

FACTOR STRUCTURE OF THE INTEGRATED TRAINING OF ELITE ATHLETES - REPRESENTATIVES OF MOUNTAIN SPORTS

Kozina Zh.L.¹, Ryepko O.A.¹, Prusik Kr.², Cieślicka M.³
Kharkov National Pedagogical University¹
Academy of Physical Education and Sports in Gdansk, Poland²
Kazimierz Wielki University in Bydgoszcz, Poland³

Annotation. The purpose of this study was to identify the characteristics of the factor structure of the readiness of mountaineers and climbers of different specializations. The study involved 26 athletes, among them - 10 masters of sports of international class (speed climbing), 10 masters of sports of international class (climbing difficulty) and 6 world-class climbers. The age of the athletes was 19-22 years. Identified 10 factors in the overall readiness of the surveyed athletes. It is shown that the most prominent climbers factors are adaptive capacity of the cardiovascular system, special endurance. Do climbers (climbing difficulty) - relative strength, stability, reaction speed, arm strength and the press. Do climbers (climbing speed) - spigot size hand, the mobility of the nervous system, the reaction rate. Shows the complexity of the manifestations of power-speed in relation to the performance of morphological and functional characteristics and capabilities of psychophysiological representatives of mountain sports. Found that the development of the power-speed positive effect on the improvement of psycho-physiological regulation of the body. The obtained data on the characteristics of the severity of different factors in representatives of different types of rock climbing and mountaineering can be used to predict future specialization novice climbers.

Keywords: rock climbing, mountain climbing, speed, strength, endurance, factor structure, psychophysiology, response of the nervous system, complexity, selection.

Introduction

Rock climbing is a kind of sports, involving basic human skills, i.e. the skills, which were already intrinsic of primitive men, determining their abilities to survive [6]. Basic skills are: run, jumps, throwing objects, blowing movements and climbing. Just climbing is the most ancient skill, intrinsic property of primates. At present, there have been found the facts, which witness, that climbing had played significant role in human phylogeny and continues to be important in human ontogeny. There are some scientific facts [6], which witness that ability to move in vertical plane facilitated development of primates' hands, thinking, owing to necessity to solve a lot of tasks of space orientation at a certain unit of time, activation of thinking's creative aspect and coordination of right and left sides of brain. Crawling is one of in-born reflexes of a newly born infant, alongside with prehensile movements and other (<http://ru.wikipedia.org/>). Besides, in the process of crawling all muscles work, that is why this stage of ontogeny is very important for development of muscular system. It was determined that crawling strengthens all systems of organism; crawling children have better immune system. In the process of crawling one more important process takes place: link between right and left sides of brain is adjusted. Those children, who started to crawl earlier, very often both sides of brain are well developed and nearly equally active.

Glenn Doman considers crawling to be the so-called basis of civilization (<http://www.polzi.com.ua.html>). Scientists of Britain university in York are of the same opinion (<http://allxtreme.ru/newsextreme>). Rocky landscape of Eastern and South Africa made our ancestors to rise on back limbs. Anthropological researches show that upright movement may be appeared on the earth as a response to specificities of relief. The same conclusions were made by N.N. Iordanskiy [6]. Analyzing human development this author points that men relates to order of primates and evolutionary history of human being is a part of this group's phylogeny. The most important abilities of primates are connected with development of devices for tree climbing. First of all it is improvement of prehensile ability of limbs (ability to rotate hand and forearm around longitudinal axis, pronation and supination, i.e. rotation of hand upward-downward) and development of opposed position of thumb in respect to other fingers, that make prehensile movements easier. These reflexes increased significantly total manipulating ability of limbs. i.e. ability to act with an object in hand.

Tree climbing requires high level of touch sense – for feeling surface of support. In this connection, on end phalanges of fingers there appeared fleshy finger tips, covered with skin, rich with touch sense cells and nerves' ends. But the most important role in climbing belongs to eyes, as far as jumps from branch to branch require stereoscopic eyesight with precise evaluation of distance and reliability of support. Extremely important changes, connected with adaptation to climbing took place in central nervous system. Movement from branch to branch is one of the most difficult means of locomotion, which requires precise determination of distance and quality of supports as well as appropriate correction of own movement. On trees every step or jump is a "separate creative act". With improvement of all mentioned functions, natural selection facilitated progressing of brain, especially cerebral cortex and cerebellum [6].

