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The improvement of technical skill at the stage of the specialized basic preparation in fitness by means of powerlifting

Abstract. ***Purpose:*** *to develop methodical recommendations of the improvement of technical skill at the stage of the specialized basic preparation in fitness by means of powerlifting.* ***Material and methods:*** *Masters of sports in powerlifting and candidates for the master of sports in powerlifting – members of a national team on weightlifting and powerlifting of the Kharkov area took part in the research. Methods were used: theoretical analysis and generalization, analysis of scientific literature, pedagogical supervision, pedagogical experiment, video registration method, methods of mathematical statistics.* ***Results:*** *we developed a number of methodical recommendations which are submitted on finishing technical skill on the basis of the analysis of technique of a performance of the competitive exercise deadlift which is made by means of the program Dartfish by highly skilled sportsmen. As a result of the experiment it is established that the gain of result was more significant in the experimental group which was engaged by the developed technique.* ***Conclusions:*** *it is experimentally proved that the use of computer programs of video registration allows improving qualitatively the feedback between a coach and a sportsman, optimizing the process of training of a sportsman and correction of his technique, increasing the gain of sports result.*

Keywords: *physical preparation, fitness, video analysis, powerlifting exercises.*

Introduction. Thanks to the growth of popularity of fitness more and more people start being engaged in this sport. The popularity of fitness is explained by simplicity, availability, rapid growth of results and beneficial influence on health.

Classes by fitness promote the increase in muscular force, ligaments and joints fix, rozvit endurance, flexibility and other useful properties help, cultivate will, confidence in the forces, increase operability of the whole organism. All this does the research of the existing means of preparation in fitness actual, and with it there is a question – what technique of trainings is the most effective? The problem of a choice of the correct technique of trainings by sportsmen is connected with a large number of such techniques and their incomplete scientific justification. Therefore the extremely actual is a scientific approach to the solution of this problem.

Powerlifting– is a power sport which essence consists in the overcome scales of the heaviest encumbrance. Powerlifting is also called power triathlon. It is connected by that three exercises enter at it as competitive disciplines: knee-bend with a bar on shoulders, a bar press, lying on a horizontal lava, and draft of a bar – which in the sum also define the qualification of a sportsman. These three exercises are widely applied in fitness as basic to the development of muscles of the whole body. The main feature of a performance of competitive exercises is the dynamic, overcoming operating mode of muscles at slow uniform speed, and movement of a bar has to be carried out without accelerations with a constant speed. These exercises is often used as the indicator of absolute force of a back and feet in quality, and also are applied as the test practically in all sports.

In fitness competitive exercises of powerlifting are used behind the direct appointment – for the development of force, and, above all – for the accumulation of mass of muscles of a body.

A study of technique of competitive exercises of powerlifting is one of the problems of training of sportsmen in fitness. As notes a number of authors

(B. Sheyko [31, p. 330] and F. Hetfild [29, p. 156]), an individualization of a technique of competitive exercises causes special difficulties in coaches, thus anatomic and physiologic features of sportsmen are poorly considered. All this constrains the progress of sportsmen. There is a contradiction between need of an individualization of a technique of execution of exercise by a sportsman and insufficient its preparedness in the theory and in practice.

The objective of the research: to develop methodical recommendations of the improvement of technical skill at a stage of the specialized basic preparation in fitness by means of powerlifting.

Tasks of the research:

1. To analyse a technique of execution of competitive exercise in powerlifting.
2. To prove a technique of improvement of technical skill of competitive exercise in fitness experimentally.

Material and methods of the research. Masters of sports in powerlifting and candidates for the master of sports in powerlifting – members of a national team of the Kharkov area on weightlifting and powerlifting took part in the research. Methods were used: theoretical analysis and generalization; analysis of scientific literature; pedagogical supervision; pedagogical experiment; video registration method; methods of mathematical statistics.

Results of the research and their discussion. *Analysis of a technique of execution of dead lift.* The analysis of a technique of execution of dead lift by highly skilled sportsmen was carried out – members of a national team of the Kharkov area on weightlifting and powerlifting. Masters of sports in powerlifting and candidates for the master of sports in powerlifting took part in the research. We asked sportsmen to execute competitive exercise dead lift for video registration implementation. It should be noted that the equipment for video was installed at an angle 90 degrees to demonstration at distance about 5 meters. It had to guarantee supervision over shift/movement and consider possible mistakes. Records were made for a series pulled in classical style and style of sumo. One-time repetitions were executed approximately in 80% range from 1 limit maximum of a sportsman.

