Modeling and forecasting in preparing Uzbekistan's national teams for complex sports competitions

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Abstract

Purpose: To improve the performance of young athletes in Uzbekistan's national teams in complex competitions using a mechanism for modeling and forecasting.

Methods: Analysis of scientific and methodological liter ature, pedagogical tools, pedagogical observation, mathe matical and statistical analysis.

Results: The forecasting models applied in the fourth stage have great scientific significance. While the exponential smoothing method shows the dynamics of results in a simplified form, the Bayesian hierarchical model enables probability-based forecasting of gold, silver, and bronze medal flows. Furthermore, the Elo rating used in team sports and Monte Carlo simulations allow for determining how results may change under various scenarios. Therefore, these methods serve to predict the outcomes of future competitions and scientifically guide the preparation process.

The fifth stage focuses on resource optimization, utilizing mathematical methods such as integer programming to select the most effective option within the constraints of athlete numbers, training camp quantities, quotas, and budget. This stage ensures the economic efficiency of sports policy and creates conditions for achieving maximum results with minimal expenditure.

Conlcusion: The research results demonstrate that applying phased modeling and forecasting technologies in the preparation of Uzbekistan's national teams for major international competitions significantly enhances effectiveness. The data collected and systematized in the first stage serves as the primary source for forming an objective assessment of athletes' performance. The integral indicators employed in the second stage - Medal Points per Athlete (MPA), Gold Conversion Rate (GCR), and Depth Index - enable a comprehensive and multifaceted analysis of sports effectiveness. The comparative analysis and clustering conducted in the third stage identify priority sports and create opportunities for evidence-based resource allocation.

Keywords: Uzbekistan national teams, "Children of Asia" competitions, modeling, forecasting, integral indicators, Bayes model, Elo rating, optimization, scenario analysis, KPI monitoring.

Introduction

In recent years, the issue of training young athletes in the global sports system, determining their potential, and scientifically forecasting their future achievements has become one of the urgent scientific and practical directions. In particular, the results of national teams in international multi-sport competitions not only reflect the sports potential of the country but also clearly demonstrate the level of organizational, pedagogical, and methodological development of the sports system. Therefore, analyzing the results of such competitions and developing mechanisms for modeling and forecasting based on them plays a decisive role in preparing athletes for consistently high results in the international arena.

The "Uzbekistan - 2030" Strategy also defines the broad involvement of youth in physical education and sports, support for talented athletes, and their scientific preparation for international competitions as one of the priority tasks. In implementing these tasks, international tournaments such as "Children of Asia" serve as an important scientific and practical laboratory for assessing the effectiveness of training young athletes and analyzing the activities of sports schools and federations. Through these competitions, the level of physical, technical, tactical, and psychological preparedness of athletes is tested, and the results allow for identifying the strengths and weaknesses of the national sports system.

As noted in scientific literature, relying solely on medal counts when assessing sports results is a one-sided approach. This is because the final medal tally does not fully reflect the quality of athletes' training, their level of competitiveness, and the effectiveness of resource utilization. Therefore, the use of integral indicators has become widespread in modern sports theory. Metrics such as Medal Points per Athlete (MPA), Gold Conversion Rate (GCR), and Depth Index allow for determining the ratio of medals won to the number of athletes, as well as conducting an in-depth analysis of results.

Furthermore, the application of forecasting models serves to predict athletes' future results on a scientific basis. While the exponential smoothing method represents the dynamics of results in a simplified form, the Bayesian hierarchical model allows for determining the probability distribution of gold, silver, and bronze

medals. Methods such as Elo rating and Monte Carlo simulation help evaluate results in team sports across multiple scenarios. Additionally, optimization methods like integer programming enable the selection of the most effective options for athlete training within the constraints of existing quotas, the number of training camps, and budget limitations.

Another crucial aspect is risk management and scenario modeling. By developing optimistic, baseline, and pessimistic scenarios, it is possible to determine what results the sports system can achieve under various conditions. This approach ensures risk reduction and efficient resource utilization in sports management. Finally, through the implementation of monitoring and KPI systems, the effectiveness of athletes' training will be continuously monitored, and forecasts will be updated when necessary.

