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Physical Education and Sports as Strategic Priorities for Sustainable Social Development: A Neuropsychological Aspect

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Abstract: *The article examines the importance of physical education and sports as priorities of the future and their role in the realisation of the strategy of sustainable development of society. In particular, the neuropsychological aspect of the impact of physical activity on the individual and society is reflected. The positive influence of sport on cognitive functions, emotional state, socialisation and development of volitional qualities is emphasised. Special attention is paid to the integration of physical education into education and work environment as a tool to promote physical and mental health, increase productivity and harmonise interpersonal relations. Physical education is considered as a key element in the formation of a healthy, socially active and sustainable society. Physical activity and sports play a key role in the development of today's society, promoting healthy lifestyles, fostering social inclusion and supporting global efforts towards sustainable development. In the context of the Sustainable Development Goals (SDGs) defined by the United Nations, physical activity and sport initiatives are tools that influence different aspects of life: health, education, economy, and environment. The article demonstrates that physical education and sport are important components of a healthy lifestyle and have a significant impact on human physical and mental health; sports programs can be used to solve social problems and promote sustainable development of society. Neuropsychological research provides new perspectives on the use of physical education and sport in health and education. The article also underscores the growing importance of artificial intelligence in sports science, alongside the neurocognitive effects of physical activity on mental health. The role of exercise in human life cannot be overstated. Beyond its widely acknowledged health benefits, physical activity helps shape character and provides valuable psychological relief.*

Keywords: *sustainable development of society; neuropsychological aspect of the impact of physical activity; mental health; healthy lifestyle; sustainable development.*

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1. Introduction

We live in an era that is characterised by rapid technological change, urbanisation, and an increasing amount of psychological and emotional strain. And due to this, physical education and sport are of particular importance. Not only are they one of the most important evidence-based sources of improved health outcomes, but are also key factors in developing a harmonious personality, strengthening social ties, and achieving overall social well-being.

Given the global challenges outlined in the UN Sustainable Development Goals, physical activity are becoming important tools to building a sustainable future (United Nations Development Programme, 2024). They contribute to the integration of multiple dimensions - the physical, emotional, social, and cognitive aspects, creating the basis for a healthy and productive society.

In this context, neuropsychological aspects of physical activity are important, as they encompass the impact of sports on brain function, cognitive development, emotional stability, and adaptation to challenges. The ability of sport to influence brain neuroplasticity, formation of volitional qualities, and to harmonise the psycho-emotional state constitutes an important component of developing human potential.

Lyseyko, Yatsiv, & Pityn (2023) show that “physical education and sport are integral components of the sustainable development of society, promoting health, social inclusion, and economic growth. For the future, they remain an important tool for the formation of a harmonious, healthy, and socially responsible society. Investment in sport and physical activity should be a priority at both national and international levels”.

In their work, Ratey & Hagerman (2008) highlight “a profound relationship between physical activity and brain function. They show that exercise is not only a means of supporting physical health, but also a powerful tool for optimising cognitive function, regulating emotional state, and preserving mental health”.

Diamond & Ling (2016) contended that “physical activity has a positive effect on memory, learning, attention, and thinking speed. In particular, exercise is effective in reducing cognitive decline associated with aging and may also slow the development of Alzheimer's disease”.

This article examines the role of physical activity and sport as future priorities, their impact on sustainable development strategies, and the neuropsychological mechanisms underlying their effectiveness.

The purpose of this article is to analyse the contribution of physical education and sport to the formation of socio-educational dimensions within sustainable development strategies, to evaluate their effects on the psychological state of individuals, and to consider the prospective neuropsychological implications of physical education and sport.

2. Methodology of the Article

This theoretical article adopts an interdisciplinary approach to analyse the role of physical education and sport in the formation of sustainable societal development strategies, particularly focusing on neuropsychological aspects. The methodology is based on a theoretical synthesis of contemporary research, integrating the fields of physical education, psychology, neuroscience, and sociology.

The article is theoretical and analytical in nature, seeking to consolidate existing knowledge on the subject, examine concepts and models of sustainable development that incorporate the role of physical activity in society, and contextualise current neuropsychological research on how physical activity influences cognitive functions, emotional well-being, and social adaptation.

