

PECULIARITIES OF SPECIAL PHYSICAL FITNESS OF ELITE HIGH JUMPERS FROM RUN

Kutek T.B.

Zhytomyr Ivan Franko State University

Abstract. *Purpose:* analysis of special physical fitness features of elite high jumpers from run, considering main competition exercise's specificities. *Material:* experiments covered 87 sportsmen. As a result of known coaches' questioning tests for special physical fitness were selected. *Results:* we outlined the test, which permits to determine prevailing of components of power, speed or speed-power character in sportsman's physical fitness. The most important condition of determination of training programs' content shall be components of speed-power fitness. *Conclusions:* the offered test meets requirements to informative character and reliability and can be used in practical work for assessment of elite high jumpers' from run special physical fitness and correction of training process at different stages of many years' sport perfection.

Key words: test, control, fitness, correction, jump, informative, reliability, program.

Introduction

Effectiveness of sportsmen's training depends on determination of their condition on the basis of objective criteria of special physical fitness, followed by correction of training process's components [8; 10; 11].

Controlling such complex dynamic system as sport training, it is necessary to consider all main laws of administrating. In this case coach is a controlling system and sportsman – a controlled one. Multifaceted, often variable under influence of different factors sportsman's condition shall be constantly monitored by introducing changes in trainings program. This task shall be solved on principle of feedback. According to this principle, controlling system shall receive information about effect of influencing on controlled object [1; 16; 17].

The used in training process methods of sportsman readiness assessment do not permit their application as objective criteria at different stages of training. At the same time trend to intensification of training process implies optimizing of controlling system, which is realized in systemic character and with prognostication. For this purpose, informative and reliable pedagogic tests of sportsman's specific motor functioning are used [2; 9; 12; 14; 15].

In many kinds of sports orientation of sport training depends on prevalence of power, speed or speed-power components of sportsmen's special physical fitness [1; 3; 4; 18]. As on to-day, various pedagogic tests permitting assessment of these components have been offered [2; 7; 8]. Analysis of scientific literature proves that many tests for assessment of high jumpers' components do not meet requirements of reliability and informative [8; 16; 20-23].

Specialists could not determine degree of reliability for Cooper's test (12 minutes' run on track). That is why it is used only by some sportsmen and only one time (in first half of October). Besides, for jumper this test was not a specific one [1; 9]. Also degree of reliability was not determined for such tests as jerk of weight rod, toss kernel (4 kg) by two arms from below, ten - times' jump from the spot from one foot to other and many other. There was not detected degree of reliability for sprinter exercises (60, 80, 100 meters' run) [2; 8; 12; 6].

Purpose, tasks of the work, material and methods

The purpose of the research is to determine advantages of power, speed, speed-power skills of high jumpers, considering specificities of competition exercise.

The methods and organization of the research: experiments embraced 87 sportsmen – high jumpers of different qualification. As a result of questioning of known coaches we selected tests for special physical fitness. We selected tests with the highest degree of correlation with indicators of power, speed and speed-power skills of sportsmen. They were: high jump, standing on jerking foot, by wave of free leg; high jump from three step run.

Results of the research

As a result of conducted research we determined close correlation dependence of these jumps' indicators between them at all levels of sport fitness: from III grade to international master of sports (correlation coefficients from $r = 0.635$ to $r = 0.735$ accordingly). With it in every grade group certain indicator of percentage correlation has connection with power, speed and speed power exercises (see table 1). For example at level of III grade numerical expression of percent correlation between two jumps from 65% to 70% has high correlation coefficient with indicator of speed exercise (30 meters' run - $r = 0.738$). Analogous picture is from 71% to 78% – with indicators of speed-power exercises (triple jump from the spot – $r = 0.912$) and from 79% to 85% – with indicator of power exercise (relative strength of muscle flexor of jerk foot – $r = 0.921$). It should be noted that with increasing of sportsman's qualification ranges of this correlation change to certain extent. At level of candidates masters of sports and masters of sports high correlation coefficient was detected with speed parameter (30 meters' run – $r = 0.824$) in the range of from 72% to 75% and power parameter – from 82% to 87% (relative strength of muscle flexor of jerk foot – $r = 0.836$). At level of international masters of sports high correlation coefficient was found with 30 meters' run – $r = 0.908$ in the range from 73% to 76% and power parameter from 83% to 88% ($r = 0.854$). In this connection it was assumed that indicator of percent correlation between these jumps can be the test for determination of prevalence of power or speed-power components of special physical fitness of different qualification high jumpers.

