

Changes of technical preparedness of 13-14-year-old handball players to develop high-speed and power abilities

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Abstract.

Purpose: to increase the level of technical preparedness of handball players of 13 - 14 years old on the basis of development of high-speed and power abilities.

Material: 28 sportsmen of 13 – 14 years old participated in the research that made control (n=14) and experimental (n=14) of groups. The following methods were used: the analysis of scientific and methodical literature allowed to establish condition of studying of the problem and to define the purpose and task of the research; the pedagogical testing was held for the purpose of establishment of the level of development of technical preparedness of handball players and indicators of high-speed and power abilities; the pedagogical experiment was under construction with the participation of two groups: control – training process of which answered contents of the program of handball sports school, and experimental – contents of which was complemented with the program of preparation with use of specially selected exercises. Running and hopping exercises with use of high-speed ladder and stuffed ball were entered the program of training of handball players of experimental group. The pedagogical experiment lasted 8 weeks then changes of the level of technical preparedness of handball players of two groups analyzed.

Results: it is established that results of performance of separate test exercises, which defined technical preparedness, have interrelation of different extent of manifestation (from low to close) with high-speed and power abilities of young sportsmen. The reliable improvement of technical preparedness of sportsmen of experimental group turned out to be consequence of the pedagogical experiment. So, dribble around stand at distances of 30 m with overcoming horizontal obstacle and time of performance of complex exercise decreased ($p \leq 0,05$); number of passes for 20 s in wall from distance of 5 m from it and number of hits into the goal corners increased when performing shots on goal ($p \leq 0,05$).

Conclusions: 1. The analysis of references indicates the high role of physical fitness and technical skill of sportsmen in formation of sports result. 2. Inclusion of exercises of high-speed and power orientation in the educational-training process of handball players increased the level of technical preparedness of sportsmen 13-14 years old of experimental group.

Keywords: young handball players, technical skill, high-speed and power abilities, training of handball players, technical improvement

Introduction.

Experts consider the solution of question of improvement of technical preparedness of sportsmen-players in various directions. Data about influence of separate physical qualities on formation of methods of technique are directed in works of one authors (Pomeshchikova, I. P., 2016; Pomeshchikova, I. P., Chek, O. O. and Kudimova, O. V., 2015), new approaches in application of physical means of improvement of technique methods are in others (Acsinte, Alexandru and Eftene, Alexandru, 2007; Bykova, O. O., 2010, 2017), it is noted on need of accounting of biomechanical parameters of movements and anthropometrical characteristics of sportsmen for more rational creation of process of technical improvement (Binthu, Mathavan, 2012; Hamish, A. Kerr, Eric, H. Ledet, Ashar Ata, Jennifer, L. Newitt, Matthew, Santa Barbara, Milan, Kahanda, and Erin, Sperry Schlueter, 2017; Lucy, Parrington, Kevin, Ball and Clare, Mac Mahon, 2015; Tim, J. Gabbett, David, G. Jenkins and Bruce, Abernethy, 2011).

So, it is specified on connection of anthropometrical characteristics of upper extremities of handball players with method of performance of shots on goal and their effectiveness in the researches of Binthu Mathavan (2012). Lucy Parrington, Kevin Ball & Clare MacMahon (2015) established in the researches that kinematic characteristics of movements of handball players influence effectiveness of performance of separate techniques, emphasizing that the method of performance of goal-shots influences their effectiveness. Juan Antonio García, Ruperto Menayo & Pablo Del Val (2017) studied free throws in handball, who specify in

the work that speed of flight of ball and accuracy when performing free throws in handball at sportsmen of different age changes depending on activity of counteraction of a goalkeeper.

Results of number of researches specify on connection of physical, technical fitness of sportsmen and efficiency of their game activity. So, Tim J. Gabbett, David G. Jenkins & Bruce Abernethy (2011) demonstrates influence of physical fitness of the qualified rugby players on their technical skill and efficiency of game activity. Considering physical fitness, authors were based on studying of explosive speed, high-speed endurance and force.

