UDK: 796.42

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.123-136

PROGRAMMING OF INVOLVEMENT OF INNOVATIVE TECHNOLOGIES IN TRAINING OF MEMBERS OF THE ATHLETICS TEAM OF UKRAINE

Yevhen Hutsol

Leonid Pylypei

Medical Institute of Sumy State University, Sumy, Ukraine

Purpose: theoretical and methodological substantiation of programming technology for the involvement of innovative technologies in the training process of the national team of Ukraine in athletics.

Material and Methods: The research was carried out among athletes of the national team of Ukraine at the level not lower than the Master of Sports of Ukraine by conducting a questionnaire, self-experiment, pedagogical observation and pedagogical experiment.The total number of respondents is 43 athletes. Among the participants of the experiment are the winners of the Olympic Games and world championships, champions and winners of the European championships, champions of Ukraine.

Results: The article presents programming as a rigidly determined system of sequential and time-tested operations within a certain time on the basis of the developed design of the control system. The algorithm for constructing a system for attracting innovative technologies to the preparation of athletes is carried out on the basis of regression analysis with numerical coefficients according to the formulas.

Conclusions: the proposed programming technology makes it possible to create an effective system for constructing an individual training process in the national team of Ukraine in athletics.

Keywords: model, programming, innovative technologies, athletes.

Introduction

The modern system of training athletes of the national team of Ukraine in athletics is characterized by intensification of the training process, a large number of official international competitions, which, in turn, requires athletes to constant high physical and psychophysical loads, rapid recovery of the central nervous system and body [1; 6].

Studies show that basic systematic usage of programming of training's innovative technologies in the training process of the national athletics team of Ukraine, that could help make the training process more rational and effective, promote better recovery of athletes after significant training and competitive loads [2].

Innovative technologies such as hypoxic training (except for members of the endurance group), psychophysical, mental training, analysis of the current state of the body are not programmed at all or used sporadically, detached from the constant training process. There is no constant support of the national team by specialists in biochemistry, biomechanics. Natural biorhythms are not taken into account in the training building process. Electrical stimulation methods are not used for recovery, there is no consulting work on pharmacological support of the athlete's body. Taking biologically active dietary supplements has exclusively individual character and often leads to disqualification of athletes for the use of illicit drugs [3; 10].

The relevance of the introduction of innovative training technologies in the training process of athletes has been confirmed by researchers [4; 10]. Theoretical developments and methodical developments of implementing of innovative technologies in training process are insignificant in volume. The content of innovative technologies, forms, methods, means of training, questions of increase of training process efficiency, taking into account the chosen discipline of track and field athletics, were investigated by scientists. However, the constant growth of international competitions, increasing the level of results, increasing competition - all this requires constant review of the structure, content and direction of the training

process in general, and the involvement of programming of innovative technologies in particular [1; 4].

Programming is a rigidly determined system of successive operations and actions worked out in practice, which lead to the achievement of a specific sports result within the allotted time [1; 12].

At the present stage of development of the system of preparation for the Olympic Games, it is not enough to use knowledge from only one specific field of knowledge.

The triumphant progress of science is characterized by countless applications and improvements. There are fundamental laws of this process. The Pareto 80/20 law is one of the most universal. The influence of this law on the training process in sports on endurance in general and athletics in particular has been confirmed by research by scientists [9]. Of course, "80/20" is not a magic formula. The actual ratio in practice is very rarely 80/20. The universe is supposedly unstable, but in most of the processes taking place in it, a proportion of about 80/20% is stable. So, directly or indirectly, but the principle of 80/20 is familiar to most programmers and executives of computer corporations IBM, Microsoft and others [5].

The theory and methods of sports and sports training in athletics should play an integrative role in combining all the knowledge that provides scientifically sound principles and patterns of training, methodological approaches and training technologies based on physiology, psychology, anatomy, biochemistry of muscle activity and others [10; 11].

Therefore, the modern system provides for the integration of new technologies into the theory and especially the practice of training of the national athletics team of Ukraine. Developments of scientists in the field of pharmacology, sports nutrition, new computer technologies are associated with the improvement of sports uniforms, inventory and equipment.