The methodology of this theoretical article involves:

- a systematic review of the scientific literature with a focus on recent research in the neuropsychology of physical activity;
- a critical analysis of the concepts of sustainable development and the relationship with the social and educational functions of physical activity;
- a synthesis of different fields - psychology, neuroscience, and sociology;

The theoretical article uses indirect methods: literature review, data interpretation, synthesis of information, systematisation of knowledge, and critical analysis.

Although the study is theoretical and does not involve direct work with participants, ethical standards are observed: sources of information with appropriate references to the authors are used correctly, avoiding distortions and manipulations in interpreting the results of scientific papers.

3. The Role of Physical Education and Sports in the Formation of Future Personality

The demand for a healthy lifestyle is widespread throughout the world, and this concept includes not only proper, balanced nutrition and avoidance of bad habits, but also regular physical activity in the form of training and sports. It should be noted that an active lifestyle has become increasingly popular and socially valued among people of all ages. However, it is important to recognise that under current lifestyle conditions, opportunities for physical activity are often limited, as is sedentarism, particularly among office workers. Moreover, the prevalence of digital dependency and insufficient development of sports infrastructure further hinder the promotion of physical activity and engagement in sports.

The national system of physical education for children and adolescents greatly influences personality formation, its connection with the traditions of people, lifestyle, hobbies, and moral values. Physical education in the various educational institutions is based on the principles of an individualised approach, the prioritisation of health promotion, and the wide application of various means and forms of physical education. The level of physical development, children's health indicators, absence of harmful habits, participation in physical education, and observance of a healthy lifestyle are among the criteria indicating the effectiveness of physical development (Zhdanova, Chekhovska, & Shevtsiv, 2014; Pulido-Gil et al., 2022).

Physical education and sports are considered one of the means of socialisation, improvement of individual professional qualities, and development of the motor sphere. Thus, physical education and sports constitute key prerequisites, with physical education the most important means of comprehensive and harmonious human development.

According to scientists, physical activity plays a crucial role in human life, because, in addition to the obvious benefits, it contributes to the development of endurance and personality. Sports also help to alleviate stress. Today's scientists, such as I.I.V. Barsagaeva, claims that children who regularly engage in sports are 5-7% more successful in passing exams than children who do not engage in physical activity (James et al., 2023).

Appropriate activity, i.e., a variety of physical exercises, is the basis of physical education and sport. These exercises contribute to the development of skills necessary for life. In addition, through sport, people develop their physical abilities, which optimises their health and improves their performance.

Physical education represents both a component of societal and individual culture and a means of rationally utilising physical activity to optimise health, support personal development, and prepare individuals for practical activities (Doroshenko et al., 2019).

It is scientifically proven that professional and amateur athletes enjoy significantly better health than people who do not exercise at all (Malm, Jakobsson, & Isaksson, 2019). Moderate physical activity helps to strengthen the cardiovascular system and thus normalise blood pressure. Physical activity also improves brain function and helps slow down the ageing process. Sport has a positive effect on the human psyche, reducing stress and negative feelings.

By doing sports, people develop different qualities. They become more confident, more motivated, physically stronger, learn teamwork, and develop willpower. Training is often closely linked to various character-building aspects, such as overcoming weaknesses and fears, and redefining personal values. Sport is also a process of moral development, being related to the formation of socially significant qualities, attitudes towards other people, society, and oneself. It is also worth noting that sport develops human endurance, diligence, and sociability.

There are many ways to engage in physical education and sports. The most popular are participation in various sports sections and independent training at home and outdoors (Prikhodko et al., 2021).

It is important to note that people's involvement in sports is growing. Engaging in sport activities is a global trend. Self-guided exercise is particularly popular and many people appreciate the convenience it brings. One can freely choose the time and place to exercise. There are many different applications with detailed descriptions of exercises and video instructions.

Consequently, physical education can be regarded as a distinctive form of cultural activity, the outcomes of which contribute to both individual development and the advancement of society as a whole. Physical education also contributes to the emergence of social trends, such as healthy lifestyles. Sport is a functional mechanism for health promotion, self-realisation, self-expression, and human development. Therefore, the importance of physical education and sports has grown significantly in today's society.

Physical education and sports play a fundamental role in the formation of personality, influencing its physical, psychological, social, and moral development. In the context of advanced information technologies and the prevalence of information overload in modern society, physical activity emerges as a crucial factor in educating the younger generation, fostering physical potential, and supporting the harmonious development of the body. Sport promotes the development of the cardiovascular system, musculoskeletal system, and immunity. Regular physical activity prevents obesity, diabetes, and cardiovascular diseases.

