

PSYCHOPHYSIOLOGICAL POSSIBILITY OF MOUNTAINEERS AND CLIMBERS SPECIALIZING IN SPEED CLIMBING AND CLIMBING DIFFICULTY

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Annotation. The purpose of this study was comparative characterization of psycho-physiological features of elite athletes - the representatives of the climbing on the complexity, speed and climbers. The study included 26 elite athletes (age 19-22 years). It is shown that athletes much more accurately reproduce a time interval of 30 seconds, compared with a time interval of 1 minute. Revealed that the climbers (climbing speed) and in some cases, climbers (climbing difficulty) show significantly better results on tests of reaction rate under difficult conditions. Found higher rates of mobility and strength of nervous processes in rock climbers compared with climbers. This fact is related to the specific training and competitive activities of climbing, which requires a global concentration or under conditions of maximum circa power voltage.

Keywords: rock climbing, mountain climbing, speed, strength, endurance, psychophysiology, reaction, nervous system, complexity, selection.

Introduction

At present stage of rock-climbing progressing, revelation of psycho-physiological qualities of elite athletes [2, 3, 4, 10], specializing in different kinds of rock-climbing and mountaineers, has become of special importance. These kinds of sports make high demands to nervous system's functioning in connection with need in prompt decisions in non-standard conditions with practically maximal tension of all main muscular groups. It should be noted that just this aspect of rock-climbing distinguishes it from other kinds of sports, also requiring maximal force. For example, weight lifter fulfils standard, already known action and in process of its fulfillment he is concentrated, mainly, on demonstration of maximal force. In rock-climbing, alongside with ability to endure maximal or close to maximal loads, the necessary condition of successful passing of distance is also high level of operative thinking, concentration of attention, space orientation and so on, that require high level of psycho-physiological abilities [3, 10, 11, 12, 15].

In this connection one of tasks of development of rock-climbing theoretical-methodic principles is study of different rock-climbing kinds representatives' psycho-physiological abilities and their comparative characteristics with representatives of other kinds of sports, first of all mountaineering, which gave birth to rock climbing.

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Purpose of the work, material and methods

The purpose of the work – is to provide comparative characteristics of psycho-physiological abilities of mountaineers and representatives of different rock-climbing kinds.

The methods of the research: theoretical analysis and generalization of literature sources, psycho-physiological methods of research (speed of plain and complex responses to light exposure in different testing modes, determination of strength and mobility of nervous system), which were carried out with the help of computer program "Psychodiagnostics" [7, 8, 9], methods of mathematical statistics.

26 sportsmen took part in the research; 10 of them –international masters of sports, specializing in speed rock-climbing, 10 international masters of sports, specializing in complex rock-climbing and 6 mountaineer of international level. Age of sportsmen was 19-22 years old.

Results of the research

Results of psycho-physiological testing did not show any confident differences in tests for reproduction of time intervals of 30 sec. and 1 minute by representatives of different rock-climbing kinds and mountaineering kinds (see fig.1). It should be noted that the tested sportsmen reproduced much more precisely time interval of 30 seconds, comparing with time interval of 1 minute, which was accelerated in their subjective sensing (see fig. 1). May be this fact is also connected with specificity of training and competition activity of this kind of sports representatives.

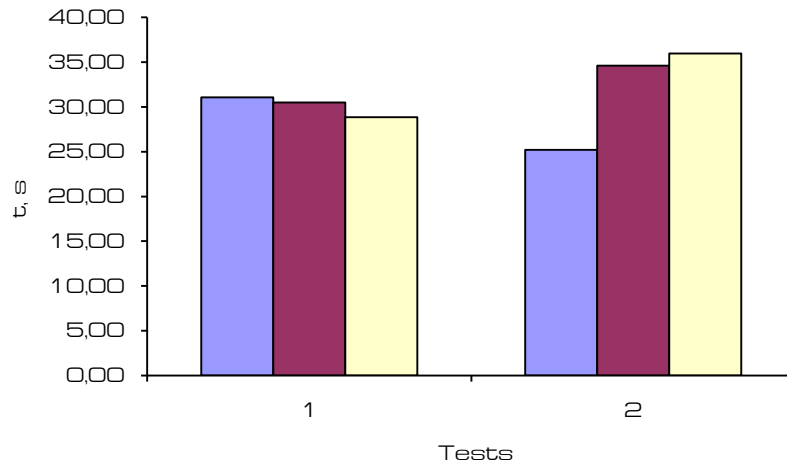


Fig.1. Reproduction of time intervals by elite athletes, specializing in speed climbing ($n=10$), climbing on complexity ($n=10$) and mountaineering ($n=6$):

1 - reproduction of time interval 30 sec, s.

2 - reproduction of time interval of 1 minute, s.