The problem of lack of involvement of innovative technologies was investigated in the development of training programs of individual plans for the year for members of the national team of Ukraine in athletics, but the lack of programming

technology and long-term planning and plans for the Olympic cycle to attract innovative technologies requires further research.

Purpose of the study: theoretical and methodological justification of programming technology to attract innovative technologies to the training process of the national athletics team of Ukraine.

Material and Methods of the research

The research was carried out among the athletes of the national team of Ukraine at the level not lower than the Master of Sports by conducting a questionnaire, self-experiment, pedagogical observation and pedagogical experiment. The total number of respondents is 43 athletes. Among the participants of the experiment are the winners of the Olympic Games and world championships, champions and winners of the European championships, champions of Ukraine.

Results of the research

The system of innovative technologies for training athletes solves the problems facing the elite athletes group of the national team of Ukraine in modern conditions - increasing the efficiency of the training process, promoting faster recovery after exercise etc. It is important to keep in mind that only the development and recommendations for the implementation of quality theoretical developments and provisions of the system of innovative training technologies, even for all their importance, still can give little to professionals, athletes and coaches in accordance with the demands of practice. Therefore, for the real conditions of functioning of an effective system of attracting innovative technologies to the training process it is necessary not only to determine and theoretically substantiate the necessary possibilities of using of the innovative technologies system in the preparation and solution of specific targets, but also to evaluate its parameters (points), which reflect some real parameters of the analyzed system. Accordingly, the question of testing and diagnosing the main models of indicators of the athletes' involvement degree in innovative technologies in their training process is relevant. The question is to determine the quantitative characteristics of the innovative technologies system to

ensure the desired result and, accordingly, the study of methodological approaches to solving the necessary tasks.

In our study, we propose specific directions for the formation of a methodology for evaluating the effectiveness of various innovative technologies, in this case, for elite athletes. The proposed methodological approach is based on the idea of models for attracting innovative technologies as the optimum to which the system of innovative technologies is directed in its development. With this approach, the potential of the system is formed by dynamic characteristics that reflect the movement of the innovative technologies system along the path of development and focus on assessing its place in the athletes' training process in relation to the process of preparation for competition in general. In this case, from the point of view of the purpose of the assessment, both actual and forecast estimate is carried out.

In the first case, the real characteristics of the training parties are evaluated, which show changes in the characteristics of the selected benchmarks of the models for comparison, i.e. it is determined how significant the impact of a particular innovative technology was on the final result of an athlete. In the second case, it is determined which innovative technologies need to be involved in the training process or change the scope or conditions of their use so that its results correspond to the model. In this case, in essence, the problems of feedback, feedback interpolation are being considered and solved, for which the known conditions are the end result - optimal models of psychophysical fitness or training models to be achieved by an athlete in the intermediate (end of the general season) or final (end of sports career) stage of sports activities.

The assessment of the studied model parameters of both the system as a whole and its individual indicators is important not in itself, but first of all in relation to their degree of sufficiency for the successful solution of the athlete's training tasks. It is possible to determine the parameters of models of innovative training technologies only by comparing its general characteristics, or individual elements with a specific selected analogue. It is advisable to use some relative or significant indicators for comparison.

To determine the degree of involvement of each of the innovative technologies in the training process of individual athletes, a questionnaire method was used and a special scale was developed, by which each respondent on a four-point scale determined the degree of involvement of each technology in their training process (from "1 - never used" to "4 - use constantly throughout the training process".

As a benchmark, we will choose the athlete model that has the highest rates of involvement of innovative technologies in the training process according to a survey conducted among members of the Ukrainian national track and field team, i.e. the highest amount of points corresponding to the maximum use of all proposed innovative technologies. To successfully solve the problems of this study, it was necessary to create standardized scales for all innovative technologies and reduce the final results of athletes of different disciplines to a common indicator, which allowed to compare the results of athletes from different groups of athletics - IAAF Scorecards. Each of the innovative technologies reflects only a certain part of the impact on the training process and the end result of the athlete as a whole. For completeness of the information all indicators of physical qualities both special, and the general are united in one whole.

