



Improving the efficiency of training qualified athletes in the athletics heptathlon

UDC 796.093.61/.62



Associate Professor **V.A. Borovaya**¹
 Postgraduate student **E.S. Netsvetaeva**¹
 Dr. Hab., Professor **E.P. Vrublevskiy**¹
 PhD, Associate Professor **S.V. Sevdalev**¹
¹Skorina Gomel State University, Gomel, Belarus

Corresponding author: vru-evg@yandex.ru

Abstract

Objective of the study was to increase the efficiency of training athletes specializing in track and field heptathlon based on the design of key individual biomechanical parameters in individual disciplines.

Methods and structure of the study. A decision-making algorithm has been developed for the individualization of the training of qualified athletes specializing in track and field heptathlon. The latter was tested in the training process of the strongest all-around athletes in Belarus, and its effectiveness was assessed by the magnitude of the increase in sports results and indicators in individual all-around disciplines.

Results and conclusions. Following the decision-making algorithm when individualizing the training of athletes contributed to the increase in the total amount of the all-around due to the “pulling up” of the lagging disciplines to the indicators of the predicted model. Thus, the sports results of the five athletes who took part in the experiment improved by an average of 6.29%, and the performance in the technical disciplines of the heptathlon by 9.92% compared to the previous year. Particular attention is paid to the development of individual biomechanical model indicators, which serve as the basis for the formation of control training effects aimed at improving the technical training of all-round athletes.

Keywords: *sportswomen, competitive activity, heptathlon, points, result, technical training, individualization.*

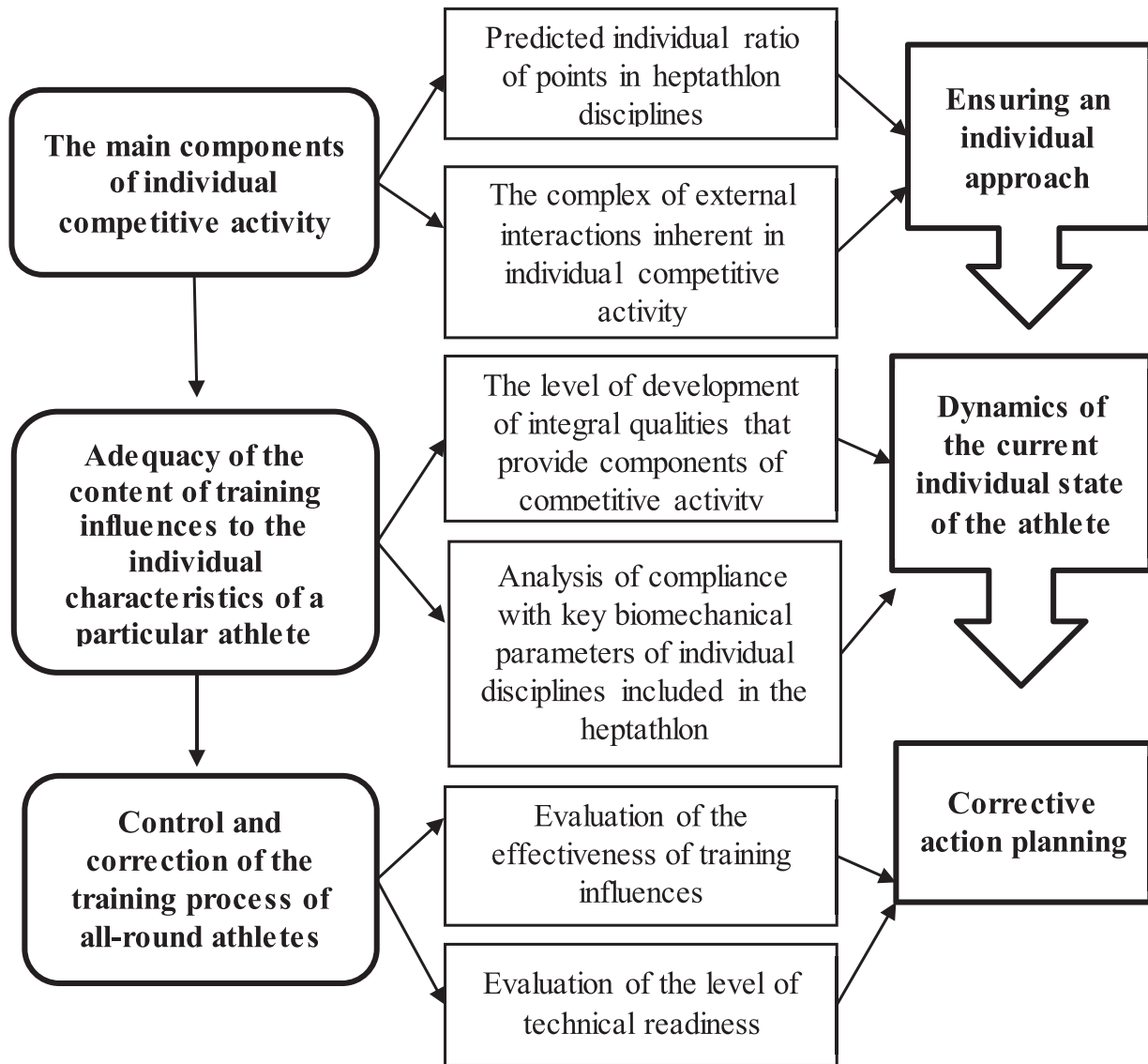
Introduction. The problem of increasing sports performance in women specializing in track and field heptathlon is solved mainly by increasing the volume and intensity of the training load, as well as indicators of the functional fitness of female athletes [3, 4, 6]. At the same time, not enough attention is paid to the search for methods to optimize the technical readiness of multiathlons, allowing to use their motor abilities to the maximum in each heptathlon discipline. In order for all-around athletes to fully use their motor potential, which is necessary for a two-day struggle with rivals and progressive fatigue, they need to have a stable technique for performing all disciplines included in the all-around [1, 5]. This actualizes the search for pedagogical influences and specially organized conditions aimed at increasing the efficiency of movements and the accuracy of fulfilling the parameters of competitive exercises, which will make it possible to achieve the maximum possible contribution of individ-