Processing of video filming was carried out by means of the program Dartfish©. A change of angles of biolinks at a draft performance by the sportsmen No. 1 and No. 2 is shown respectively in pic. 1 and pic. 2.

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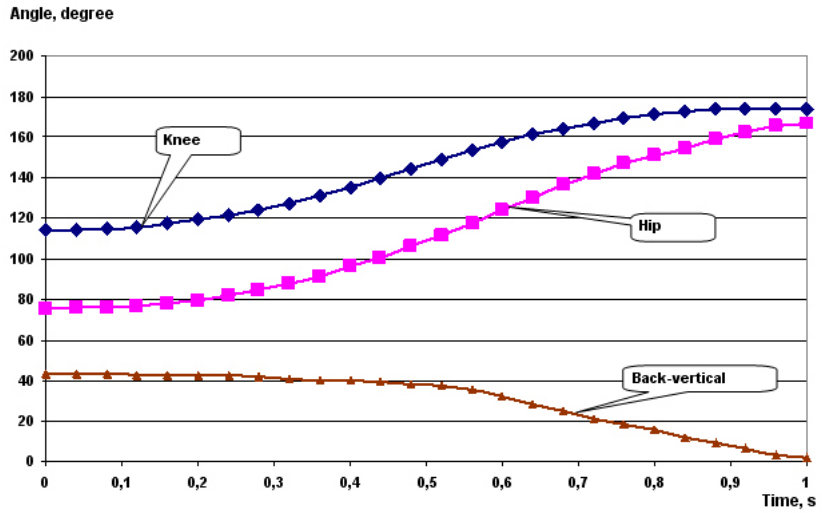
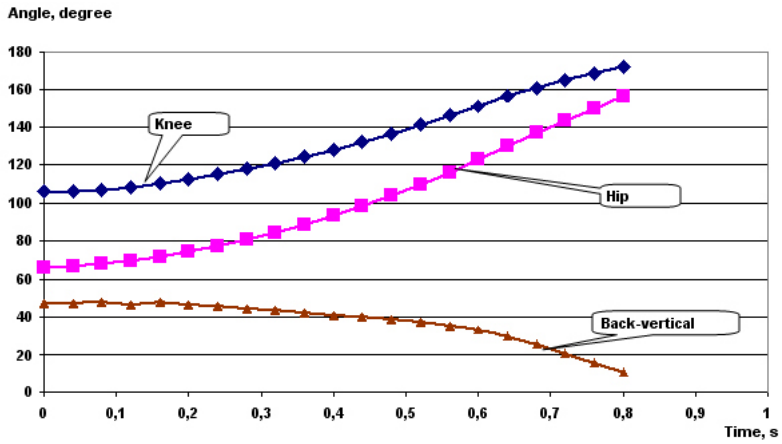


Pic. 1. Change of angles between biolinks in the course of the draft performance by the sportsman No. 1

In such look data on angular characteristics is low-informative. Much more the volume of information it is possible to receive knowing the speed of change of angles of biolinks. For this purpose we will differentiate curve changes of angles on time. The result is presented in pic. 3 and pic. 4.

The draft performance by the sportsman No. 1 begins with a simultaneous extension of knee and coxofemoral joints during 0,44 s, thus during the first 0,2 about the speed of extension knee – than the speed of the coxofemoral increases linearly and above. The angle between a back and a vertical remains approximately constant by the time of 0,3 s. Further, the speed of extension of knee and coxofemoral joints are almost identical from the moment of 0,24 s and to 0,4 s.

Since the moment 0,44 s, the speed of extension of a knee joint starts decreasing, forming an excess (extremum) on graphics of speed and from the moment of 0,54 s its change is almost linearly. At this time the main contribution to straightening brings a coxofemoral joint. It continues to increase extension speed up to the moment 0,64 s, and further also, passing an extremum, forms a linear recession.



