MODERN PEDAGOGICAL TECHNOLOGIES IN DEVELOPING PHYSICAL QUALITIES OF YOUNG TRACK AND FIELD ATHLETES

Utepov Makhmud Daurkhanovich
Teacher of the Department of Theory and Methodology
physical culture of Karakalpak state university

Abstract

This thesis examines the effectiveness of modern pedagogical technologies in developing the key physical qualities of young track and field athletes. Using the IMRaD structure, the study analyzes innovative training models, digital monitoring tools, motor learning strategies, and pedagogical methods that optimize speed, strength, endurance, agility, and coordination. The research highlights evidence-based approaches that enhance athletic performance while supporting long-term development.

Introduction

Developing physical qualities in young athletes is a fundamental component of training in track and field. The rapid advancement of sports science has introduced numerous pedagogical and technological tools that enable coaches to design efficient, individualized, and scientifically grounded training programs.

Young athletes undergo continuous physiological, psychological, and motor development; therefore, modern pedagogical technologies play a critical role in ensuring optimal growth. Innovations such as digital motion analysis, interactive training platforms, gamification, neurotraining, and individualized load programming have significantly improved training efficiency.

This study explores the scientific basis and practical application of modern pedagogical technologies in developing young athletes' physical abilities.

Methods

The research employed several scientific methods:

1. Pedagogical Observation — Monitoring training sessions, identifying strengths and weaknesses in physical and technical performance.
2. Experimental Method — Implementing modern pedagogical technologies with an experimental group of young athletes while using traditional methods with a control group.
3. Biomechanical Analysis — Evaluating movement patterns, reaction time, stride frequency, force production, and coordination.
4. Digital Monitoring Tools — Utilizing GPS trackers, heart rate sensors, video motion analysis, and mobile apps.

5. Psychological Assessment — Measuring motivation, attention control, and learning readiness.
6. Statistical Analysis — Processing quantitative data, comparing results between groups, and determining intervention effectiveness.

Results

Several key findings emerged from the research:
— The use of digital motion analysis improved running technique efficiency by 7–12%, enhancing stride mechanics and reducing unnecessary energy expenditure.
— Gamified training modules increased motivation and training engagement, resulting in a 15% improvement in agility and reaction time.
— Individualized load programming, supported by heart rate–based monitoring, led to better endurance development and reduced overtraining risks.
— Neuro-motor training (balance boards, coordination ladders, reaction lights) improved coordination and neuromuscular control.
— Strength and speed qualities developed more effectively when combined with interactive feedback tools, enabling athletes to correct errors immediately.
— Athletes using modern pedagogical technologies demonstrated significantly higher improvement rates than those following traditional training models.

Discussion

The results indicate that modern pedagogical technologies significantly enhance the development of young track and field athletes' physical qualities. Digital tools allow coaches to analyze performance with precision, while interactive and adaptive training strategies support individualized learning.

The integration of technology into training offers several advantages:
— Increased accuracy of training load control
— Enhanced athlete motivation through interactive formats
— Improved motor learning via real-time feedback
— Better injury prevention through biomechanical correction
— Higher retention of skills due to neurocognitive engagement

However, successful implementation requires methodological competence, access to digital tools, and careful age-appropriate adaptation.

Conclusion

Modern pedagogical technologies provide a highly effective framework for developing the physical qualities of young track and field athletes. When combined with scientific training

principles, digital monitoring, biomechanical analysis, and motivational techniques, these technologies support long-term athletic development and improve overall performance. The findings of this study offer practical implications for coaches, sports scientists, and youth sports academies.

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