Original Article

Factors that determine high efficiency in developing speed and strength abilities of female hurdlers

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Abstract:

The objective of the research is to mark out the factors determining highly efficient development of speed and strength abilities of female hurdlers. Conducted a questionnaire survey of trainers and female athletes. 77 people took part in the survey. To achieve the objective of the research were applied the following methods: theoretical analysis and literature summary; questionnaire survey, interview; study of the dynamics of physical condition and performance capacity in the process of competitive activity; assessment of the physical condition level; statistical processing of the data. Studies have shown that hurdling is a separate sport. The goal of sport development in hurdling is to achieve the best possible sport results. The skills of a female athlete in this case are determined by application of high-tech modern technology with a stable dynamic structure, rational management of external and internal strengths and depend on a number of certain factors determining high efficiency of development of speed and power qualities by female hurdlers. According to this research, it has been identified that the most significant factors determining high efficiency of speed and power abilities of female hurdlers are the following: lack of injuries, positive dynamics of physical condition in the competition period and the highest level of fitness for the main start of a season.

Key words: hurdling, female hurdlers, speed and strength abilities.

Introduction

Achieving high results in sport today is impossible without special training. Application of moving abilities and muscle strength is typical for any sport specialization, including hurdling. Herein, speed and strength abilities play an important role. [1,7,8].

Review of some sources of literature and summarization of female hurdlers' training experience reveals the problems concerning control over the training process aimed at development of speed and strength abilities. [2,8]. Modern methodical and scientific literature elaborates a technique for developing speed and strength abilities only for certain kinds of throwing and jumping. At the same time, the available research findings and guidelines are rather general and do not focus on any distinctions between male and female bodies. Nevertheless, a females is weaker than a males due to her anatomical nature. Therefore, development of speed and strength abilities by females has some specifics. Hurdling requires high speed and strength abilities, especially when jumping a hurdle. [1,2,4,6].

With relatively equal fitness for running, sportswomen who jump hurdles faster and more technically are more likely to win. The performance analysis of the strongest female hurdlers gives evidence about a number of problems related to control of their speed and strength training. These cause lower results of athletic performance and sometimes avoidable injuries.

Training process does not consider the fact that females develop muscle strength more slowly than males. The studies conducted in the recent years by leading Russian and foreign experts in the field of athletics reveal that if proper exercises are applied in the system of speed and strength training for women specializing in hurdling the probability of injury reduces significantly and sports results are going up. [1,3,5].

However, we have not been able to find papers that would reveal the factors determining high efficiency of speed and strength abilities of female hurdlers given the peculiarities of their body.

Material and methods

To achieve the objective of the research were applied the following methods: theoretical analysis and literature summary; questionnaire survey, interview, inquiry; study of the dynamics of physical condition and performance capacity in the process of competitive activity; assessment of the physical condition level (physical fitness, functional condition of the body and physical development) of sportswomen; statistical processing of the

data. All subjects understood the purpose of this study and provided written informed consent prior to participation in the study in accordance with the ethical standard of the Declaration of Helsinki.

Literature data was reviewed to assess the problem and compare the information with the findings of the experimental studies. The questionnaire survey, interview, inquiry were applied to study the mode of training and sports activities, specifics of organization of general and special physical training, dynamics of performance capacity, control structure of the training process aimed at development of speed and strength abilities by sportswomen.

The questionnaire survey and interviews were conducted both among sportswomen and experts in physical training and sports. The interviews with sportswomen provided valuable information about their individual attitude towards various special exercises, revealed certain causes of injuries, and helped to identify efficient ways of self-training individualization. While interviewing the experts in the field of athletics and conducting the survey, we cleared up various organizational issues, as well as the elements providing comprehensive teaching and training sessions.

We used the method of special control exercises, observation, timing, pairwise comparison, review of current performance rates in the championship of Russia and international competitions in Europe for examining physical condition and performance capacity of female hurdlers.

A test of physical fitness level was conducted to assess the development of physical and special abilities, as well as to analyze the efficiency of means and methods of training in order to increase sportswomen's performance.

We applied an express evaluation and assessment criteria of the body functional condition to evaluate functional condition of the body. In addition, Stange tests of breath holding were conducted, the fatigue index was calculated.