Pic. 2. Change of angles between biolinks in the course of the draft performance by the sportsman No. 2

The beginning of reduction of speed of extension of a coxofemoral joint (0,64 s) coincides with the end of straightening of a back concerning a vertical. Thus, the exercise can be broken into four stages.

1. 0–0,3 s – is an active work of knee and coxofemoral joints. The angle between a back and a vertical remains mainly invariable.

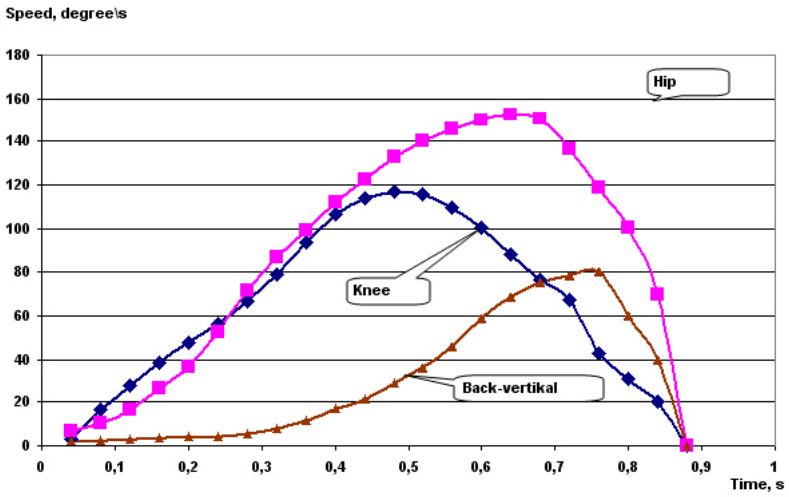
2. 0,34–0,44 s – the end of an active work of a knee joint, the beginning of straightening of a back concerning a vertical.

3. 0,44–0,64 s – the end of an active phase of straightening of a coxofemoral joint and back concerning a vertical.

4. 0,64–0,9 s – the final straightening of all biolinks who take part in the performance of the exercise.

The preservation mainly invariable an angle between a back and a vertical to the end of extension of a knee joint (so-called the rack "sumo") allows building to a minimum load of a lumbar department of a spine column and by that to prevent a possible traumatism.

Otherwise the athlete No. 2 carries out the exercise. By the first at it the hip starts being unbent, and only then enter turn of a knee. Further, as well as at the sportsman No. 1 at the second stage, the speed of extension of a hip exceeds knee speed, however this extension happens synchronously by the time of a simultaneous extremum after which speed of extension of both biolinks starts decreasing. The difference in the performance is also observed in a change of an angle between a back and a vertical. In this case this change begins from the beginning of the performance of the exercise and lasts with the growth of speed practically by its end.

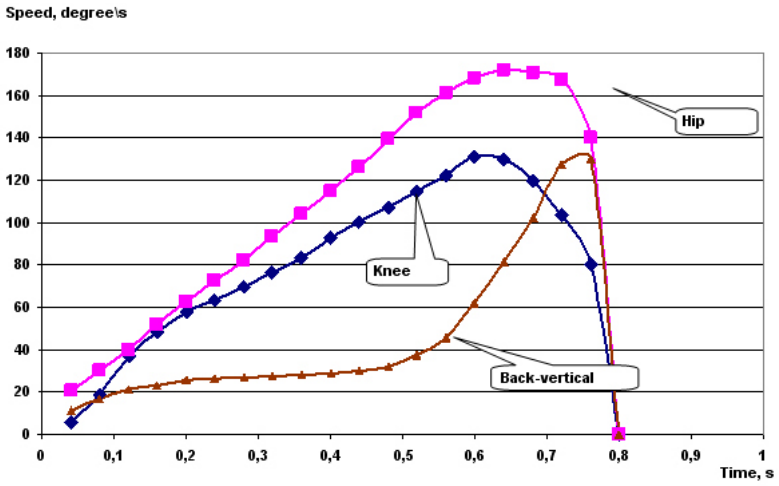


Pic. 3. Speed of change of angles between biolinks in the course of the draft performance by the sportsman No. 1

Thus, here it is possible to allocate only two stages:

1. Simultaneous extension with the increase of speed of all biolinks that take part in the performance of the exercise (0–0,64 s). Including straightening of a back concerning a vertical.

