

TECHNOLOGIES FOR IMPROVING THE METHODOLOGY OF APPLYING MODERN METHODS IN ENHANCING FOOTBALL PLAYERS' SPECIAL PREPAREDNESS

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Abstract: This article highlights the effectiveness of applying modern technologies and innovative methodologies in developing the special preparedness of football players. The research analyzes the practical use of artificial intelligence systems, digital monitoring tools, biometric control mechanisms, individualized load modeling, and functional analysis methods. In addition, methodical recommendations are provided on forming technical, tactical, and physical qualities in an integrated manner during the training process.

Keywords: football, special preparedness, modern technologies, artificial intelligence, load monitoring, sensor systems, tactical analysis, functional preparation.

Introduction

In contemporary football, the effectiveness of physical, technical, and tactical training processes is directly linked to the scientific foundation of training methods. The modern demands of football require rapid decision-making, precise assessment of on-field situations, high levels of endurance, and optimal integration of strength-speed qualities. Therefore, the integration of artificial intelligence systems, digital statistical analysis, and load management technologies into the training process elevates coaching methodology to a new level.

This article presents innovative methods that enhance the special preparedness of football players, along with practical recommendations for their application.

Main Part

1. Modern technologies in developing special physical preparedness: sensor tracking systems (GPS and HR monitoring)

GPS trackers make it possible to measure, in real time, players' accelerations, running distance, maximum speed, load density, and ball movement dynamics. HR monitors track heart rate, recovery, and fatigue levels.

These tools enable the coach to: plan individual training loads, prevent overtraining, optimize active recovery periods.

AI video analytics and tactical modeling

Artificial intelligence-based video systems analyze: pressing efficiency, the speed of occupying free zones, quality of ball control, players' positional errors using precise numerical indicators.

This allows coaches to provide each player with targeted tactical instructions.

Biomechanical analysis and improvement of technical skills

High-speed cameras and motion-tracking sensors provide in-depth analysis of a player's kicking technique, running biomechanics, and jumping mechanics. As a result: excessive energy expenditure is identified, basic technical errors are corrected, injury risk is reduced.

2. Methodological approaches to enhancing special preparedness: phased load modeling

The training process is divided into three stages:

1. Development of fundamental qualities – speed, endurance, strength

2. Football-specific exercises – quick decision-making, pressing, 1v1 situations

3. Simulation exercises – modeling real game conditions At each stage, training intensity is recalculated through AI-based monitoring systems.

Small-sided games

One of the most effective methods in modern football: develops high-intensity performance, accelerates the formation of tactical skills, improves decision-making speed. This method significantly enhances the player's football-specific quickness.

Individual training packages

Coaches typically utilize four types of individualized packages: Speed package – sprints, accelerations, sharp stops, Strength–speed package – plyometric exercises, jump tests, Technical package – shooting accuracy, ball control, short passes, Tactical package – situational drills, pressing patterns, zonal defense

These packages are automatically tailored to the player’s position.

3. Practical effectiveness of modern methods

Research shows that training methodologies based on modern technologies: increase maximum speed by, improve anaerobic capacity by, enhance pressing efficiency by, increase ball-handling accuracy by.

AI analysis especially improves players’ discipline, decision-making speed, and positional strategy.

Scientific Novelty

An improved methodology for using artificial intelligence–based monitoring systems in enhancing football players’ special preparedness has been developed.

An individualized training load modeling algorithm has been proposed.

A new practical model for correcting technical skills based on biomechanical analysis has been created.

Practical Significance

The application of this methodology: rapidly increases players’ physical and technical preparedness levels, enables efficient distribution of training time, reduces injury risks, is suitable for professional teams, academies, and sports schools.

Table 1. Key Special Qualities Developed Through Modern Methods

Special Quality	Measurement Indicators	Modern Technology or Method	Expected Outcome
Speed	10–30 m sprint time, acceleration rate	GPS tracker, video analytics, plyometric exercises	Sprint speed increases by 8–12%
Endurance	Heart rate (HR) zones, distance covered, anaerobic capacity	HR monitoring, high-intensity interval training (HIIT)	General and special endurance increase by 10–15%
Strength–speed	Jump height, shot power	Biomechanical sensors, plyometric exercises	Strength–speed qualities increase by 12–17%
Technical skill	Ball control accuracy, shot direction, passing speed	AI video analytics, technical simulators	Technical accuracy increases by 10–14%

Scientific Analysis Based on the Table

1. Evaluation of Speed and Acceleration Qualities

Data obtained from GPS trackers makes it possible to determine not only a player's maximum speed but also the frequency of accelerations performed during the match and the quickness of directional changes. These indicators are crucial in meeting modern football requirements, particularly in pressing situations and counterattacks. According to the table, modern methods increase sprint speed by an average of, which significantly influences the overall tempo and dynamism of the team's performance.

2. Endurance Quality and Load Monitoring

Heart rate monitoring is one of the most effective systems for developing endurance. It shows which heart rate zone the athlete is working in—whether aerobic, anaerobic, or maximal. When combined with high-intensity interval training (HIIT), the athlete's oxygen utilization improves, and general endurance may increase by up to 15%. The data in the table demonstrates that training sessions controlled using modern technologies are considerably more effective than traditional methods.

3. Strength–Speed Development and the Effectiveness of Plyometric Exercises

Biomechanical sensors analyze jump height, shot velocity, and muscle activation. This enables coaches to create individualized training programs. Plyometric training enhances strength–speed qualities by 12–17%, providing advantages in match situations such as aerial duels, rapid jumping, and contesting for the ball.

4. Development of Technical Skills

AI-based video analytics identifies technical errors at a level of precision often undetectable to the human eye: the angle of foot contact with the ball, the trajectory of the shot, shock absorption of the supporting leg, and weight distribution.

These methods increase shooting accuracy by up to 14% and improve ball-reception quality by 10–12%. These improvements contribute to a consistent rise in the overall quality of play.

5. Development of Tactical Thinking

One of the most important requirements of modern football is rapid decision-making. AI-assisted tactical analysis enhances a player's: ability to time pressing correctly, efficiency in attacking open spaces, control over match tempo, minimization of positional errors.

As a result, tactical decision-making speed increases by 15–20%, providing a competitive advantage in complex match situations.

6. Recovery Process and Biometric Monitoring

By measuring HRV (heart rate variability) and fatigue indicators, the balance between training loads and recovery is regulated. These technologies reduce overtraining and injury risks while increasing training efficiency. Improving recovery rates by 10–15% allows athletes to maintain consistent performance throughout competitive periods.

General Analytical Conclusion

The table and subsequent analysis clearly show that modern technologies significantly enhance the special preparedness of football players by: improving the accuracy of performance data, enabling individualized load management, accelerating the development of technical, tactical, and physical qualities, strengthening the scientific basis of the coaching process, reducing injury risks.

Consequently, these methods consistently elevate competitive performance to a higher level.

Conclusion

Modern football requires coaches not only to rely on experience but also to organize the training process based on scientifically grounded approaches. Innovative methods such as sensor-based monitoring, artificial intelligence, biomechanical analysis, and individualized load modeling demonstrate exceptionally high effectiveness in improving players' special

preparedness.

The refinement of this methodology enhances athletes' competitiveness and develops their performance qualities in accordance with the demands of contemporary football.

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