It is interesting that children like to climb on different vertical structures (bookcases, roofs and so on) and natural objects (trees, stones, etc). In this connection it should be noted that rock climbing is a kind of activity, which facilitates activation of basic skills and in-born reflexes, which played so important role in human ontogeny. Person

wants to activate basic skills in periods, when it is necessary to activate creative potential, to achieve some qualitatively new goals in life. In this connection rock climbing is useful for students, who often strive not only for stimulation of basic skills but also for extreme [4, 5, 7, 20, 21]. That is why, popularity of rock climbing, as well as mountaineering, is increasing and at present, development of sport rock climbing implies creation of theoretical methodic principles of training process's building. These problems are now only in the process of researching [1, 2, 3, 13, 14, 15, 18], and one of them is peculiarities of speed-power training for rock-climbing that implies determination of factorial structure of sportsmen's preparedness; sportsmen, who specialize in different kinds of rock climbing and mountaineering.

The research has been fulfilled as per topic of Ministry of education and science, youth and sports of Ukraine for 2011-2016, 91 "Theoretical-methodic principles of individualization in physical education and sports". State registration No. 0112U002001 and as per state financed topic 3-13 of Ministry of education and science, youth and sports of Ukraine for 2013-2014 "Theoretical-methodic principles of application of information, pedagogic and medical-biological technologies for formation of healthy life-style". State registration No. 0113U002003.

Purpose, tasks of the work, material and methods

The purpose of the work is determination of factorial structure of preparedness of mountain kinds of sports' representatives; carrying out of comparative analysis of factorial structure of mountaineers' preparedness and representatives of different rock-climbing kinds.

The methods of the research: theoretical analysis and generalization of literature sources, anthropometric methods (determination of body height, body mass, lengths and masses of body segments, girths of body segments), physiological methods (registration of heart beat frequency, (HBF), ortho-static test, Harvard step-test), pedagogical testing, including standard tests, used in rock climbing for registration of speed power level, psycho-physiological methods (speed of simple and complex response to light in different modes of testing, determination of strength and mobility of nervous system) [7, 8, 11, 12, 16, 17, 19], mathematical-statistic methods with using of correlation factor analysis and comparing of samples with the help of computer mathematical-statistic programs «EXCEL», «SPSS».

The research covered 26 sportsmen; from them – 10 international masters of sports, specializing in speed rock climbing. 10 international masters of sports, specializing in complex rock climbing and 6 mountaineers of international class. Age of sportsmen was 10-22 years old.

Results of the research

Profound study of rock climbing opportunities, as a mean of speed-power training, implies determination of links between indicators of speed-power qualities and indicators, which reflect functional state of nervous system. With this aim we carried out complex examination of elite sportsmen- representatives of different kinds of rock climbing and mountaineering.

For revelation of concealed links between indicators of speed-power preparedness, morpho-functional qualities and psycho-physiological abilities of sportsmen – representatives of kind of sports, implying movement on vertical support in natural conditions, in particular, different kinds of rock climbing and mountaineering, we carried out factor analysis with method of main components of complex testing's indicators [9, 10, 19].

Factor analysis included indicators of anthropometric data, ortho-static test, special physical skills and psycho-physiological abilities of sportsmen. In total 42 indicators were included in factor analysis. According to requirements to factor analysis procedure we included indicators, relating to one test and correlating between each other, as per procedure of testing (e.g. mean square deviation and variation coefficient in indicators of response speed; mean square deviation is excluded). With analysis of factorial loads we used confident correlation coefficients of every indicators with separate factor with $p < 0.05$. Thus, as a result of mathematical processing of 42 indicators of sportsmen's complex testing we determined structure of complex readiness of top rock climbers and mountaineers; we analyzed indicators of individual factorial structure of preparedness and composed models of factorial structure of different rock-climbing and mountaineering representatives.

The applied by us indicators of complex testing, total quantity of them was 42 tests, point at multi-factor and multi-vector character of analysis of morpho-functional peculiarities' structure, of speed power preparedness and psycho-physiological abilities of rock climbers and mountaineers.

In factorial structure of sportsmen's – representatives of rock climbing and mountaineering- preparedness, the first factor, which was 14.81% from total dispersion, included the following indicators: "length of forearm" ($r=0,95$), "length of fingers" ($r=0,93$), "distance between stretched aside hands" ($r=0,88$), "height" ($r=0,77$), "length of shoulder" ($r=0,74$), "length of hand" ($r=0,70$), "mass of body" ($r=0,625$), "mistakes in test "response in chosing one signal from three", "jumping from sitting position 15 times" ($r=0,57$) (see tables 3.6).