Sport plays an important role in the formation of psychological endurance, self-discipline, and self-confidence, as physical activity cultivates determination, perseverance, and the ability to overcome difficulties. Physical activity helps to reduce stress and anxiety, increasing the level of emotional resilience, and fosters a desire for self-improvement and new achievements.

Team sports develop the ability to cooperate, understand roles and responsibilities; through communication in a healthy environment, the respect for others is formed regardless of their origin or social status. Playing sports develops a sense of responsibility to the team, coach, or oneself (Rybchych, 2015).

In educational programmes, physical education contributes to the development of a well-rounded personality: regular participation enhances cognitive activity and academic performance, while physical activity encourages children to think creatively and develop problem-solving skills.

The integration of sport into the education system and everyday life ensures the formation of a harmonious, healthy, and self-sufficient personality, capable of withstanding the challenges of the present-day world.

4. The Role of Physical Education and Sports in the Development of Socio-Educational Features as Components of a Strategy for Sustainable Development of Society

Sport as the pinnacle of physical education has its own social and educational characteristics. Important and responsible activities, such as selecting talented youth, testing them, and equipping them with sports skills, require scientific work.

Physical education and sports are increasingly gaining prominence in today's society. That is, in the processes of industrial labour (industry, construction, agriculture, etc.) are well set questions of health promotion, increase in working capacity, and, most importantly, fitness. Physical education and sports are implemented in general education institutions, preschools, and other organisations as a socially and educationally significant process of state importance. A number of laws and government resolutions aimed at organising such mass health-improvement and sports activities are being applied practically. Another important direction is the reorganisation of physical education and sport in our country, where the results of best practices and scientific research are widely used (Prystupa et al., 2020).

These processes must be well internalised by the students. Here we would like to draw your attention to two features of the scientific organisation of work:

- conducting scientific research and training of leading specialists in the field;
- evaluation of the latest best practices and wide implementation of positive results.

These areas have been purposefully applied to industry sectors and have yielded positive results. The role of sports coaches and teachers working in the system of continuing education in achieving positive results in these areas is important. Only with the proper training and guidance of a true specialist, it is inevitable that young athletes will be healthy enough to reach the top in sports competitions. In this regard, every specialist in the domain must understand the characteristics of the young body, master the sciences of anatomy, physiology, pedagogy, psychology, sports metrology, biomechanics, and the theory of physical culture. To foster children's interest in sports, a coach or teacher should take into account the psychological states during classes.

One of the main psychological conditions for the formation of young people's interest in sports is a comprehensive study of the child's psychological characteristics. These include: character, temperament, capabilities, direction of activity, and internal motives. Good results in the formation and development of this interest depend on the spirit in which the teacher-coach leads the class and how they fulfil their duties. Satisfaction with their achievements in competition, general morale, sportsmanship, and disappointment with mistakes made during the competition are important factors affecting the child's personality. These factors, together with the psychological process and characteristics, constitute the rich inner world of each child, which is called the psychological state. A child's participation in sports depends on the ability of the teacher or coach to convince the child of his own strength, to instill in him the need for self-confidence and perseverance in overcoming any difficulties in competitions. The study of individual characteristics of children and daily support forms in them vitality, purposefulness, interest in knowledge, and desire to overcome difficulties arising in learning. Another key factor in fostering interest is understanding children's individual characteristics and emotional states during physical activity, as well as organising engaging lessons that prepare them for future participation in sports programmes. Physical education and sports are among the important factors in improving labour skills and their continuation. In this regard, it is important to organise the work of each sports specialist on the basis of new requirements, experience, effective, targeted use of scientific achievements, and results of scientific research (Andreyeva, 2014).

Physical education and sports are important components of a sustainable development strategy for society. They promote the development of social and educational qualities in individuals, foster civic consciousness, and support the creation of a harmonious and inclusive society. In the context of global challenges such as social inequalities, climate change, and declining physical activity, education is of particular importance as a tool for sustainable development.

Physical education is integrated into the Sustainable Development Goals (SDGs). In particular: according to SDG #3, physical activity prevents chronic diseases, reduces stress, and promotes mental health; according to SDG #4, integrating sport into the curriculum contributes to a well-rounded individual; and according to SDG #10, sport creates equal opportunities for socialisation regardless of gender, ethnicity, or social status. SDG #16 explains that physical education promotes social inclusion and peaceful coexistence skills (United Nations Development Programme, 2024).