2. Completion of extension of biolinks (0,64–0,82 s) with a reduction of speed. The finishing breakthrough by a back for the achievement of a vertical situation.



Pic. 4. Speed of change ofangle between biolinks in the course of the draft performance by the sportsman No. 2

Introductions of a technique of improvement of technical skill. We developed a number of the methodical recommendations which are submitted on finishing technical skill, to sportsmen of the first category to the level of candidates for the master of sports and masters of sports on the basis of the analysis of a technique of execution of competitive exercise made by means of the program dartfish dead lift by highly skilled sportsmen.

The ideal technique of classical dead lift:

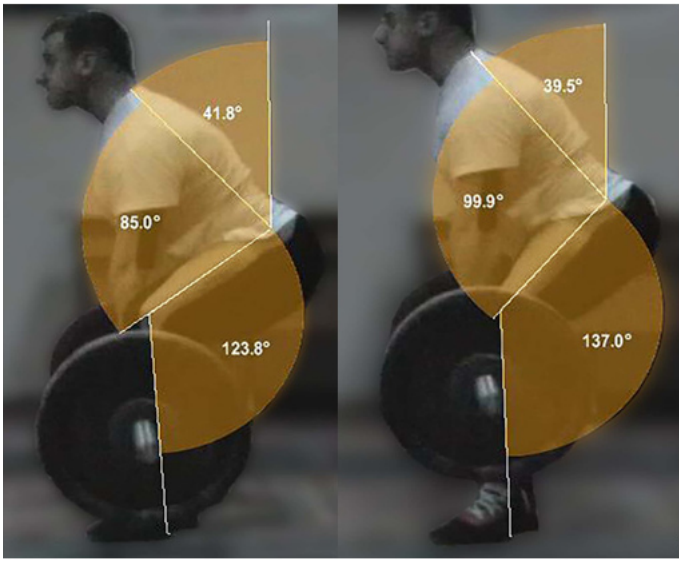
1. A back in draft has to remain equal during the whole movement.
2. In starting situation a pelvis can be lifted above or lower depending on specific features of a sportsman.
3. The direction of starting effort – back and up.
4. The projection of the center of weight has to pass through the fifth.
5. The rate of a performance of draft – is slow, uniform.
6. The statement of feet – is a little already shoulders, foot parallel to each other.
7. Dashing of a bar – on width of shoulders or a little wider (it is usually used different dashing).

Characteristic motive errors of competitive exercise “draft”:

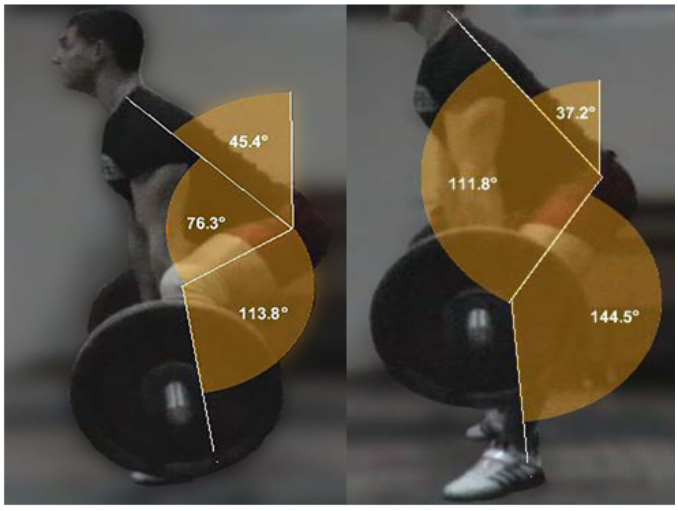
1. A big gap between a signature stamp of a bar and a body throughout a rise.
2. A “concave” back.
3. A deviation back at draft end.
4. A “dead” point at the level of knees.

These mistakes considerably don’t allow sportsmen to come to results which answer their potential opportunities.