Thus, we determined the test, with the help of which it became possible to find out prevalence of power, speed or

speed-power components in special physical fitness of sportsman at different stages of sport perfection (see table 1).

Table 1

Correlation of indicators of high jump, standing on jerk foot and high jump from three steps run with indicators of power, speed-power and speed fitness of different qualification high jumpers (%)

Qualification, sport result	Indicator of percent correlation between two jumps	30 meters' run from high start	Triple run from the spot from foot to foot	High jump from the spot by two feet	Relative strength of muscle flexor of jerk foot
III grade 1.55-1.74 m	79-85%	0.392	0.310	0.317	0.921
	71-78%	0.612	0.912	0.886	0.476
	65-70%	0.738	0.594	0.488	0.547
II grade 1.75-1.89 m	81-86%	0.216	0.114	0.436	0.708
	76-80%	0.765	0.419	0.584	0.814
	71-75%	0.900	0.401	0.727	0.442
I grade 1.90-2.04 m	81-87%	0.378	0.412	0.693	0.746
	76-81%	0.413	0.680	0.723	0.562
	72-75%	0.736	0.459	0.671	0.419
CMS, MS, 2.05-2.20 m	82-87%	0.216	0.642	0.687	0.836
	76-81%	0.468	0.492	0.926	0.362
	72-75%	0.824	0.236	0.342	0.244
IMS 2.24-2.41 m	83-88%	0.413	0.451	0.574	0.854
	77-82%	0.524	0.563	0.698	0.610
	73-76%	0.908	0.406	0.381	0.298

Notes: the most significant coefficients: IMS, MS, CMS – $r = 0.470$; $P = 0.05$; other grades – $r = 0.410$; $P = 0.05$.

Further course of the researches was oriented on testing and substantiation of the received by us test for checking up its reliability and informative character (validity). Reliability means degree of coincidence of many times' results. Role of reliability coefficient was played by correlation coefficient, which was calculated between to masses of results with testing of one and the same group of sportsmen. The obtained coefficients r in the range from $r = 0.957$ to $r = 0.993$ witness about high reliability of the test and are applicable in groups of sportsmen from iii grade to international masters of sports.

Analysis of interconnection of physical skills and parameters of different qualification high jumpers was conducted with consideration of sportsmen's individual features. Distribution into sub-groups with prevailing of power, speed and speed-power special fitness' components at all levels of sport qualification was fulfilled with the help of test, received in our researches (see table 2).

Table 2

Results of determination of individual special physical fitness of different qualification high jumpers

Qualification, sport result	Indicator of percent correlation between two jumps	Prevalence of components of sportsman physical fitness's components
III grade 1.55-1.74 m	79-85%	Power
	71-78%	Speed-power
	65-70%	Speed
II grade 1.75-1.89 m	81-86%	Power
	76-80%	Speed-power
	71-75%	Speed

Qualification, sport result	Indicator of percent correlation between two jumps	Prevalence of components of sportsman physical fitness's components
I grade 1.90-2.04 m	81-87%	Power
	76-80%	Speed-power
	72-75%	Speed
CMS, MS, 2.05-2.20 m	81-87%	Power
	76-80%	Speed-power
	72-75%	Speed
IMS 2.24-2.41 m	83-88%	Power
	77-82%	Speed-power
	73-76%	Speed

Notes: as test we used percent correlation between high jumps standing on jerk foot by waving of free leg and indicators of high jump from three steps' run.

Discussion

Analysis of scientific literature, questioning of known coaches proved demand in working out of new, more effective, more reliable and informative tests in trainings of sportsmen, specializing in speed-power kinds of track and field events [1; 3; 8; 9; 16].

Results of the conducted researches supplement existing pedagogic tests, which permit to assess sport fitness depending on prevalence of power, speed and speed power components in jumpers' special physical fitness [1; 3; 12; 18; 19].

