

## Changes in technical preparedness of 13-14-year-old handball players under the influence of coordination orientation exercises

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### Abstract:

*Purpose:* to establish influence of exercises of coordination orientation on changes of indicators of technical preparedness of handball players of 13-14 years old.

*Material:* two groups of young men of 13-14 years old of Kharkiv and Ternivka of the Dnipropetrovsk Region participated in the research. 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 the 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 coordination 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 – keeping of whom was added with the program of preparation with application of exercises of coordination orientation. The program of training of handball players of experimental group included acrobatic exercises and hopping exercises with use of coordination ladder that were combined when performing with techniques of playing handball. Exercises were directed to the maintenance of balance on one and two legs, irritation of vestibular mechanism and were combined with performance of techniques of handball at first on the spot, in the movement subsequently. Complexity and intensity of performance of exercises changed depending on extent of mastering by them. The pedagogical experiment lasted 6 months then changes of level of technical preparedness of handball players of two groups were 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 coordination abilities of young sportsmen. The reliable improvement of technical preparedness of sportsmen of the experimental group turned out to be the consequence of the pedagogical experiment. So, dribble around stand at distance of 30 m with overcoming horizontal obstacle decreased ( $p \leq 0,05$ ) and number of passes for 20 s in wall from distance of 5 m from it increased ( $p \leq 0,01$ ). *Conclusions:* 1. The analysis references specifies on the high role of physical fitness and technical skill of sportsmen in formation of sports result. 2. The average positive interrelation ( $r = 0,57$ ) is established between technical preparedness of handball players and their coordination abilities. 3. The inclusion of complex-coordination exercises in educational-training process of handball players increased the level of technical preparedness of sportsmen of 13-14 years old of experimental group.

**Key words:** young handball players, technical skill, coordination abilities, training of handball players, preparation improvement.

### Introduction

Sports technique, according to J. Czerwinski and F. Taborsky (2000), – is the basis of any team game. The authors specify that techniques are formed on the basis of motive preparedness on condition of frequent use of methods in game conditions. Many authors dealt with the problem of improvement of technical skill of sportsmen (Druz V. A., 2015, 2017; Lucy Parrington, 2015). One suggest using technical means of study (Briskin Y., 2014), others note need of development of certain physical qualities (Dr. Lin Wang, 2010) for the purpose of the solution of this question. The large number of scientific researches, which results specify on the interrelation of physical and technical fitness with efficiency of competitive activity of sportsmen of different profession and qualification, was found in modern scientifically-methodical literature (Druz V. A., 2015; Bykova O. O., 2016; Antonov S., 2017; Strelnykova E. Ya, 2015; Maysa Rabea, 2013).

Numerical researches emphasize the relevance of use of means of coordination orientation in the course of physical and technical training of sportsmen in different types of sport. One scientists (Strelnykova E. Ya, 2016; M. Srinivasan and Dr. Ch. Vst., Saikumar, 2012; Robert S. K. Ng., 2017) emphasize

the positive influence of use in training process of sportsmen of acrobatic exercises and exercises with application of coordination ladder on the development of certain physical qualities, others note the positive influence of exercises of vestibular orientation on the process of development of techniques and increase in efficiency of competitive activity (I. P. Pomeshchikova, 2016).

Chepea Bogdan, Orțănescu Dorina, Shaao Mirela (2013) specify in their work that most of coaches, when planning process of training of young sportsmen, prefer as physical and technical training. Coaches take away the greatest number of time at trainings – from 65% to 70% on performance of tasks on physical and technical training. Alexandru Acinte, Eftene Alexandru (2007), note need of use the combined exercises during training process of handball players, which will be directed to the improvement of preparedness of sportsmen in different aspects at once. It induced us on the search of means of study which would be allocated for the simultaneous improvement of physical qualities and technical skill of young handball players.

Our previous researches were sent to the search for ways of improvement of training of sportsmen by means of acrobatic exercises (Bykova O., 2005; 2006; 2010; Strelnikova E. Ya., 2016). Questions of application of acrobatic exercises were raised for the purpose of prevention of traumatism of sportsmen, the role of acrobatic preparation in educational-training process of sportsmen in separate sports is defined and it is noted that classes by acrobatic exercises by biomechanical characteristics of movements (Druz V. A., 2015; 2017) have to answer those to technical-tactical operations which are performed by sportsmen in competitive activity. The received results are peculiar subsoil for the solution of tasks of this research.

Results of the previous researches conducted by us allow assuming that use of acrobatic exercises during educational-training classes of handball players of 13-14 years old, hopping exercises with turns and with use of coordination ladder will positively influence the level of technical preparedness of young sportsmen. The purpose of the work is to establish influence of classes by exercises of coordination orientation on changes of indicators of technical preparedness of handball players of 13-14 years old.