According to the settled concepts about a rational and effective way of a performance of exercises of powerlifting it is possible to carry such requirements to bases of a technique of movements of competitive exercises:



Pic. 5. Videogramms which illustrate changes of angles between biolinks in the course of the draft performance by the sportsman No. 1



Pic. 6. The videogram which illustrates changes of angles between biolinks in the course of the draft performance by the sportsman No. 2

1. Creation in the working joints of the optimum angular relations, especially in the heaviest sites of a way of raising of a bar (for example, in "dead points") when it is impossible to use its movement on inertia. Consecutive inclusion in work of certain muscular groups, at first stronger, then – less strong.

2. Providing on each site of a way of rising of a bar of the most rational direction of its movement and a message to it optimum speed.

3. Creation of necessary conditions which provide the efficiency of a performance of a final way of a bar.

4. Creation of necessary basic conditions to a body of the sportsman and his different links for the purpose of longer and effective transfer.

The introduction of the developed technique was carried out only in the experimental group (5 sportsmen). Other 5 sportsmen of the control group trained without a use of our technique. The essential difference of techniques is in a group that in the experimental group of planning was carried out taking into account a video registration technique. Differences weren't between the control and experimental group on the volume of the carried-out loading in number of raising of a bar (nrb).

In the experimental group, thanks to the program of video registration, we managed to establish rather precisely asynchronous movements at the performance by sportsmen of the competitive exercise of powerlifting "draft". It is obvious that technical shortcomings of such character can lead not only to the decrease in the competitive productivity, but also to serious traumatizing of a sportsman. Such control method of a technique of execution of competitive exercises of powerlifting will allow to enter in due time amendments into the training process of sportsmen, using specially preparatory exercises with emphasis on prevention of any distortions. It is also expedient to use exercises for the elimination of a power disproportion of muscles of the left and right parts of a body (various drafts by one hand and so forth).

Besides, it is established that the powerlifter "releases" a pelvis at the beginning of a bar separation from a scaffold, and thus he transfers load more of back muscles. It, in our opinion, can testify that muscles of a back of the sportsman are

stronger than muscles of feet, or it can be a consequence of accumulation in the last of fatigue after the first competitive exercise "knee-bend".

Attempts which are carried out by powerlifters on the verge of opportunities, not always are ideal by the settled technique. But such deviations from "ideal" should be considered not every time as shortcomings and mistakes at high-class sportsmen. Sportsmen find the most optimum option of a technique of execution of exercise in overcoming of the maximum weight considering a situation, a condition of preparedness and specific features. Therefore the improvement of sports skill needs to be carried out not only due to strengthening of weaknesses, but also due to the subsequent development of stronger, that is it is necessary to try to arrange more equipment under the athlete, and not vice versa.

Before the experiment we recorded the best results in dead lift of sportsmen of the experimental and control groups. The analysis of results of the research by t-criterion testifies that there weren't divergences ($p<0,05$) by the beginning of the pedagogical experiment between sportsmen of the experimental and control groups on indicators of the general physical fitness. At a final investigation phase, from March 16 to March 26 in 2015, we held the repeated testing of sportsmen of the experimental and control groups in dead lift for the purpose of comparison of results at the beginning and at the end of the research.

By the method of mathematical statistics we turned the set of the separate empirical data which are obtained as a result of the research on the system of forms and numbers, evident for a perception, which formed the basis for the implementation of scientific conclusions in the qualification work.

By the results of the research it is possible to draw a conclusion that the improvement of indicators is observed both in the experimental, and in the control groups.

Errors are noticed as a result of the pedagogical supervision that sportsmen made in the course of the repeated testing. Mistakes were defined in dead lift in three attempts. Total of mistakes which were made in dead lift by the sportsmen, were 11. Sportsmen of the control group made 8 mistakes in the course of the repeated testing, and the sportsmen of the experimental group – 3 mistakes that confirms the highest level of assimilation of a technique of competitive exercises by the sportsmen of the experimental group. According to Styudent's criterion ($p<0,05$) the reliable differences are found out in number of mistakes that the sportsmen of the control and experimental groups made during the repeated testing.

The comparative analysis of results of the pedagogical supervision over the competitive activity of the sportsmen of the experimental and control groups allows to claim that sportsmen of the experimental group made a smaller quantity of mistakes.

