STRUCTURAL MODEL OF IN-GROUP DYNAMIC OF 6-10 YEARS OLD BOYS' MOTOR FITNESS

Ivashchenko O.V., Yermakova T.S.
H.S. Skovoroda Kharkiv National Pedagogical University

Abstract. *Purpose:* to determine structural model of in-group dynamic of 6-10 years old boys' motor fitness. *Material:* in the research 6 years old boys (n=48), 7 years old (n=45), 8 years old (n=60), 9 years' age (n=47) and10 years' age (n=40) participated. We carried out analysis of factorial model of schoolchildren's motor fitness. *Results:* we received information for taking decisions in monitoring of physical education. This information is also necessary for working out of effective programs of children's and adolescents' physical training. We determined model of motor fitness and specified informative tests for pedagogic control in every age group. In factorial model of boys' motor fitness the following factor is the most significant: for 6 years – complex development of motor skills; for 7 years - also complex development of motor skills; for 8 years – strength and coordination; for 9 years – complex development of motor skills; for 10 years – complex development of motor skills. *Conclusions:* In factorial model of 6-10 years old boys' motor fitness the most significant are backbone and shoulder joints' mobility, complex manifestation of motor skills, motor coordination. The most informative tests for assessment of different age boys' motor fitness have been determined.
Key words: factorial analysis, informative indicators, modeling, motor fitness, boys.

Introduction

The problem of motor functioning and health improvement is important both in Ukraine and in European space [26, 27, 28, 42, 44, 46, 47, 48]. Health strengthening and increase of children's and adolescents' workability depend on optimal motor functioning, which is ensured by physical education at school (V.K. Baltsevych [2]; T.Yu. Krutsevych, G.V, Bezverkhnia. [9]).

One of conditions of schoolchildren's motor fitness improvement is organization of pedagogic control at physical culture lessons [4, 5, 6, 17, 19, 33, 34, 35, 36, 37], in conditions of sport training 3, 18, 16, 17, 27]. Effectiveness of pedagogic control depends on the presence of object of control and informative indicators characterizing change of its state. In recent publications it has been determined that modeling is an effective method for receiving of new information concerning current and finalizing control on the base of testing of children's and adolescents' motor fitness [13, 33, 34, 35, 36, 37]. One of methods of statistical modeling is factorial and discriminant analysis. Effectiveness of their application is witnessed by the data of scientific literature [29, 30, 31, 32, 33, 34, 35, 36, 40]. The mentioned works note that it is necessary to search methodological approaches to solution of motor fitness problems and pedagogic control of children and adolescents.

So, determination of motor fitness factorial model is of practical importance for taking decisions in monitoring of physical education as well as for working out of effective programs for children's and adolescents' physical training.

Purpose, tasks of the work, material and methods

The purpose of the research: is to determine structural model of group dynamic of 6-10 years old boys' motor fitness.

The methods of the research: for solution of our tasks we used such methods as analysis of scientific literature, pedagogic testing and methods of mathematical statistic. Factorial analysis was used as method of modeling.

In planning of the research we used conceptual approaches to working out scientific researches' programs in physical education and sports [1, 8, 12, 14].

Testing program included commonly known tests [10, 11, 21, 22] for assessment of 6-10 years old boys' motor fitness. We registered results of motor tests. The results are presented in table 1.

In the research 6 years old boys (n=48), 7 years old (n=45), 8 years old (n=60), 9 years' age (n=47) and10 years' age (n=40) participated.

