduced into the practice of health-oriented physical education allowing for targeted influence on a single organ and functional system. The special value of such exercises is that they can be dosed in terms of strength, pace, and amplitude of movement by using different exercises. They are aimed at developing strength, muscle endurance, and joint development and eliminating the effects of hypodynamy. Exercises that are often performed on training equipment have an impact on specific groups of muscles and joints. Besides, performing such exercises requires compliance with the physiological starting position. Their high importance for the development of the organism requires further in-depth study based on a synthesis of available knowledge[6].

Objective: to consider the main effective physical exercise options that can affect posture.

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[1] L. F. Vasileva Prikladnaya kineziologiya – iskusstvo vosstanovleniya zdorovya (Moscow: Eksmo, 2016).

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Methods

Qualitative content analysis and synthesis and systematisation of scientific literature taken from the problem field of research were used as research methods, which allowed us to determine the impact of physical exercises on changes in the functional state of the human body and posture.

Based on the application of the problematisation methodology, an attempt was made to identify basic physical exercises (stretching, with gymnastic objects, with weights, special corrective physical exercises) aimed at eliminating postural disorders.

The criteria for selecting scientific literature were the reputation of the author and the information resource (printed publication), as well as the degree of the attractiveness of information in relation to the research topic.

Results and Discussion

Systematic and dosed exercise strengthens the muscular system and is, therefore, the best way to prevent postural disorders. The elimination of posture disorders is a prerequisite for primary and secondary prevention of orthopaedic and internal organ diseases[7].

Motion activity in natural conditions is a combination of static and dynamic work, which is carried out in combination with tonic muscle tension, while the motion elements are a combination of stretching and contraction, which carried out in parallel, coordinated, and in their interaction ensure a normal motion act[8].

Adequate muscle activity is a natural means of physiological stimulation in the body. It supports and improves dozens of adaptive mechanisms at various levels of vital activity. The work done by muscles is determined by the dynamics of their traction force and length. Well-known types of muscle work (overcoming, conceding, holding) are determined only by the direction in which the muscle changes length: shortening, lengthening, maintaining length. For these three types of work (the first two are dynamic and the last one is static), there are three options for changing muscle traction force as compared to isometric force: increasing, decreasing, and maintaining it without changes[9].

The use of stretching exercises promotes morphological restructuring and improves the elastic features of pathologically altered tissues that limit the amplitude of movements

[7] S. V. Shmeleva; F. A. Yunusov; Y. S. Morozov; A. I. Seselkin y S. Y. Zavalishina, “Modern Approaches to Prevention and Correction of the Attorney Syndrome at Sportsmen”, Prensa Med Argent Vol: 104 num 2 (2018).

[8] E. V. Morozova; S. V. Shmeleva; O. G. Rysakova; E. D. Bakulina y S. Yu. Zavalishina, “Psychological Rehabilitation of Disabled People Due to Diseases of the Musculoskeletal System and Connective Tissue”, Prensa Med Argent Vol: 104 num 2 (2018) y Ju. L. Oshurkova y T. I. Glagoleva, “Physiological Activity of Platelet Aggregation in Calves of Vegetable Feeding”, Biomedical & Pharmacology Journal Vol: 10 num 3 (2017): 1395-1400.

[9] V. Yu Karpov; I. N. Medvedev; A. V. Romanova; S. S. Usov y R. V. Kozyakov, “Functional Disorders in the Respiratory System in Adolescents with Bronchial Asthma”, Indian Journal of Public Health Research & Development Vol: 10 num 8 (2019): 1904-1909.

or cause deformation[10]. The essence of the use of strength exercises for health purposes is, in particular, the use of the micro-pump function of the skeletal muscles, which, when contracted, squeeze blood into vessels and, when relaxed, attract blood, i.e. they perform the function of the so-called "peripheral hearts"[11].

Skeletal muscles are known to have supple and elastic features that contribute significantly to stretching and contraction in natural conditions[12]. However, the elasticity of muscles is imperfect. At the beginning of a stretch, the muscle has little resistance to tensile force, whereas at further stretching, the muscle's resistance to tensile force increases. The nonlinearity of a stretched muscle depends on the fact that some areas of the muscle contract while others remaining at rest are stretched[13].

The mechanical action of muscles is manifested as traction applied to the attachment point. The main mechanical condition determining muscle traction is load. Without load, there can be no tension for the muscle and no traction. If a muscle is stretched again at short intervals, its length is increased by more than a single "assistance"[14]. The load stretches the muscle as it concedes. A muscle does the overcoming work against the load[15].

Exercises with gymnastic equipment — sticks, dumbbells, balls, shock absorbers — are physical exercises with local and dosed force on stretching muscles, their relaxation, coordinating movements, and corrective and breathing exercises. The impact of exercises with equipment is increased in comparison with similar exercises without equipment due to its weight, improvement of the lever of the moving body segment, an increase of inertial forces arising from the flywheel and pendulum-like movements, and complication of requirements for coordination of movements[16]. Special training equipment used for various manifestations of the pathology in the form of block devices, as well as mechanisms, ensures that the effect is enhanced by better localisation and, as a rule, a longer duration of the exercise, a more precise dosage of the load, and an increase in the stretching effect or intensity of tension[17].

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[10] A. R. Baymurzin; V. D. Chepik y A. I. Alifirov, “Physical education and sport university service: Practical basics”, Teoriya i Praktika Fizicheskoy Kultury num 5 (2019): 14-16.

[11] V. A. Kudinova y V. Y. Karpov, “Sports progress statistics analysis for Russia”, Teoriya i Praktika Fizicheskoy Kultury num 5 (2019): 42-43.

