UDC 796.422.12:796.012.62:617.7

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 3, pp.77-84

THE INFLUENCE OF PLYOMETRIC TRAINING ON THE IMPROVEMENT OF SPECIAL PHYSICAL PREPARATION OF HIGH-QUALIFIED VISUALLY IMPAIRED SPRINTERS DURING PRE-COMPETITION STAGE

Liudmyla Shesterova[1]

Leilia Adzhametova[2]

Kharkiv humanitarian-pedagogical academy[1],

Kharkov state academy of physical culture[2],

Kharkov, Ukraine

Purpose: describes the effectiveness of applying plyometric training on different flooring of highly qualified visually impaired sprinters at the pre-competition stage.

Material and methods: the indicators of special physical fitness of the Honored Master of Sports of Ukraine in para-athletics among athletes with visual impairments during the pre-competition stage of the annual macro-cycle were studied. The following methods were used: analysis and generalization of scientific and methodological literature, analysis of training loads and processing of parameters of training activity, testing of the level of development of high-speed and speed-power, pedagogical observation, methods of mathematical statistics.

Results: changing the flooring on which plyometric exercises were performed led to positive changes in the performance of the athlete's physical fitness.

Conclusions: the use of preparation at the pre-competition stage of a highly qualified visually impaired sprinter in the six-week plyometric program contributed to a significant increase in speed and speed-power indices of the athlete ($p < 0.05$-0.01).

Keywords: plyometric, special physical preparation, pre-competition stage, visually impaired.

Introduction

The rapid growth of sports results in Paralympic sports dictates the need to create new methods and approaches in the system of sports training. These circumstances call for the creation, improvement and modernization of methodological developments that help increase the effectiveness of the content and organization of the training process [2, 4]. This is especially important for visually impaired athletes, because the reduction of the functions of the visual analyzer affects the work of other sensory systems and the body as a whole [6, 10, 12].

It is generally accepted that the basis of sprinters training is the use of various exercises for speed, speed-power and power [5]. Many experts prefer running and jumping exercises, similar in their kinematic and dynamic structure with competitive exercise [1, 5]. Plyometric is considered to be one of the methods often used in sports to achieve the required sports form. Plyometric exercises are used in many sports, including jumping, and are aimed at forming the technique of their implementation [3, 7, 11]. S. Kramskoy, K. Herodek, S. Markovic, R. Stankovic believe that based on tendon reflexes to reproduce the "explosive" reaction, plyometric is a connecting factor between speed and power [8]. Plyometric method helps to increase power, helping the nervous system to "enable" and activate muscles, that is, it "forces" the muscles to develop the most effort in the shortest period of time [8, 9].

The scientific and scientific-methodical literature describes the application of the plyometric method of training in many Olympic sports. The use of plyometric exercises in the training of Paralympic athletes today has no scientific justification. The coaches of the Paralympic national team of Ukraine in the training process use a variety of such exercises, relying on practical experience in training athletes who do not have abnormalities in health. Therefore, the study and elucidation of the effectiveness of plyometric exercises for the development of speed and speed-power abilities of high-qualified visually impaired sprinters is relevant.

Purpose of the study: describes the effectiveness of applying plyometric training on different flooring of highly qualified visually impaired sprinters at the pre-competition stage.

The study was performed on the topic «Improvement of the training process of disabilities athletes in various sports» for 2016-2020 (state registration number 0116U008944).

Material and Methods of research

The research was conducted at the pre-competition stage of the annual macro-cycle (September - October 2019) during the preparation of the athlete for the World Para Athletics Championships. The research was participated by Honored Master of Sports of Ukraine in athletics among visually impaired athletes, Paralympic champion, world record holder.

The following methods were used in the work: analysis and generalization of scientific and methodological literature, analysis of training loads and processing of parameters of training activity, testing of the level of development of high-speed and speed-power, pedagogical observation, methods of mathematical statistics.

Results of the research

At the beginning of the pedagogical research before the application of the experimental training program, the following level of special physical fitness was observed in the athletes (tab. 1).

Table 1

Indicators of the level of development of speed and speed-power abilities at the beginning of the research

Indicator	Results	
	$\overline{X} \pm \sigma$	V%
Standing broad jump (m	2,51±0,06	2,22
Standing triple jump (m	7,23±0,04	0,50
30 м sprint (s)	3,97±0,03	0,67
60 м sprint (s)	7,41±0,04	0,49

The athlete performed each exercise three times during testing. All results corresponded to the model indicators for high-qualified visually impaired sprinters. The coefficients of variation were 0,49 – 2,22%, indicating the close homogeneity of the results, which confirms the skill of the athlete. We have developed a six-week program of plyometric in order to improve the special physical fitness of high-qualified visually impaired sprinters. The training program provided change flooring on which plyometric exercises were performed. The first three weeks the plyometric exercises were performed on the sand, the next three weeks – on the seamless polyurethane sports coating of the athletics stadium Estadio Olimpico Antonio Dominguez in Santa Cruz de Tenerife, (Spain). The athlete's training program consisted of three training sessions in the gym, three plyometric training, two technical training and two recovery training (cross, yoga, swimming). The duration of each practice ranged from 1 to 2.5 hours. Plyometric were performed on Monday, Wednesday and Saturday after an individual warm-up for a visually impaired athlete. The plyometric training program is depicted in table 2.