The assessment in the tests of breath-holding was conducted according to the criteria that are generally accepted at the present time.

The fatigue index (FI) was estimated according to the formula:

$FI = \frac{SD}{\sum P}$, where: SD – summarized data of the indicators of systolic pressure, estimated at the beginning of the first, second and third minute of rest after 15 squats; $\sum P$ – summarized data of the pulse indicator.

The difference between the data of the work index and after full recovery (index of norm) showed the degree of fatigue (FI). Three main degrees of fatigue level were marked out (in standard units): an average level of fatigue - 1.1-2.0; a significant level of fatigue – 2.1-3.0; fatigue - 3.1 or more.

The research data were subjected to mathematical processing. It was conducted to estimate the following statistical parameters:

x - estimation of the arithmetic mean value;

δ - estimation of the standard deviation;

m - estimation of the average error of the arithmetic mean;

t - assessment of differences by Student's t-test.

Interpretation of the findings of the mathematical processing was conducted according to the recommendations by A.E. Bolotin. [3]. During the analysis of mathematical indicators, the confidence level was considered significant at $p = 0.05$.

Results

Control over training process of track and field female athletes involves assessment of the current level of their fitness and its transformation into operational control influence. This influence must be efficient, urgent and realizable in a period under review.

One of the most essential problems in sport science today is to improve efficiency of training process management by means of complex control. This problem is especially important in connection with development of speed and strength abilities by sportswomen. Although it is still far from its final solution, there is some progress in dealing with it. To a large extent it is caused by the widespread use of modern scientific approaches to organizing training process, in particular, methods and ideas of a system approach.

Achieving high sport results in the process of specifically planned competitions is one of the main criteria of training process success and accuracy. Hence, the most urgent problem is to work out issues of organization of training and control over the fitness level of sportswomen at different training stages.

A complex control system, applied in hurdling, consists of assessing performances in competitions, measuring the level of various aspects of sportswomen's fitness, and tracking the loads parameters. [3,5].

The process of special physical training of female athletes is considered as a specialized function of the integral training process, which is based on the achievement of model results. The level of special physical fitness of sportswomen is under complicated reconstruction in different training periods. Consequently, when assessing the level of special physical fitness at each stage, it is necessary to focus on one's own, specific for this training period, model-diagnostic complex. The model-diagnostic complex implies a minimized set of characteristics, required for the task, with high probability of achieving success.

The choice of criteria for selection of informative indicators is an important task, which will determine efficiency of a diagnostic unit. A necessary condition for comprehensive assessment of general and special physical fitness of sportswomen is to identify informative criteria, which have strong correlations with the indicators of competitive activities of sportswomen. But at the same time, in our opinion, a significant loss of information can occur due to the fact that the result is in a complex correlation with various parameters.

The factual material available in the scientific literature and practice of sports allows selecting from a large variety of characteristics and compose the minimum number, which reflects, with high probability, certain aspects of general and special physical fitness of sportswomen.

Since management of training process is a transformation of the initial physical condition into a planned one, in order to conduct this, certain main conditions are required:

- it is necessary to know the condition of a sportswoman and have a description of the condition she should have;

- it is necessary to identify the most informative indicators of general and special physical fitness of the sportswoman and how their change can be controlled.

Considering training for competitions as a continuous process of improvement, it is necessary to work out model characteristics in advance. Experience proves that actual condition of sportswomen does not always correspond to the planned results. Due to that fact, one of the most important tasks of training process management is to search for the reasons that cause a mismatch of the planned and the actual. The main role is given to the issue of value and importance of the received information about the condition of sportswomen's fitness.

By the nature of the information obtained during the complex control over the training level of sportswomen, it can be divided into four groups:

- tests with the information content that does not change in any terms of test conducting. They can be applied for initial testing. In general, they characterize physical development, personal features of sportswomen;

- tests with the information content that grows as the competition approaches. The analysis of these indicators' dynamics is quite a substantial basis for training adjustment. In general, these tests characterize physical fitness, level of technical skills, level of functional responses;

- tests whose informative value decreases as the competition approaches. These indicators characterize objectively the level of fitness, however, the upcoming competition obviously negate their value, resulting in reconstruction of correlations between the studied indicators. Applying the information at the preparatory stage is impractical;

- tests that selectively characterize certain stages of training. Applying these tests in the complex control should be conducted selectively and the obtained information should be private.