The socio-educational role of physical culture is integral to sustainable development strategies. Participation in sports competitions fosters the formation of moral and ethical values, promotes adherence to rules, and cultivates tolerance, compassion, and empathy. Moreover, sports help develop a sense of responsibility towards the team, the coach, and oneself (Rathore & Lom, 2020; Pujari, 2024).

Sport integrates representatives of different social groups, overcoming the barriers of inequality, while participation in team sports fosters abilities such as cooperation, interaction, and

support for each other. Through sports, the future personality gains self-confidence and the capacity to lead others.

Participation in sports events at the regional and international levels contributes to the formation of pride in one's country, as the ideas of environmental responsibility, social justice, and peace are spread.

In contemporary society, it is essential to integrate physical education into broader social programmes for sustainable development. This involves incorporating physical activity into school and university curricula, promoting sports education as a means of fostering moral and social values, organising large-scale sporting events that bring communities together around the principles of global health and inclusion, and utilising sport as a platform for the integration of individuals with special needs.

Physical education and sport are an integral part of the strategy for sustainable development of society, promoting health, socialisation, and education of future generations. Their integration into social, educational, and environmental programmes creates opportunities for harmonious coexistence, equality, and progress. The advancement of physical education should be prioritised at all levels of governance, as it serves as a foundation for fostering a socially responsible and sustainable society.

Physical education as a component of a healthy lifestyle is gaining importance in the context of global policy and public health. Its impact goes well beyond the Sustainable Development Goals (SDGs), encompassing various initiatives and programmes implemented by international organisations, in particular the World Health Organisation (WHO).

Physical education has a significant impact on global policy, as health is also a political priority because many governments recognise that public health is a key factor in the economy and national security (Pujari, 2024). Movement is seen as an effective tool to prevent non-communicable diseases (NCDs), which are one of the leading causes of death in the world (Rathore & Lom, 2020).

Sport is used as a platform to build international relations, promoting peace and understanding. Major sporting events, such as the Olympic Games, become a platform for dialogue between countries. Physical education promotes social inclusion, especially among marginalised groups. Sport programmes are used for youth outreach, and for the prevention of crime and drug use. The World Health Organisation (2024) actively advocates for physical activity as a key factor in health. It develops guidelines for different age groups and implements global initiatives to boost physical activity across populations.

5. The Influence of Physical Education and Sports on the Psychological State of a Person

It is well known that physical exercise has a positive effect on human health. Physical exercise helps to reduce weight, normalise heart rate and blood pressure, and is also the first prerequisite for health, strength, and endurance of a person, whose balanced physique is harmoniously combined with developed muscles.

Physical exercise strengthens bones, ligaments, and muscles, making them stronger and more resistant to stress and injuries. Less attention is paid to the effect of physical exercise on the mind, but many studies have established a connection between regular physical activity and mental health. Movement has a positive effect on the mind, especially for people suffering from depression and anxiety (McMorris, 2015).

Physical activities have a positive effect on the psyche. Improved blood circulation and deeper breathing contribute to a better supply of blood and oxygen to the brain. In addition, the ability to concentrate increases. Exercise gradually reduces nervous tension and the result is a feeling of joy: we do not feel pain, discomfort, and all organs function normally. This feeling of joy, in turn, creates a good mood.

The hormone responsible for a good mood and well-being is known as beta-endorphin. It has been established that the level of this hormone in the blood increases significantly after running: by 42% after 10 minutes and by 110% after 20 minutes (Schoenfeld & Swanson, 2021). It is assumed that prolonged physical activity aimed at developing endurance increases the level of beta-endorphin more than short-term training. Beta-endorphin has a strong euphoric effect - it helps to overcome depression and achieve mental balance.

Moderate physical activity helps to increase self-esteem, reduce anxiety and depression, fight bad habits, and minimise the effects of stress. Numerous studies have shown that physical exercise is a reliable protection against risk factors and related "diseases of civilisation", such as physical inactivity, obesity, smoking, and some other harmful factors (Erickson, Hillman, & Kramer, 2015).