In our research we also received new data, which permitted to determine test - percent correlation between high jumps standing on jerk foot by waving of free leg and indicators of high jump from three steps' run, with the help of which it became possible to find out level of special physical fitness of sportsman at different stages of sport perfection. Informative character and reliability of this test was proved by factorial, correlation and dispersion analysis [7] and indeed can be applied for optimizing of system of training monitoring on the base of systemic control and prognostication. Besides, the main in determination of training process content shall be speed-power fitness.

Conclusions

The received results of the research permit to make conclusion that the offered test meets the requirements to informative character and reliability and can be used in practical work for assessment of special physical fitness of elite high jumpers from run and for training process's correction at different stages of sport perfection. We think that the most important condition of training programs content's determination shall be speed-power fitness's components.

The prospects of further researches are connected with seeking of informative and reliable tests for sportsmen of all speed-power kinds of track and field events.

Acknowledgement

The research was conducted in compliance with topic 2.11 "Theoretical methodic principles of control over sportsmen's training system, who specialize in track and fields jumps" of combined plan of scientific and research works in sphere of physical culture and sports for 2011-2015 of Ministry of Ukraine of family, youth and sports. State registration number; 0111U003839.

Conflict of interests

Author declares absence of any conflict of interests.

References:

1. Akhmetov R.F. *Teoretiko-metodichni osnovi upravlinnia bagatorichnoiu pidgotovkoiu sribuniv u visotu visokogo klassu* [Theoretical and methodological foundations of long-term preparation jumpers tall high class], Zhitomir, 2005, 283 p. (in Ukrainian)
2. Akhmetov R. F. *Teoretiko-metodichni osnovi upravlinnia sistemoiu bagatorichnoi pidgotovki sportsmeniv shvidkisno-silovikh vidiv sportu. Dokt. Diss.* [Theoretical and methodological foundations of the system of long-term training athletes speed-power sports. Dokt. Diss.], Kiev, 2006, 39 p. (in Ukrainian)
3. Bobrovnik V. I. *Racional'na sistema organizacii trenuval'nogo procesu v sribkakh u visotu na etapakh maksimal'noi realizacii individual'nikh spromozhnostej ta zberezhenia dosiagnen'* [The rational system of training process in the high jump on stage to realize individual capacity and conservation achievements]. *Teoriia i metodika fizichnogo vikhovannia i sportu*, 2002, vol.1, pp. 3–11. (in Ukrainian)
4. Verkhoshanskij Iu.V. *Osnovy special'noj fizicheskoy podgotovki sportsmenov* [Fundamentals of special physical preparation of athletes], Moscow, Physical Culture and Sport, 1988, 331 p. (in Russian)

