Physical Education: Body, Movement, Strategy, and Nonverbal Communication

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Annotation

In this article, I show how physical education can become a space for the development of mental mechanisms - provided that we stop reducing it to running, jumping and passing fitness standards. Drawing on the CCFP model presented in previous articles of the module [1], [5], and on research of 2024-2025, I substantiate that physical education possesses exceptional potential for the development of non-verbal communication and charisma (MM-8), emotional intelligence (MM-3), forecasting and strategic thinking (MM-11), spatial imagination (MM-10), constructive argument (MM-7), critical thinking (MM-6) and eloquence (MM-2). Motor activity, team games, tactical planning and bodily reflection here serve not as an end in themselves, but as a means of developing thinking. I pay special attention to the diagnostics of progress [2] and the connection of subject-based learning with the school's infrastructure. The restructuring of physical education teaching is not merely a methodological question, but a strategic task: it is precisely through bodily experience that the cognitive apparatus capable of strategic, spatial and non-verbal thinking is formed - the type of thinking that is necessary for understanding the embodied nature of consciousness [7].

Keywords: physical education, mental mechanisms, non-verbal communication, strategic thinking, emotional intelligence, spatial imagination, bodily intelligence, diagnostics, infrastructure.

Introduction: The Body as Co-Author of Consciousness

I will begin with a statement that may seem contentious, but which I consider fundamental. Physical education at school is not a subject about "how to run a hundred meters" or "how to pass fitness standards." It is a subject about how the body works in space, how movement intertwines with thought, and how bodily experience forms the personality. We are accustomed to thinking that thinking happens somewhere in the head, in the convolutions of the cortex, and that the body is merely an executive mechanism, an appendage to the brain. But can one understand strategy without having felt risk? Can one learn empathy without seeing how a partner's shoulders tense after a mistake? The body is not an application to consciousness, but its co-author, its first and most immediate interlocutor. It is precisely through movement, through effort, through coordination in space that a person learns to become aware of himself - not speculatively, but with his whole being.

Of course, physical fitness and health are important. But this is a tool, not a goal. The goal is the ability to read the language of the body (MM-8), to understand emotions through bodily contact (MM-3), to forecast the development of a situation and make strategic decisions (MM-11), to see space and one's place in it (MM-10), to cooperate and constructively argue in a team (MM-7). As I have already shown in the first article of this series [5], the principle of the dual purpose of a lesson means that every physical education lesson must simultaneously solve two tasks: the subject task (the mastery of motor skills) and the meta-subject task (the development of mental mechanisms). These tasks do not contradict each other - on the contrary, they mutually reinforce each other, like two hands supporting one burden.

The Dual Purpose of the Lesson and the Boundaries of the Possible

It is important to emphasize: physical education creates the conditions of possibility for the development of mental mechanisms, but is not their sufficient cause. In itself, performing exercises or playing ball will not develop strategic thinking. Development occurs only through specially organized pedagogical activity, where the teacher acts as a

facilitator and architect of the cognitive apparatus [1], [5]. Research confirms: contemporary physical education often "prioritizes the mastery of basic sports skills to the detriment of cognitive development" [8]. This is a profound misconception. As 2025 works show, physical education has the potential to support both motor and cognitive development, and programs that integrate motor complexity with cognitive tasks can substantially improve adolescents' executive functions [8]. Moreover, open motor skills positively influence executive functions, and exercises requiring strategic skills prove especially effective [9]. And a study published in Scientific Reports showed that chronic participation in strategic sports significantly reduces stress, while self-sufficient sports improve cognitive flexibility [13].

But I want to go further and show how each of the eleven mental mechanisms can be developed through physical education teaching - and how this changes the very approach to the subject. Physical education is not merely a "physical" subject. It is the school of embodied intelligence, where thinking and movement form an inseparable unity. That is precisely why physical education, in my view, is a key subject for the formation of the communicative-cognitive framework of the personality [1]. The restructuring of its teaching is not merely a methodological question. It is part of the historical necessity of changing the pedagogical paradigm about which I wrote in articles [3] and [4]. The industrial school reduced physical education to a set of standards to be passed. But post-industrial society needs people capable of thinking, creating, adapting - and physical education here is a key instrument. As I showed in [2], subject-centrism is one of the main reasons for the vitality of the old model. Overcoming this subject-centrism begins with a rethinking of the role of physical education in education.

