

Original Article

Technical preparedness of sportsmen in the kettlebell sport

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Abstract:

We studied the influence of training on the indexes of technical preparedness of sportsmen in the kettlebell sport (long cycle) on the stage of the specialized base preparation. Twenty seven sportsmen (18–24 years old, with 1 grade and candidates in masters of sport) took part in the research. The sportsmen participated in either the experimental group (EG, n=13) or the control group (CG, n=14). For the sportsmen, all explored parameters of technical preparedness of the EG were better than in the CG ($P<0.05-0.001$), which testifies to the efficiency of the experimental program of the study.

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Introduction

Modern competitions in the kettlebell sport are held both in biathlon (snatch and jerk) and in long cycle [2, 7, 8]. All competitive exercises are performed for 10 minutes. Therefore at the same time with the high level of development of physical qualities, technical preparedness of sportsman plays an important part in achievement of high sport results. It is indicated in scientists' works [3, 5, 6], that technical preparedness is determined by the degree of mastering by the sportsman of the system of motions, that answers the features of the kind of sport and direct on achievement of high sport results.

Scientists [1, 6, 9] mark, that sport technique, as important factor of increasing of competitive results, is constantly perfected. The bases of the technique of competitive exercises in biathlon are widely presented in scientists' works [4, 5, 7], but the technique of long cycle is not lighted up enough. Most of trainers and sportsmen consider that to master the technique of long cycle considerably more difficult, than the technique of biathlon.

It is set in researches [3, 7], that norm of KMS with 24 kg–kettlebells sportsmen fulfill for 6–8 months, however for fulfillment of norm of MS with 32 kg–kettlebells they spend 3–4 years. Authors draw a conclusion, that with heavy kettlebells it is necessary to pass to higher level of technical preparedness. Such defects in technical preparedness, as an inefficient distribution of accents in cycle of motions and violation in the spatial and rhythmic structure of motions, led to unproductive expenditure of energy. And in the process of competitive activity sportsman can not realize his potential in full. Most of authors [2, 6, 7] consider that during investigation the technique of exercises with kettlebells, basic attention has to be spared on sportsman position, to the technique of motions in separate phases, rate and rhythm of exercises.

Materials and methods

Twenty seven sportsmen from Lviv aged 18–24, with 1 grade and candidates in masters of sport (CMS) took part in the research. They have been included in experimental group (EG, n=13) and control group (CG, n=14). The sportsmen have been evenly distributed by the weight categories with certainly even indexes of technical preparedness ($P>0.05$). Duration of pedagogical experiment – 2 years (4 stages of the experimental program). The level and dynamics of EG and CG sportsmen technical preparedness indexes were checked up during control training in setup period and during competitions in competitive period at the beginning and at the end of pedagogical experiment.

Research of indexes of technical preparedness has been conducted according to such parameters:

- duration of basic phases during implementation of long cycle (phase of kettlebells holding on a chest before lowering; phase of kettlebells lowering and getting up them on a chest; phase of kettlebells holding on a chest before lifting);

- the corners between parts of body in the basic phases of implementation of long cycle (corner between body and legs at the moment of beginning kettlebells lowering, corner between body and legs during kettlebells lowering; corner between body and hands during kettlebells lowering, corner between body and legs at the moment of kettlebells stop in «dead point», corner between body and hands at the moment of kettlebells stop in «dead point», corner between body and hands at the moment of getting up kettlebells on a chest);

- compliance rate of implementation of competitive exercise at every minute to the overall result.

For fixing of indexes of technical preparedness video camera was applied during trainings and competitions. Obtained information has been worked with the use of the proper computer programs.

During the researches the authenticity of difference between the indexes of sportsmen of experimental and control groups by means of Student's criterion has been determined. The dynamics of results in each of groups has been also estimated.

The aim of the article is to explore the influence of trainings by the experimental program on the indexes of technical preparedness of sportsmen in the kettlebell sport (long cycle) on the stage of the specialized base preparation.

Tasks of article:

1. To define interconnection between the indexes of technical preparedness of sportsmen and their results of competitions.

2. To develop the experimental program and check up its influence on technical preparedness of sportsmen in long cycle.

Research methods: theoretical analysis and generalization of scientific and methodical literature, pedagogical supervision, testing, biomechanics video and computer analysis, pedagogical experiment, methods of mathematical statistics.