However, this does not mean that physical education and sports are a panacea for all diseases. They allow a healthy person to always be healthy and strong. This is a real goal for which it is worth sparing no effort. Dosed movements balance blood sugar levels and eliminate chronic muscle tension, which is characteristic of people who are constantly under stress. Such physical activity helps regulate stress levels, as sports provide a constructive outlet for releasing accumulated aggression—channeling it externally rather than directing it towards loved ones, and turning it into a positive, beneficial activity. During sports, the body produces endorphins, which are natural antidepressants. Endorphins (chemical compounds similar in structure to opiates, which are naturally produced in neurons in the CNS) induce a state behaviourally characterised as euphoria, which is why they are often called 'hormones of happiness' or 'hormones of joy'.

Physical activity increases the flow of oxygen throughout the body, particularly to the brain. This enhanced oxygenation helps reduce symptoms of various mental health conditions, including feelings of hopelessness, depression, stress, and insomnia.

The first investigation that studied how physical activity affects mood was conducted in 1970. It involved two groups of men. The first group exercised for six weeks: the programme included jogging, swimming, and cycling. The second group led a sedentary lifestyle (Berger & Motl, 2000). It turned out that the men in the first group recovered from depression significantly faster. During times of stress and despair, people tend to isolate themselves from their surroundings (Biddle et al., 2021).

However, at present, finding an appropriate outlet is crucial, and physical exercise plays a significant role in facilitating this. Many objective and subjective factors play a role in this: expanding the social environment, developing new interests, knowledge, and goals, changing the environment and distracting from depressive thoughts, and reducing aggression, anger, and other destructive feelings. As is known, health is a state of complete physical, mental, and social well-being, and not just the absence of diseases and physical defects.

It is important to recognise that all aspects of health are interconnected, and impairment in one component can negatively affect the others. Therefore, serious health problems can alter mental health, emotional state, relationships with others, and changes in the value system. In this case, we are talking about the connection between the psyche and the somatic (body). Regular sports also have an undeniable effect on the prevention of psychosomatic diseases. The influence of sports not only extends to physiological and psychological health, but is also a factor in the development of personality and contributes to the formation of a full-fledged individual. Self-confidence, emotional stability, and purposefulness are qualities that everyone wants to develop in themselves, and sports contribute to their development. Even training at an amateur level can affect physical form, character, and overall personality.

Evidently, much depends on the type of sport and the specifics of the chosen training. Professional training and competition preparation are one aspect, while classes aimed at enjoyment and general fitness are quite another.

Professional athletes usually experience a kind of "personality breakdown". From a young age, they become accustomed to strict restrictions in nutrition and lifestyle. For them, the most

important factor is that the motivation to succeed acts like an arrow, guiding them steadily towards victory and enabling the achievement of truly significant results.

In typical individuals, changes occur more gradually and gently. To overcome inertia, anyone who regularly attends a swimming pool or gym should set a clear goal before starting their training. An amateur athlete gradually becomes more purposeful and must develop discipline to adhere to a consistent training regimen (Kutsenko et al., 2021).

In addition, in classes, participants learn to overcome both physical and psychological weaknesses. For example, boxing can help reduce the fear of getting hit, while acrobatics eliminates the fear of falling from heights.

Furthermore, sports contribute to the speed of decision-making in all team games, as well as in extreme training. Classes help get rid of painful shyness and teach you to quickly master situations that require fast communication. As a result, self-esteem improves, and the individual experiences greater well-being and a sense of calm.

It is known that physical activity affects biochemical processes. Metabolic changes and hormonal fluctuations occur during training. Following exercise, individuals often experience a pleasant fatigue and a sense of calm, while negative thoughts and feelings of depression tend to diminish. Table 1 summarises the impact of physical education and sport on human psychological well-being:

Table 1. The influence of physical education and sport on the psychological state of a person

Psychological aspect	Positive impact of physical education and sport	Mechanisms of influence
Reducing stress and anxiety	Decreased cortisol (stress hormone), increased endorphins (happy hormones).	Neurochemical configurations and activation of the parasympathetic nervous system.
Improved mood	Increased levels of serotonin and dopamine (neurotransmitters responsible for satisfaction and motivation).	Neurochemical configurations and activation of pleasure centres in the brain.
Increased self-esteem and confidence	Achieving athletic goals, improving fitness, and feeling in control of your body.	Formation of positive body image, development of coping skills.
Develop emotional resilience	Learning to control emotions during competition and training; developing self-regulation skills.	Formation of stress management skills, development of willpower.
Reducing symptoms of depression	Increasing endorphin levels, improving social interaction, and a sense of achievement.	Neurochemical configurations and improving social connections.
Improved cognitive function	Increasing levels of neurotrophic factors and improving blood flow to the brain.	Neuroplasticity and improving neural connections.
Improved sleep quality	Reducing stress levels and physical fatigue.	Regulation of circadian rhythms and lowering anxiety levels.
Reducing feelings of loneliness	Participation in team sports and social interaction.	Formation of social bonds, sense of belonging.