Influence of the level of physical fitness of handball players on efficiency of their game activity was reflected in the work of Bykova O. O., (2016). The author emphasizes that coordination and high-speed and power abilities have the greatest influence on efficiency of competitive activity of sportsmen at the age of 13 – 14 years within physical fitness. At the same time Baștiurea Eugen, Stan Zenovia, Rizescu Constantin, Mihăilă Ion, Andronic Florin (2014) open existence of negative impact of overdevelopment of muscular strength of upper extremities on ability of handball players to coordinate actions when performing throwing movements.

Many authors consider solution of the problem of improvement of process of sports preparation in the direction of development of new sets of exercises in application which have certain tasks. So, Gülşah Şahin, Mehmet Aslan, Erdal Demir (2016) describe positive influence of exercises with overcoming resistance of rubber plait when performing squats and jumping out for improvement of force and high-speed and power abilities of sportsmen in the work. Özkan Çdmenlđ, Hürmüz Koç, Fatma Çdmenlđ, Celil Kaçođlu provide data on efficiency of plyometric exercises for increase in height of jump of volleyball players, at the same time authors emphasize that the quality of basic surface (wooden or synthetic) has no influence on gain of indicators of spring ability at sportsmen. Karatnik I. V., Grechanyuk O. O., Bubela O. Yu., Pityn M. G. (2016) point to the general influence of exercises on development of high-speed and power endurance, speed of movement separate links of body and work with resistance of weight of own body on physical fitness of badminton players. Authors offer 3 options of rotation of the training modules, which are directed on: 1) development of speed 2) development of force 3) development of spring ability. Rovnyi A., Pasko V. (2017) suggest to improve physical fitness of rugby players by means of hypoxemic trainings. Our previous researches were directed to establishment of interrelations between physical and technical training of sportsmen (Bykova, O. O., 2016; Pomeshchikova, I. P., 2016); development of the program of training of young handball players on the basis of use of exercises of coordination orientation and experimental confirmation of its positive influence on technical preparedness of sportsmen (Bykova, O., Druz, V., Pomeshchikova, I., Strelnikova, E., Strelnikov, G., Melnyk, A. and Shyriaieva, I., 2017; Bykova, O. O., 2017). The received results are the peculiar subsoil for the solution of tasks of this research. Results of the previous researches, which were conducted by us, allow assuming that use of specially selected running and hopping exercises in different starting positions and with use of high-speed ladder and stuffed balls during the educational-training classes of handball players of 13 - 14 years old will positively affect the level of technical preparedness of young sportsmen. The work purpose is to increase the level of technical preparedness of handball players of 13 - 14 years old on the basis of development of high-speed and power abilities.

Materials and methods. 28 young men of 13 - 14 years old participated in the research. All participants of the research studied in sports school in groups of the previous preparation and had permission of the doctor to classes in sports sections. The researches were adopted by the Committee on ethics of Kharkiv state academy of physical culture. Testing of technical preparedness was (Danilov, O. O., Kubrachenko, O. G., Kushniriuk, S. G. and Maslova, V. M., 2003; Ignat'eva, V. YA., Maksimov, V. S. and Petrachova, I. V., 2004): 1) performance of the maximum number of passes of handball in wall from distance of 5 m during 20 s (size and weight of ball answered the age of sportsmen); 2) performance of dribbling at distance of 30 m; 3) performance of dribble around stand at distance of 30 m with overcoming horizontal obstacle; 4) 12 throws from the 6 meter line from basic situation after 3 steps of running start to the marked goal corners. Balls lie on the 9 meter lines opposite to each of two stands of goal. Time for performance of exercise is limited by 2 minutes; 5) complex exercise (fig. 1). Three stands and four handballs are necessary for exercise performance. One stand was established on the middle of the 6-meter line, two others – on crossing of the line from stands of goal to the 4-meter line which limits the goalkeeper's game.