## Material and methods

Two groups of young men of 13-14 years old of Kharkiv (n=14) and Ternivka of the Dnipropetrovsk Region (n=14) participated in the research. All participants of the research studied in sports school in groups of the previous preparation of the 4<sup>th</sup> year of study and had permission of a 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: 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. The level of development of coordination abilities was defined by indicators of performance of the following test exercises: 1) Romberg's test (stand on one leg, foot of another concerns knees of supporting leg, eyes are closed), 2) walking on gymnastic lava with performance of the maximum quantity of turns around themselves, 3) walking blindly back forward on the line, putting sock of one leg to heel of another, 4-5) throw of ball weighing 1 kg one hand from above on distance which equals 50% and 75% from maximum, 6-7) reconstruction of time intervals which are filled with light and sound irritant, 8) run difference on 30 m smooth run and run on 30 m with performance of 5 turns on 360°, 9-10) reconstruction and assessment of size of the offered pieces.

Sportsmen were divided into control and experimental groups, considering the lack of reliability in differences of results of tests on technical preparedness and the level of development of coordination abilities, for the purpose of establishment of efficiency of use of acrobatic exercises and hopping exercises with turns and with use of coordination ladder during educational-training classes of young handball players. Sportsmen of control group were engaged according to the standard program of handball sports school during 6 months. The educational-training process of handball players of the experimental group was based on the standard program of preparation for handball sports school and added with specially selected sets of exercises of complex-coordination orientation. Specially selected complexes included acrobatic exercises and hopping exercises with use of coordination ladder that were combined when performing with techniques of playing handball. Exercises were directed to the maintenance of balance on one and two legs, irritation of vestibular mechanism and were combined with performance of techniques of handball at first on the spot, in the movement subsequently. Complexity and intensity of performance of exercises changed depending on the degree development by sportsmen (Bykova O. O., 2017).

Special sets of exercises were carried out in preparatory, main and final parts of educational-training classes. Complexes of acrobatic exercises, hopping exercises with turns and with use of coordination ladder entered the preparatory part that were carried out without ball and were combined with kinds of handball movements. The main part included individual and group acrobatic exercises, running and hopping exercises with turns and with use of coordination ladder which were combined with kinds of ball handling and counteraction to it. Such acrobatic exercises as throwing and rolling, which were performed at slow speed on soft horizontal surface, were used in the final part.

### Results of the research and their discussion

The level of technical preparedness of handball players of 13-14 years old by results of performance of test tasks, which are recommended by the practicing coaches and experts in the field of handball [14, 18], is established (tab. 1).

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

Statistics	Dribble around stand at distance of 30 m (s)	Passes of handball in wall for 20 s (number of times)	Dribbling 30 m, (s)
$\bar{X}$	7,14	17,76	5,27
m	0,08	0,46	0,07

Analyzing indicators of technical preparedness of handball players of 13-14 years old, it was defined that the average time of dribbling on straight line on distance in 30 m at sportsmen made  $5,27 \pm 0,07$  s. Handball players succeeded to perform on average  $17,76 \pm 0,46$  passes in wall from distance of 5 m for 20 s, dribble around stand at distance of 30 m took on average  $7,14 \pm 0,08$  s. The held pedagogical testing allowed establishing indicators of coordination abilities of handball players of 13-14 years old (tab. 2).

Table 2. Indicators of coordination abilities of handball players of 13-14 years old (n = 28)

Control tests	$\bar{X}$	m
Romberg's test, (s)	20,54	0,56
Indicator of dynamic balance in exercise «walking with turnovers on gymnastic lava», (con.un)	77,72	3,78
Indicator of dynamic balance in exercise «walking back forward on the line», (con.un)	3387,98	122,25
Replication mistake of size of the set pieces, (%)	10,84	1,25
Mistake of estimation of size of the set pieces, (%)	9,06	0,82
Mistake in throw of the stuffed ball on distance in 50% of maximum weighing 1 kg, (m)	2,48	0,37
Error of reconstruction of time light interval, (%)	1,45	0,19
	11,46	1,00
	10,64	0,96
Difference of time of run of 30 m on straight line and 30 m 5 turns, (s)	1,86	0,06