According to indicators with the highest correlation coefficients, which were included in first factor, it was named "Length of body segments, height" (see fog.1).

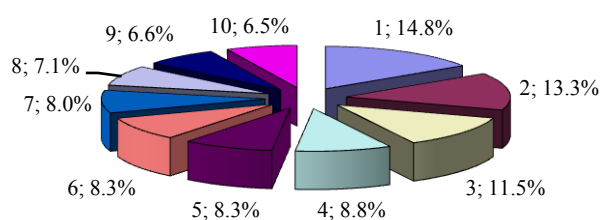


Fig.1. Factorial structure of complex preparedness of elite sportsmen, specializing in speed climbing ($n=10$), complex climbing ($n=10$) and mountaineering ($n=6$):

- 1 – length of body segments, height;
- 2 – adaptation abilities of cardio-vascular system, special endurance;
- 4 – girths of arms, mobility of nervous system;
- 5 – relative strength, stability of response speed;
- 6 – strength of fingers, psychic stability;
- 7 – response speed;
- 8 – sense of time;
- 9 – strength of arms and abdomen muscles;
- 10 – concentration of attention, strength of back muscles.

The second factor, which was 13.33% from total dispersion, included the following indicators: “high jump” ($r=-0,94$), “chin ups – 15 times” ($r=0,86$), “HBF in standing position” ($r=-0,82$), “latent period of response in test “level of functional mobility of nervous processes”, in feedback mode” ($r=0,81$), “HBF in lying position” ($r=-0,74$). This factor included indicator of high jump with negative correlation coefficient and HBF indicators in ortho-test, also with negative correlation coefficient. Decreasing of HBF indicators in ortho-test witnesses about increasing of adaptation abilities of cardio-vascular system, which is in reverse connection with indicator of explosive strength (high jump test). Such interconnection is quite logical, as far as explosive strength and functional abilities of cardio-vascular system are conditioned by different energy supply systems. According to indicators, which were included in second factor, we named it: “Adaptation abilities of cardio-vascular system, special endurance” (see fig.1).

Third factor, which was 11.51% from total dispersion, included the following indicators: «mistakes on the 2nd stage of test “level of functional mobility of nervous processes”, in the mode of forced rhythm” ($r=-0,91$), «mistakes on the 1st stage of test “level of functional mobility of nervous processes”, in the mode of forced rhythm” ($r=-0,88$), «mistakes on the 4th stage of test “level of functional mobility of nervous processes”, in the mode of forced rhythm” ($r=-0,85$), «mistakes on the 3rd stage of test “level of functional mobility of nervous processes”, in the mode of forced rhythm” ($r=-0,82$), “minimal time of signal exposure in test “level of functional mobility of nervous processes” in feedback mode” ($r=-0,68$), time of fulfillment of test “level of functional mobility of nervous processes” in feedback mode” ($r=-0,57$).

For characterizing of this factor we took as a key indicators, indicator of mistakes during fulfillment of psycho-physiological tests, as far as this indicator characterizes strength of nervous system, which creates negative interconnection with this factor. That is why, in compliance with indicators, included in this factor, it was named “Strength of nervous system” (see fig.1).

The fourth factor, which was 8.88% from total dispersion, the following indicators were included: “girth of shoulder” ($r=0,86$), “width of hand” ($r=0,79$), Time of reaching minimal exposure in test “level of functional mobility of nervous processes” in feedback mode” ($r=-0,73$). The fourth factor was named “Girths of arms, mobility of nervous system” because time of reaching minimal exposure with negative interconnection with this factor reflects functional mobility of nervous system.

The fifth factor (8.37%) included indicators “latent period of response in test “strength of nervous processes” ($r=-0,86$), “raising body up to belt” ($r=0,77$), “latent period of response in choosing one signal from three” ($r=-0,59$). In the name of this factor we accentuated indicators of relative arms strength, as far as it creates with this factor high correlation coefficient; that is why the fifth factor was named “Relative strength, stability of response speed”.

The sixth factor (8.37%) included indicators: “hanging in hold of 1 cm depth” ($r=0,91$), “mistakes on 5th stage of test “level of functional mobility of nervous processes” in mode of forced rhythm” ($r=-0,58$). In compliance with the included indicators this factor was named “Strength of fingers, psychic stability”.