Results

Technical preparedness – is the integral index of all sides of preparedness of sportsman, and first of all, physical. Uneven distribution of efforts during implementation of separate phases of exercise, lack of coordination of motions and breathing reduce to unproductive expenditure of energy and decrease of competitive result. For research of interconnection between the indexes of technical preparedness of sportsmen and their results in long cycle we conducted the correlation analysis of technical parameters (duration of basic phases during a long cycle, corners between parts of body in basic phases, rate of exercise) at the sportsmen with a different qualification (group A and B) with their competitive results (with 32 kg–kettlebells). Group A included sportsmen with 1 grade and CMS (n=23), group B – masters of sport (MS) (n=14).

Analysis of interconnection has shown that in group B the coefficients of correlation are higher, than in group A, by all parameters of technical preparedness (tabl. 1). So, connection of duration of basic phases during long cycle with competitive results has shown that the highest coefficients of correlation in group B have fixed with duration of phase of kettlebells holding on a chest before lowering ($r = -0.73$) and before lifting ($r = -0.82$) ($P < 0.05$). In group A in these phases the middle degree of interconnection has been exposed ($r = -0.35$; $r = -0.59$). In the phase of kettlebells lowering and getting up them on a chest connection with the competitive results of sportsmen of both groups hasn't been exposed ($r = -0.07$; $r = 0.12$) ($P > 0.05$) (tabl. 1).

Table 1. Interconnection between indexes of technical preparedness of sportsmen with a different qualification (n=37) and their results in long cycle

№	The indexes of technical preparedness	Coefficients of correlation	
		Group A (n=23)	Group B (n=14)
1.	Duration of phase of kettlebells holding on a chest before lowering	-0.35	-0.73
2.	Duration of phase of kettlebells lowering and getting up them on a chest	-0.07	0.12
3.	Duration of phase of kettlebells holding on a chest before lifting	-0.59	-0.82
4.	Corner between body and legs at the beginning of kettlebells lowering	0.35	0.68
5.	Corner between body and legs during kettlebells lowering	0.28	0.57
6.	Corner between body and hands during kettlebells lowering	-0.18	-0.54
7.	Corner between body and legs in «dead point»	-0.31	-0.46
8.	Corner between body and hands in «dead point»	-0.42	-0.76
9.	Corner between body and hands at the moment of getting up kettlebells on a chest	-0.32	-0.65
10.	Rate of exercise at 1-st minutes	0.58	0.37
11.	Rate of exercise at 10-th minutes	0.26	0.71

Research of connection of sport results with the sizes of corners between parts of body in the basic phases of long cycle testifies that by all indexes the certainly highest coefficients of correlation have been exposed in a group B ($P < 0.05$) – connection was definite as close ($r = -0.54 - -0.76$). Degree of connection in group A is characterized as weak and middle ($r = -0.18 - -0.42$) (tabl. 1).

Analysis of interconnection between competitive results and indexes of rate has showed that in group A the coefficient of correlation between a rate at first minute and competitive result ($r = 0.58$) testifies to high degree of connection and it certainly higher ($P < 0.05$) than in group B ($r = 0.37$) (tabl. 1). At tenth minute the higher coefficient of correlation have been exposed in group B ($r = 0.71$) ($P < 0.05$), that testifies, that sportsmen of high class begin exercise in low rate, but finish with maximal acceleration.

Taking into account works of leading scientists [3, 6, 7] and results of our previous researches [1, 2, 9, 10], we have developed the experimental program of training sportsmen in long cycle on the stage of the specialized base preparation on the basis of effectively important indexes of technical preparedness of sportsmen. According to the results of previous researches, we have concluded that effectively important indexes of technical preparedness in long cycle: duration of phases of kettlebells holding in static positions, positions of parts of body (corners) in the basic phases of implementation of exercise, compliance rate of implementation of competitive exercise at every minute to the competitive result. Task of the experimental program: to increase of level of effectively important indexes of technical preparedness of sportsmen, to increase of volumes of loading on every next stage of the author program, maximal realization of principle of deep specialization during preparation to competitions, to increase of competitive result.