Non-Verbal Communication and the Chaos of Bodily Signals

Non-verbal communication and charisma (MM-8) develop through physical education in the most direct and natural way. Movement is the language of the body. Sport, dance, team games - these are constant non-verbal communication: gestures, facial expressions, postures, distance, eye contact. The ability to "read" the body language of partners and opponents, to consciously use gestures for effective communication, to produce a convincing impression through bodily expressiveness - all of this requires special pedagogical work. The teacher must not simply "play basketball," but teach how to "read" the movements of partners; not simply "perform an exercise," but become aware of how the body expresses emotions and intentions. A 2025 study shows that multimodal communication in physical education lessons includes speech, intonation, facial expressions, eye contact, gestures, proxemics, body movements and posture, and these means are used in different proportions for organization, demonstration, motivation, coaching and feedback [14]. The teacher's possession of a rich repertoire of communication facilitates the achievement of physical education goals for all students. Team sports, as the data show, contribute to the recognition of emotions by facial expression, and coordination in groups, especially with non-verbal signals, is a complex task [14].

Emotional Intelligence: Sport as a Laboratory of Affect

Emotional intelligence (MM-3) is a powerful trainer that physical education provides in a natural form. Sport is emotions: the joy of victory, the bitterness of defeat, anger, disappointment, delight, fear. The ability to recognize these states through bodily sensations, to understand the emotions of partners through their movements, and to manage oneself in stressful situations is a key skill that develops through bodily experience. For this, one must create situations requiring emotional regulation, discuss emotional experience after games, and reflect on bodily sensations and their connection with emotions. Research confirms that physical education is an ideal environment for the development of emotional skills [12]. A 2025 systematic review showed that well-planned pedagogical models and active methodologies allow the development of self-esteem, empathy, emotional self-regulation and motivation. Moreover, integrated approaches that purposefully combine movement and emotions give more positive and stable effects than traditional interventions focusing exclusively on physical aspects [12]. Gamified interventions for the development of motor skills also effectively influence emotional intelligence [15], and studies of emotional intelligence in students engaged in individual and team sports have revealed a correlation between the type of activity and emotional development [12].

Strategy and Forecast: The Game as a Model of Uncertainty

Forecasting and strategic thinking (MM-11) are especially vividly manifested in team games. Where will the opponent run? What will be the next shot? How to rebuild the defense? These questions require rapid, intuitive, but

at the same time deeply strategic thinking. The ability to foresee actions, to make decisions under conditions of uncertainty and limited time, to plan and adjust strategy in real time - all of this develops through specially organized games and exercises. Research confirms that sports education improves decision-making abilities and raises strategic potential, leading to improved planning and adaptability in competitive and real-life situations [17]. Chronic participation in strategic sports significantly reduces stress, which indirectly indicates the development of strategic thinking [13]. And a study published in Nature showed that cognitive training interventions can significantly improve football performance by improving decision-making speed, tactical understanding and situational awareness [13]. The socio-constructivist model of tactical development in team sports is aimed at developing the higher-order thinking skills necessary for tactical decision-making [17].

Space, Coordination and Embodied Thinking

Spatial imagination and 3D visualization (MM-10) are movement in space. Understanding one's body in space, coordination, orientation on the field, estimation of distances and trajectories - all of this requires and develops spatial imagination. Coordination exercises, sports games, gymnastics, dances - these are the instruments. Research confirms that coordination-based physical activity programs effectively improve visuospatial working memory and general motor skills in primary school-age children [10]. School age is a critical period for the integrated development of cognitive and motor functions, and U-12 gymnasts demonstrate higher indicators of mental rotation and postural balance [10].

Argument, Reflection and Critical Thinking

Constructive argument (MM-7) also finds a natural environment in team games. One must agree on strategy, discuss mistakes, make collective decisions, respect the opinions of partners, and acknowledge one's mistakes. The ability to argue one's position, to listen and accept the decisions of partners, not to resort to personal attacks, to acknowledge mistakes and learn from them - all of this is formed in joint play. Research shows that team sports require not only individual skills, but also the capacity for meaningful social interactions and shared understanding [17]. The program of tactical development based on critical thinking emphasizes interpretation, analysis, inference, evaluation, explanation and self-regulation through guided reflection and collective dialogue, promoting the joint construction of strategic responses on the basis of reflective discussion and mutual support [17].

Critical thinking (MM-6) and eloquence (MM-2) also develop through physical education - through the analysis of game situations, the evaluation of one's own actions, the necessity of explaining strategies, arguing decisions, and giving feedback. Research shows that cognitive-reflective learning in physical education can significantly improve students' critical thinking abilities [8]. A study using RASCH modeling showed that indicators of critical thinking, including inference, recognition of assumptions, deductive reasoning, interpretation and evaluation of arguments, demonstrated a 70% reduction in difficulty for students in the experimental group [8]. The phenomenon-oriented learning model also supports the development of critical thinking skills [8].