The seventh factor (8.06%) included the following indicators: “latent period of response of choosing two signal from three” ($r=-0,95$), latent period of response in test “level of functional mobility of nervous processes” in mode of forced rhythm” ($r=-0,64$), “latent period of simple visual response” ($r=-0,64$), “girth of thigh” ($r=0,58$). This factor included indicators, which characterize values of response speed and thigh’s girth. Indicators of response speed

characterize speed of impulse in CNS and thigh girth indirectly reflects muscles' development that, in its turn, reflects level of speed-power preparedness. The name of this factor stresses indicators of response speed, because they create the highest coefficients of interconnection with this factor. That is why the fifth factor was named "Response speed".

The eighth factor (7.15%) included indicators "reproduction of 30 seconds time interval" ($r=0,94$), "reproduction of 1 minute time interval" ($r=0,78$); The eighth factor was named "Sense of time".

The ninth factor (6.69%) included such indicators as: "forearm girth" ($r=0,74$), "rising legs to chest in hanging position 20 times" ($r=0,71$), "difference between HBF in standing and lying positions" ($r=0,70$). The ninth factor was named "strength of arms and abdomen muscles" because the highest interconnection coefficients with this factor were created by indicators of arms girth and strength of abdomen muscles.

The tenth factor (6.57%) included indicators "mistakes in test "strength of nervous processes" ($r=-0,83$), "mistakes in test "simple visual-motor response" ($r=-0,61$), "width of back" ($r=0,58$). This factor was named "Concentration of attention, strength of back muscles".

Further we determined individual factorial values for every sportsmen, expressed in percents from maximal indicators and composes averaged factorial models of preparedness for speed rock climbers, complex rock climbers and mountaineers (see fig.1).

We determined that first factor "Length of body segments, height" is more expressed in respect to maximal for the given sample values among mountaineers (65.0%). Among speed rock climbers expressiveness of this factor was 44.33%, and at complex rock climbers - 48.34% (fig. 2).

Second factor "Adaptation abilities of cardio-vascular system, special endurance", in respect to maximal for the given sample values, is expressed at the highest level among mountaineers (89.44 %). Representatives of other researched groups show lower expressiveness of this factor: speed rock climbers - 21.67 %, complex rock climbers - 62.78 % (see fig. 2).

Third factor "Strength of nervous system" in respect to maximal for the given sample values, is expressed at the highest level among complex rock climbers: mean value of individual expressiveness of this factor is 60.56%. Speed rock climbers and mountaineers showed lower expressiveness of this factor in comparison with complex rock climbers (42.78% - speed rock climbers and 51.67% - mountaineers).

The highest expressiveness of the fourth factor "Arms girths, mobility of nervous system" in respect to maximal for the given sample values, belongs to speed rock climbers (53.89%) and mountaineers (56.11%), complex rock climbers have expressiveness of this factor 47.22% (see fig. 2).

Fifth factor «Relative strength, stability of response speed" in respect to maximal for the given sample values, belongs at the highest level to complex rock climbers (75.0%). Speed rock climbers and mountaineers have expressiveness of the fifth factor accordingly 39.45% and 29.44% (see fig.2).

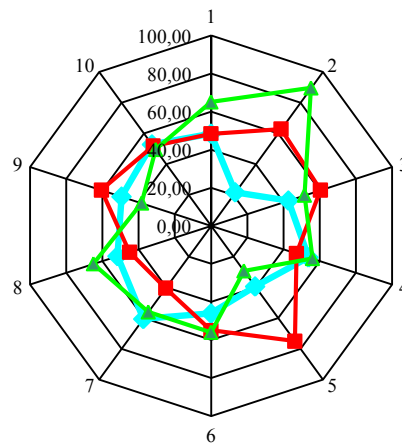


Fig. 2. Expressiveness of factors of complex elite sportsmen's preparedness, who specialize in speed rock climbing ($n=10$), complex rock climbing ($n=10$) and mountaineering ($n=6$), % maximal for the given sample values

- 1 – length of body segments, height;
- 2 – adaptation abilities of cardio-vascular system, special endurance;
- 4 – girths of arms, mobility of nervous system;
- 5 – relative strength, stability of response speed;
- 6 – strength of fingers, psychic stability;
- 7 – response speed;
- 8 – sense of time;
- 9 – strength of arms and abdomen muscles;
- 10 – concentration of attention, strength of back muscles.