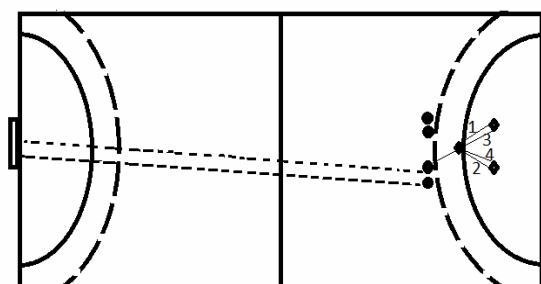


Fig. 1. Scheme of performance of complex exercise

The sportsman stood at stand on the 6-meter line facing the goal. On signal the handball player did dash to the left stand, touched it by hand, came back and ran all over the first stand, then to right and repeated the cycle. Then he ran up to two balls and serially threw them into opposite goal. After that exercise repeated, only starting from the right stand. Time and the number of hits by ball into the goal were counted.

Investigating high-speed and power abilities of handball players of 13 - 14 years old, six test exercises were used: 1) standing long-jump, 2) run of 30 m from high start, 3) standing high-jump, 4) bending and extension of hands in emphasis, lying in 15 seconds, 5) trunk rising in set for 30 seconds, 6) throwing of handball ball on range.

Control and experimental groups of handball players were elected, each on 14 sportsmen for the purpose of establishment of efficiency of use of specially selected exercises during the educational-training classes of young handball players. The lack of reliability in differences of results of tests on technical preparedness and the level of development of high-speed and power abilities of two groups ($p > 0,05$) was defined at the previous investigation phase. Within 8 weeks sportsmen of control group were engaged according to the standard program of handball sports school. The educational-training process of handball players of experimental group was based on the standard program of preparation for handball sports school and complemented with specially selected sets of exercises of high-speed and power orientation.

Specially selected complexes included dashes on short distances after performance of various jumps, exercise jump on high-speed ladder with the different angle of bending of joints of the lower extremities and trunks, exercise jump in situation emphasis, lying also exercises with stuffed ball (weight of ball 1 kg) (Bykova, O. O., 2017).

Special sets of exercises were carried out in preparatory or main parts of the educational-training classes. Complexes of individual exercises entered the preparatory part: dashes on short distances after kinds of jumps, exercise jump with use of high-speed ladder in situation, standing and in emphasis, lying. Complexes of group exercises entered the main part: running and hopping exercises, holding and passing stuffed ball. The final part of training joined stretching exercises of those groups of muscles which actively took part in training work.

Results of the research.

The defined indicators of technical preparedness of handball players of 13-14 years old by the results of performance of 5 test tasks which are recommended by the practicing coaches and experts in the field of handball are presented in tab. 1.

Table 1. Level of technical preparedness of handball players of 13 - 14 years old (n = 28)

Statistics	Ball throws into the goal (number of hits)	Complex exercise		Dribble around stand at distance of 30 m (s)	Passes of handball in wall for 20 s (number of times)	Dribbling 30 m, (s)
		time of performance, (s)	number of hits into the goal (times)			
\bar{X}	6.74	31.03	2.64	7.14	17.76	5.27
m	1.21	0.50	0.20	0.08	0.46	0.07

Indicators of high-speed and power preparedness of young handball players were established by means of 6 test exercises (tab. 2).

Table 2. Average values of high-speed and power preparedness of examinees of handball players of 13 - 14 years old (n = 28)

Statistics	Standing long-jump, (sm)	Run of 30 m, (s)	Trunk rising in set lying on back for 30 seconds (number of times)	Bending and extension of hands in emphasis, lying in 15 seconds (number of times)	Standing high-jump, (sm)	Throwing of handball ball on range, (m)
\bar{X}	194.54	5.16	30.39	7.50	28.75	33.32
m	2.54	0.05	0.49	0.18	0.32	1.05

The interrelation between separate indicators of high-speed and power abilities of young men and results of performance of exercises on determination of technical preparedness of handball players is established as a result of the carried-out correlation analysis (tab. 3).

It is visible from table 3 that the majority of the given indicators of high-speed and power abilities of handball players of 13 - 14 years old have correlation interrelation with results of performance of test exercises which define technical preparedness of sportsmen.

The received data of interrelations of technical preparedness of young handball players with the level of development of their high-speed and power abilities became the basis for use of specially selected exercises in the educational-training process of handball players of experimental group.