In order to be able to correlate the indicators for different qualities, they are given in one-dimensional scale. But for the reliability and compliance of the relationship of the developed scales with the objective indicators of success of athletes in sports, it is necessary to periodically compare the coefficients' correlation . All testing methods must meet and be tested for validity and reliability and other requirements of testing theory.

Substantiation of quantitative values of regression coefficients was based on the classification of training loads (quantitative scale) depending on the purpose of their implementation (according to Volodymyr Zatsiorsky, 1995, in edition [4], which is a quantitatively ranked scale from "1" to "5" , in which the rank "1" corresponds to the lowest load, and "5" - the highest); Borg scale, where the level of workload is assessed by pedagogical and sport-specific (from 6 to 20) indicators; developed specifically for this study table [7] and IAAF scorecard indicators.

To assess training and competitive loads, loads are estimated in conventional units using the criterion of intensity "K_{and}" and the criterion of specific volume "K_o" (it is found by multiplying K_{and} by the length of the distance).

To find the numerical values and K_{and} developed tables, the creation of which is the main selection of equivalent results, which are evaluated by an equal number of points and determine the points for different results in the same type of running. In the development of K_{and} were taken from the World Data Bank results of athletes [8].

Regulatory indicators for physical qualities are determined by dividing the scale into the necessary corridors-intervals in accordance with the requirements for each of the groups of athletics' disciplines. If it is necessary to check the normative indicators, discriminant and variance analyzes are applied to a specific discipline.

The algorithm for building the training process using innovative technologies provides the basic conditions and operations that must be performed to achieve effective training of members of the national athletics team of Ukraine. The algorithm for constructing the process of attracting innovative technologies involves the factor approach methodology. The logic of the factor approach involves identifying the level of impact on the outcome of each innovative technology that is necessary for successful competitive activities. The control algorithm is based on elementary mathematical operations.

Innovative training technologies: training in hypoxia, psychophysiological training (mental, ideomotor training, autogenic training, visualization), innovative methods of recovery (cryotherapy, massage, swimming and running in the pool, vibrotherapy), monitoring the current state of the body (resting heart rate(RHR), blood tests and all individual body systems), the use of stretching in the training process, strength toning before competitions, the use of BADS, simultaneous reactivation, taking into account biorhythms, electrostimulation.

Accordingly, the maximum integrated use of the above mentioned innovative technologies is necessary to maximize the quality of the training process, perform training tasks and quickly recover between training and competitive activities.

After the survey and pedagogical experiment, which lasted for two competitive seasons, a low level of use of innovative technologies was established in the national athletics team of Ukraine and significantly higher sports results of athletes who integrated innovative technologies in the training process. The sports results of the representatives of different disciplines of athletics were compared according to the IAAF points table, and the level of involvement of innovative technologies was compared according to the scale developed by us. The survey showed that athletes who used innovative training technologies in an integrated manner had a higher level of results, which was confirmed by further research.

According to the calendar for 2017-2018 years, the system-pedagogical design was carried out. Sports and pedagogical innovations were used as a necessary technology, which allowed to develop and create a system of athletes training from micro to macro level on the basis of the latest scientific data and practical experience of the modern system of athletes training. Planning was carried out on the basis of the purpose and tasks of organizational, substantive and methodological aspects of the future training process.

Accordingly, programming was performed as a rigidly determined system of sequential and time-tested operations within a certain time of microcycles and macrocycles on the basis of the developed design of the control system.

After processing the questionnaire materials, diagnostics, testing, the following was done (based on the methodology of the factor approach): the obtained data were combined into integrated indicators, the level of integrated use of innovative technologies was determined by a formula, not a simple summation of standardized indicators. To develop an algorithm of this type, a regression equation is used, i.e. a method of multiple regression, which makes it possible to establish the presence of relations, while allowing to determine the contribution of each of the independent variables to the dependent variable.

To design an integrated indicator, so that the obtained indicators were compared with each other, all indicators are reduced to a single system of

measurements. We have developed scales in which the degree of involvement of each of the innovative technologies is converted into conventional units (points).