Results of the research

For determination of structural model of in-group dynamic of boys' motor fitness we carried out factorial analysis by 15 indicators. Results of analysis are given in table 1.

http://dx.doi.org/10.15561/18189172.2015.1004

Table 1

Structural model of in-group dynamic of 6-10 years old boys' motor fitness. Method of rotation. Varimax with normalization of Kaiser

№	Description of test	Age	N	Factors					h^2
				1	2	3	4	5	
1	Static posture on one foot (sec.)	6	48	689				-426	789
		7	45		668				524
		8	60			846			789
		9	47				782	318	776
		10	40			758			587
2	Walking on hexagon segments (steps)	6	48	687				468	801
		7	45	557					395
		8	60				640		448
		9	47		654				466
		10	40	751					686
3	Exercises for combining of arms' torso's and legs' movements (points)	6	48				-907		829
		7	45		778				703
		8	60			754		-330	748
		9	47	-702					597
		10	40				898		830
4	Walk on straight line after 5 rotations, deviations (cm)	6	48					924	866
		7	45		-606				511
		8	60					775	633
		9	47				837		743
		10	40	428		-544	414	334	791
5	Shuttle run 4x9 m (sec.)	6	48			921			912
		7	45	-814					729
		8	60	732					576
		9	47		-645				486
		10	40		608			390	611
6	30 meters' run (sec.)	6	48			489		582	636
		7	45	-805					703
		8	60	651				349	596
		9	47	692	-485				745
		10	40		-844				756
7	Frequency of arms' movements (times)	6	48		732		497		892
		7	45					900	838

№	Description of test	Age	N	Factors					h^2
				1	2	3	4	5	
		8	60		672		322		756
		9	47	-675			330		618
		10	40	-700			435		696
8	Seizing of falling Dietrich's stick (cm)	6	48			659	499	434	911
		7	45				840		776
		8	60		679			333	635
		9	47	320	375	596		-349	805
		10	40	642			387	444	867
9	Long jump from the spot (cm)	6	48		824	-318			855
		7	45	740					582
		8	60	-519	414		430		680
		9	47		787				641
		10	40		779				722
10	300 meters' run (sec.)	6	48	-878					858
		7	45	-787					700
		8	60	712					589
		9	47	663					505
		10	40	314		723			701
11	Chin ups on rope in mixed hanging (times)	6	48	764	379	-306	-381		968
		7	45	682					584
		8	60	-828					748
		9	47		357	-689			651
		10	40	389	528			-470	696
12	Rising into sitting position during 1 minute (times)	6	48	783				307	733
		7	45	508			383	435	678
		8	60	-713					616
		9	47		557	-562			666
		10	40	423		-600			701
13	Torso bending from sitting position (cm)	6	48		835		-433		911
		7	45			-778			632
		8	60	-516	544				730
		9	47					865	787
		10	40	-402	-398		643		759

№	Description of test	Age	N	Factors					h^2
				1	2	3	4	5	
14	Index mark of backbone mobility (bridge)	6	48		-601	747			957
		7	45			736			579
		8	60				-656		441
		9	47			733			595
		10	40					938	891
15	Index mark of shoulder joints' mobility	6	48		-310	375	632		688
		7	45		-338	399	572		669
		8	60			-606			545
		9	47	430			324	-433	562
		10	40	693					521
	Full dispersion, % of dispersions	6	48	20.678	17.552	17.124	14.823	13.860	
		7	45	24.557	11.795	10.131	9.177	8.355	
		8	60	22.562	12.361	9.947	9.690	8.300	
		9	47	15.544	15.483	12.351	11.735	9.174	
		10	40	18.435	15.355	13.413	12.519	11.865	

As a result of analysis in group of 6 years' age boys we marked out five factors, which explain 84.037% of dispersion's variation.

First factor (informative potential 20.678%) has the highest correlation with results of tests № 10 (-0.878), № 11 (0.764), № 11 (0.783). The factor characterizes level of endurance and strength itself.

Second factor (informative potential 17.552%) has the highest correlation with results of tests № 13 (0.835), № 9 (0.824), № 7 (0.732). The factor characterizes complex development of flexibility, speed power and dexterity.

Third factor (informative potential 17.124%) has the highest correlation with results of tests № 5 (0.921), № 14 (0.747), № 8 (0.651). The factor was named general coordination of movements.