The basic features of the experimental program are: contents of the experimental program is directed on the permanent accented perfection of effectively important indexes of technical preparedness of sportsmen; narrowing sport specialization (providing participation of sportsmen in one type of competitions for a year – long cycle); increasing volumes of the special load; permanent development of strength of muscles of legs and back; correlation and interdependence of technical and physical preparedness of sportsmen (the rise of physical preparedness requires transition on the new level of technical preparedness and on the contrary – more perfect technique requires perfection of physical preparedness); individual approach (accordance of the training loading with individual possibilities, weight category and preparedness of sportsman); implementation by sportsmen in a special-preparatory stage and competitive period one time for a week long cycle with duration more than 5 minutes, and one time on a stage – with duration more than 10 minutes in one approach; the use of kettlebells with different weight (from 16 to 40 kg with a step 2–4 kg) promotes to the rational dosage of load; rational organization of educational-training process (wide use of didactic principles and methods of training and renewal of capacity of sportsman) provides the decrease of level of sporting traumatism and promotes to rapid growth of sport results. To verify the efficiency of employments by the experimental program to perfection of technical preparedness of sportsmen, we have done the analysis of basic parameters of sportsmen technique of EG ($n = 13$) and CG ($n = 14$) (tabl. 2, 3, 4).

Analysis of duration of phase of kettlebells holding on a chest before lowering has shown that at the beginning of experiment the indexes of sportsmen of EG and CG between itself certainly did not differ ($P > 0.05$) (tabl. 2). At the end of research the duration of this phase in EG (2.37 sec) have been certainly better than in CG (3.63 sec) for 1.26 sec ($P < 0.001$). Analysis of duration of phase of kettlebells lowering and getting up them on a chest testifies that and at the beginning and at the end of research the duration of this phase in EG and CG between itself certainly did not differ ($P > 0.05$) (tabl. 2). Research of duration of phase of kettlebells holding on a chest before lifting testifies that at the beginning of research this index of technical preparedness of sportsmen of EG and CG between itself certainly did not differ and make 7.27 and 7.38 sec accordingly ($P > 0.05$) (tabl. 2). But at the end of experiment the duration of this phase in EG (5.23 sec) have been certainly better than in CG (6.55 sec) for 1.32 sec ($P < 0.001$). Substantial abbreviation of phase of kettlebells holding on a chest before lifting in EG will promote to the increasing of competitive result that confirms high efficiency of employments by the author program.

Table 2. Duration of basic phases during implementation of long cycle by sportsmen of EG and CG in the process of the pedagogical experiment ($\bar{X} \pm m$, sec, $n = 27$)

№	Basic phases of long cycle	Stages	EG ($n = 13$)	CG ($n = 14$)	Stydent's criterion (t)
1.	Phase of kettlebells holding on a chest before lowering	Beginning	4.72±0.15	4.59±0.26	0.43
		End	2.37±0.10	3.63±0.27	4.38
		t	13.04	2.56	
2.	Phase of kettlebells lowering and getting up them on a chest	Beginning	0.70±0.03	0.67±0.02	0.83
		End	0.62±0.02	0.64±0.02	0.71
		t	2.22	1.06	
3.	Phase of kettlebells holding on a chest before lifting	Beginning	7.27±0.29	7.38±0.22	0.30
		End	5.23±0.24	6.55±0.19	4.31
		t	5.42	2.86	

Verification of efficiency of the author program was carried out also after the sizes of corners between parts of body in the basic phases of implementation of long cycle by sportsmen of EG and CG in the process of experiment. Analysis of sizes of all explored corners at the beginning of experiment testifies that between the indexes of sportsmen of EG and CG reliable difference is not exposed ($P>0.05$) (tabl. 3).

Analysis of corners between body and legs at the beginning of kettlebells lowering testifies that at the end of research the indexes of both groups certainly have become better: in CG – for 11.3 degree ($P<0.05$), and in EG – for 23.7 degree ($P<0.001$). At the end of experiment size of the explored corner in EG (193.2 degree) has been certainly better than in CG (183.6 degree) for 9.6 degree ($P<0.05$). Research of size of corner between body and legs during kettlebells lowering testifies that at the end of experiment size in EG (164.8 degree) has been certainly better than in CG (157.6 degree) for 7.2 degree ($P<0.05$).

Analysis of dynamics of size of this corner has shown that in both groups there are positive changes, but in EG a difference between initial and final data makes 15.6 degree ($P<0.001$), in CG – 5.8 degree ($P>0.05$). Research of corner between body and hands during kettlebells lowering testifies to the reliable improvement of indexes of both groups in the process of experiment – in CG for 8.1 degree ($P<0.05$), in EG – 13.5 degree ($P<0.001$). At the end of experiment in EG has been exposed certainly better index than in CG for 5.7 degree ($P<0.05$). Analysis of corners between body and legs in «dead point» has shown that at the end of experiment in EG indexes were certainly better than in CG for 5.2 degree ($P<0.05$). During the experiment the indexes of both groups have become better: in EG – for 12.5 degree ($P<0.001$), in CG – for 6.7 degree ($P<0.05$).