This diagnostic system is used due to the presence of a normal, almost formal distribution of scores obtained in practice. In this case, the low values of the survey results correspond to the low level of development of the studied qualities, the average - to the average, and the high indicators - high respectively. The attractiveness of the result scales of different evaluation types of tests lies in the ability to reduce large arrays of heterogeneous data into easy-to-understand, visual and convenient to analyze. For ease of comparison, they are presented in the form of tables.

Developed integrated models, the indicators of which are converted into points, for each of the innovative technologies and in points (when comparing the results of athletes), provide an opportunity for comparison, mathematical and statistical processing using computer technology and the formation of an integrated indicator. At the same time, the coefficients of values of individual innovative technologies are derived, which are of paramount importance for achieving high results by representatives of various disciplines of athletics. Certainly, each elite athlete requires an individual approach and must have a coefficient of individual scales. The corrective indicator for the calculation of this coefficient should be the real feedback system in general.

The algorithm for building a system for attracting innovative technologies to train athletes in each of the groups of disciplines of athletics is based on regression analysis by the formula:

$$I=a_0+a_1*H+a_2*PT+a_3*R+a_4*Ph+a_5*An+a_6*S+a_7*T+a_8*Pr+a_9*B+$$
$$+a_{10}*E+a_{11}*SM+a_{12}*SEM+a_{13}*EFM+a_{14}*DFM+a_{15}*SFM+a_{16}*GEM+$$
$$+a_{17}*StEM+a_{18}*AM+a_{19}*FM\ ,$$

where I - an integrated indicator of the use of innovative technologies;

a_1, a_2.... a_{19} - numerical coefficients of multidimensional linear dependence of the integral indicator on specifically important qualities;

H- hypoxic training;

PT- psychophysical training;

R - Innovative methods of recovery;

$_{Ph}$ - use of pharmacological agents and dietary supplements;

An- analysis of the current state of the organism;

$_{S}$ - stretching;

T- toning;

Pr- simultaneous preactivation;

B- taking into account biorhythms;

E- electrostimulation;

SM - models of means for development of speed;

SEM - models of means for the development of speed endurance;

EFM - models of means for development of explosive force;

DFM - models of means for development of dynamic force;

SFM - models of means for development of slow force;

GEM - models of means for development of the general endurance;

StEM - models of means for the development of strength endurance;

AM - models of means for development of agility;

FM - models of means for development of flexibility.

The programming algorithm involves determining the degree of deviation of individual indicators of functional status, psychophysical fitness, the use of innovative technologies with the norms in accordance with the model of the athlete who makes maximum use of innovative technologies in the training process.

Programming involves:

– determination of effective directions, forms, means of correction of deviations from the model;

– determination of optimal parameters of use of each of the specified technologies for representatives of each of groups of disciplines of track and field athletics.

Conclusions / Discussion

In the course of our study, most of the successful training programs during H.E.'s auto-experiment correlated with Pareto's "Principle 80/20" law. In particular, this ratio was in practice with a small deviation in the use of the main traditional aerobic and anaerobic loads in micro- and macrocycles, depending on the stages and periods of the training process - from 90/10 (in the base period) to 70/30 (in the pre-competition period), which confirms the research of scientists [9].

During this study, a system and forms of integration of innovative technologies were created, which are based on the characteristics of each group of athletics disciplines and which the athlete can use constantly during the training process, rather than sporadically and detached from the logic of training programs. Based on the information exchange on the effectiveness of various innovative technologies, the most effective of them for specific athletics disciplines and the algorithm of their integrated involvement are determined, taking into account the specifics of each of the disciplines.

To create an effective system of integration of innovative technologies in the process of programming the training of athletes during the experiment in the national athletics team of Ukraine according to previous studies created conditions for training using innovative technologies such as hypoxic training, electrical stimulation, toning, simultaneous reactivation, mental training, innovative recovery methods etc.

The efficiency of the programming system was tested by the 9-time champion of Ukraine, master of sports of international class H.E. to prepare for performances in running at distances of 400 m and 800 m. Achieved results for 400 m - 45.89 sec. and 800 m - 1.46.56, this is the sixth result in the history of performances of Ukrainian athletes.