Examples of Lessons: From Basketball Strategy to Dance Improvisation

Now imagine how this might look in a lesson. Here is a basketball lesson in grades 7-9. The teacher does not simply say: "Divide into teams and play." He gives an assignment before the game: to analyze the strengths and weaknesses of one's own team and the opponents, to forecast how the game will develop, to develop a strategy of defense and attack. After the game - reflection: did the course of the game coincide with the forecasts, why, what could have been done differently. Research shows that tactical success in team sports depends not only on individual skills, but also on the capacity for meaningful social interactions and shared understanding [17]. Here forecasting (MM-11), constructive argument (MM-7), eloquence (MM-2) and critical thinking (MM-6) are developed [1].

Or another example: volleyball in grades 6-8, but with a restriction on verbal communication. The teacher says: "In this game you may use only non-verbal signals - gestures, facial expressions, gaze, posture. How will you tell your partner that the ball is flying toward him? How will you show that you yourself will receive the ball?" After the game - analysis: which signals were understandable, which were not, what you felt when you could not speak. Research confirms that multimodal communication includes all these components, and team sports contribute to the recognition of emotions [14]. Here non-verbal communication (MM-8), emotional intelligence (MM-3) and spatial imagination (MM-10) are at work [1].

And here is a lesson in grades 5-7 where one must simultaneously perform a physical exercise and solve a cognitive task - a "dual challenge." Juggling a ball and counting in one's head, balancing on one leg and naming cities on a certain letter. Then a complication: two balls, more complex examples. Afterward - reflection: what was the most difficult, how you coped with two tasks simultaneously, what you learned about the connection between movement and thinking. 2025 studies showed that programs integrating motor complexity with cognitive tasks substantially improve adolescents' executive functions [8]. The "dual challenge" demonstrated that embodied learning experience, implemented in a structured but playful format, can be both engaging and effective [11]. Here critical thinking (MM-6), spatial imagination (MM-10) and emotional intelligence (MM-3) are developed [1].

Tactical analysis of the game in grades 8-10: observation of the game situation, forecasting of action options, decision-making, discussion in the group. Research shows that critical thinking allows structured reasoning, analysis of arguments and strategic deduction and can be developed through purposeful instruction [8]. Spatial positioning skills improve group coordination [14]. Here forecasting (MM-11), critical thinking (MM-6), constructive argument (MM-7) and eloquence (MM-2) are developed [1].

Dance improvisation in grades 5-8: choose an emotion, create a short dance sequence expressing it, show it to the group so that the spectators guess the emotion. Afterward - reflection: how you chose the movements, how you understood the emotion in the dance of others. Research confirms that rhythmic gymnastics, implemented through pedagogically substantiated and student-centered approaches, can develop critical thinking by engaging students in decision-making, reflection, creativity and cooperation [16]. Physical education is an ideal environment for the development of self-awareness, empathy and self-regulation [12]. Here spatial imagination (MM-10), emotional intelligence (MM-3) and non-verbal communication (MM-8) are at work [1].

And finally, sports debates in grades 9-11: "What is more important in team sports - individual technique or team strategy?" Two teams prepare arguments, conduct a debate, and what is evaluated is not only the argumentation, but also the ability to listen, not to interrupt, not to resort to personal attacks, and to respect another's position. Afterward - reflection: did your position change, what did you learn about sport and about yourself. Research shows that socio-constructivist models support a student-oriented environment where athletes actively construct knowledge through dialogue and joint problem solving [17]. The TRST model emphasizes interpretation, analysis, inference, evaluation, explanation and self-regulation through guided reflection and collective dialogue [17]. Here constructive argument (MM-7), critical thinking (MM-6) and eloquence (MM-2) are directly developed [1].

Diagnostics: Dynamics Instead of a Standard

The diagnostics of mental mechanisms, as I showed in the sixth article [2], must be procedural, dynamic, and embedded in learning itself. For physical education, this means that we evaluate not only physical fitness, but also progress in the development of thinking and communicative abilities. What exactly is evaluated? The ability to recognize non-verbal signals and consciously use body language (MM-8) - research emphasizes that coordination in groups with non-verbal signals is a complex task [14]. The ability to recognize one's emotions through bodily sensations and to understand the emotions of others (MM-3) - pedagogical models in physical education can contribute to the development of empathy, self-regulation, confidence and motivation [12]. The ability to foresee the actions of opponents and make strategic decisions (MM-11) - sports education improves decision-making abilities [17]. The ability to orient oneself in space and estimate trajectories (MM-10) - coordination-based programs improve visuospatial working memory [10]. The ability to argue, listen, not resort to personal attacks (MM-7) and to analyze game situations, make substantiated decisions, reflect (MM-6) - cognitive-reflective learning improves critical abilities [8]. The diagnostic instruments may be as follows: a "movement diary," where the student records observations about body language, emotions, and strategic decisions; video analysis of games with subsequent debriefing; reflective reports with the questions "What did I feel during the game?", "How did I understand what my partners were feeling?", "What strategic decisions did I make?", "What did I learn about myself through movement?"; observation of team interaction; analysis of game situations. An example of dynamics: in September a seventh-grader plays chaotically, does not see the field, does not foresee the actions of opponents, cannot explain his decisions, is silent in the team, does not notice non-verbal signals. In December he begins to see the field, can forecast one or two actions of the opponent, explain some decisions, begins to use gestures. In May he actively forecasts the development of the game, makes strategic decisions, argues for them, actively uses body language, understands the emotional state