Results and discussion

In recent years, the issue of training young athletes in the global sports system, determining their potential, and scientifically forecasting their future achievements has become one of the urgent scientific and practical directions. In particular, the results of national teams in international multi-sport competitions not only reflect the sports potential of the country but also clearly demonstrate the level of organizational, pedagogical, and methodological development of the sports system. Therefore, analyzing the results of such competitions and developing mechanisms for modeling and forecasting based on them plays a decisive role in preparing athletes for consistently high results in the international arena.

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Another crucial aspect is risk management and scenario modeling. By developing optimistic, baseline, and pessimistic scenarios, it is possible to determine what results the sports system can achieve under various conditions. This approach ensures risk reduction and efficient resource utilization in sports management. Finally, through the implementation of monitoring and KPI systems, the effectiveness of athletes' training will be continuously monitored, and forecasts will be updated when necessary.

In the third stage, comparative analysis and clustering methods allow for dividing sports into high-performing, developing, and low-performing groups. This creates a scientific basis for setting priorities in sports policy, identifying disciplines that require additional support, and redistributing resources.

The forecasting models applied in the fourth stage have great scientific significance. While the exponential smoothing method shows the dynamics of results in a simplified form, the Bayesian hierarchical model enables probability-based forecasting of gold, silver, and bronze medal flows. Furthermore, the Elo rating used in team sports and Monte Carlo simulations allow for determining how results may change under various scenarios. Therefore,

Table. Mechanism of modeling and forecasting technology in preparing Uzbekistan's national teams for comprehensive sports competitions

Stage	Work to be carried out	Scientific foundations (approaches, methods, techniques, indicators)	Expected result
Data collection	*Summarizing the results of the 2022 and 2024 "Children of Asia" Games by sport. Calculating the number of participants, gold-silver-bronze medals, and total points.*	*Statistical observation, comparison method, monitoring, structural data collection.*	*The dynamics of the overall results of the Uzbekistan national team will be determined.*
Development of indicators	*Calculation of integrated indicators such as MPA (Medal Points per Athlete), GCR (Gold Conversion Rate), and Depth Index.*	*Integral indicators, mathematical formulas, method of systematizing indicators.*	*The effectiveness of sports is measured using digital indicators.*
Analysis and comparison	*Comparison of results for 2022 and 2024, identification of high-performing, developing, and low-performing clusters.*	*Comparative analysis, clustering method, grouping method, efficiency coefficients.*	*Priority sports and resource efficiency are determined.*
Forecasting model	*Basic forecast for 2026 based on exponential smoothing; Predicting gold-silver-bronze medal flows using a Bayesian hierarchical model; Elo rating and Monte Carlo simulations for team sports.*	*Forecasting methods (exponential smoothing, Bayesian model), probability methods, rating approach, simulation*	*The forecast of expected points and medals in upcoming competitions will be determined.*
Resource optimization	*Selection of the most effective option based on quota, number of training camps, and budget.*	*Optimization method (integer programming), boundary analysis, efficiency coefficient.*	*Athletes and resources are distributed most efficiently.*
Scenario analysis	*Develop optimistic, baseline, and pessimistic scenarios and compare the results.*	*Risk management, scenario modeling, probability method, confidence interval (CI).*	*The range of expected outcomes is determined for each scenario.*
Decision-making and monitoring	*Monitor results and update forecasts through monthly KPIs and dashboards.*	*KPI indicators, monitoring system, feedback loop, management methods.*	*The preparation of national teams is managed based on forecasts.*

these methods serve to predict the outcomes of future competitions and scientifically guide the preparation process.

The fifth stage focuses on resource optimization, utilizing mathematical methods such as integer programming to select the most effective option within the constraints of athlete numbers, training camp quantities, quotas, and budget. This stage ensures the economic efficiency of sports policy and creates conditions for achieving maximum results with minimal expenditure.