ual all-around disciplines to the total amount of points.

Objective of the study was to increase the efficiency of training athletes specializing in track and field heptathlon based on the design of key individual biomechanical parameters in individual disciplines.

Methods and structure of the study. An analysis of the literature [3, 4] and our own results of the study [1, 5, 6] contributed to the development of an algorithm (see figure) for making decisions in the individualization of the training of qualified athletes specializing in track and field heptathlon. The algorithm was tested in the training process of the strongest all-around athletes in Belarus, and its effectiveness was assessed by the magnitude of the increase in sports results and indicators in individual all-around disciplines.

Results of the study and their discussion. Following the developed algorithm assumes at the first stage the determination of the predicted individual



Decision-making algorithm for individualizing the training of qualified athletes specializing in heptathlon

ratio of points (in %) of an athlete in the heptathlon disciplines. To do this, you can use the data of the table, which presents the results of our analysis of the competitive activity of the strongest all-rounders in the world (n=35). 221 best results of the season in the heptathlon, shown by athletes during their sports careers aged 18 to 31, were subjected to statistical processing and the most significant age categories were selected. So, 18 years old is the age of the first serious international competitions with standard apparatus. This is followed by the age of 20 years - the period when the first significant jump is observed in the annual competitive result of heptathletes. The second most significant increase in competitive results occurs at the age of 23, and the maximum average amount was demonstrated by athletes at the age of 27. The increase in the average amount, compared with 23

years, amounted to 139.91 points.

The next stage is the creation of individual biomechanical models, which involves the use of a generally accepted technique for assessing technical skill in each of the heptathlon disciplines based on a video analysis of the competitive activity of female athletes. Thus, in the 100-meter hurdles, it is possible to analyze the timing of running sections of the distance, vertical fluctuations of the general center of mass of the body while overcoming the barrier, the time to overcome the obstacle itself and the support after leaving it. In the high and long jumps, the analysis is carried out according to the following indicators: the individual features of the rhythmic-tempo structure, the spatial and angular characteristics of the take-off run in multiathlons (especially the last three steps) are determined. The analysis of the competitive activity of heptathletes



The ratio of points in the heptathlon disciplines of the strongest athletes in the world, specializing in track and field heptathlon, in the age aspect

Age	Contribution of individual disciplines to the total score, %						
	100m hurdles	High jump	Shot put	200m run	Long jump	Javelin-throwing	800m run
18 years old	17,2	16,0	11,1	15,9	14,8	11,0	14,0
20 years old	16,3	15,7	11,9	15,2	14,8	12,2	13,9
23 years old	16,5	15,7	12,1	15,0	14,6	12,1	14,0
27 years old	16,4	15,6	12,2	14,7	15,0	11,9	14,2

in the shot put is carried out according to the kinematic indicators in the final phase of movement (speed, height and angle of the projectile, the duration of the acceleration of the shot and the push itself).

Technical mastery in javelin throwing is evaluated by kinematic characteristics at the moment of setting the right and left (stopping) legs, as well as angular characteristics at the moment of projectile release. Significant shortcomings were revealed in the technique of performing the final effort in the javelin throw among heptathletes, which did not allow them to fully realize their motor potential in this all-around discipline [1]. This is the lack of "overtaking" the projectile, depriving the athletes of the opportunity to use the energy of elastic deformation of the muscle-tendon structures in the throw; passive work of the right leg after setting, which leads to the absence of a two-support position and "crawling" from the right leg to the left; violation of the sequence of inclusion of muscles in the work, as a result of which the throw is performed with one hand, without engaging the strong underlying parts of the body.