Forth factor (informative potential 14.823%) has the highest correlation with results of test № 3 (-0.907). The factor was named coordination of movements of different body parts.

Fifth factor (informative potential 14.823%) has the highest correlation with results of test № 4 (0.924) and it characterizes vestibular stability of 6 years old boys.

Thus, in factorial model of motor fitness the following is marked out: complex development of motor skills (factors 1,2); general coordination (factors 3); coordination of movements of different body parts (factor 4) and vestibular stability (factor 5). Analysis of communities (h^2) showed that tests № 11 (0.968), № 14 (0.957), № 5 (0.912), № 13 (0.911), № 8 (0.911) have the highest informative potential for assessment of 6 years boys' motor fitness. .

In group of 7 years old boys, analysis marked out also five factors, which explain 64.015% of dispersion's variations.

First factor (informative potential 25.223%) has the highest correlation with results of tests № 5 (-0.814), № 11 (0.764), № 16 (-0.805), № 10 (-0,787). The factor characterizes development of general motor coordination, dexterity and endurance. This factor is a complex one and takes priority place.

Second factor (informative potential 13.112%) has the highest correlation with results of tests № 3 (0.778), № 1 (0.668), № 4 (-0.606). The factor characterizes motor coordination.

Third factor (informative potential 9.891%) has the highest correlation with results of tests № 13 (-0.778), № 14 (0.736). The factor was named flexibility.

Forth factor (informative potential 8.279%) has the highest correlation with results of tests № 8 (0.840), № 15 (0.572). The factor was named dexterity.

Fifth factor (informative potential 7.511%) has the highest correlation with results of test № 7 (0.900) and it characterizes dexterity of 7 years old boys. The factor was named dexterity.

Thus, in factorial model of motor fitness the following is marked out: complex development of motor skills (factors 1); general coordination (factors 2); flexibility (factors 3) and dexterity (factor 4, 5). Analysis of communities (h^2) showed that tests № 7 (0.838), № 8 (0.776), № 5 (0.729), № 3 (0.703), № 6 (0.703) have the highest informative potential for assessment of 7 years boys' motor fitness.

In group of 8 years old boys' analysis marked out also five factors, which explain 62,861% of dispersion's variations.

First factor (informative potential 22.562%) has the highest correlation with results of tests № 11 (-0.828), № 5 (0.732), № 12 (-0.713). The factor characterizes strength and coordination.

Second factor (informative potential 12.361%) has the highest correlation with results of tests № 8 (0.679), № 7 (0.672), № 15 (-0.606). The factor characterizes complex development of dexterity.

Third factor (informative potential 9.947%) has the highest correlation with results of tests № 1 (0.846), № 3 (0.754). The factor was named motor coordination.

Forth factor (informative potential 8.3%) has the highest correlation with results of tests № 14 (-0.656), тест № 2 (0.640). The factor was named motor coordination.

Fifth factor (informative potential 8.3%) has the highest correlation with results of test № 4 (0.775) and characterizes vestibular stability of 8 years old boys. The factor was motor coordination.

Thus, in factorial model of 8 years old boys' motor fitness strength and coordination are marked out. Analysis of communities (h^2) showed that tests № 1 (0.789), № 3 (0.748), № 11 (0.748), № 13 (0.730), № 9 (0.68) have the highest informative potential for assessment of 8 years boys' motor fitness.

In group of 9 years old boys, analysis marked out also five factors, which explain 64.286% of dispersion's variations.

First factor (informative potential 15.544%) has the highest correlation with results of tests № 3 (-0.702), № 6 (0.692), № 7 (-0.675). The factor characterizes dexterity and motor coordination.

Second factor (informative potential 15.483%) has the highest correlation with results of tests № 8 (0.679), № 7 (0.672), № 15 (-0.606). The factor characterizes complex development of dexterity.

