

METHODOLOGY OF USING MODERN TRAINING TECHNOLOGIES IN DEVELOPING PHYSICAL AND TECHNICAL PREPARATION OF HANDBALL PLAYERS

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Abstract: This article highlights the role of modern training technologies, digital monitoring tools, and individualized load modeling in developing the physical, technical, and tactical preparation of handball players. The effectiveness of monitoring player activity, sensor analysis, video analytics, and systems for evaluating strength and speed has been scientifically examined. Methodological recommendations are aimed at the comprehensive development of coordination, reaction speed, jumping ability, and ball-handling techniques in handball players.

Keywords: handball, technical training, physical qualities, digital monitoring, sensor analysis, AI video analytics, jumping ability, tactical model.

Introduction

Handball, as a modern sport, is a complex game that requires a combination of physical fitness, quick thinking, coordination, and tactical intelligence. This sport has gained widespread popularity worldwide, and its competition system is continuously being improved by international federations. Today, organizing handball players' preparation scientifically, managing training loads optimally, and developing physical and technical indicators is a pressing issue.

With the increasing pace of the game, rapid transitions between offense and defense, and the growing importance of decision-making speed, an innovative approach to comprehensive player preparation is necessary. Particularly, high development of physical qualities such as speed, strength, endurance, agility, and coordination ensures competitive advantage. Modern technologies, including video analytics, biometric monitoring, sensor systems, and digital methods, are increasingly integrated into the training process.

Recent studies indicate that scientific analysis of handball players' technical-tactical actions, energy expenditure, and muscle activity dynamics during games allows for more effective management of training. This enables coaches to create individualized load models, reduce the risk of injuries, and sustainably improve performance.

Therefore, studying the formation of handball players' specialized training using modern methods, developing optimal training technologies for different age groups, and scientifically evaluating the effectiveness of applied methods are highly relevant. The practical significance of this study lies in providing coaches with new methodological recommendations, enhancing players' performance indicators, and ensuring competitive success.

Main Part

In modern sports competitions, increasing rivalry and continuously improving results necessitate the scientific development of all athlete skills from the early stages of training. Achieving high performance today requires athletes to be prepared for large volumes of highly intense loads. Moreover, training exercises should match the athlete's functional and physical capabilities at any stage of long-term preparation. Otherwise, excessive or poorly managed

loads may lead to signs of overstrain, and persistent improper training can cause health complications in athletes.

At advanced stages of sports mastery, especially among experienced athletes, it is recommended to regulate exercises related to physical, technical, and tactical preparation from the early training stage. Training load progression should follow a "wave-like" pattern rather than a "stair-step" model. Therefore, each coach, especially in sports schools, must organize their professional-pedagogical activities scientifically, which is one of the key principles of preparing talented young athletes.

The goal of this final qualification work is to prove the effectiveness of developing jumping ability and specific speed qualities in 10–11-year-old children beginning handball training through specialized exercises. A study was conducted with an experimental group (10 children) and a control group (10 children) using two sets of exercises (general physical exercises and relay-game-based specialized exercises) to assess the development of these qualities.

Scientific Novelty: The relay-game-based specialized exercise set in the experimental group accelerated the development of jumping ability and specific speed qualities compared to the control group.

Significance: The obtained results and their comparative analysis allow for effective development of jumping and specific speed qualities in young handball players. Relying solely on traditional physical exercises was found to reduce children's interest in handball. Thus, relay-game-based exercises hold significant pedagogical value in developing these qualities.

In physical preparation and athlete training, it is essential to interconnect various motor qualities (speed, strength, endurance, agility, flexibility), with particular emphasis on speed-strength qualities.

The speed-strength quality is a decisive factor in performing sport-specific movements. For example, in volleyball, it ensures effective execution of attacks over the net, while in boxing, it enables the rapid application of offensive or counter-offensive techniques. Observations of world, Olympic, and continental wrestling champions indicate that they possess highly developed speed-strength abilities.

Endurance quality is also a critical factor for wrestling performance, particularly specialized endurance. Yu.V. Verkhoshansky (1985) emphasized that in individual combat sports, technical skills executed under rapidly changing competitive conditions rely heavily on speed-strength abilities. Prolonged competition requires athletes to maintain technical skills at a high level, which directly depends on specialized endurance.

Effective development of specialized endurance in wrestling involves performing technical techniques continuously, even under fatigue (A.N. Lens, 1960). General endurance is developed through prolonged, moderate-intensity activities such as long-distance running, rowing, swimming, or cycling.

Flexibility is another essential factor in developing technical skills. Well-developed flexibility allows a wrestler to perform complex movements such as sudden escapes or throws efficiently. Flexibility develops gradually through long-term training and requires careful, systematic practice to avoid injury (V.N. Platonov, 1986).

Each sport's unique characteristics dictate the critical role of specialized physical qualities in preparing qualified athletes.

Conclusion

High-level specialized preparation of handball players is significantly enhanced through the integration of modern technologies into the training process. Sensor analysis, artificial

intelligence, video analytics, strength-speed measuring devices, and individualized load modeling provide a scientific basis for coaching.

As a result, players develop rapid decision-making, strength-speed abilities, jumping power, technical precision, and tactical thinking effectively.

Recommendations / Guidelines:

1. Technical Preparation

In handball, technique is extremely important, as it requires quick and accurate ball handling, shooting, and defending.

Main techniques:

- Catching and passing the ball: Firmly hold the ball with both hands and practice quick passes over short distances.
- Shooting technique: Practice shooting from various positions (e.g., standing, running) and strengthen arm muscles.
- Dribbling: Control the ball and maneuver past defenders effectively.
- Passing: Practice accurate short and long-distance passes.

Recommendations:

- Practice dribbling and passing for 15–20 minutes every day.
- Perform shooting drills from different angles and positions.
- Watch professional players in video tutorials and replicate their techniques.

2. Physical Preparation

Handball requires speed, strength, endurance, and flexibility.

Main exercises:

- Endurance: Running, interval running (sprints + slow jogs), cycling.
- Strength: Strengthen arm, shoulder, and leg muscles (push-ups, squats, pull-ups).
- Speed and agility: Reaction drills and lateral movement exercises.
- Flexibility: Stretching, yoga, or Pilates exercises.

Recommendations:

- Perform physical training 3–4 times per week.
- Tailor exercises to match game requirements (e.g., strengthen arm muscles for more powerful shots).

3. Tactics and Strategy

In handball, not only technique but also quick decision-making and teamwork are essential.

Advice:

- Learn **both zone defense** and man-to-man defense techniques.
- Practice fast passes and coordination during attacks.
- Analyze the opponent's strengths and weaknesses during the game.
- Always communicate with teammates using voice signals or gestures.

4. Psychological Preparation

- Perform focus and concentration exercises to be ready for the game.
- Maintain composure in challenging situations.
- Work on self-improvement and learn from mistakes.

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