As for a gain of sports result,) it is visible from these tables (tab. 1 and 2that the greatest gain of result made 7,8 % for the end of experiment in the control group, the smallest – 1,6%. In the experimental group the greatest gain – 10,2%, the smallest – 3,4%. Thus, the general gain of result made 4,7% during the experiment in control group and 7,2% in the experimental group.

Table 1

Results of the performance of dead lift by the sportsmen of the control group

№ of sportsman		1	2	3	4	5
The best result in dead lift, kg		275	275	245	245	320
Before the beginning of the experiment	Draft, kg	260	255	242,5	240	300
	Ratio kg with the best result of %	94,5	92,7	99,0	98,0	98,3
At the end of the experiment	Draft, kg	275	272,5	247,5	247,5	315
	Ratio kg with the best result of %	100	99,0	101,0	101,0	98,4

Table 2

Result of the performance of dead lift by the sportsmen of the experimental group

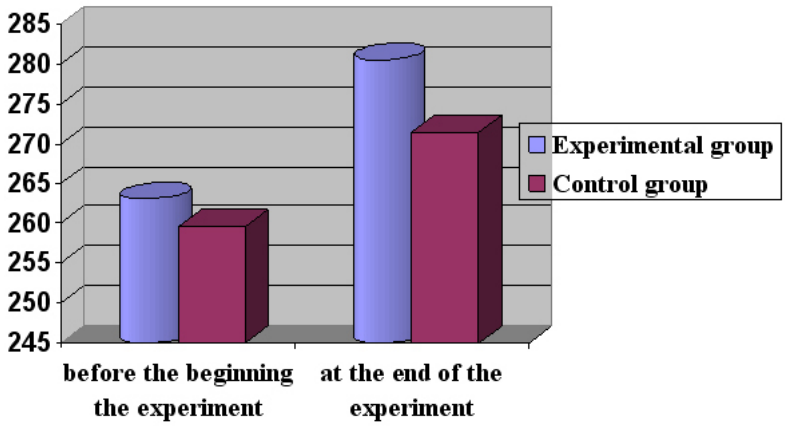
№ of sportsman		1	2	3	4	5
The best result in dead lift, kg		275	275	245	245	320
Before the beginning of the experiment	Draft, kg	262,5	237,5	240	285	290
	Ratio kg with the best result of %	95,5	96,9	98,0	96,6	93,5
At the end of the experiment	Draft, kg	280	257,5	257,5	295	312,5
	Ratio kg with the best result of %	101,8	105,1	105,1	100	100,8

The schematically comparative analysis of indicators in the control and experimental groups after the experiment ($p<0,05$) is shown in pic. 7.

Conclusions. Thus, it is possible to draw a conclusion that the result gain was more significant in the experimental group during the experiment, that is bigger. The average result in dead made 263 kg ($p>0,05$) in experimental group lift before the experiment and 259,5 kg ($p>0,05$) in the control group. At the end of the experiment the average result in dead lift made 280,5 kg ($p<0,05$) in the experimental group and 271,5 kg ($p<0,05$) in the control. In percentage expression the result gain made 6,46% in the experimental group and in the control – 3,38%. As we see, the improvement of indicators is observed both in the experimental, and in the control groups, but in the experimental group is on 3,08% more, and it will give to sportsmen a considerable advantage during the competitive activity.

Table 3
Ratio of average values in the control and experimental groups

Group		Experimental group		Control group		
Research measurement		$\bar{X}$	σ	$\bar{X}$	σ	p
The best result in dead lift, kg, before the experiment	Draft, kg	263	2,26	259,5	2,25	>0,05 (enough)
	Ratio kg with the best result of %	96,1	2,26	96,5	2,25	
The best result in dead lift, kg, at the end of the experiment	Draft, kg	280,5	2,31	271,5	2,15	<0,05 (enough)
	Ratio kg with the best result of %	102,56	2,31	99,88	2,15	



Pic. 7. The comparative analysis of indicators in the control and experimental groups after the experiment (p<0,05)

A uniformity of the group structure was observed in both groups during the whole experiment. From what it is possible to draw a conclusion on a uniform gain of results during the experiment at all its participants.

It is experimentally proved that the use of computer programs of video registration allows improving qualitatively the return communication between the coach and the sportsman, optimizing the process of training of the sportsman and the correction of his technique, increasing a gain of sports result.

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