Third factor (informative potential 12.351%) has the highest correlation with results of tests № 14 (0.733), № 11 (-0.689), № 8 (0.596). The factor characterizes flexibility, strength and dexterity.

Forth factor (informative potential 11.735%) has the highest correlation with results of tests № 4 (0.837), № 1 (0.782). The factor was named motor coordination.

Fifth factor (informative potential 9.174%) has the highest correlation with results of test № 13 (0.865) and characterizes flexibility of 9 years old boys. The factor was flexibility.

Thus, in factorial model of 9 years old boys' motor fitness the following are marked out: compels development of motor skills (factors 1, 2, 3), coordination (factor 4), flexibility (factor 5). Analysis of communities (h^2) showed that tests № 8 (0.805), № 13 (0.787), № 1 (0.776), № 6 (0.745), № 4 (0.743) have the highest informative potential for assessment of 9 years boys' motor fitness.

In group of 10 years old boys, analysis marked out also five factors, which explain 71.586% of dispersion's variations.

First factor (informative potential 18.435%) has the highest correlation with results of tests № 2 (0.751), № 7 (-0.700), № 15 (0.693). The factor characterizes dexterity and motor coordination.

Second factor (informative potential 15.355%) has the highest correlation with results of tests № 6 (-0.844), № 9 (0.779), № 5 (0.608). The factor characterizes complex development of dexterity, coordination and flexibility.

Third factor (informative potential 13.413%) has the highest correlation with results of tests № 1 (0.758), № 10 (0.747), № 8 (0.651). The factor characterizes complex development of dexterity, coordination and flexibility.

Forth factor (informative potential 12.519%) has the highest correlation with results of tests № 3 (0.898), № 13 (0.643). The factor was named motor coordination of different body parts.

Fifth factor (informative potential 11.865%) has the highest correlation with results of test № 14 (0.938) and characterizes flexibility of 10 years old boys. The factor was flexibility.

Thus, in factorial model of 9 years old boys' motor fitness the following are marked out: compels development of motor skills (factors 1, 2, 3), motor coordination of different body parts (factor 4), flexibility (factor 5). Analysis of communities (h^2) showed that tests № 14 (0.891), № 8 (0867), № 3 (0.830), № 4 (0.791), № 13 (0.759) have the highest informative potential for assessment of 10 years boys' motor fitness.

Discussion

The received results supplement the data about application of factorial and discriminant analysis for determination of children's and adolescents' motor fitness structure [4, 5, 6, 31, 39, 29, 40,]. Like in the works of Geoffrey D. Broadhead and Gabie E. Church [30], O.M. Khudolii, A.A. Titarenko [23], Khudolii O.M., Iermakov S.S., Ananchenko K.V. [37], Zh.L. Kozina, N. Popova [7] we observed high prognostic significance of factorial analysis in determination of models and informative indicators of junior school age children.

The materials, presented in table, witness that as a result of analysis of motor fitness factorial models there was received information, which is required for taking decisions in physical education monitoring as well as for working out of effective programs for junior schoolchildren's physical training.

So, factorial analysis permitted to determine models of motor fitness and specify informative indicators for pedagogic control in every age group.

Conclusions:

In factorial model of boys' motor fitness the most important are:

- 6 years – complex development of motor skills (factor 1), coordination (factor 2), flexibility (factor 3), dexterity (factors 4, 5);
- 7 years - complex development of motor skills (factor 1), coordination (factor 2), flexibility (factor 3), dexterity (factors 4, 5);
- 8 years – strength and coordination;
- 9 years - complex development of motor skills (factor 1,2,3), coordination (factor 4), flexibility (factor 5);
- 10 years - complex development of motor skills (factor 1,2,3), motor coordination by different body parts (factor 4), flexibility (factor 5);

The most informative tests for assessment of boys' motor fitness are:

6 years old boys:

- № 11 " Chin ups on rope in mixed hanging" (0.968);
- № 14 " Index mark of backbone mobility (bridge)" (0.957);
- № 5 "Shuttle run 4x9 m" (0.912);
- № 13 " Torso bending from sitting position " (0.911);
- № 8 " Seizing of falling Dietrich's stick " (0.911);

7 years old boys:

- № 7 " Frequency of arms' movements (times) " (0.838);
- № 8 " Seizing of falling Dietrich's stick (cm)" (0.776);
- № 5 "Shuttle run 4x9 m" (0.729);
- № 3 " Exercises for combining of arms' torso's and legs' movements (points)" (0.703);
- № 6 " 30 meters' run (sec.)" (0.703);

8 years old boys:

- № 1 " Static posture on one foot (sec.) " (0.789);
- № 3 " Exercises for combining of arms' torso's and legs' movements (points)" (0.748);
- № 11 " Chin ups on rope in mixed hanging" (0.748);
- № 13 " Torso bending from sitting position " (0.730);
- № 9 "Long jump from the spot" (0.680);

9 years old boys:

№ 8 " Seizing of falling Dietrich's stick (cm)" (0.805);

- № 13 " Torso bending from sitting position" (0.787);
- № 1 " Static posture on one foot (sec.) " (0.776);
- № 6 "30 meters' run" (0.745);
- № 4 " Walk on straight line after 5 rotations, deviations" (0.743);

10 years old boys:

- № 14 " Index mark of shoulder joints' mobility " (0,891);
- № 8 " Seizing of falling Dietrich's stick " (0.867);
- № 3 " Exercises for combining of arms' torso's and legs' movements " (0.830);
- № 4 " Walk on straight line after 5 rotations, deviations" (0.791);
- № 13 " Torso bending from sitting position" (0.759).

The prospects of further researches imply determination of structural model of in-group dynamic of 6-10 years old girls' motor fitness.

Conflict of interests

The authors declare that there is no conflict of interests.

References:

1. Ashmarin BA. *Methodic of pedagogic researches in physical education*. Leningrad; 1978. (in Russian)
2. Baltsevych VK. *Onto kinesiology of a man. Moscow*, Theory and practice of physical culture; 2000. (in Russian)
3. Ivashchenko OV. *Normativnye pokazateli trenirovochnykh nagruzok na nachal'nom etape podgotovki iunykh gimnastok 6—8 let. Cand. Diss*. [Normative indicators of training loads at initial stage of junior, 6-8 yrs., girl-gymnasts], Moscow; 1988. (in Russian)
4. Ivashchenko OV, Pelepenko OV. Osoblivosti rozvitku rukhovikh zdibnostej u divchat serednikh klasiv [Specific features of secondary school girls' motor skills' training]. *Teoriia ta metodika fizichnogo vikhovannia,* 2011;10:3-9. http://dx.doi.org/10.17309/tmfv.2011.10.743
5. Ivashchenko OV, Dudnik ZM. Vikovi osoblivosti rozvitku rukhovikh zdibnostej divchat starshikh klasiv [Age specificities of senior school girls' motor skills' training]. *Teoriia ta metodika fizichnogo vikhovannia,* 2011;8:3-5. http://dx.doi.org/10.17309/tmfv.2011.8.727
6. Ivashchenko OV. Osoblivosti funkcional'noi, koordinacijnoi j silovoi pidgotovlenosti iunakiv 9-11 klasiv [Specific features of functional, coordination and power fitness of 9-11 forms' boys]. *Teoriia ta metodika fizichnogo vikhovannia,* 2014;1:24-33. - http://dx.doi.org/10.17309/tmfv.2014.1.1042
7. Kozina ZhL, Popova N. Faktorna struktura zagal'noi fizichnoi pidgotovlenosti divchatok 11-15 rokiv [Factorial structure of general physical fitness of 11-15 years old girls]. *Teoriia ta metodika fizichnogo vikhovannia,* 2013;4:48-52. http://dx.doi.org/10.17309/tmfv.2013.4.1036
8. Krutsevych TYu. *Scientific researches in mass physical culture*. Kiev: Health: 1985. (in Russian)
9. Krutsevych TYu, Bezverkhnya GV. *Recreation in physical education of different population groups*. Kiev, Olympic Literature; 2010. (in Ukrainian)
10. Liakh VI. *Dvigatel'nye sposobnosti* [Motor abilities]. Fizicheskaia kul'tura v shkole 1996;2:C. 2–6. (in Russian)
11. Sergiienko LP. *Testing of school children's motor skills*. Kiev: Olympic Literature; 2001.(in Ukrainian)
12. Filin VP, Rovnij AS. *Methods of research in sports*, Kharkov: Basis; 1992. (in Russian)
13. Khudolii OM, Ivashchenko OV. *Modeliuvannia procesu navchannia ta rozvitku rukhovikh zdibnostej u ditej i pidlitkiv* [Simulation of training process and development of children's and adolescents' motor skills], Kharkov: OVS, 2014. (in Ukrainian)
14. Khudolii OM, Ivashchenko OV. *Osnovi naukovo-doslidnoi roboti u fizichnomu vikhovanni i sporti* [Principles of scientific research work in physical education and sports], Kharkov: OVS, 2014. (in Ukrainian)