[12] S. Yu. Zavalishina y I. N. Medvedev, “Features aggregation erythrocytes and platelets in old rats experiencing regular exercise on a treadmill”, Advances in gerontology Vol: 29 num 3 (2016): 437-441.

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[15] G. S. Mal y S. Yu. Zavalishina, “Functional Platelet Activity During Ontogeny in Rats”, Indian Journal of Public Health Research & Development Vol: 10 num 8 (2019): 1915-1919.

[16] E. S. Tkacheva y S. Yu. Zavalishina, “Functional Features of Platelet Secretion in Piglets During Early Ontogenesis”, Biomedical & Pharmacology Journal Vol: 12 num 1 (2019): 485-489 y I. N. Medvedev, “Place and Possibilities of the Robotic System Lokomat in the Rehabilitation of Patients after Ischemic Stroke”, Biomedical & Pharmacology Journal Vol: 12 num 1 (2019): 131-140.

[17] I. N. Medvedev y N. I. Gromnatskiĭ, “Correction of thrombocyte hemostasis and biological age reduction in metabolic syndrome”, Klinicheskaia meditsina Vol: 83 (2005): 54-57.

A positive factor in performing weight-bearing exercises is the ability to dose the load with a sufficiently high degree of accuracy. This allows one to select individual training loads that consider physical, psychological, and age features. It is possible to correct individual loads downwards or upwards based on the level of training and the health of the trainee[18].

To create physiological force loads, the method of re-lifting a nonlimited weight to pronounced fatigue is widely used. The success of this method is due to the fact that a large amount of work causes significant shifts in metabolism, creates opportunities for increased plastic metabolism, leads to functional muscle hypertrophy and strength growth, and allows for better control over the exercise technique[19].

To form and maintain a correct posture, special corrective physical exercises are created that can correct the curvature arc in the spine:

1. Asymmetric exercises based on the correction of the spine. They optimise the curve of the spine, moderately stretch the muscles and ligaments at the concave curvature arc, and differentiate strengthening of weakened muscles at the convex side. These exercises aim to selectively strengthen the one-sided muscles of the torso.

2. Symmetrical exercises have a minimal biomechanical effect on the spinal curve. They do not require consideration of the complex biomechanical conditions of a deformed locomotive system. This eliminates the risk of their incorrect use. Symmetrical exercises have a different impact on the symmetrically located muscles of the torso, which are physiologically unbalanced due to the deformation of the spine. Weak torso muscles (e.g. on a convex curvature arc) must be given increased functional load during each symmetrical exercise so that they train harder than stronger muscles.

3. Detorsion exercises aimed at correcting existing distortions and preventing possible spinal disorders.

4. Unloading the spine is a necessary condition for general and local impact on it. The most common unloading position is horizontal. In the lying position, muscle tension is relieved and the spine can be given an appropriate position: the localisation of the centre of gravity changes and the body gets the largest support area to ensure a stable balance. In a standing position on the knees, the fixation points get closer, the muscles and ligaments relax, and the spine "sags moderately"[20].

Symmetrical and asymmetrical exercises are mainly used to affect the spine in the frontal plane. Special corrective exercises of a derotative nature are used to influence deformation in the horizontal plane. However, this type of exercise has not been widely

[18] M. V. Eremin; V. Yu. Karpov; N. N. Marinina; O. G. Rysakova; S. Yu Zavalishina y A. V. Zhalilov, “The Problem of Rehabilitation of Patients with Bronchial Asthma”, Biomedical & Pharmacology Journal Vol: 12 num 2 (2019): 713-722.

[19] I. N. Medvedev, “Formation of hemostasiopathy in arterial hypertension and insulin resistance”, Prensa Medica Argentina Vol: 105 num 2 (2019).

[20] M. G. Mal; S. Yu. Zavalishina; O. N. Makurina; V. V. Zaitsev y T. I. Glagoleva, “Functional Features of Vascular Endothelium with Developing Arterial Hypertension”, Prensa Med Argent Vol: 105 num 1 (2019).

used, as the specifics of the reaction of muscles to load that move the spine in the horizontal plane have not been sufficiently studied[21].

Breathing exercises are actively used for posture disorders. They normalise the mechanism of breathing and mutually coordinate breathing and movements, strengthen respiratory muscles, improve chest and diaphragm movement, and prevent and correct chest deformations. Special attention should be paid to the training of deep breathing, which provides physiological conditions for breathing muscles and has a general strengthening effect. In this regard, it is very useful to introduce additional breathing exercises in the starting position lying on one side. These increase the intercostal spaces. This body position has a moderate detorsion effect on the vertebrae and ribs at the concave side[22]. The optimal physical exercise program should be designed in such a way that the body simultaneously trains and avoids the possibility of developing chronic fatigue. During the process of training, fatigue should increase gradually, and the moment when work stops should be determined individually in each case. Training occurs when another load is carried out following the achievement of full recovery from previous physical work. Another workload must not be allowed to begin until the moment of full recovery from the previous work — this is very dangerous for the development of chronic fatigue[23].

Conclusion

Physical exercise is a powerful biological stimulant for most physiological functions in the body. This allows using dosed physical exercises to increase the volume of any muscle group. Adequate exercise also produces simultaneously positive changes in the nervous, endocrine, cardiovascular, respiratory, and excretory systems. With the help of special physical exercises, it is possible to regulate the functional state of the body. They are very often used for posture disorders. From the point of view of biomechanics, their appearance is connected to the presence of factors disturbing the vertical position of the spine, as the body has weak adaptive reactions that ensure that the vertical posture is maintained. Redistribution of loads on the structures of the spine through exercises can provide posture correction through selective training of torso muscles and normalisation of the spine. Regular physical exercises in case of posture disorders should always be aimed at preventing its progression and correcting existing spinal curves. This effect is most often achieved through weight-bearing exercises.

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