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FACTORS INFLUENCING THE MAINTENANCE OF STATIC AND DYNAMIC EQUILIBRIUMS

Tuychieva Dildora Turgunovna
Senior Lecturer, Department of Theory and Methodology of Sports Types of Gymnastics, The Uzbek State University of Physical Education and Sports
dildoratuychiyeva49@gmail.com

Abstract

Balance beam exercises are one of the most challenging events in women's gymnastics, where maintaining body stability plays a crucial role in conditions where the ability to restore it through physical strength is extremely limited, and where the only "weapons" are precision of movement and a subtle sense of balance.

This is especially evident when performing acrobatic elements. Moreover, the number of such exercises and combinations increases year after year, and they are the main cause of a significant number of errors and falls from the apparatus. During the initial specialized training stage, it is crucial to lay a solid foundation for developing the fundamentals of a sound technique for performing advanced exercises. The lack of consensus among specialists on the nature and mechanisms of developing local motor skills, as well as a clear understanding of the most important key points of their technique, leads to disagreements regarding the content of training sessions for young gymnasts and the methods and means of their acrobatic preparation.

A number of studies point to various factors that reduce the reliability of performing elements and combinations on the beam. These include insufficient specialized physical, technical, and motor skills, errors in teaching methods, and psychological factors. However, there are specific features of performing exercises on the narrow surface of the apparatus, elevated above the floor. Even such simple and natural movements as walking cannot be transferred naturally from the floor to the beam. The placement of the support links (or, more simply, the arms and legs) on the apparatus is a crucial element of beam technique. Various techniques for placing the feet and hands on the beam have been

developed, but the need for clarification of concepts, an understanding of the reasons for using a particular technique for positioning the support links, and their impact on the quality and time required to master elements on the beam remains. Traditional, i.e., A tightly closed foot placement, with legs tightly pressed together, allows for maximum pressure to be concentrated in a minimal area and for precise direction of the impulse that drives the push-off. However, while this approach is theoretically feasible, it is extremely unreliable and even dangerous in practice.

This article examines the physiological, biomechanical, and environmental factors that determine a person's ability to maintain static and dynamic balance. Particular attention is paid to the role of proprioception, vestibular function, the musculoskeletal system, as well as the influence of external conditions, psychoemotional state, and physical fitness. An analysis of the key mechanisms that ensure body stability at rest and in motion is provided, and the main areas for developing balance skills are highlighted.

The purpose of the study was to identify the most significant internal and external factors influencing the maintenance of static and dynamic balance in humans.

Research Objectives

1. To study the physiological mechanisms that ensure balance.
2. To identify factors influencing static equilibrium.
3. Identify the factors influencing dynamic equilibrium.
4. Analyze the influence of external conditions on stability.
5. To determine the role of physical fitness and training in the development of balance.

Research Methods

Analysis and synthesis of scientific literature. Modern scientific sources on biomechanics, sports physiology, and neurophysiology devoted to the

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mechanisms of maintaining static and dynamic equilibrium were reviewed. Factors influencing body stability and motor coordination were analyzed.

Theoretical modeling. Based on literature data, a theoretical modeling of the influence of individual factors (center of gravity, support area, muscle tone, visual control) on balance maintenance was performed.

Comparative analysis. A comparison of parameters influencing static equilibrium with factors determining dynamic equilibrium was conducted, allowing us to identify common and distinctive features of stability mechanisms.

A systems approach. Balance is considered as a complex interaction of the body's sensory, nervous, muscular, and biomechanical systems. This allowed us to assess the relationships between factors and their integral impact on stability.

Graphical method. To visually represent the structure of factors and their influence, diagrams and structural models were used to reflect the mechanisms that maintain equilibrium.

Human balance is the ability to maintain a stable body position, both static and in motion. This function is the result of the coordinated work of the nervous system, muscles, and sensory systems. Maintaining balance is important not only for athletic performance but also for everyday activities, fall prevention, and safe movement. Studying the factors that influence balance is essential for developing effective training and rehabilitation methods.