5. Gamalij V.V. Modelirovanie tekhniki dvigatel'nykh dejstvij v sporte [Modeling technique of motor actions in sport]. *Nauka v olimpijskom sporte*, 2005, vol.2, pp. 108–116. (in Russian)
6. Kuznecov V.V., Shustin B.N. Metodologija postroenija model'nykh kharakteristik sil'nejshikh sportsmenov [Methodology of model characteristics of the strongest athletes]. *Sovershenstvovanie upravleniia sistemoy podgotovki kvalificirovannykh sportsmenov* [Improving the management of the system of training of qualified athletes], Moscow, 1980, pp. 68–69. (in Russian)
7. Kutek T.B. *Teoretiko-metodichni osnovi upravlinnia bagatorichnoiu pidgotovkoiu kvalifikovanih sportsmenok, iaki specializuiut'sia v legkoatletichnikh stribkakh. Dokt. Diss.* [Theoretical and methodological foundations of long-term training of qualified athletes who specialize in athletics jump. Dokt. Diss.], Lviv, 2014, pp. 36 p. (in Ukrainian)
8. Laputin A. N., Bobrovnik V. I. *Olimpijskomu sportu – vysokie tekhnologii* [Olympic sports – high techniques], Kiev, Knowledge, 1999, 164 p. (in Russian)
9. Maksimenko G. N. *Teoretiko-metodicheskie osnovy podgotovki iunykh legkoatletov* [Theoretical and methodological foundations of training young athletes], Lugansk, Alma Mater, 2007, 394 p. (in Russian)
10. Ogandzhanov A.L. *Upravlenie podgotovkoy kvalificirovannykh legkoatletov-prygunov* [Management training of qualified athletes-jumpers], Moscow, Physical Culture and Sport, 2005, 200 p. (in Russian)
11. Platonov V.N. *Sistema podgotovki sportsmenov v olimpijskom sporte* [The system of preparation of sportsmen in Olympic sport], Kiev, Olympic Literature, 2004, 808 p. (in Russian)
12. Popov G. I. *Biomekhanicheskie osnovy sozdaniia predmetnoj sredy dlia formirovaniia i sovershenstvovaniia dvizhenij. Dokt. Diss.* [Biomechanical basis for the creation of the subject environment for the development and perfection of movements. Dokt. Diss.], 1992, Moscow, 626 p. (in Russian)
13. Popov G.I. *Biomekhanika* [Biomechanics], Moscow, Academy, 2005, 254 p. (in Russian)
14. Ratov I.P., Popov G.I. *Biomekhanicheskie tekhnologii podgotovki sportsmenov* [Biomechanical technology training athletes], 2007, Moscow, Physical Culture and Sport, 120 p. (in Russian)
15. Selivanova T.G. *Issledovaniia vozmozhnostej korrekcii dvizheniia sportsmenov pri ispol'zovanii stimulacionnykh i programmiruiushchikh ustroystv* [Research the possibility of correcting movement of athletes using stimulus and programming devices], Moscow, Physical Culture and Sport, 2005, 127 p. (in Russian)
16. Strizhak A.P. *Nauchno-metodicheskie osnovy upravleniia trenirovochnym processom vysokokvalificirovannykh legkoatletov-prygunov. Dokt. Diss.* [Scientific and methodical bases of management training process of highly skilled athletes-jumpers. Dokt. Diss.], Moscow, 1992, 32 p.
17. Khmel'nic'ka I. V. *Programne zabezpechennia biomekhanichnogo videokomp'iuternogo analizu sportivnikh rukhiv* [Software biomechanical analysis of computer video athletic movements]. *Olimpijs'kij sport i sport dlia vsikh* [Olympic sport and sport for all], Kiev, 2010, p. 568. (in Ukrainian)
18. Shestakov M. P. *Upravlenie tekhnicheskoy podgotovkoy v legkoj atletike na osnove komp'iuternogo modelirovaniia* [Management of technical training in athletics on based computer simulation], *Nauka v olimpijskom sporte*, 2005, vol.2, pp. 187–196. (in Russian)
19. Shustin B. N. *Model'nye kharakteristiki sorevnovatel'noj deiatel'nosti* [Model characteristics of competitive activity], Moscow, SAAM, 1995, pp. 50–73. (in Russian)
20. Kutek T.B. Application of hardwares in the process of training of skilled sportswomen. *Physical Education of Students*, 2013, vol.5, pp. 60–64. doi:10.6084/m9.figshare.771086
21. Kutek T.B., Impact on the effectiveness of rehabilitation funds qualified athletes specializing in the long jump with a running start. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013, vol.12, pp. 37–41. doi:10.6084/m9.figshare.879680
22. Kutek T.B., Stimulation of regenerative processes of qualified athletes specializing in the high jump with a running start. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013, vol.11, pp. 57–61. doi:10.6084/m9.figshare.815875
23. Moreno-Aranda J., Sierag A. Force response to electrical stimulation of canine skeletal muscles. *Journal of Biomechanics*, 1991, vol.2, pp. 595–599.

Information about the author:

Kutek T.B.: <http://orcid.org/0000-0001-9520-4708>; kuttam2010@rambler.ru; Zhytomyr Ivan Franko State University; Most Berdichevskaya, st. 40, Zhytomyr, 10008, Ukraine.

Cite this article as: Kutek T.B. Features special physical readiness of the qualified jumpers from the takeoff. *Physical education of students*, 2015, no.2, pp. 3-7. <http://dx.doi.org/10.15561/20755279.2015.0201>

The electronic version of this article is the complete one and can be found online at: <http://www.sportpedu.org.ua/html/arhive-e.html>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<http://creativecommons.org/licenses/by/3.0/deed.en>).

Received: 07.04.2015

Accepted: 25.04.2015; Published: 30.04.2015