So, the average time of maintenance of balance in Romberg's test at sportsmen, who participated in the research, made  $20,54 \pm 0,56$  s. The indicator of dynamic balance in exercise "turns on lava with advance forward" at young men made  $77,72 \pm 3,78$  con.un., in "walking on the line blindly" –  $3387,98 \pm 122,25$  con.un. Analyzing mistakes at measurement of size of the set piece, it was defined that examinees were mistaken on average on  $10,84 \pm 1,25\%$ . Performing this task, 7,14% of the studied contingent reduced length of piece, 10,71% of all sportsmen constantly increased length of pieces, 82,14% - made mistakes, both increasing, and reducing the size of pieces. Studying results of estimation of the set pieces, it was established that the medium mistake at implementation of this test made  $9,06 \pm 0,82\%$ . It should be noted that all handball players both exaggerated the size of the set piece, and underestimated its size and performed task precisely, when performing task. The bigger number of exact measuring off was recorded in the second (50% of examinees) and the fourth (73% of examinees) attempt from five.

When performing throwing of the stuffed ball with the dosed effort by handball players, it was possible to measure long distances more precisely, at the same time differences in mistake indicators at ball throwing on the different set distances had no statistically reliable character ( $t = 1,39$ ;  $p \square 0,05$ ). So, the mistake at throwing of the stuffed ball on distance which equals 50% of maximum made  $2,48 \pm 0,37$  m that is 1,03 m more, than at throwing on distance which equals 75% of maximum. At the same time only 2 handball players were mistaken sideways increases in necessary effort (7,14%), other 92,8% of examinees of sportsmen did not throw to the necessary mark. Considering mistake size at reproduced time interval, which was set in the sound and light way, it was noted that the mistake made  $11,46 \pm 1,00\%$ , sound –  $10,64 \pm 0,96\%$  at reconstruction of time light interval, the difference between indicators is not reliable ( $t = 0,58$ ;  $p > 0,05$ ). It should be noted that when performing reconstruction of time interval by the set light signal (from 5 attempts) 50% of sportsmen performed tasks or it is correct or increasing interval. 50% of handball players reduced time interval on the contrary, or also reproduced it truly. At reconstruction of the time interval set by sound signal at all sportsmen both right performance, and increase in interval was observed. The average difference of time of smooth run for 30 m and run on 30 m with 5 turns on  $360^\circ$  at handball players of 13 - 14 years old made  $1,86 \pm 0,06$ s.

As a result of the carried-out correlation analysis, the interrelation between separate indicators of coordination abilities of young men and level of their technical preparedness (tab. 3) is established. So, the

coefficient of correlation of  $r = 0,57$  indicates the average positive interrelation between the general point of technical preparedness of handball players and the general point of coordination abilities of sportsmen. Analyzing results of performance of separate test exercises, it is possible to note that between results of test exercises that defined technical preparedness and coordination abilities of young sportsmen, there is the interrelation of different extent of manifestation (from low to close).

Table 3 Correlation interrelation between indicators of coordination preparedness of handball players of 13-14 years old and level of their technical preparedness (r)

Test exercises on coordination preparedness	General point of technical preparedness, (con.un.)	Test exercises on technical preparedness		
		Dribble around stand at distance of 30 m, (s)	Passes of handball in wall for 20 s, (number of times)	Dribbling 30 m, (s)
Romberg's test, (s)	0,49	-0,39	0,35	-0,19
Walking on gymnastic lava with turns, (con.un.)	0,28	-0,15	0,58	-0,43
Walking on the line blindly, (con.un.)	0,29	-0,22	0,34	-0,28
Throw of ball weighing 1 kg on distance which equals 50% from maximum, (m)	-0,35	0,35	-0,38	0,56
Throw of ball weighing 1 kg on distance which equals 75% of maximum	-0,30	0,41	-0,32	0,36
Error of reconstruction of time interval which is filled with light irritant, (%)	-0,52	0,43	-0,50	0,46
Error of reconstruction of time interval which is filled with sound irritant, (%)	-0,52	0,50	-0,39	0,56
Run difference on 30 m and run on 30 m with 5 turns, (s)	-0,33	0,39	-0,29	0,25
Mistake at measuring off of size of the offered pieces, (%)	-0,48	0,75	-0,34	0,52
Mistake at assessment of size of the offered pieces, (%)	-0,58	0,46	-0,37	0,39
General point of coordination preparedness (un.)	0,57	-0,40	0,59	-0,63

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

Distribution to control and experimental groups happened by the results of test exercises which defined technical preparedness and the level of development of coordination abilities of handball players of 13-14 years old on condition of absence reliable differences ( $p \geq 0,05$ ).

The received results of the previous researches were considered by us by drawing up sets of exercises which were carried out by handball players of the experimental group during the experimental period of the research. The offered exercises combined in themselves acrobatic exercises, hopping exercises with turns and with use of coordination ladder and performance of techniques of playing handball.