Research Results

A study of the acrobatic training of female gymnasts on the balance beam revealed that the scientific and methodological literature understudies the specific aspects of acrobatic exercise technique, taking into account the specific positioning of the body's support segments on the narrow and elevated surface of the apparatus, and the development of specific methods for mastering them based on this understanding. A systemic-structural analysis of the exercises identified the most significant technical criteria, the fundamental motor composition of the elements studied, the nature of the subordination of their individual stages and phases, and examined the structure of the relationships between related movements performed with different support segment positions. The leading

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criterion for performing acrobatic exercises on the balance beam is the takeoff speed, which determines the overall technique of the element.

A biomechanical analysis of the technique of performing related acrobatic elements on the balance beam revealed significant differences in their energy-generating phase. These differences include: a shallower squat depth, a shorter takeoff phase, a greater vertical component of the takeoff velocity, and a greater vertical and lesser horizontal component of the force applied during the takeoff on an element with sequential placement of the support links. These differences result in a change in the trajectory of the athletes' body center of mass, resulting in a greater takeoff height and a smaller horizontal displacement of the body center of mass. These characteristics, inherent in elements performed on the balance beam with sequential placement of the support links, play a positive or negative role depending on the type of acrobatic exercise.

A gymnast's performance in performing acrobatic elements on the balance beam depends significantly on the angles of stability and the support area. The data obtained indicate significantly lower stability in the frontal plane for gymnasts performing acrobatic elements with sequential placement of the support links. An analysis of the static stability of young athletes performing acrobatic exercises on the balance beam from various starting positions revealed that when the feet are together, the overturning force is 0.7 kg, while with sequential placement, it is half as much—0.33 kg. Calculations revealed that the angle of stability in the frontal plane when performing the elements studied from a position where the feet are positioned sequentially is three times smaller (1.6°) than with parallel placement (4.8°).

Through an analysis of literature and our own research, we developed a methodology for teaching young gymnasts acrobatic balance beam exercises. This methodology includes preparatory and introductory exercises consisting of special physical training (SPT) and special physical training (STP) routines, along with recommendations for their application during training. The methodology is based on the principle of mastering the most common movements that form the basis of exercises within a single structural group and aims to promptly develop universal basic skills specific to this apparatus.

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The results of the pedagogical experiment confirm our hypothesis that the proposed method for teaching balance beam gymnastics exercises, using the results obtained through a biomechanical analysis of the technique of performing similar-looking elements, allows for a shorter learning curve and improved quality and reliability of the exercises. Developed based on a study of the structure of the kinematic and dynamic characteristics of movements, this method allows for a sufficiently controlled training process for young gymnasts, offering a wide selection of precisely defined basic actions, considered as parts of holistic movements structurally linked to the key technical components of gymnastics exercise sets.

Conclusions

Maintaining static and dynamic balance depends on a complex set of factors, including sensory processing, the development of stabilizing muscles, coordination skills, body biomechanics, and the influence of external conditions. Understanding these factors allows for targeted training programs and the prevention of balance disorders.

References

1. Arkhipov A.A. Teaching gymnasts dynamic balance in acrobatic combinations on the balance beam. Abstract of Cand. Sci. (Pedagogical Sciences) Dissertation. Kyiv, 2018. - 24 p.
2. Afonin V.N. Study of means and methods of current control in gymnastics (using the training of top-level athletes as an example): Abstract of Cand. Ped. Sci. (Pedagogy) Dissertation. Moscow, 2015. - 25 p.
3. Babushkin G.D. On the relationship between the functional state of the vestibular and motor analyzers in gymnasts // Improving the forms and methods of management: Abstract of the report of the All-Union scientific conf., Omsk, 2020.-P. 86-88.
4. Veldyaev S.V. Methodology for Teaching Working Postures in Horizontal Bar Exercises. Abstract of Cand. Sci. (Pedagogical Sciences) Dissertation. Volgograd, 2019. 24 p.