According to this statement, the system of complex educational control allows solving the tasks of female athletes' educational and training process management by means of adjusting impacts.

Depending on the terms of control starts, the information of indicators characterizing the level of general and special physical fitness of sportswomen can be subjected to significant changes.

If the complex approach is used to register various conditions of sportswomen in the period of training for a competition it is possible to reveal new facts about the effect of various training means on the fitness level of athletes' in everyday conditions of training and in extreme conditions of important competitions.

An objective assessment of fitness condition and dynamics of its change is one of the main conditions for efficient management of the training process. The procedures of complex control provide an objective assessment of the fitness level of sportswomen, which takes into account all aspects of fitness in a particular period of time, reveal the leading factors that have caused the current condition.

Application of complex control in hurdling is difficult due to the fact that the techniques used for this are mostly some special tests that identify changes only in some aspects of sportswomen fitness.

The data of complex educational control in hurdling allows assessing objectively the level of general and special physical fitness of sportswomen at various stages of training, and their comparison with the model values provides conditions for efficient management of the training process.

For a better insight into the factors determining high efficiency of the educational and training process aimed at development of speed and power abilities by sportswomen, we conducted a questionnaire survey of trainers and female athletes. 77 people took part in the survey. The survey of experts showed that in terms of assessment of the educational and training process in development of speed and power abilities by female hurdlers, there is no consensus about its structure and content. The review of Russian and foreign literature, as well as the opinions of coaches, showed that development of speed and power abilities is attracting more and more attention. Respondents were asked to compose a rank structure of factors according to their value in improving efficiency of educational and training process aimed at development of speed and power abilities by female athletes. (Table 1) presents the findings of this study.

Table 1. Rank structure of factors determining high efficient development of speed and power abilities by female hurdlers (n=77)

Value	Factors	Rank indicator,
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(rank)		%
1	Lack of injuries among sportswomen	20.5
2	Positive dynamics of physical condition in the competition period	19.4
3	The highest level of sportswomen's fitness in the main start of a season	14.9
4	Rational distribution of loads in development of speed and strength abilities	14.4
5	Organization of training given the individual characteristics of sportswomen's muscles and ligaments structure	10.6
6	High level of sportswomen's motivation to achieve success	10.1
7	Level of general physical fitness	5.6
8	High rates of development of moral and volitional qualities	4.5

Analysis of (Table 1) shows that the respondents ranked the lack of injuries among sportswomen as the first place. In our opinion, it explains the importance of high physical fitness for competing. According to the experience of the sportswomen participating in international competitions, injuries make it impossible to achieve the set objectives. The experts ranked dynamics of physical condition of athletes in the competition period as number two. Work experience of the leading modern coaches shows that the greatest success can be achieved only when a sportswoman's fitness remains high for a long time and if she consistently performs throughout the whole season. Such results can be achieved due to a high level of sportswomen's physical condition.

The level of sportswomen fitness for the main start of the season was put on the third place by the experts. This factor requires realization of the main goal of the educational and training process - to achieve the highest physical fitness for the main competition of the season. Other factors are less significant.

Discussion

Studies have shown that hurdling is a separate sport. The goal of sport development in hurdling is to achieve the best possible sport results. The skills of a female athlete in this case are determined by application of high-tech modern technology with a stable dynamic structure, rational management of external and internal strengths and depend on a number of certain factors determining high efficiency of development of speed and power qualities by female hurdlers. Compared to the sports with quite a variety of forms to achieve the desired results (sport games, martial arts, etc.), a competitive skill in hurdling is more stable, and there is a strong correlation between a certain set of physical characteristics and factors determining high efficiency of development of women's speed and power qualities. Therefore, to improve technical training in hurdling it is necessary to understand in detail the main factors that determine high efficiency of women's speed and power qualities.

Conclusion

According to this research it has been identified that the most significant factors determining high efficiency of speed and power abilities of women specializing in hurdling are the following: lack of injuries among sportswomen, positive dynamics of physical condition in the competition period and the highest level of sportswomen's fitness for the main start of a season.

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