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TECHNOLOGIES FOR DEVELOPING THE PHYSICAL QUALITIES OF YOUNG BASKETBALL PLAYERS THROUGH ARTIFICIAL INTELLIGENCE

Togoyev Alisher Uktamovich
Navoi State University
Teacher of the Department of "Types of Sports Activities"

Annotation: This article examines, from a scientific and practical perspective, the significance and application of artificial intelligence (AI) technologies in developing the physical qualities of young basketball players. It discusses the effectiveness of using AI to design individualized training programs, analyze movement patterns, optimize workloads, prevent injuries, and monitor athletes' readiness.

Keywords: artificial intelligence, basketball, young athletes, physical qualities, monitoring, training, analysis.

INTRODUCTION

Basketball is a sport that requires speed, agility, strength, endurance, and coordination, and therefore an individualized approach plays a crucial role in training young athletes. Traditional training methods are often conducted based on general plans and may not fully take into account the individual characteristics of each basketball player. Consequently, the use of artificial intelligence (AI) technologies is considered a modern and effective tool for developing the physical qualities of young basketball players.

Through AI technologies, the training process becomes individualized, enabling real-time monitoring of an athlete's movements, speed, endurance, strength indicators, coordination, and reaction time. With the help of sensor devices, video analysis systems, virtual trainers, and AI-based assistants, the physical preparation of young basketball players can be developed on a scientific basis, thereby enhancing the overall efficiency of training sessions.

Moreover, AI allows for predicting injury risks, optimizing workloads, and managing training at an individualized level. Therefore, artificial intelligence technologies hold significant importance in modernizing the preparation of young basketball players and raising the quality of sports performance to a higher level.

MAIN PART

1. Physical Qualities that Need to Be Developed in Basketball Players

Agility, strength, endurance, coordination,reaction time

AI technologies enable real-time measurement and analysis of these physical qualities.

2. Monitoring Systems Supported by Artificial Intelligence

Sensor devices:

GPS trackers, heart rate monitors, accelerometers and gyroscopes, impact-detection sensors

Capabilities:

Determining training intensity, measuring running, jumping, and impact forces, monitoring fatigue levels, optimizing workload balance

3. Video Analytics and Motion Recognition Systems

Using cameras and neural networks, it becomes possible to analyze:

•Jump balance, acceleration, turning actions, agility drills

•Ball-handling and dribbling techniques

All results are delivered to coaches in real time for rapid correction and feedback.

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4. Workload Management and Individual Training Programs

AI algorithms design individual training plans based on the athlete's:

Age, physical performance indicators, previous training results, fatigue level

This approach reduces injury risks and increases training efficiency.

5. Injury Prevention

AI systems assist in:

Detecting muscle imbalances, preventing excessive workload, assessing movement mechanics,monitoring sleep and recovery

AI predicts potential injury risks in advance and adjusts training intensity accordingly.

6. Virtual Trainers and AI-Based Assistants

These technologies enable:

Automatic monitoring of exercises, improving ball-handling and dribbling techniques, enhancing reaction speed, identifying technical errors

7. AI-based training platforms

Type of Technology	Function	Impact on Physical Qualities
Virtual trainer	Automatically monitors exercises	Coordination, speed
Simulators	Replicate game situations	Reaction, agility
AI scheduling algorithms	Create individualized training plans	Endurance
Video analytics	Detect technical errors	Technique + physical qualities

ANALYSIS

In the process of developing the physical preparedness of young basketball players through artificial intelligence (AI), a number of technological solutions are utilized. Research and practical observations indicate the following:

1. Effectiveness of Sensor-Based Monitoring Systems

GPS trackers, heart-rate monitors, accelerometers, and other wearable devices allow for real-time tracking of athletes' running distance, jump balance, impact force, speed, and fatigue level. These data play a crucial role in optimizing training intensity and reducing injury risks.

2. Video Analytics and Movement Analysis

AI-based video analytics systems analyze players' dribbling, acceleration, turning movements, blocking actions, and ball-handling techniques. The results help coaches detect technical errors and develop personalized training programs.

3. Workload Management and Individual Training

AI algorithms create optimal training plans based on the athlete's age, level of physical preparedness, recovery speed, and previous training results. This approach enhances training efficiency and reduces injuries caused by excessive workloads.

4. Injury Prevention

By detecting muscle imbalances, analyzing movement mechanics, and monitoring fatigue indicators, AI can predict injury risks in advance. Thus, training sessions can be managed more safely and effectively.

5. Virtual Trainers and AI Assistants

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Virtual training platforms allow athletes to practice technical and tactical skills, perform coordination and speed exercises, and improve overall physical conditioning. AI assistants record performance in real time and automatically adjust individual training parameters.

6. Digital Analysis and Forecasting

Data collected through AI technologies are stored and analyzed in large digital databases. This enables forecasting future developmental dynamics, improving training plans, and making strategic coaching decisions.

Result:

The analysis demonstrates that incorporating AI technologies significantly optimizes the physical preparation of young basketball players. Training becomes individualized, injury risks decrease, and both technical and physical indicators improve consistently.

CONCLUSION

Artificial intelligence (AI) technologies elevate the physical development of young basketball players to a new qualitative level. Studies show that AI enables real-time monitoring of each athlete's individual physical indicators, workload levels, fatigue, and technical abilities. This provides opportunities to optimize the training process, reduce injury risks, and increase overall training efficiency.

Sensor devices, video analytics systems, virtual trainers, and AI assistants serve to systematically develop young basketball players' speed, agility, strength, endurance, coordination, and reaction speed. Furthermore, AI algorithms enhance physical preparedness by managing and optimizing training at an individualized level.

As a result, AI technologies act as an effective tool that complements and improves traditional training methods, bringing the preparation process of young basketball players to a higher qualitative stage. In the future, wider application of these technologies will play a key role in unlocking the full potential of young athletes and achieving high sporting results.

RECOMMENDATIONS

1.Basketball academies and schools should implement AI-based monitoring systems.
2.Use sensors and AI-driven motion analysis to track each athlete's training indicators.
3.Coaches should receive professional training in AI technologies.
4.Optimize training workloads using AI algorithms.
5.Utilize AI systems that can predict injury risks in advance.

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