Table 3. Interrelation of technical preparedness of handball players of 13 - 14 years old with the level of development of high-speed and power abilities (n = 28)

Indicators of high-speed and power abilities	Indicators of technical preparedness					
	Dribble around stand at distance of 30 m (s)	Passes of ball in wall for 20 s (number of times)	Dribbling 30 m, (s)	Ball throws into the goal (number of hits)	Complex exercise	
					time of performance, (s)	number of hits into the goal (times)
Standing long-jump, (sm)	0.21	0.32	-0.56	0.24	-0.34	0.21
Run of 30 m, (s)	0.31	0.16	0.67	0.19	0.69	-0.32
Trunk rising in set lying on back for 30 seconds (number of times)	0.19	0.52	0.21	0.57	0.18	0.47
Bending and extension of hands in emphasis, lying in 15 seconds (number of times)	0.17	0.68	0.43	0.67	0.08	0.49
Standing high-jump, (sm)	0.27	0.12	-0.34	0.15	-0.59	0.21
Throwing of handball ball on range, (m)	0.32	0.67	0.31	0.56	0.09	0.64

Results of the previous researches were considered by us at drawing up sets of exercises which were carried out by handball players of experimental group during the experimental period of the research (tab. 4).

Table 4. Scheme of use of the offered sets of exercises in the educational-training process of handball players of experimental group

Serial number of day in week microcycle	Short characteristic of complexes	Duration of performance of complexes
1	dashes on short distance after kinds of jumps	10 minutes
2	hopping exercises with use of high-speed ladder from situation emphasis, lying	10 minutes
3	Day off	
4	hopping exercises with use of high-speed ladder in situation, standing	15 minutes
5	Day off	
6	running and hopping exercise holding or passing stuffed ball	15 minutes
7	Day off	

Use of specially selected sets of exercises of high-speed and power orientation in the educational-training process of handball players of experimental group led to the reliable improvement of the majority of indicators of technical preparedness of young sportsmen. Comparison of indicators of technical preparedness of handball players of experimental and control groups after the pedagogical experiment showed authentically the best results of handball players of experimental group on all indicators ($p \leq 0,05$), except dribbling speed at distance of 30 m and quantity of hits of ball into the goal in the complex exercise ($p \leq 0,05$) (tab. 5).

Table 5. Indicators of technical preparedness of handball players of control and experimental groups after the pedagogical experiment (n=14)

Groups, statistics	Dribble around stand at distance of 30 m (s)	Passes of ball in wall for 20 s (number of times)	Dribbling 30 m, (s)	Ball throws into the goal (number of hits)	Complex exercise	
					time of performance, (s)	number of hits into the goal (times)
Indicators ($\bar{X} \pm m$)						
Control group	7.47±0.09	20.07±0.42	5.14±0.05	6.91±1.02	34.09±1.01	2.09±0.19
Experimental group	7.09±0.16	21.16±0.33	5.01±0.05	9.26±0.51	32.01±0.06	2.37±0.14
t	2.069	2.059	1.83	2.060	2.055	1.18
p	$\leq 0,05$	$\leq 0,05$	$\leq 0,05$	$\leq 0,05$	$\leq 0,05$	$\leq 0,05$

Discussion.

The problem of optimization of the training process of sportsmen at different stages of preparation in the researches is lifted by many authors. Some specialists suggest taking into account the functionality of athletes (Olga A Rovnaya, Leonid V Podrigalo, Oleksandr Y Aghyppo, Mirosława Cieślicka and Błażej Stankiewicz, 2016), other psychophysiological features (Podrigalo, L., Iermakov, S., Potop, V., Rovnaya, O., and Tropin, Y., 2017). Palagin A. A. (2014) provides the description of the developed programmatically methodical, providing the initial stage of study of handball players, which is directed to the improvement of physical and technical-tactical fitness of sportsmen, on the basis of intensive integrated influence. Popovici Ileana-Monica, Lupan LenuŃa, Lupan Veniamin (2013) experimentally confirmed need of account for the educational-training process of models of physical, technical, tactical and psychological fitness of handball players which are definitely interconnected among themselves for rational planning of their training process.