The sixth stage involves scenario analysis (optimistic, baseline, and pessimistic variants), enabling the application of a risk management approach. This establishes a mechanism for maintaining the stability of the training system and facilitating quick decision-making even in the face of unexpected situations during international sports competitions.

The final stage involves decision-making and monitoring, where training effectiveness is controlled through a KPI system and regular feedback mechanisms. Monthly results are tracked using dashboards, and forecasts are updated accordingly. This allows for the implementation of sports management based on modern digital tools.

Overall, the harmony of these stages enables the management and forecasting of Uzbekistan's national team preparation on modern scientific grounds. This approach forms a complex mechanism necessary for achieving successful results in the international sports system. The “Children of Asia” competitions serve as a great opportunity for Uzbek athletes. The achieved results demonstrate the strengths of our country's sports system, while existing problems indicate areas that require attention in the future. Consequently, there arises a need for comprehensive development of the republic's sports system, strengthening technical and psychological preparation in certain sports, and developing new strategies in areas such as

swimming and team sports.

Thus, the "Children of Asia" competitions are not only a platform for young athletes to demonstrate their potential but also a mirror that allows for scientific and practical analysis of the country's sports system. Through this process, the prospects, strengths, and weaknesses of the sports system are identified, and measures necessary for sustainable development in the future are determined.

Conclusion

The implementation of forecasting models (exponential smoothing, Bayesian model, Elo rating, and Monte Carlo simulation) in the fourth stage allows for highly accurate predictions of results in upcoming competitions. The fifth stage focuses on resource optimization, guiding sports policy towards principles of economic efficiency based on integer programming and efficiency coefficients. In the sixth stage, the development of optimistic, baseline, and pessimistic scenarios through scenario analysis reduces risks and expands possibilities for sustainable management of the sports system. Finally, the monitoring and KPI systems implemented in the seventh stage ensure continuous oversight of the training process and regular forecast updates. Overall, this scientific approach enables the management of athlete training based on modern theoretical and practical methods, forming a comprehensive mechanism necessary to ensure the consistent success of Uzbekistan's national teams in the international arena. Therefore, the widespread application of this mechanism in sports practice guarantees the achievement of even higher results by our country's athletes in future competitions.

References

Salomov R.S., Kerimov F.A. **(2010).** Pedagogical Technologies in Physical Education. Textbook - Tashkent: UzSPCI Publishing and Printing House. p.126.

Strengthening the General Functional Capabilities of the Body in the Conditions of a Feasible Increase in Muscle Activity after Intervention on the Heart / S.Y. Zavalishina, D.M. Pravdov, E.D. Bakulina, M.V. Eremin, O.G. Rysakova, A.V. Dorontsev // Biomedical and Pharmacology Journal. - 2020. - No. 13 (2). - P. 597-602.

Usmanov M.K. The efficiency of experimental methods for improving complex technical and tactical actions of boxers // ASEAN Journal of Physical Education and Sport Science. - 2022.

Kerimov F.A. **(2001).** Theory and Methodology of Sports Wrestling. - Tashkent: UzSPCI, p 286.

Tojiyev A. **(2022).** Psychological preparation of an athlete for sports competitions // Uzbek Scholar Journal. Vol. 7. - pp. 102-106.

Kubitdinov J. **(2024).** Improving the process of specific strength and physical fitness of athletes through exercises in "ZAJA POWER" sports equipment // Journal of Foreign Languages and Linguistics. - Vol. 5. - No. 5.

Matveev, L. P. **(2019).** General Theory of Sport and its Applied Aspects: Textbook / L. P. Matveev. - 6th ed. - Moscow: Sport, 340 p.: ill. - (Olympic Education). - ISBN 978-5-907225-00-8.

Platonov V.N. **(2015).** System of Athlete Training in Olympic Sport. General Theory and its Practical Applications: Textbook [for trainers]: in 2 books /V. N. Platonov. - K.: Olymp. lit., Book 1. - 2015. - 680 p.

Matveev, L.P. **(1999).** Fundamentals of General Sports Theory and Athlete Training System / L.P. Matveev. - Kiev: p.318.

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