Table 2

The program of plyometric exercises

Day	Exercise	Quantity
Monday	Alternate leg bounds	5 × 40 repetitions
	Frog squat jump	5 × 20 repetitions
	Alternating lunge jump	5 × 20 repetitions
	Skater squat with jump	3 × 20 repetitions
	Sparrows squat jump	3 × 20 repetitions on each leg
Wednesday	Alternate leg bounds	5 × 40 repetitions
	Squat jumps	3 × 20 repetitions
	Mountain climber	3 × 40 repetitions
	Burpees	3 × 20 repetitions
	Sparrows squat jump	3 × 20 repetitions
	Tuck jumps	3 × 20 repetitions
Saturday	Alternate leg bounds	5 × 40 repetitions
	Single-leg bounds	3 × 20 repetitions
	Kneeling jump squat	5 × 20 repetitions
	Reverse lunge with knee-ups	3 × 20 repetitions
	Alternate leg bounds from place	3 × 20 repetitions

The duration of rest between sets of plyometric exercises was regulated and controlled by external signs of fatigue and heart rate of the athlete (according to the recommendations of the ophthalmologist, the heart rate of the athlete after exercise should not exceed 174 beats/min.).

After three weeks of using plyometric exercises on the sand, we tested the level of special physical fitness of the researched athlete (tab. 3).

Table 3

Indicators of the level of development of speed and speed-power abilities after 3 weeks of training

Indicator	Initial testing		Intermediate testing		Reliability of estimate		
	$\overline{X} \pm \sigma$	V%	$\overline{X} \pm \sigma$	V%	T	t гр	P
Standing broad jump (m)	2,51±0,06	2,22	2,54±0,06	2,17	5,00	4,30	<0,05
Standing triple jump (m)	7,23±0,04	0,50	7,29±0,04	0,49	6,00	4,30	<0,05
30 м sprint (s)	3,97±0,03	0,67	3,93±0,03	0,64	3,61	4,30	>0,05
60 м sprint (s)	7,41±0,04	0,49	7,33±0,04	0,49	6,93	4,30	<0,05

Reliably significant changes were observed in all tests, except for the 30 meter sprint ($p < 0,05$) (tab.3). In the run indicators for 30 meters were not observed statistically significant changes between initial and intermediate testing ($p > 0,05$). In our opinion, the slight increase in the results of the 30 m sprint race is explained by the relatively short time between the initial and intermediate testing, as well as the use of plyometric exercises on an unstable surface – sand. The next testing of the athlete was conducted at the end of a six-week plyometric program (tab. 4). The last 3 weeks the exercises were performed on the seamless polyurethane sports coating of the athletics stadium Estadio Olimpico Antonio Dominguez in Santa Cruz de Tenerife, (Spain).

An analysis of the results indicates significant changes in all studied indicators ($p<0,05$-$0,01$). The largest increase was observed in the results of standing broad jump – 6,5% and standing triple jump – 3,3%. The athlete's result in the 30 meter sprint improved from 3,97 ± 0,03 s to 3,86 ± 0,04 s. The athlete overcame distance 60

meter by 2,9% faster than in the beginning of the research. Changing the flooring on which plyometric exercises were performed led to positive changes in the level of development of high-speed and speed-power abilities of the muscles of the athlete's legs at the pre-competition stage.

Table 4

Indicators of the level of development of speed and speed-power abilities at the beginning and end of the research

Indicator	at the beginning research		at the end of the research		Reliability of estimate		
	$\overline{X}$	σ	$\overline{X}$	σ	T	t rp	P
Standing broad jump (m)	2,51	0,06	2,67	0,08	12,25	4,30	<0,01
Standing triple jump (m)	7,23	0,04	7,47	0,08	8,67	4,30	<0,05
30 м sprint (s)	3,97	0,03	3,86	0,04	12,85	4,30	<0,01
60 м sprint (s)	7,41	0,04	7,19	0,06	13,00	4,30	<0,01

These changes also affected the competitive result of the athlete, who won two gold and bronze medals in the 100 m, 200 m and 400 m, respectively, at the World Para Athletics Championships 2019 in Dubai (UAE). The athlete showed the result of season best in the 100 m and 400 m. The 200 meter race visually impaired sprinter improved her personal best for 0.27 seconds. In our opinion, the show of results was contributed by the use of plyometric, which had a positive effect on the condition of the musculoskeletal system of the athlete, which, in turn, made it possible to more quickly and powerful push off from the support.