■ - rock climbers (speed climbing); ■ - rock-climbers (climbing on complexity) ■ - mountaineers

Concerning psycho-physiological qualities of representative of different rock-climbing kinds and mountaineers, it should be noted the following: rock-climbers (speed climbing) and in some cases rock-climbers (climbing on complexity) show confidently better results in tests for quickness of response in complex conditions. For example, rock-climbers, specializing in speed climbing and rock climbers, specializing in climbing on complexity has confidently less latent period of response in test “level of functional mobility of nervous processes” in feedback mode in comparison with mountaineers ($p<0.05$). Rock-climbers (speed climbing) have also less latent period of response in test “level of functional mobility of nervous processes” in the mode of forced rhythm in comparison with rock climbers (climbing on complexity) and mountaineers ($p<0.01$, $p<0.001$) latent period of response in test “strength of nervous processes” ($p<0.001$) (Fig. 2).

In general, rock-climbers, both rock-climbers, specializing in speed climbing and those, specializing in climbing on complexity, have higher mobility and strength of nervous processes in comparison with mountaineers. It is witnessed by less quantity of mistakes in tests “response to choice of two signals from three” ($p<0.05$), “level of functional mobility of nervous processes” in feedback mode ($p<0.05$), “level of functional mobility of nervous processes” in the mode of forced rhythm ($p<0.05$) and “strength of nervous processes” ($p<0.001$), that characterize strength of nervous system (see fig.4, 5).

Mobility of nervous system of rock-climbers, especially speed rock-climbers was also higher than of mountaineers. It is witnessed by confidently less value of minimal time of signal exposure in test “level of functional mobility of nervous processes” in feedback mode, comparing with mountaineers ($p<0.05$) (see fig.3).

However, it should be noted that in relatively unchanging conditions quickness of response of mountaineers and rock-climbers on complexity is higher than of speed rock-climbers; it is witnessed by values of latent period of response in selecting one signal from three ($p<0.05$, $p<0.001$) (see fig. 2).

Analyzing the obtained psycho-physiological data of rock-climbers, specializing in different by character passing of distance and mountaineers we can note that rock-climbers have higher indicators of mobility and strength of nervous processes and less indicators of latent period of complex responses in complicated conditions of testing, than mountaineers. Evidently this fact is connected with specificity of training and competition activity of rock-climbers, which require total concentration in conditions of maximal or close to maximal force efforts.

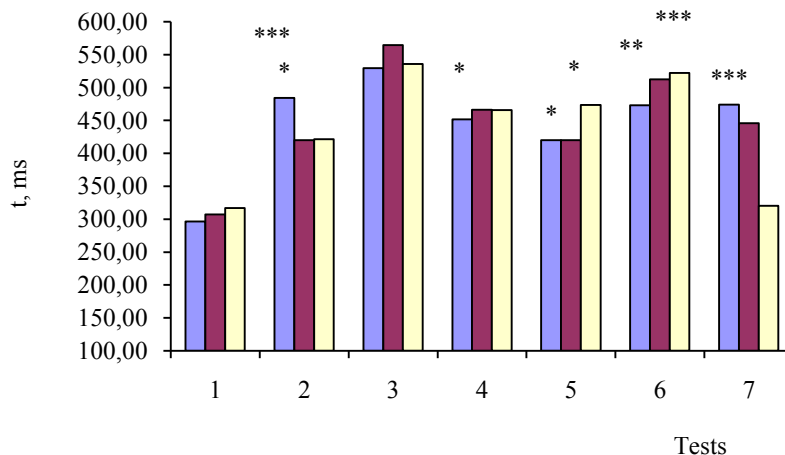
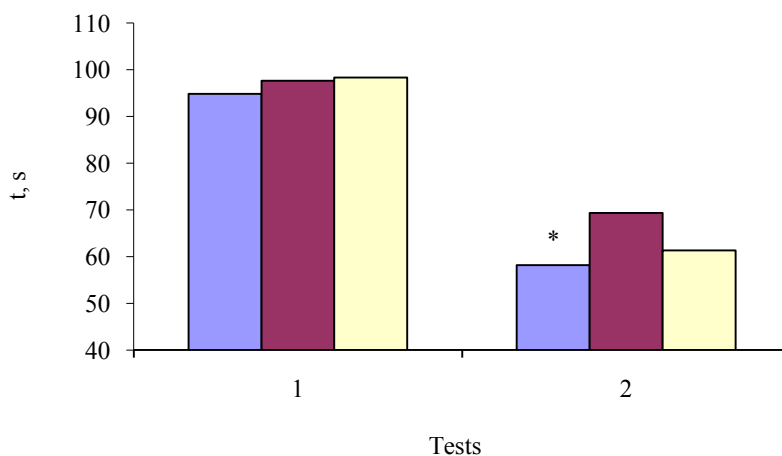