Research of corner between body and hands in «dead point» testifies that in EG at the end of research indexes have been better than in CG for 4 degree ($P<0.05$). At the end of experiment the indexes of EG have been better than at the beginning for 8.4 degree ($P<0.01$), in CG – for 4.1 degree ($P>0.05$). Also at the end of research corner between body and hands in the moment of getting up of kettlebells on a chest in EG has been better – a difference makes 4.2 degree. In the process of experiment the indexes of both groups have become better, but if in CG a difference between initial and final data makes 8.4 degree ($P<0.05$), in EG – 11.7 degree ($P<0.01$) (tabl. 3).

Table 3. The corners between parts of body in the basic phases of implementation of long cycle by sportsmen of EG and CG in the process of the pedagogical experiment ($X\pm m$, degree, $n=27$)

№	The explored corners	Stages	EG (n=13)	CG (n=14)	Stydent's criterion (t)
1.	Corner between body and legs at the beginning of kettlebells lowering	Beginning	169.5±3.43	172.3±3.30	0.59
		End	193.2±2.26	183.6±2.67	2.74
		t	5.77	2.66	
2.	Corner between body and legs during kettlebells lowering	Beginning	149.2±1.84	151.8±2.42	0.86
		End	164.8±1.81	157.6±2.39	2.06
		t	6.04	1.71	
3.	Corner between body and hands during kettlebells lowering	Beginning	26.3±2.54	26.6±2.57	0.08
		End	12.8±1.28	18.5±2.26	2.19
		t	4.75	2.37	
4.	Corner between a body and feet in «dead point»	Beginning	104.4±1.89	103.8±1.83	0.23
		End	91.9±1.29	97.1±1.93	2.24
		t	5.46	2.52	
5.	Corner between body and hands in «dead point»	Beginning	29.6±1.84	30.3±1.59	0.29
		End	21.2±1.65	26.2±1.63	2.16
		t	3.40	1.80	
6.	Corner between body and hands in the moment of getting up of kettlebells on a chest	Beginning	20.2±2.91	21.1±2.96	0.22
		End	8.5±0.88	12.7±1.63	2.27
		t	3.85	2.49	

Research of rate of implementation of long cycle by sportsmen of EG and CG has shown that at the beginning of experiment during all ten minutes the rate of sportsmen of both groups between itself certainly did not differ ($P>0.05$) (tabl. 4). At first minute at the beginning of experiment rate in EG and in CG was the highest, and at last minute – the lowest. That is at the beginning of experiment sportsmen of both groups began implementation of exercise in high rate, in the process of implementation of exercise rate for certain went down and at the end of experiment sportsmen finished with the lowest rate ($P<0.001$).

For the period of experiment the tendency of changes of rate during 10 minutes in CG has not changed – at first minute the highest rate has been fixed, at tenth minute – the lowest (tabl. 4). In EG, opposite, the tendency at the end of experiment has certainly changed: at first minute the lowest rate has been fixed and at last minute – the highest, that testifies to efficiency of the experimental program.

Comparison of the rate of implementation of exercise by the sportsmen of EG and CG at the end of experiment testifies, that at first minute rate in EG has been certainly lower than in CG for 0.75 getting up

($P < 0.05$). Beginning from sixth and till tenth minute rate in EG has been certainly higher than in CG ($P < 0.05 - 0.001$). The biggest difference in the rate has been fixed at tenth minute – 2.34 getting up ($P < 0.001$) (tabl. 4).

Table 4. Rate of implementation of long cycle for 10 minutes by sportsmen of EG and CG in the process of the pedagogical experiment ($X \pm m$, quantity of getting up, $n=27$)