of partners and opponents, and participates in constructive discussion of strategy. It is precisely such dynamics, and not a static assessment of "passed/failed the standard," that should be the subject of diagnostics [2].

Infrastructure as a Cognitive Niche

The development of mental mechanisms requires not only new teaching methods, but also appropriate infrastructure. By creating it, we form what Andy Clark and Kim Sterelny call a cognitive niche (Issue 3, Art. 13). Infrastructure is not merely "premises," but the material part of the environment that provides scaffolding for the development of mental mechanisms. Without this niche, the mechanisms remain abstract concepts. A sports complex - a space for team games where strategic thinking, non-verbal communication and constructive argument develop [17]. A gym - a space for individual work on the body, the development of coordination, strength, and endurance [10]. Team game courts - spaces where tactical thinking and non-verbal communication develop in a natural game environment [17]. A dance studio - a space for the development of bodily expressiveness, emotional intelligence, and spatial imagination [16]. A climbing wall or obstacle course - a space for the development of spatial thinking, forecasting and decision-making under conditions of physical challenge [1]. The creation of this infrastructure is not an expense, but a strategic investment. Every child who finds through these spaces their "point of entry" - whether it be team games, dances, martial arts or individual sports - receives a powerful impulse for the development of all the other mental mechanisms [1].

Interdisciplinary Bridges

Physical education does not exist in isolation. It is connected with all the other subjects. With biology - through anatomy, physiology, and an understanding of how the body works and how movement influences health. This develops emotional intelligence (an understanding of oneself as a bodily being) and critical thinking (the evaluation of information about health) [1]. With psychology (a new subject) - through the psychology of movement, sport, and body-oriented psychology, which develops emotional intelligence, self-regulation, and an understanding of the connection between body and psyche [12]. With mathematics - through statistics in sport, data analysis, measurement of results, calculation of trajectories, which develops forecasting and strategic thinking [1]. With physics - through biomechanics, the laws of motion, levers, centrifugal force; an understanding of the physical principles of movement develops cause-and-effect thinking [1]. With art - through dance, choreography, expressive movement, which develops spatial imagination, emotional intelligence, and non-verbal communication [16]. With life safety (a new subject) - through safety in movement, first aid, behavior in extreme situations, which develops forecasting and strategic thinking [1]. With informatics - through modeling of movement, data analysis and algorithmic description of tactical schemes, which connects bodily experience with the logic of algorithms [6].

Conclusion: The School of Embodied Intelligence

I want to end with what is perhaps the most important. Physical education is not merely a school subject. It is the school of embodied intelligence. It teaches us that thinking is inseparable from the body, that movement is a form of cognition, that bodily experience is the foundation on which all our consciousness is built. It forms the cognitive apparatus capable of strategic, spatial, non-verbal, emotional thinking - the type of thinking that is necessary for understanding the embodied nature of consciousness. That is precisely why physical education, in my view, is a key subject for the formation of the communicative-cognitive framework of the personality [1]. When we teach a child physical education, we teach him not simply to run, jump and pass standards. We teach him to understand his body - how it moves, how it reacts to load, how it expresses emotions. We teach him to think in space - to see the field, estimate distances, plan trajectories. We teach him to interact with others - to read body language, manage emotions, negotiate, make collective decisions. That is precisely why the restructuring of physical education teaching is not merely a methodological question. It is a strategic task. As I showed in the article "Epistemological Recursion in Cognitive Science" [7], contemporary neuroscience is stuck in the "trap of correlations": we record the results of the brain's work, but do not understand the mechanism of its self-organization. The brain is an embodied organ; its work is inseparable from the body, from movement, from interaction with space. Understanding how consciousness arises from neural activity requires precisely the type of thinking that physical education develops - an understanding of embodiment, spatiality, dynamism, and non-verbality. And if we want our children to become not merely trained bodies, but embodied thinkers - we must give them this instrument in full measure. Not for the sake of grades. Not for the sake of the Unified State Exam. For the sake of understanding embodiment. In the next article I will turn to

the subject that, in my view, is the bridge between informatics and the physical world, between algorithms and real actions - to art and music.

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