Application of specially selected sets of exercises of coordination orientation in educational-training process of handball players of the experimental group, led to the improvement of two indicators of technical preparedness of young sportsmen unlike indicators of sportsmen of the control group (tab. 4).

Table 4 Indicator of technical preparedness of handball players of experimental and control groups before and after the experiment

Experiment term, statistics	Dribble around stand at distance of 30 m, (s)	Passes of handball in wall for 20 s, (number of times)	Dribbling 30 m, (s)
Indicators ( $\bar{X} \pm m$ )			
Experimental group (n=14)			
Before the experiment	7,22±0,08	17,93±0,67	5,50±0,12
After the experiment	6,86±0,15	21,36±0,32	5,31±0,05
t	2,10	4,59	1,52
p	□0,05	□0,01	□0,05
Experimental group (n=14)			
17,93±0,67	7,46±0,13	18,79±0,66	5,33±0,06
After the experiment	7,27±0,10	20,07±0,43	5,24±0,05
t	1,14	1,63	1,10
p	□0,05	□0,05	□0,05

So, time of dribble around stand at distance of 30 m with overcoming horizontal obstacle authentically decreased ( $p \leq 0,05$ ) at sportsmen of the experimental group and number of passes for 20 s in wall from distance of 5 m from it increased ( $p \leq 0,01$ ).

### Discussion

The role of technique in formation of sports result is considered by many authors from different foreshortenings. The researches of Binthu Mathavan (2012) specify on the communication of anthropometrical characteristics of upper extremities of handball players with technique of execution of goal-shots and their effectiveness. Some experts of beach volleyball (Alexandre I. A. Medeiros, M. Isabel Mesquita, O. Rui Marcelino & José M. Palao (2014) is noted the communication of efficiency of game actions with technique of performance of methods of game. 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 which confirms our assumption to rather big role of technical preparedness of sportsmen for efficiency of their game actions and need of search of new ways of improvement of process of technical training.

The received by us results of the research specify on the communication of physical and technical fitness of handball players and confirm results of Tim J. Gabbett, David G. Jenkins & what demonstrate influence of physical fitness of the qualified rugby players on their technical skill and efficiency of game activity.

The direction of improvement of technical skill of young handball players through use of specially selected exercises is elected by us, finds the support in many researches. So, Antonov S., Briskin Y., Perederiy A., Pityn M., Khimenes Kh., Zadorozhna O., Semeryak Z., Svystelnyk I. (2017) point to the positive influence of classes by difficult coordination exercises on technical preparedness of the sportsman-bowman. Mariana Rohleva (2015) suggests using kind of physical exercises which are jointed in three different complexes during the annual training process for the improvement of training of handball players of college team. One of these complexes is based on combination of acrobatic exercises with high-speed and power preparation. Cosma Alexandru, Pascu Dănuț, Lică Eliana (2013) note the significant role of acrobatic exercises in training process of volleyball players and emphasize that the content of these exercises has to answer not only techniques of game but also the period of preparation in the annual cycle. Authors suggest applying means of acrobatics to the improvement of training process of volleyball players widely. Kostopoulos N. (2012) also emphasizes the positive influence of acrobatic exercises on assimilation of technique of sport. M. Srinivasan and Dr. Ch. VST. (2012) points to the improvement of maneuverability in movements during game activity of badminton players due to use of exercises with application of coordination ladder in training process. Dariusz Gierczuk, Zbigniew Bujak (2013) lead up efficiency of use of acrobatic exercises in training process of martial artists.

### Conclusions

1. The analysis of scientific and methodical sources specifies on 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 by bio-kinematic parameters to technique of sport is one of the directions of the improvement of process of training of sportsmen and will promote the simultaneous improvement of physical and technical preparedness.

2. The interrelation between results of test exercises which defined technical preparedness and coordination abilities of young sportsmen of different extent of manifestation is established (from low to close). The average positive interrelation ( $r = 0,57$ ) is established between the general data of technical preparedness of handball players and their coordination abilities.

3. The inclusion of complex-coordination exercises in educational-training process of handball players increased the level of technical preparedness of sportsmen of 13-14 years old of the experimental group. So, time of dribble around stand at distance of 30 authentically improved ( $p \leq 0,05$ ) and number of performance of passes in wall for 20 s increased ( $p \leq 0,01$ ). The obtained by us data allow recommending to handball coaches to apply specially selected by us complexes of acrobatic exercises and hopping exercises with turns and with application of coordination ladder that are combined with performance of techniques of playing handball in educational-training process of handball players of 13-14 years old.

The subsequent researches will be sent to the search for new ways of increase in efficiency of educational-training process of handball players.

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