Our researches were constructed on hypothesis of existence of influence of the level of development of physical abilities of young handball players on formation and improvement of their technical skill. Confirmation of relevance and importance of this problem is displayed in the works of Libomir Pavlovic, Ivana Bojic, Dragan Radovanovic, Zoran Valdevit (2015), Palagin A. A. (2014), what emphasize that the efficiency of competitive activity of handball players depends on technical preparedness and correctly chosen tactics of game. Authors note that physical fitness is the base for rational formation technical-tactic actions which is confirmed also by our research.

As the work of Gabbett, Tim J.; Stein, Josh G.; Kemp, Justin G.; Lorenzen, Christian (2013), our research emphasizes the role of speed and force for game activity in contact game sports. Our thought coincides with opinion of authors who emphasize need of rational application of exercises of physical and technical training and search of opportunities of their combination in the article. The direction of improvement of technical skill of young handball players with use of specially selected exercises, which were elected by us, finds the support in many researches. Mariana Rohleva (2015) suggests using during annual training process of kind of physical exercises which are jointed in three different complexes for improvement of training of handball players of the college team. One of these complexes is based on combination of acrobatic exercises with high-speed and power preparation. The issue of improvement of technical skill of young handball players through providing sufficient coordination base was resolved in our previous works (Bykova, O., Druz, V., Pomeshchikova, I., Strelnikova, E., Strelnikov, G., Melnyk, A., Shyriaieva, I., 2017). However sometimes insufficient level high-speed and power ability did not give the chance to young sportsmen to perform correctly that, whether other exercises that induced to focused development in sportsmen together with coordination and high-speed and power abilities.

Efficiency of the exercises, which are selected by us in this research, and the character of loads, which were applied in work with handball players of experimental group, gave the chance through improvement of indicators of high-speed and power abilities to affect technical skill of players. The received by us results of the research has something in common with results of the researches of Cazan Florin, Rizescu Constantin, Georgescu Adrian (2013), Thomas A. Haugen, Espen Tønnessen, Jonny Hisdal, Stephen Seiler (2013). So, Cazan Florin, Rizescu Constantin, Georgescu Adrian (2013) offer for improvement of explosive force, speed and force, to use the program of trainings which is based on performance of intermittent efforts. Thomas A. Haugen, Espen Tønnessen, Jonny Hisdal, Stephen Seiler (2013) are pointed to possibility of development of speed of football players thanks to the scheme of special "dash" exercises which are performed in power trainings. Warren B. Young (2006) emphasizes importance of combination hopping and "dash" exercises for development of specific speed. The author specifies that performance of vertical jumps influences a little the development of sprint speed up, however use of plyometric exercises in the horizontal area – significantly influences its gain.

Our approach of improvement of technical preparedness of handball players of 13 - 14 years old on the basis of development of high-speed and power abilities, with use of exercises on high-speed ladder, can be applied also in the training process of sportsmen of other game sports – rugby, basketball, volleyball, soccer, futsal, beach volleyball and so forth.

Conclusions.

The analysis of scientific and methodical sources indicates the high role of physical fitness and technical skill of sportsmen in formation of sports result. The search of new exercises and complexes which will be adapted on biokinematic parameters to technique of sport is one of the directions of improvement of process of training of sportsmen and will promote simultaneous improvement of physical and technical fitness.

The interrelation between results of test exercises which defined technical preparedness and high-speed and power abilities of young sportsmen of different extent of manifestation is established (from low to close).

Inclusion of exercises of high-speed and power orientation in the educational-training process of handball players increased the level of technical preparedness of sportsmen 13-14 years old of experimental group. So, stand time of dribble around stand for distances of 30 m authentically improved ($p \leq 0,05$) and when performing complex exercise ($p \leq 0,05$), number of passes for 20 s in wall from distance of 5 m ($p \leq 0,05$) and number of hits into the goal corners increased when performing goal-shots ($p \leq 0,05$). The obtained by us data

allow recommending to handball coaches to apply specially selected by us complexes running and hopping exercises with application of high-speed ladder and stuffed balls in the educational-training process of handball players of 13-14 years old that answer features of playing handball on biomechanical parameters of movements and performance of muscular work.

The subsequent researches will be aimed at finding new ways of increase in efficiency of the educational-training process of handball players.

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Conflict of interests.

The authors note that there is no conflict of interests.

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