

## Influence of the level of development of absolute force on indicators of technical preparedness of shot putters at the stage of specialized basic preparation

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The results of the researches of influence of indicators of absolute force on parameters of technical preparedness of the qualified shot putters are presented.

**Purpose:** to investigate influence of the level of development of absolute force on indicators of technical preparedness of the qualified shot putters.

**Material & Methods:** analysis and generalization of scientific and methodical literature, pedagogical testing, video filming with the subsequent biomechanical analysis, methods of mathematical statistics. 12 qualified shot putters participated in the research.

**Results:** the high correlation interrelation between the level of development of absolute force and separate indicators of technical preparedness of shot putters is revealed.

**Conclusions:** technical preparedness of shot putters farthest depends on the level of development of absolute muscular strength of legs, chest and hands, in particular, triceps.

**Keywords:** shot putters, absolute force, technical preparedness, stage of specialized basic preparation.

### Introduction

Shot-put demands manifestation of the maximum efforts in short period therefore power abilities take the central place in the course of preparation of shot putters [3; 4; 1]. J. Silvester [8] noted that the result of putting depends on the development of power abilities. Among power abilities and types of forces, which are necessary for shot putters, the leading researchers M. Zaviyera-Koch, H. Stone, B. Poprawski but other, provide advantage to increase in the level of absolute force, considering its main in shot put [2; 7; 9].

J. Larry, W. Wilkins and R. Pavlovic [5; 6; 10] investigated influence of the level of development of absolute force on result and speed of shot-put. They defined that the maximum speed of departure to apparatus is reached due to the powerful dynamic reduction of muscles.

However, despite of the significant amount of the works, which are devoted to power preparation in shot-put, influence of absolute force of separate muscular groups on indicators of technique isn't defined yet, which are urgent, especially at the stage of specialized basic preparation.

### Communication of the research with scientific programs, plans, subjects

The research was carried out according to the subject of the scientific research of KhSAPC "Modeling of technical and tactical actions of the qualified sportsmen in swimming and high-speed and power disciplines of track and field athletics" No. of the state registration is 0111U000191.

### The purpose of the research:

to investigate influence of the level of development of absolute force on indicators of technical preparedness of the qualified shot putters.

### Material and Methods of the research

12 shot putters of 15–17 years old which were at the stage of specialized basic preparation, participated in the research. The following methods of the research were used in operating time: analysis and generalization of scientifically methodical literature, pedagogical testing, and video filming with the following biomechanical analysis, methods of mathematical statistics. Video filming was carried out by the high-speed video camera with video with frequency of 1300 shots for second. The biomechanical analysis was carried out by means of the programs Dartfish Connect (Switzerland) and Kinovea (France).

### Results of the research and their discussion

The analysis of indicators of the absolute force (tab. 1), showed that the largest level of its development in the studied shot putters is observed in muscles of the lower extremities, muscles of extensors of trunk and muscles of chest and hands, in particular triceps.

Variation coefficients which were in limits of 8,87–9,33% indicate uniformity of the studied indicators and testify to the lack of essential divergences in indicators of the absolute force of shot putters which took participation in the research.

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Video filming, which results are presented in table 2, was carried out for determination of technical parameters of movements.

According to table 2 the general time of shot put takes less than a second at sportsmen, who participated in the research and averages 0,958 0,07 s. Comparison of separate indicators of technique of the qualified sportsmen with similar at highly skilled shot putters allowed to establish that only time of jump off and height of departure of shot answered parameters of technique of the last one. All other indicators were lower that, in our opinion, is explained by the insufficient level of preparedness of sportsmen who took participation in the experiment.

Comparison of coefficients of variation of indicators of the absolute force with coefficients of variation of indicators of technical preparedness indicates the smaller uniformity of the last one. Heterogeneity of indicators of the majority of time parameters of technical preparedness is explained by specific features of technique of shot put of each of sportsmen, who participated in the research.

The correlation analysis was carried out by the method of pair correlation of Pearson for definition of the extent of influence of the level of development of absolute force on indicators of technical preparedness of a shot put (tab. 3).

The obtained data confirm the considerable dependence between the general time of shot put and results in bar press, lying ( $r=-0,696$ ). The recorded interrelation indicates that the big absolute force, first of all muscles of chest and hands, in particular triceps, is capable to show the sportsman, the less time he will spend for putting, will more quickly push out a shot.

All studied indicators of the level of development of absolute force of shot putters have rather considerable influence for the time of a jump off, however the highest degree of interrelation is observed between times of a jump off and

results of sit down with bar on shoulders. The coefficient of correlation makes ( $r=-0,751$ ) that specifies on negative by the return interrelation and demonstrates that the more absolute muscular strength of the lower extremities at the sportsman is, the quicker a jump off is carried out.

The moderate interrelation is observed between times of performance of starting and the majority of the studied indicators of the level of development of absolute force, however the studied indicators of the level absolute force had no considerable influence on time of starting.