◆ speed rock climbing ■ complex rock climbing ▲ mountaineers

Complex rock climbers have maximally expressed sixth factor “Strength of fingers, psychic stability” in respect to maximal for the given sample values; its average value is 55.0% as well as mountaineers – 56.11%; speed rock climbers have value 46.11% (see fig.2).

Speed rock climbers have maximal value of expressiveness of seventh factor «Speed of response” in respect to maximal for the given sample values, (60.56%). Complex rock climbers have value of expressiveness 40.56% and mountaineers – 56.11% (see fig.2).

Eighth factor “Sense of time” is expressed, in respect to maximal for the given sample values, approximately equally in all studied groups: mountaineers – 65.0%, speed rock climbers – 51.67%, complex rock climbers – 45.0% (see fig. 2).

Ninth factor “Strength of arms and abdomen muscles” is maximally expressed, in respect to maximal for the given sample values, in group of complex rock climbers (60.56%), expressiveness of this factor in speed rock climbers’ group is 49.45%, in group of mountaineers – 38.33% (see fig.2).

Tenth factor “Concentration of attention, strength of back muscles” is maximally expressed, in respect to maximal for the given sample values, in speed rock climbers’ group (52.78%), in group of complex rock climbers this factor is expressed by 51.67%, and in mountaineers’ group – by 49.44% (see fig.2).

Thus, in mountaineers’ group the most expressed factor is “Adaptation abilities of cardio-vascular system, special endurance”, in group of complex rock climbers two factors are maximally expressed: “Relative strength, stability of response speed” and “Strength of arms and abdomen muscles”, in group of speed rock climbers – “Girths of arms, mobility of nervous system” and “Speed of response”.

The obtained data reflect, on the one hand, complex character of manifestation of speed-power qualities in interconnection with indicators of morpho-functional peculiarities and psycho-physiological abilities. Accordingly, development of speed-power qualities will positively influence on perfection of psycho-physiological regulation of organism’s functioning.

The obtained data about specificities of different factors’ expressiveness in groups of different rock climbing kinds and mountaineers can be used for predicting of future specialization of beginning rock climbers.

Conclusions:

1. We have determined 10 factors in general structure of preparedness of examined sportsmen. We found that for mountaineers the most expressed is factor “Adaptation of cardio-vascular system, special endurance”; for complex rock climbers two factors: “Relative strength, stability of response speed” and “Strength of arms and abdomen muscles” are the most expressed, for speed rock climbers the most expressed factors are “Girths of arms, mobility of nervous system” and “Speed of response”.

2. It has been found that manifestation of speed power qualities has complex character in interconnection with morpho-functional peculiarities’ indicators and psycho-physiological abilities of representatives of mountain kinds of sports. Development of speed-power qualities influences positively on perfection of psycho-physiological regulation of organism’s functioning.

3. The obtained data about specificities of different factors’ expressiveness in groups of different rock climbing kinds and mountaineers can be used for predicting of future specialization of beginning rock climbers.

The prospects of further researches imply development of theoretical methodic principles of training process’s building in rock climbing on different stage and experimental testing of rock climbers’ training programs.

References:

- 1 Bajkovskij Iu.V. O koncepcii klassifikacii vidov sporta i vidov deiatel'nosti po stepeni ekstremal'nosti [On the concept of classification of sports and activities on the degree of extreme]. *Ekstremal'naia deiatel'nost' cheloveka, problemy i perspektivy podgotovki specialistov* [Extreme human activities, problems and prospects of training], Moscow, 2007, pp. 7-13.
- 2 Bajkovskij Iu.V. Bleer A.N. *Fizicheskaia kul'tura: vospitanie, obrazovanie, trenirovka* [Physical culture: education, education and training], 2011, vol.3, pp. 76-79.
- 3 Dvoenosov V.G. *Teoriia i praktika fizicheskoi kul'tury* [Theory and practice of physical culture], 2009, vol.7, pp. 87-91.
- 4 Korobejnikov G.V., Dudnik O.K., Koniaieva L.D. *Diagnostika psikhofiziologicheskikh staniv sportmeniv* [Diagnostics of psychophysiological state athletes], Kiev, 2008, 64 p.
- 5 Iermakov S.S. *Fiziceskoe vospitanie studentov tvorcheskikh special'nostej* [Physical Education of the Students of Creative Profession], 2004, vol.3, pp. 8-24.
- 6 Il'in E.P. *Psikhologija individual'nykh razlichij* [Psychology of individual differences], Sankt Petersburg, Peter, 2004, 701 p.
- 7 Iordanskij N.N. *Evolucija zhizni* [Evolution of life], Moscow, Academy, 2001, 425 p.
- 8 Baribina L.M., Kozina Zh.L., Tikhenko V., Tolstobrov A. *Pedagogika, psihologija ta mediko-biologichni problemi fizicnogo viovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2009, vol.3, pp. 14-19.
- 9 Kozina Zh.L., Iermakov S.S., Pogorelova A.O. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2012, vol.3, pp. 53-61.
- 10 Kozina Zh.L., Barybina L.N., Grin' L.V. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2010, vol.5, pp. 30-35.