Analysis of practice and literature sources [1, 4, 6] showed that in the existing system of training of athletes of the national team of Ukraine there was no integrated use of innovative technologies.

The proposed technology of programming the involvement of innovative technologies for the training of athletes makes it possible to create an effective

system for building an individual training process in the national athletics team of Ukraine.

Experimental testing of programming technology involving innovative training technologies in the national athletics team of Ukraine confirmed the effectiveness of this programming technology, which was introduced in the training of individual members of the national team of Ukraine.

Prospects for further research include research, development of computer programs, technologies for integrated involvement of innovative technologies for training elite athletes.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

References

1. Bompa, T., Buccicheli (2016), Periodizacija sportivnoj trenirovki [Periodization training for sports], Sport, Moscow (in Russ.).
2. Hucol, Ye .M., Pylypej, L.P. (2019), "The blood indicator's relevance as an marker in elite athletes innovative preparation in high-altitude conditions", Teorija i metodyka fizychnoho vyhovannja i sportu, (4), 12-14. (in Ukr.)
3. Iordanskaja, F.A. (2015), Gipoksija v trenirovke sportsmenov i faktory, povyshajushhie ee effektivnost' [Hypoxia in sportsmen's training and factors that increase it's effectiveness], Sovetskij sport, Moscow (In Russ.).
4. Issurin, V. B. (2016), Podgotovka sportsmenov XXI veka: nauchnye osnovy i postroenija trenirovki [Preparation of XXI centuries sportsmen: training's scientific basis and building], Sport, Moscow (in Russ.).
5. Koch, R. (2019) Pryncyp 80/20. Sekret dosjahnennja bil′shoho za menshyh vytrat [The 80/20 Principle: The secret of achieving more With Less], KM-BUKS, Kyiv. (in Ukr.)

6. Platonov, V.N. (2015) Sistema podgotovki v olimpijskom sporte. Obshhaja teorija i ee prakticheskoe primenenie: uchebnik v 2 kn. [Preparation system in Olympic Sport. Genaral Theory and it's practical using: textbook in two books], Olimpijskaja literatura, Kyiv. (in Ukr.)
7. Pylypej, L.P., Hucol, Ye. M. (2019) "Vykorystannja trenuvannja v umovah hipoksiji elitnymy sportsmenamy zbirnoji komandy Ukrajiny z lehkoji atletyky", Sportyvnyj visnyk Prydniprovja, (3), 29-35. (in Ukr.)
8. Suslov, F. P., Popov, Ju. A., Kulakov, V. N., Tihonov, S. A. (2017), Beg na srednie i dlinnye distancii [Middle and long distance running], Kuznecov, V.V. (red.), Fizkul'tura i Sport, Moscow (in Russ.).
9. Fitzgerald, M. (2017), Beg po pravilu 80/20 [80/20 Running], MIF, Moscow, (in Russ.)
10. Anthony, M.J. (2018) "Effects of intermittent hypoxic training performed at high hypoxia level on exercise performance in highly trained runners", Journal of Sports Sciences, (18), 2045-2052. (in Eng.)
11. Brocherie, F., Girard, O., Faiss, R., Millet, G.P. (2017) "Effects of repeated-sprint training in hypoxia on sea-level performance: A meta-analysis", Sports Medicine, (47(8)), 1651-1660. (in Eng.)
12. Girard, O., Brocherie, F., Millet, G.P. (2017) "Effects of altitude/hypoxia on single-and multiple-sprint performance: a comprehensive review", Sports Medicine,(47(10)), 1931-1949. (in Eng.)

Received: 21.04.2020.
Published: 04.05.2020.

Information about the Authors.

Yevhen Hutsol: postgraduate student, Medical institute of Sumy State University: Rymskoho-Korsakova Street 2, Sumy, 40000, Ukraine.
ORCID.ORG/0000-0001-7007-5903
E-mail: kfv@sport.sumdu.eu.ua

Leonid Pylypei: PhD (Physical Education and Sport), Professor, Medical institute of Sumy State University: Rymskoho-Korsakova Street 2, Sumy, 40000, Ukraine.
ORCID.ORG/0000-0003-3508-1675
E-mail: kfv@sport.sumdu.eu.ua