Minutes	Stages	EG (n=13)	CG (n=14)	Stydent's criterion (t)
1	Beginning	5.62±0.24	5.71±0.24	0.27
	End	4.54±0.14	5.29±0.24	2.70
	t	3.89	1.24	
2	Beginning	5.08±0.14	5.14±0.18	0.26
	End	4.62±0.18	5.07±0.20	1.67
	t	2.02	0.26	
3	Beginning	4.54±0.18	4.57±0.17	0.12
	End	4.69±0.17	4.93±0.20	0.91
	t	0.61	0.69	
4	Beginning	4.31±0.21	4.29±0.22	0.07
	End	4.85±0.19	4.86±0.23	0.03
	t	1.91	1.79	
5	Beginning	4.00±0.16	4.07±0.19	0.28
	End	4.85±0.15	4.50±0.17	1.54
	t	3.88	1.69	
6	Beginning	3.77±0.20	3.86±0.20	0.32
	End	4.92±0.14	4.36±0.19	2.37
	t	4.71	1.81	
7	Beginning	3.46±0.22	3.57±0.23	0.35
	End	5.08±0.18	4.29±0.16	3.28
	t	5.70	2.57	
8	Beginning	2.85±0.19	3.00±0.23	0.50
	End	5.15±0.15	3.71±0.22	5.41
	t	9.50	2.23	
9	Beginning	2.69±0.21	2.79±0.21	0.34
	End	5.23±0.17	3.50±0.31	4.89
	t	9.40	1.90	
10	Beginning	2.38±0.26	2.36±0.27	0.05
	End	5.77±0.23	3.43±0.39	5.17
	t	9.77	2.26	

Discussion

The correlation analysis of indexes of technical preparedness of sportsmen and their competitive results has shown that for achievement of high results in long cycle on the stage of the specialized base preparation sportsmen must perfect technique of long cycle on the whole and its separate parameters (shortening of static phases, observance of necessary corners between parts of body, observance of proper to result rate at every minute).

Analysis of indexes of technical preparedness has shown that in EG at the end of pedagogical experiment the better results than in CG have been certainly fixed by most technical parameters ($P < 0.05 - 0.001$). It testifies to efficiency of the experimental program in relation to perfection of effectively important indexes of technical preparedness in EG.

Research of changes of duration of phase of kettlebells holding on a chest before lowering testifies that the reliable improvement of the indexes was happened in both groups: in CG the difference between initial and final data makes 0.96 sec ($P < 0.05$), in EG – 2.35 sec ($P < 0.001$). In relation to the analysis of dynamics of duration of phase of kettlebells lowering and getting up them on a chest is needed to mark that in CG at the end of experiment the indexes have become better for 0.03 sec ($P > 0.05$), but in EG the difference between initial and final indexes makes 0.08 sec ($P < 0.05$). In spite of rapid implementation by sportsmen of both groups this phase of long cycle, the results of testing of sportsmen of EG have confirmed the positive influencing of employments by the experimental program on perfection of technique of this phase. The duration of phases of kettlebells holding on a chest before lifting during research of sportsmen of both groups have certainly become better: in CG – for 0.83 sec ($P < 0.01$), in EG – for 2.04 sec ($P < 0.001$).

Researches of corners between parts of body in the basic phases of implementation of long cycle have shown higher efficiency of the experimental program than operating program in relation to perfection of technical preparedness of sportsmen.

Analysis of rate of long cycle has shown that at the beginning of experiment the sportsmen of both groups during first five minutes fulfilled exercise in higher rate than middle (for 5–50 %) and from seventh till tenth minutes – in lower rate than middle (for 10–40 %). At the end of experiment in CG the tendency of rate has not changed: at first five minute rate was higher than middle for 2–20 % and at eighth–tenth minutes – lower than middle for 15–20 %. In EG at the end of experiment at first six minutes rate was lower than middle for 2–10 %, and at seventh–tenth minutes – higher than middle for 2–15 %. It testifies to efficiency of the experimental program in relation to the improvement of indexes of technical preparedness of sportsmen during preparation to competitions in long cycle.

In the whole the conducted research allows to make a conclusion about advantage of the experimental program above the existing one in relation to development and perfection of effectively important indexes of technical preparedness of sportsmen which specialize in long cycle on the stage of the specialized base preparation.

High level of technical preparedness of sportsmen on the stage of the specialized base preparation will promote the improvement of their sport results in long cycle both on this stage and on next stages of many years preparation in the kettlebell sport.

Conclusions

1. The verification of efficiency of the experimental program has shown its more expressed positive influence, comparatively with the operating program, on the improvement of indexes of technical preparedness of sportsmen in long cycle on the stage of the specialized base preparation.

2. It is set that sportsmen of EG at the end of experiment have certainly better ($P < 0.05$ – 0.001) indexes than sportsmen of CG in duration of phase of kettlebells holding on a chest before lowering for 1.26 sec and before lifting – for 1.32 sec, in sizes of corners between parts of body in the basic phases of exercise – for 4–9.6 degree, in rate of exercise – for 0.56–2.34 getting up and in accordance of rate in every minute to the competitive result – for 29.4–37.5 %.

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