15. Khudolii OM, Ivashchenko OV. *Teoriia ta metodika vikladannia gimnastiki* [Theory and methodic of gymnastic's training], Kharkov: OVS, 2014. (in Ukrainian)
16. Khudolii OM, Iermakov SS. Regularities of the learning process of young gymnasts. *Teoria ta metodika fizicnogo vihovanna,* 2011;5:3-18. http://dx.doi.org/10.17309/tmfv.2011.5.707 (in Ukrainian)
17. Khudolii OM, Ivashchenko OV. Informacijne zabezpechennia procesu navchannia i rozvitku rukhovikh zdibnostej ditej i pidlitkiv (na prikladi sportivnoi gimnastiki) [Informational provisioning of training process and development of children's and adolescents, motor skills (on example of calisthenics)]. *Teoriia ta metodika fizichnogo vikhovannia* 2013;4:3–18. http://dx.doi.org/10.17309/tmfv.2013.4.1031 (in Ukrainian)
18. Khudolii OM, Shlemin AM. *Methods of preparing young gymnasts*. Kharkov, KHPY, HHPY; 1988. (in Russian)
19. Khudolij OM. Metodika planuvannia navchal'noi roboti z gimnastiki v shkoli [Methodic of planning of gymnastic training work in school]. *Teoriia ta metodika fizichnogo vikhovannia* 2008;9:19-35. http://dx.doi.org/10.17309/tmfv.2008.9.454 (in Ukrainian)
20. Khudolii OM. Tekhnologiia navchannia gimnastichnim vpravam. Dopovid' 1 [Technology of gymnastic exercises' training. Report 1]. *Teoriia ta metodika fizichnogo vikhovannia* 2009;8:19—34. http://dx.doi.org/10.17309/tmfv.2009.9.562 (in Ukrainian)
21. Khudolii OM, Ivashchenko OV. Pedagogichna praktika v shkoli [Teaching practice at school]. *Teoriia ta metodika fizichnogo vikhovannia,* 2011;9:19-32. http://dx.doi.org/10.17309/tmfv.2011.9.740
22. Khudolii OM, Ivashchenko OV, Karpunec' TV. Robocha programa z pedagogichnoi praktiki v shkoli [Working program of pedagogic practice in school]. *Teoriia ta metodika fizichnogo vikhovannia,* 2012;9:19-31. http://dx.doi.org/10.17309/tmfv.2012.9.821
23. Khudolii OM, Titarenko AA. Osoblivosti rozvitku rukhovikh zdibnostej u khlopchikiv molodshogo shkil'nogo viku [Peculiarities of motor abilities' development in junior school age boys]. *Teoriia ta metodika fizichnogo vikhovannia,* 2010 *8*,3-12. http://dx.doi.org/10.17309/tmfv.2010.8.644 (in Ukrainian)
24. Khudolii OM, Ivashchenko OV, Chernenko SO. Chinniki, shcho vplivaiut' na efektivnist' navchannia fizichnim vpravam khlopchikiv molodshikh klasiv [Factors, influencing on effectiveness of physical exercises' training of junior form boys]. *Teoriia ta metodika fizichnogo vikhovannia* 2013;1:21—26. http://dx.doi.org/10.17309/tmfv.2013.1.1006(in Ukrainian)
25. Adashevskiy VM, Iermakov SS, Firsova IuIu. Physical mathematical modelling of difficult elements of acrobatic rockand-roll. *Physical Education of Students*. 2013;3:3-10. http://dx.doi.org/10.6084/m9.figshare.662463