6. Neuropsychological Aspect of the Impact of Physical Education and Sports on a Person in the Future

In the future, physical culture and sports will become even more important for the formation of a harmonious personality and the maintenance of social well-being. Neuropsychological studies show that regular physical activity contributes to the improvement of both individual mental health and overall cognitive performance.

The key neuropsychological effects of physical activity include exercises that stimulate the production of brain-derived neurotrophic factor (BDNF), which promotes the formation of new neural connections. Brain-Derived Neurotrophic Factor (BDNF) is an important protein that

supports existing neurons and stimulates the growth of new neural connections in the brain. High levels of BDNF are associated with improved cognitive function, increased neuroplasticity, and a reduced risk of developing neurodegenerative diseases. Physical activity is one of the most effective ways to elevate BDNF levels in the brain. BDNF, a member of the neurotrophic factor family, plays a key role in the development, maintenance, and functioning of the nervous system. It promotes neuronal survival, stimulates their growth and differentiation, and supports synaptic plasticity—the ability of neurons to change in response to experience and learning (Kosholap et al., 2021).

Exercises that stimulate the production of BDNF are aerobic exercises such as running, swimming, cycling, brisk walking, and dancing. This category is the most studied in terms of increasing BDNF levels. Regular aerobic training helps increase blood circulation to the brain, which provides more oxygen and nutrients to neurons. Running and other long-term aerobic exercises are especially effective in stimulating the production of BDNF. Also stimulating the production of BDNF are high-intensity exercises (HIE) such as interval training, sprints, and Tabata. High-intensity interval training (HIIT) combines short periods of high intensity with periods of rest or low intensity. This type of training contributes to a rapid and significant increase in BDNF levels, as well as to improvements in metabolic health and endurance.

Although strength training—such as lifting heavy weights, bodyweight exercises, squats, push-ups, and pull-ups—is less effective than aerobic exercise at raising BDNF levels, it still contributes to its production. Regular strength training improves overall physical health and may promote BDNF growth through mechanisms related to stress and muscle recovery. Flexibility exercises are not the main BDNF stimulants. However, they help reduce stress and improve mental health, which can indirectly support healthy BDNF levels. Any physical activity that elevates heart rate and uses multiple muscle groups can help the BDNF levels to increase. Team sports also support social interaction, which has positive effects on mental health (Ovcharuk et al., 2021).

During exercise, oxygen consumption by the muscles and brain increases, inducing mild stress that stimulates BDNF production as a protective response. Movement promotes the release of endorphins, cortisol, and other hormones that regulate BDNF levels. Physical activity can also stimulate neuroplasticity, promoting the growth of new neural connections and maintaining existing ones.

Physical activity represents an effective mechanism for stimulating the production of brain-derived neurotrophic factor (BDNF), which contributes to improved cognitive function, neuroplasticity, and overall mental health. Aerobic exercise, high-intensity interval training, and strength training are the most effective for increasing BDNF levels. Regular physical activity not only supports physical health, but also plays an important role in maintaining brain health and preventing neurodegenerative diseases. Integrating exercise into your daily routine is key to ensuring long-term mental and physical well-being.

This increases learning ability, memory, and cognitive processing speed. Cognitive resilience is also important because in the current world, where stress and high information overload are becoming the norm, sports help strengthen cognitive resources, improve concentration, and decision-making ability.

Physical exercise activates the dopamine system, which provides a sense of satisfaction and reduces anxiety. In addition, sports help alleviate depression and emotional burnout. In the future, playing sports will help develop self-discipline, motivation, resilience in overcoming difficulties, and adaptability to new challenges.

Team sports develop communication skills, empathy, and the ability to cooperate effectively, which will be especially valuable in a future society focused on teamwork.

Thus, physical education and sports in the future will become not only a means of maintaining health, but also key tools for revealing a person's cognitive and emotional potential.