- 11 Kozina ZH. L., Baribina L.M., Korobejnikov G.V., Mishchenko D. I., Cikunov O. A., Kozin O. V. *Biuletyn'. Derzhavna sluzhba intelektual'noyi vlasnosti Ukrainy* [Bulletin. State Intellectual Property Service of Ukraine], 2002, vol.25, p. 15.
- 12 Korobejnikov G.V., Korobejnikova L.G., Kozina Zh.L. *Ocinka ta korekciia psikhofiziologichnikh staniv u sporti* [Assessment and correction of physiological states in sports], Kharkov, 2012, 390 p.
- 13 Kravchuk T.A. *Teoriia i praktika prikladnykh i ekstremal'nykh vidov sporta* [Theory and practice of applied and extreme sports], 2008, vol.2(14), pp. 21-23.
- 14 Kravchuk T.A., Zhmakina T.N. *Fizkul'turnoe obrazovanie Sibiri* [Physical education Siberia], 2005, vol.1, pp. 50-54.
- 15 Mavliutova S.Z. Bajkovskij Iu. V. *Teoriia i praktika prikladnykh i ekstremal'nykh vidov sporta* [Theory and practice of applied and extreme sports], 2010, vol.2, pp. 53-55.
- 16 Lizogub V.S. *Fiziologichnij zhurnal* [Journal of physiological], 2010, vol.56(1), pp. 148 - 151.
- 17 Makarenko N.V. *Fiziologichnij zhurnal* [Journal of physiological], 1999, vol.45(4), pp. 125–131.
- 18 Sharafutdinov D.R. *Teoriia i praktika fizicheskoy kul'tury* [Theory and practice of physical culture], 2012, vol.5, pp. 35-37.
- 19 Kozina Zh.L., Barybina L.N., Lugina I.V., Kozin A.V. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2012, vol.4, pp. 77-86.
- 20 Burke S.M., Durand-Bush N., Doell K. Exploring feel and motivation with recreational and elite Mount Everest climbers: An ethnographic study. *International Journal of Sport and Exercise Psychology*. 2010, vol.8(4), pp. 373–393. doi:10.1080/1612197X.2010.9671959.
- 21 López-Rivera E., González-Badillo J.J. The effects of two maximum grip strength training methods using the same effort duration and different edge depth on grip endurance in elite climbers. *Sports Technology*. 2012, vol.5(3-4), pp. 100–110. doi:10.1080/19346182.2012.716061.

Information about the authors:

Kozina Z.L.: ORCID: 0000-0001-5588-4825; Zhanneta.kozina@gmail.com; Kharkov National Pedagogical University; Artema str. 29, Kharkov, 61002, Ukraine.

Ryepko O.O.: ORCID: 0000-0001-6879-6015; Zhanneta.kozina@gmail.com; Kharkov National Pedagogical University; Artema str. 29, Kharkov, 61002, Ukraine.

Prusik Kr.: ORCID: 0000-0001-7534-675X; prusik@hot.pl; Academy of Physical Education and Sports; ul. Wiejska 1, 80-336 Gdansk, Poland

Cieślicka M.: ORCID: 0000-0002-0407-2592; rektor@ukw.edu.pl; Kazimierz Wielki University in Bydgoszcz; Chodkiewicza str. 30, 85-064 Bydgoszcz, Poland.

Cite this article as: Kozina Zh., Ryepko O.A., Prusik Kr., Cieślicka M. Factor structure of the integrated training of elite athletes – representatives of mountain sports. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013, vol.11, pp. 45-51. doi:10.6084/m9.figshare.815872

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>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<http://creativecommons.org/licenses/by/3.0/deed.en>).

Received: 28.08.2013
Published: 05.11.2013