

METHODS OF PHYSICAL TRAINING BASED ON THE BIOLOGICAL AGE OF BASKETBALL PLAYERS: A REVIEW OF SCIENTIFIC LITERATURE

Sabirova Nasiba Rasulovna

Bukhara State Pedagogical Institute of Uzbekistan, Bukhara city

sabirova.nasiba87@mail.ru

Keywords: basketball players, age-related physical indicators, biological age, Peak Height Velocity (PHV), training methodology, physical development, individual training.

Abstract: This article analyzes the scientific research of Uzbek, Russian, and foreign scientists on the methods of developing age-related physical indicators of basketball players. The importance of optimizing physical fitness and effectively organizing the training process, taking into account the biological age of young athletes, is emphasized. The article provides information about Peak Height Velocity (PHV) - the concept of the fastest growth period and its importance in sports. The research results show that age-appropriate training methods help improve physical qualities and reduce the risk of injuries.

Introduction. Basketball is a complex and dynamic sport that requires physical strength, speed, endurance, quick thinking, and a high level of coordination. The success of athletes often depends on their physical fitness and technical skills, and especially in the process of training young athletes, it is necessary to take into account the growth characteristics of their body, biological age, and individual characteristics. Age-appropriate training methods play an important role in the development of physical performance of young basketball players. The reason is that each athlete's body responds differently at different stages of growth and development. Growth rates and changes in the musculoskeletal system, especially during adolescence, change the requirements for physical activity. Therefore, coaches and scientists emphasize the need to accurately assess the biological age of young athletes and adapt the training process accordingly.

One of the important indicators in determining biological age is Peak Height Velocity (PHV), that is, the period of peak growth. The PHV stage plays an important role in the formation of athletes' physical potential, since it is during this period that their muscle strength, speed, endurance, and coordination change rapidly. Therefore, adapting training loads and training to the PHV stage allows reducing the risk of injuries and maximizing the athlete's development.

In the scientific research of Uzbek, Russian, and foreign scientists, numerous studies are being conducted on the development of physical fitness of young athletes in accordance with age. These studies contribute to the improvement of methodological approaches and the creation of individualized training systems. Also, taking into account age-related characteristics in the development of physical qualities (strength, speed, endurance, coordination) increases the possibility of preventing injuries and achieving long-term success in sports.

This article analyzes the scientific works of Uzbek, Russian, and foreign scientists on the methods of developing the physical performance of young basketball players, and also discusses age-appropriate training approaches, the concept of PHV, and their practical significance. The article serves to create a methodological basis for optimizing the training of young athletes and protecting them from injuries.

Literature review. Russian scientist A. V. Ivanov (2017) studied the relationship between biological age and physical fitness and identified changes in such indicators as basketball players' growth rate (PHV) and muscle strength, speed. Ivanov's research showed that special training is important for increasing muscle strength during the most active period of growth.

E. N. Petrova (2019) developed training programs for the development of endurance and strength indicators. He proposed special methods for young athletes, taking into account recovery and physiological adaptation. Petrova believes that the training loads of young basketball players should correspond to their biological age and growth stage.

V. I. Smirnov (2018) developed methods for periodizing the training process of young basketball players. According to Smirnov's research, it is necessary to manage training intensity, taking into account the development of muscle strength and coordination at different stages of the growth period.

T. A. Kozlova (2020) created training systems that combined the technical and physical training of young athletes. Kozlova emphasized the importance of taking into account individual characteristics using an age-appropriate approach in increasing the effectiveness of training.

One of the scientists from Uzbekistan, Sh.Akhmedov, having studied the biological and chronological aspects of the age of basketball players, emphasizes that it can directly affect the level of their physical fitness. In his opinion, coaches should adapt training sessions, taking into account the individual characteristics of young players.

Sh.Yuldashev worked on the endurance and strength indicators of young basketball players. In his research, he developed a special cardiorespiratory and strength training system for young children. He also introduced special tests to assess the physical capabilities of players.

Tursunov focuses on the methodology of developing coordination, speed, and agility in basketball players. He emphasizes that it is possible to effectively develop physical qualities by planning individual and group training, taking into account biological age.

N. Ismailov worked on optimizing the physical and technical performance of basketball players depending on the playing position. In his works, the importance of a balance between biological age, technical training, and psychological state is emphasized.

In the views of foreign scientists Leonardi and Carvalho (2018), who studied the influence of biological age (PHV) and chronological age on physical indicators in basketball players, came to the following conclusion:

- biological age, especially the PHV period, strength, speed, and agility.
- a large number of training years develops technical skills, such as dribbling, shooting, and passing.

Thus, physical and technical development are two separate factors, and they should be developed with a separate approach.

Guimarães et al. (2024, MDPI) suggest that the early biological maturation of basketball players (early matures) makes them superior in strength, vertical jump, and speed, but technical skills depend on years of training. Therefore, coaches should organize groups according to biological age and implement an individual approach.

Delectrate and others improve agility (speed and movement speed) in basketball players during the PHV period, as well as strength and neuromuscular adaptation increase in the post-PHV period. These changes indicate the need for age-appropriate physical training.

Barazetti et al. (2019), the level of biological maturation of basketball players varies depending on their playing position. For example, point guards often mature later. This is an

important factor in developing age-appropriate and position-appropriate training programs for coaches.

Samozino, Beunen, and Malina's strength and power spruts occur near the PHV stage of biological maturation, therefore coaches recommend intensifying the strength training during this period. The maturation process plays a significant role in developing strength, speed, and endurance in young basketball players.

Conclusion. Both Russian, Uzbek, and foreign scientists show the need to protect the health of athletes through age-appropriate loads. Abroad, in particular in the FIBA and NBA academic programs, it is recommended to reduce overloads due to the fact that the musculoskeletal system is still weak during PHV. Uzbek scientist Sh. Yuldashev proposed the use of special exercises (stretching, adaptation exercises) in the prevention of injuries at each age stage. Based on the opinions of Russian, Uzbek, and foreign scientists, the main priorities in the development of physical indicators of young basketball players are the determination of biological age, taking into account the PHV period, the application of individualized training programs, periodization of loads, and attention to recovery. These general approaches show that young athletes should be trained not on the basis of "the same for everyone" training, but in a way that corresponds to the growth stage, physiological and psychological characteristics of each athlete.

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