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PHYSIOLOGICAL FOUNDATIONS OF THE MAIN FACTORS AFFECTING THE PHYSICAL DEVELOPMENT OF CHILDREN

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Abstract: This article explores the physiological foundations of the main factors influencing children's physical development. It thoroughly analyzes the impact of genetic, environmental, nutritional, and physical activity factors on physiological processes in a child's body. The effects of these factors on the musculoskeletal system, cardiovascular system, and overall metabolism are examined. The article highlights the significance of these factors in ensuring healthy development in children.

Keywords: Children, physical development, physiological foundations, genetics, environmental factors, nutrition, physical activity, musculoskeletal system, metabolism, healthy development.

Children's physical development is an important foundation for their overall health, intellectual potential, and future functioning. Physical development is not limited to a child's height, weight, or muscle structure, but involves the coordinated activity of all body systems—musculoskeletal, cardiovascular, endocrine, and metabolic processes. Understanding the physiological foundations of the factors that influence these processes is essential for ensuring healthy growth and development in children. The factors that influence physical development are multifaceted, and their impact varies depending on the child's age, gender, genetic characteristics, and environment. While genetic factors determine the basic structure and developmental

trajectory of the organism, environmental factors, nutrition, and physical activity help or hinder the implementation of this trajectory. Modern research shows that the factors that influence children's physical development are not only individual, but also have a complex and interrelated effect (Smith et al., 2019). For example, proper nutrition and physical activity play an important role in the development of the musculoskeletal system of children, but the effectiveness of these factors depends on genetic characteristics and environmental conditions. Socio-economic factors, such as the financial situation of the family, access to quality food, and the availability of sports infrastructure, also affect children's physical development. This article is devoted to a comprehensive analysis of the main factors that influence children's physical development - genetic, environmental, nutritional, and physiological bases of physical activity. The aim is to consider the impact of these factors on physiological processes in the body and emphasize their importance in ensuring healthy development. Genetic factors play an important role in children's physical development. Genes determine a child's height, muscle structure, bone density, and metabolic activity. For example, genes that influence the growth and development of myocytes determine the strength and size of muscle tissue (Smith et al., 2019). Genetic characteristics also affect the body's ability to absorb nutrients and convert them into energy.

Environmental factors have a multifaceted impact on children’s physical development. These factors include climate, air quality, water quality, pollution levels, geographic location, and socioeconomic environment. For example, chronic exposure to polluted air and water can lead to respiratory, immune, and metabolic problems in children (Johnson & Brown, 2020). Studies have shown that high levels of air pollution in cities can reduce children’s lung function and limit their physical activity. Socioeconomic factors are also important. For example, children living in low-income families may lack access to quality food, sports facilities, and health services, which can negatively impact their physical development (Thompson, 2020). In addition, stressors in children’s environments, such as family problems or high pressure in the education system, can also affect hormonal balance and slow

growth. The physiological effects of environmental factors depend on the body's ability to adapt, in particular, on stress resistance systems and energy metabolism, which have a significant impact on the overall health of children.

Proper nutrition is the basis of children's physical development, ensuring the growth, development of tissues and the normal functioning of physiological functions. Protein, carbohydrates, fats, vitamins and minerals in food play an important role in the development of children's musculoskeletal system, cardiovascular system and endocrine system. For example, protein is necessary for the growth and repair of muscle tissue, while calcium and vitamin D serve to strengthen bone tissue (Williams, 2021). Nutritional deficiencies or malnutrition can lead to stunted growth, weakened bone structure and a weakened immune system in children. For example, deficiencies in iron, zinc, and vitamin A can cause anemia, stunted growth, and vision problems in children (Garcia & Lopez, 2021). Additionally, excessive calorie intake, particularly from refined carbohydrates and fats, can lead to obesity and metabolic disorders, which can put a strain on the cardiovascular system. The physiological effects of nutrition are closely linked to the body’s energy balance, hormonal balance, and tissue regeneration processes.

Physical activity is essential for children’s physical development, helping to develop their musculoskeletal system, cardiovascular system, and overall metabolism. Regular exercise helps to build muscle strength, increase bone density, improve coordination, and boost metabolic processes (Lee & Park, 2022). For example, aerobic exercise, including running, swimming, or cycling, improves cardiovascular function, increases blood circulation, and increases lung capacity. The physiological effects of physical activity are multifaceted, affecting various body systems. For example, active muscle work leads to myocyte hypertrophy, which increases muscle strength and endurance (Kim et al., 2022). Physical exercise also affects the endocrine system, regulating the production of hormones such as growth hormone, insulin, and cortisol. These hormones ensure children’s growth, energy metabolism, and ability to cope with stress. In addition, physical activity also has a positive effect

on children's psychological health, reducing stress levels and increasing self-confidence, which contributes to their overall development.

The above factors have a complex and interrelated effect on various physiological processes in the body.

Genetic factors determine the basic genetic potential for muscle hypertrophy and bone development, and food provides the nutrients necessary to realize this potential. Environmental factors affect the body's ability to adapt, enhancing or reducing their impact on physiological processes, in particular the immune system and the respiratory system (Patel & Singh, 2023). Physical activity activates the endocrine system, ensuring hormonal balance and optimizing metabolic processes. For example, regular exercise increases insulin sensitivity, which helps regulate blood sugar levels and improve energy metabolism (Davis et al., 2023). The interaction of environmental factors and food can affect the body's energy balance, leading to problems such as obesity or malnutrition in children. The coordinated effects of these factors determine the overall trajectory of children's physical development and are essential for their healthy growth. Proper nutrition is a key factor in children's physical development. Protein, carbohydrates, fat, vitamins, and minerals play an important role in the development of muscles, bones, and the cardiovascular system. For example, calcium and vitamin D help strengthen bones (Williams, 2021). Nutritional deficiencies or malnutrition can lead to stunted growth in children.

Physical activity is important for the development of children's musculoskeletal and cardiovascular systems. Regular physical exercise helps to strengthen muscles, increase bone density, and improve metabolic processes (Lee & Park, 2022). For example, aerobic exercise improves cardiovascular function and increases blood circulation.

The above factors affect various physiological processes in the body. For example, genetic factors and nutrition contribute to muscle hypertrophy, while environmental factors influence the body's ability to adapt. Physical activity activates the endocrine

system and provides hormonal balance, which has a positive effect on growth and development (Davis et al., 2023).

Conclusion. Studying the physiological basis of factors affecting the physical development of children is important for ensuring their healthy growth and overall development. While genetic factors determine the main trajectory of a child's physical development, environmental factors, proper nutrition, and physical activity play an important role in the implementation of this trajectory. The interaction of these factors ensures the coordinated functioning of the musculoskeletal system, cardiovascular system, endocrine system, and general metabolic processes of the body. A deep understanding of the physiological basis of factors affecting the physical development of children not only ensures their healthy growth, but also creates a solid foundation for their future physical and intellectual activity. Therefore, parents, educators, and health care providers should consider the importance of these factors and implement measures to support children's physical development. For example, providing quality food, creating appropriate conditions for sports, and providing an environmentally safe environment will serve the healthy development of children. Future research in this area will allow us to more effectively support children's physical development.

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