Within a sustainable development strategy, the neurocognitive benefits of physical activity are particularly important. They contribute to mental health, academic achievement, and individual adaptability. Recent studies confirm that regular exercise enhances brain function, supports

neuroplasticity, and aids in managing stress and anxiety while fostering emotional stability (de Sousa Fernandes et al., 2020).

Moreover, the integration of computer-based and data-driven technologies into physical education is opening new possibilities. These innovations enable personalised training programmes, real-time monitoring of psychophysiological conditions, and improved prevention of mental health disorders (Pujari, 2024).

Therefore, physical activity should be viewed not merely as a means of staying fit. It is also a vital factor in promoting neuropsychological well-being and supporting long-term social resilience.

7. Using Artificial Intelligence in Physical Science: A Neuropsychological Perspective

Current technological advancements, particularly artificial intelligence (AI), are opening new opportunities in sports science and practice. The integration of AI systems into training and competition processes can significantly enhance physical preparation. It also provides deeper insights into the psychophysiological and neuropsychological functioning of athletes.

Using machine learning algorithms, AI can analyse large volumes of data gathered from sensors, video surveillance, motion trackers, and neurophysiological monitoring. This enables an objective evaluation of an athlete's workload, stress levels, and cognitive readiness (Kosholap et al., 2021).

Importantly, AI is also instrumental in creating personalised training programmes, modulating psychological states, and predicting the risks of overtraining and injuries. On a neuropsychological level, AI monitors changes in brain activity linked to stress, fatigue, or recovery. This is crucial for the sustainable development of human potential.

Furthermore, AI-based virtual simulations and augmented reality have proven effective in cognitive training and competition visualisation. These technologies help form stable neural connections, improving motor memory and responsiveness (Ovcharuk et al., 2021).

Consequently, AI in sports science optimises physical training. It also supports the development of mental stability, adaptability, and cognitive abilities in athletes. These factors are crucial for the sustainable development of individuals. They also contribute to the long-term progress of society as a whole.

8. Systemic Obstacles to Sport Development: Analysis and Ways of Overcoming Them

Sport, as a powerful tool for social development and health promotion, faces multiple systemic challenges that limit its potential. These challenges, encompassing political, economic, and cultural factors, must be thoroughly analysed and effective strategies developed to promote the sustainable development of sport.

Political constraints include inadequate funding. Budgetary constraints often reduce the funding available for sport programmes, especially at the local community level. The lack of strategic planning is also a problem, as many countries do not have a clear strategy for sport development, leading to uneven distribution of resources and inefficient use of funds (Prikhodko et al., 2021).

Corruption schemes and inefficient management of sports organisations undermine trust in sport and hinder its development. There is a shortage of sports facilities in many regions, especially in rural and low-income areas. The high cost of equipment and services makes fitness inaccessible to many people, especially low-income families. There is insufficient promotion of fitness in many societies, especially among women and people with disabilities. Stereotypes and prejudices about being active can limit participation in physical activities, especially for women and people with disabilities.

Many individuals are not sufficiently motivated to participate, especially in today's lifestyles. Addressing these challenges effectively requires comprehensive programmes at both national and local levels, the active engagement of diverse stakeholders in sports development, and

the integration of modern technologies and innovative practices. Furthermore, creating favourable conditions for private investment and promoting public awareness of the benefits of healthy lifestyles demand coordinated efforts by the state, civil society organisations, the private sector, and individual citizens.

9. Conclusion

Thus, physical education and sport are not merely crucial for physical health. They also serve as powerful tools for social, psychological, and cognitive development. In the context of a sustainable societal development strategy, they play an essential role in creating an aware and harmonious future. Integrating physical activity into daily life improves the quality of education, reduces social inequalities, promotes civic awareness, and boosts mental health.

One important neuropsychological benefit of physical activity is its ability to stimulate the production of brain-derived neurotrophic factor (BDNF). This has significant implications for improving cognitive function and enhancing neuroplasticity. Additionally, BDNF plays a crucial role in preventing neurodegenerative diseases. Regular exercise strengthens the nervous system, improves adaptation mechanisms, and builds stress resistance. These effects are particularly important in today's fast-paced world.

To maximise these benefits, physical education and sport should be prioritised within national education, health, and social welfare programmes. Their progress will support the achievement of the UN Sustainable Development Goals, especially in areas such as health, inclusion, environmental responsibility, and social equality. Ultimately, physical education and sport not only promote individual well-being, but also lay the foundation for building a sustainable and progressive society.

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