The development of individual biomechanical model indicators serves as the basis for the further formation of point control training actions aimed at improving the technical training of female athletes [5]. This involves the development of special exercises, the application of which must be guided by the principle of dynamic compliance [2], according to which the latter should be adequate to the main competitive exercise according to the following criteria: muscle groups involved in the work; amplitude and direction of movement; accentuated section of the range of motion; the magnitude of the effort and the time of its development; movement speed; muscle work patterns. The main means can also be various imitation exercises with weights, which correspond to the structure of individual phases and elements of competitive exercises and are aimed at developing specific muscle groups. All this can be an effective approach to the problem of realizing the motor potential of all-around events in complex coordination disciplines of

all-around events and will allow, without being carried away by an increase in the volume and intensity of the training load, as well as an increase in the indicators of the functional fitness of athletes, to increase the competitive result.

The final decision-making stage in the individualization of the training of qualified all-round athletes can be the organization (distribution and interconnection) of training means in the annual cycle and its structural formations, as well as the planning of corrective measures. At the same time, it is important not to forget the obligation to constantly clarify the content of the training effects of the adequacy of the current state of the body of a particular athlete during training sessions [7, 8].

Conclusions. Following the decision-making algorithm when individualizing the training of athletes specializing in athletics heptathlon contributed to the increase in the total amount of the all-around due to the "pulling up" of the lagging types to the indicators of the predicted model. Thus, the sports results of the five athletes who took part in the experiment improved by an average of 6.29%, and the performance in the technical disciplines of the heptathlon - by 9.92% compared to the previous year.

In our opinion, the development of rational variants of motor actions, in order to achieve the planned sports result, is one of the unused resources that can optimize the mechanism for managing the technical preparation of heptathlons. The use of individual biomechanical models, as a guideline in the formation of the accuracy of reproduction of the kinematic and dynamic structures of a competitive exercise in multiathlon, will optimize the training process and maximize the use of their motor potential in heptathlon disciplines, which will improve sports performance.

References

1. Borovaya V.A. Analiz tekhnicheskoy podgotovlennosti vysokokvalifitsirovannykh semiborok v metanii kopya [Analysis of the technical readi-



- ness of highly qualified heptathletes in javelin throwing]. *Uchenyye zapiski BGUFGK*. 2020. No. 23. pp. 21-26.
2. Verkhoshansky Yu.V. *Osnovy spetsialnoy silovoy podgotovki v sporte [Fundamentals of special strength training in sports]*. 3rd ed. Moscow: Sovetskiy sport publ., 2013. 216 p.
 3. Dobrynskaya N.I., Kozlova E.K. Modelirovaniye sorevnovatelnoy deyatel'nosti kak osnova individualizatsii postroyeniya mnogoletney podgotovki v legkoatleticheskom mnogoborye [Modeling of competitive activity as a basis for individualization of building long-term training in athletics all-around]. *Nauka v olimpiyskom sporte*. 2013. No. 3. pp. 31-37.
 4. Mekhrikadze V.V., Slavkina E.V., Ermolaev B.V. Vzaimosvyaz vidov v zhenskom legkoatleticheskom semiborye [The relationship of species in the women's track and field heptathlon]. *Vestnik sportivnoy nauki*. 2019. No. 2. pp. 9-13.
 5. Netsvetaeva E.S., Borovaya V.A., Vrublevskiy E.P. Ispolzovaniye individualnykh biomekhanicheskikh modeley v protsesse upravleniya tekhnicheskoy podgotovkoy kvalifitsirovannykh sportsmenok, spetsializiruyushchikhsya v legkoatleticheskom mnogoborye [The use of individual biomechanical models in the process of managing the technical training of qualified athletes specializing in athletics all-around]. *Izvestiya Gomelskogo gosudarstvennogo universiteta im. F. Skoriny*. 2022. No. 2 (131). pp. 27-31.
 6. Netsvetaeva E.S., Borovaya V.A., Vrublevskiy E.P. et al. Analiz vozrastnoy dinamiki sorevnovatelnoy deyatel'nosti v legkoatleticheskikh mnogoboryakh v aspekte polovogo dimorfizma [Analysis of the age dynamics of competitive activity in athletics all-around events in terms of sexual dimorphism]. *Teoriya i praktika fizicheskoy kultury*. 2022. No. 9. pp. 14-16.
 7. Sevdalev S.V., Kozhedub M.S., Vrublevskiy E.P., Mitusova E.D. Biorhythm-based individualization of training of female different distance runners. *Teoriya i praktika fizicheskoy kultury*. 2020. 5. pp. 83-85.
 8. Sevdalev S., Skidan A., Vrublevskiy E. Organizational and methodical aspects of individualization of health improving female training. *Human. Sport. Medicine*. 2020. 20(S1). pp. 69-76.