The weak interrelation which testifies to the lack of influence of level of absolute force for the period of final effort and need of search of other ways of influence on time of final effort was observed between the majority of the tests, which are directed to the determination of absolute force and times of final effort.

The vast majority of the studied indicators of the level of development of absolute force considerably influenced the rolling time, however, the greatest coefficient of correlation was observed between results in breakthrough of bar and times of rolling ( $r=-0,667$ ). The negative communication says to the return about what the bigger complex level of absolute force is shown by the sportsman; the smaller time is spent on rolling-up performance.

The studied indicators of absolute force had no considerable influence on length of a jump off. The weak degree of interrelation which indicates the need of search of other ways of influence on this indicator of technique was observed between indicators of the level of development of absolute force and length of a jump off.

Results in sit down with bar on shoulders ( $r=0,661$ ) have the greatest influence, on height of release of a shot, among tests for determination of the level of development of absolute force. The obtained data confirm the noticeable degree of

**Table 1**  
**Average values of the level of development of absolute force of shot putters at the stage of specialized basic preparation (n=12)**

Stat. indicators	Bar press, lying (kg)	Bar press from behind a head, standing (kg)	Tests				Deadlift (kg)
			Squat with a bar (kg)	Dash (kg)	Bending forward with bar (kg)		
$\bar{X}$	108	47	160	76	54	127	
$\epsilon$	5,44	2,20	6,98	4,02	2,45	5,18	
V%	8,87	8,34	7,73	9,33	8,06	7,21	

**Table 2**  
**Average biomechanical values of technique of shot putters (n=12)**

Stat. indicators	Time of starting (s)	Time of a jump off (s)	Time of roll-up action (s)	Time of final effort (s)	General time of a push-off (s)	Length of a jump-off (m)	Height of departure of shot (m)	Shot departure angle (degr.)	Result (m)	Shot departure speed, (m/s)
$\bar{X}$	0,392	0,160	0,142	0,263	0,958	0,83	2,05	43,68	14,37	11,20
$\epsilon$	0,06	0,01	0,03	0,03	0,07	0,06	0,06	1,80	0,24	0,10
V%	25,62	14,10	36,84	20,44	12,66	12,42	5,47	7,27	2,94	1,63

**Table 3**

**Interrelation of indicators of level of absolute force with indicators of technical preparedness of shot putters at the stage of specialized basic preparation (n=12)**

Indicator of absolute force	Indicators of technique								
	Time of starting (s)	Time of a jump off (s)	Time of roll-up action (s)	Time of final effort (s)	General time of a push-off (s)	Length of a jump-off (m)	Height of departure of	Shot departure angle (degr.)	Shot departure speed, (m/s)
Bar press, lying (kg)	-0,515	-0,712	-0,574	0,223	-0,696	-0,046	0,551	-0,043	0,735
Bar press from behind a head, standing	-0,008	-0,621	-0,462	-0,116	-0,379	0,148	0,160	-0,224	0,664
Squat with a bar (kg)	-0,414	-0,751	-0,649	0,208	-0,663	-0,227	0,661	0,061	0,701
Dash (kg)	-0,392	-0,680	-0,667	0,321	-0,587	0,017	0,402	-0,232	0,657
Bending forward with bar (kg)	-0,235	-0,651	-0,593	0,176	-0,489	0,043	0,192	-0,310	0,494
Deadlift	-0,335	-0,528	-0,597	0,298	-0,496	0,107	0,324	-0,164	0,482

**Note.**  $R > R_{cr}$ , at  $R > (0,576)$

interrelation between these indicators and indicate that the bigger level of absolute muscular strength of legs of the sportsman is, the bigger height of departure of a shot.

The level of development has no absolute force of considerable influence on shot departure angle, as well as at length of a jump off and time of final effort.

Rather high degree of interrelation is observed between the speed of departure of shot and results in bar press, lying ( $r=0,735$ ). It indicates that the bigger absolute muscular strength of chest and hands, in particular triceps, the higher speed is got by a shot during departure.

Thus, the level of development of absolute force differently influences separate indicators of technical preparedness of sportsmen who specialize in shot put.

## Conclusions

1. The analysis of scientific and methodical literature showed that despite large number of the works, which are devoted to

the development of absolute force in shot put, not enough attention is paid to influence on its indicators of technical preparedness of shot putters.

2. Results of the research demonstrate the great value of indicators of absolute force for shot put. The greatest influence on parameters of technical preparedness of shot putters has the level of absolute muscular strength of legs, chest and hands, in particular triceps.

3. It is necessary to increase the level of absolute muscular strength of legs for the reduction of time of a jump off and increase in height of departure of a shot, it is necessary to increase the complex level of absolute force for the increase in speed of performance of rolling, it is necessary to increase the level of absolute muscular strength of chest and hands, in particular triceps for faster shot put and increase in speed of departure of a shot.

**Prospect of the subsequent researches.** It is provided to define influence of the level of development of absolute force on special preparedness of shot putters.

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