Conclusions / Discussion

The scientific and scientific-methodical literature describes the application of the plyometric method of training in many Olympic sports, however, its use in the preparation of Paralympic athletes isn't in scientific materials.

The research confirmed the existing view, that the basis of visually impaired sprinters training is the use of various exercises for speed, speed-power and power.

The informations of S. Kramskova, K. Herodeka, S. Markovica and R. Stankovica on the effectiveness of plyometric method is expended and supplemented.

We found that the program of plyometric exercises on different flooring has a positive effect on the condition of the musculoskeletal system of the athlete, which, in turn, make it possible to more quickly and powerful push off from the support.

An analysis of results, after applying a six-week plyometric program at the pre-competition stage of a highly- qualified visually impaired athlete, showed that the results in standing broad jump, standing triple jump, 30 m and 60 m sprint significantly changed ($p < 0,05$).Thus, the use of preparation at the pre-competition stage of a highly qualified visually impaired sprinter in the six-week plyometric program contributed to a significant increase in speed and speed-power indices of the athlete.

Further development of scientific research. The materials of research will allow to analyze the preparation of highly-qualified visually impaired sprinters of annual macro-cycle.

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. Artyushenko, F. O. and Sirenko, L. V. (2006), Osnovy sportyvnoi pidhotovky [Basics of sports training], navch. posibn., Cherkasy, Brama-Ukraina, 416 p. (in Ukr.)
2. Briskin, Yu. A., Evseev, S. P. and Perederiy, A. V. (2010), Adaptivnyiy sport [Adaptive sport], Moskow, Sovetskiy sport, pp. 271-288 (in Russ.)
3. Wendlerand, D. (2006),"Strength training: maximum effort cycles", Mir sily, No 3, pp. 28-30. (in Russ.)
4. Evseev, S. P. and Evseeva, O. E. (2015),"Theoretical problems of adaptive sports at the present stage", Kul'tura fizicheskaya i zdorov'ye, Vol. 4, No 55, pp. 78-83. (in Russ.)
5. Platonov, V. N. (2015), Sistema podgotovki sportsmenov v olimpiyskom sporte. Obschaya teoriya i ee prakticheskie prilozheniya [The system of training

athletes in Olympic sports. General theory and its practical applications], Kiev, Olimpiyskiy sport, 680 p. (in Russ.)

6. Shesterova, L. Ye. (2015),"Influence of visual impairment on individual indicators of the functional state of the sensory systems of middle school students", Slobozhans′kyy naukovo-sportyvnyy visnyk, No 4, pp. 96-99. (in Ukr.)

7. Hitzeman, S. A. and Beckerman, S. A. (1993), "What the literature says about sports vision", Optom Clin. Vol. 3, No 1, pp. 145-152. (in Eng.)

8. Kramskoy, S. I., Herodek, K., Markovic, S. and Stankovic, R. (2009), "Plyometric training for development explosive strength of legs for selected handball players", Fizicheskoye vospitaniye studentov, № 2, pp. 168-174. (in Eng.)

9. Shaji, J. and Isha, S. (2009), "Comparative analysis of plyometric training program and dynamic stretching on vertical jump and agility in male collegiate basketball player", Al Ameen J Med Sci, Vol. 2, № 1, pp. 36-46. (in Eng.)

10. Weber, W. (1992), Mechanics of the human walking apparatus, Berlin, Springer-Verlag, 242 p. (in Eng.)

11. Winter, D. (1990), Biomechanics and motor control of Human movement, New York, John Wiley & Sons, 277 p. (in Eng.)

12. Wylegala, A. (2016), "The effects of physical exercises on ocular physiology", J Glaucoma. Vol. 25, № 10, pp. 843-849. (in Eng.)

Received: 29.05.2020.

Published: 26.06.2020.

Information about the Authors

Liudmyla Shesterova: PhD (Physical Education and Sport), Professor; Kharkiv humanitarian-pedagogical academy: Rustaveli 7, Kharkiv, 61001, Ukraine

ORCID.ORG/0000-0001-8777-6386

E-mail: lydmula121056@gmail.com

Leilia Adzhametova: postgraduate; Kharkiv State Academy of Physical Culture: Klochkivska 99, Kharkiv, 61058, Ukraine.

ORCID: 0000-0001-6673-3686

E-mail: Leilia090394@gmail.com