26. Cieślicka M, Napierała M. The somatic build of lightweight rowers. *Medical and Biological Sciences*, 2009;23(3): 33 – 38.
27. Cieslicka Mirosława, Słowiński Mariusz. Training loads of female canoeing youth national team in sprint competitions. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2012;12;149-157.
28. Coskun Ali & Sahin Gulsah. Two different strength training and untrained period effects in children. *Journal of Physical Education and Sport,* 2014;14(1):42 – 46
29. Dorita du Toit, Anita E Pienaar, Leani Truter. Relationship between physical fitness and academic performance in South African children. *South African Journal for Research in Sport, Physical Education & Recreation*, 2011;33(3):23-35.
30. Geoffrey D Broadhead, Gabie E Church. Discriminant analysis of gross and fine motor proficiency data. *Perceptual and Motor Skills*, 1982;55:547-552. http://dx.doi.org/10.2466/pms.1982.55.2.547
31. Gert-Jan de Bruijn, Benjamin Gardner. Active Commuting and Habit Strength: An Interactive and Discriminant Analyses Approach. *American Journal of Health Promotion*, 2011;25(3):27-36. http://dx.doi.org/10.4278/ajhp.090521-QUAN-170
32. Gulbin JP, Croser MJ, Morley EJ, Weissensteiner JR. An integrated framework for the optimization of sport and athlete development: A practitioner approach. *Journal of Sports Sciences*, 2013;31(12):1319–1331. http://dx.doi.org/10.1080/02640414.2013.781661
33. Ivashchenko OV, Khudolii OM, Yermakova TS, Pilewska W, Muszkieta R, Stankiewicz B. Simulation as method of classification of 7-9th form boy pupils' motor fitness. *Journal of Physical Education and Sport,* 2015;15(1):142–147. http://dx.doi.org/10.7752/jpes.2015.01023
34. Ivashchenko OV, Yermakova TS, Cieslicka M, Zukowska H. Discriminant analysis in classification of motor fitness of 9-11 forms' juniors. *Journal of Physical Education and Sport*. 2015. *15(2),*238–244. http://dx.doi.org/10.7752/jpes.2015.02037
35. Ivashchenko OV, Yermakova TS, Cieślicka M, Muszkieta R. Discriminant analysis as method of pedagogic control of 9-11 forms girls' functional and motor fitness. *Journal of Physical Education and Sport*. 2015;15(3):576 – 581. http://dx.doi.org/10.7752/jpes. 2015.03086
36. Khudolii OM, Iermakov SS, Prusik K. Classification of motor fitness of 7-9 years old boys. *Journal of Physical Education and Sport,* 2015;*15(2*:245-253. http://dx.doi.org/10.7752/jpes.2015.02038
37. Khudolii OM, Iermakov SS, Ananchenko KV. Factorial model of motor fitness of junior forms' boys. *Journal of Physical Education and Sport*. 2015;15(3):585 - 591. http://dx.doi.org/10.7752/jpes.2015.03088
38. Logan SW, Robinson LE, Rudisill ME, Wadsworth DD, Morera M. The comparison of school-age children's performance on two motor assessments: the Test of Gross Motor Development and the Movement Assessment Battery for Children. *Physical Education and Sport Pedagogy*, 2014;19(1):48–59. http://dx.doi.org/10.1080/17408989.2012.726979
39. Lulzim I. Discriminant analysis of morphologic and motor parameters of athlete and non athlete girl pupils of primary school on age 14 to 15 years. *Research in kinesiology*, 2012;40(2):185-190.
40. Milić M, Milavić B, Grgantov Z. Relations between sport involvement, selfesteem, sport motivation and types of computer usage in adolescents. *Proceedings of 3rd International Scientific Congress. Anthropological Aspects of Sport, Physical Education and Recreation*. Banja Luka, University of Banja Luka; 2011. p. 34-40.
41. Mrozkowiak Mirosław, Posłuszny Mariusz, Żukowska Hanna, Iermakov Sergii, Szark-Eckardt Mirosława. The correlations among the complex of spine-pelvis traits and the feet traits in boys aged 4 to 6 years. *Pedagogics, psychology, medical-biological problems of physical training and sports,* 2014;8:46-50. http://dx.doi.org/10.6084/m9.figshare.1022955
42. Paczuski R., Cieślicka M. The moderate physical exercise significantly increases von Willebrand's factor's activity and concentration in the blood. *Polish Annals of Medicine*, 2013;20(2):100-105.
43. Pedersen S. Deliberate laterality practice facilitates sensory-motor processing in developing children. *Physical Education and Sport Pedagogy*, 2014;19(2):136–148. http://dx.doi.org/10.1080/17408989.2012.726983
44. Piccinno Andrea & Colella Dario. Physical fitness level in Italian high-school adolescents: a cross-sectional study. *Journal of Physical Education and Sport*, 2014;14(3):431-437
45. Sigal NS, Tregub VV, Kizym PN, Kochina NV. Prospecting of psychological compatibility of sports dancing pairs on personality features by means of linear discriminative functions. *Pedagogics, psychology, medical-biological problems of physical training and sports,* 2009;7:166-169. (in Russian)
46. Stankiewicz B, Cieslicka M, Kortas J, Iermakov S. Long-distance running as a social phenomenon. *Physical Education of Students*, 2012;4:140–149.
47. Vink K, Raudsepp L, Kais K. Intrinsic motivation and individual deliberate practice are reciprocally related: Evidence from a longitudinal study of adolescent team sport athletes. *Psychology of Sport and Exercise*, 2015;16:1–6. http://dx.doi.org/10.1016/j.psychsport.2014.08.012

48. Yermakova TS. Individualization of forming health culture in schoolchildren of Polish schools. *Pedagogics, psychology, medical-biological problems of physical training and sports,* 2015;1:29-33. http://dx.doi.org/10.15561/18189172.2014.1206

Information about the author:

Ivashchenko O.V.; http://orcid.org/0000-0002-2708-5636; tmfv@tmfv.com.ua; H.S. Skovoroda Kharkiv National Pedagogical University; Artema str. 29, Kharkov, 61002, Ukraine.

Yermakova T.S.; http://orcid.org/0000-0002-3081-0229; yermakova2015@gmail.com; H.S. Skovoroda Kharkiv National Pedagogical University; Artema str. 29, Kharkov, 61002, Ukraine.

Cite this article as: Ivashchenko O.V., Yermakova T.S. Structural model of in-group dynamic of 6-10 years old boys' motor fitness. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015;10:24-32. http://dx.doi.org/10.15561/18189172.2015.1004

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 18.07.2015
Accepted: 19.08.2015; Published: 20.08.2015