Fig. 2. Latent response time of elite athletes, specializing in speed climbing (n=10), climbing on complexity (n=10) and mountaineers (n=6):

- 1 – latent period of simple visual-motor response, m.sec. ;
- 2 -latent period of response of choosing of one signal from three, m.sec.;
- 3 - latent period of choosing of two signals from three, m.sec.;
- 4 - latent period of response in test “level of functional mobility of nervous processes” in feedback mode, m.sec.;
- 5 - minimal time of signal exposure in test “level of functional mobility of nervous processes” in feedback mode, m.sec.;
- 6 - latent period of response in test “level of functional mobility of nervous processes” in the mode of forced rhythm, m.sec.;
- 7 - latent period of response in test “strength of nervous processes”, m.sec.;
- * - differences are confident at p<0.05;
- ** - differences are confident at p<0.01;
- *** - differences are confident at p<0.001;

■ - rock-climbers (speed climbing) ■ - rock-climbers (complex climbing); ■ - mountaineers

Abilities of nervous system are in-born, but under influence of environmental factors they can change to some extent. In our case, probably, sports results of international level were achieved just by sportsmen with exactly such properties of nervous system, I.e. rock-climbers with more expressed mobility and strength of nervous processes. Nevertheless, properties of nervous system of the tested sportsmen seemed to change a little bit under influence of environmental factor – training and competition processes.



■ - rock-climbers (speed climbing) ■ - rock-climbers (complex climbing); ■ - mountaineers

Fig. 3. Indicators of mobility of nervous system of elite athletes, specializing in speed climbing (n=10), climbing on complexity (n=10) and mountaineers (n=6)

- 1 – time of fulfillment of test “level of functional mobility of nervous processes” in feedback mode, s.;
- 2 – time of coming to minimal exposure in test “level of functional mobility of nervous processes” in feedback mode, s.;
- * - differences are confident at $p < 0.05$;

The fact that rock climbers have higher indicators of strength and mobility of nervous system than mountaineers is rather interesting. It is known that mountaineering is one of extreme kinds of sports, connected with risk for life, requires permanent attention, carefulness, space orientation. Nevertheless, in rock-climbing – relatively safe kind of sports – we observe higher indicators of strength and mobility of nervous system. We connect it with the need in maximal concentration in conditions of maximal or close to maximal manifestations of strength and speed power abilities. In mountaineering manifestation of power in combination with maximal concentration of attention is more “stretched” in time [16, 17], is more variable, to less extent requires maximal tension of speed-power and psycho-physiological abilities. Just owing to this fact mountaineers show better results in power endurance during longer periods of time, they have higher functional abilities, but rock-climber have higher quickness, speed endurance, power endurance in short periods of time in combination with better indicators of strength and mobility of nervous system.

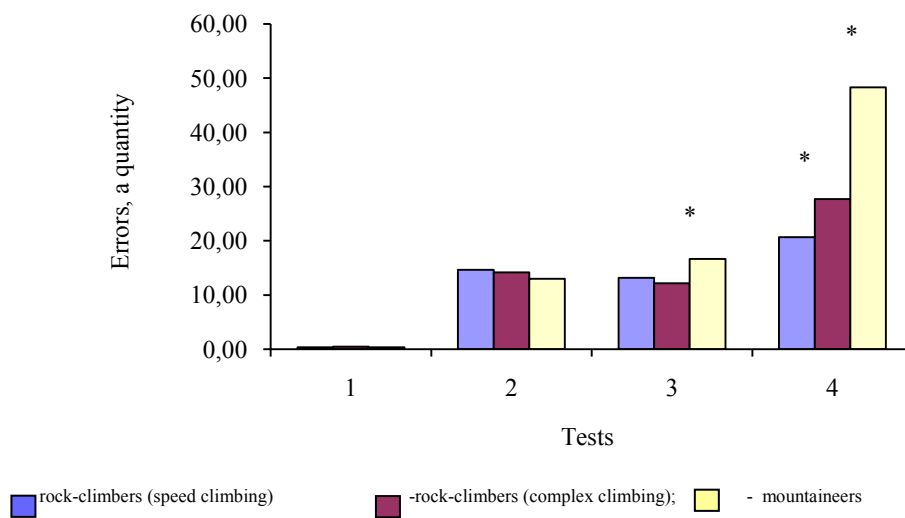


Fig.4. Quantity of errors in fulfillment of tests for determination of latent response time of elite athletes, specializing in speed climbing ($n=10$), climbing on complexity ($n=10$) and mountaineers ($n=6$)

- 1 – errors in test “plain visual motor response” q-ty;
- 2 - errors in test “response for choosing of one signal from three”, q-ty;
- 3 - errors in test “choosing of two signals from three”, q-ty;
- 4 - errors in test “level of functional mobility of nervous processes” in feedback mode, q-ty, ms.;
- * - differences are confident at $p < 0.05$;

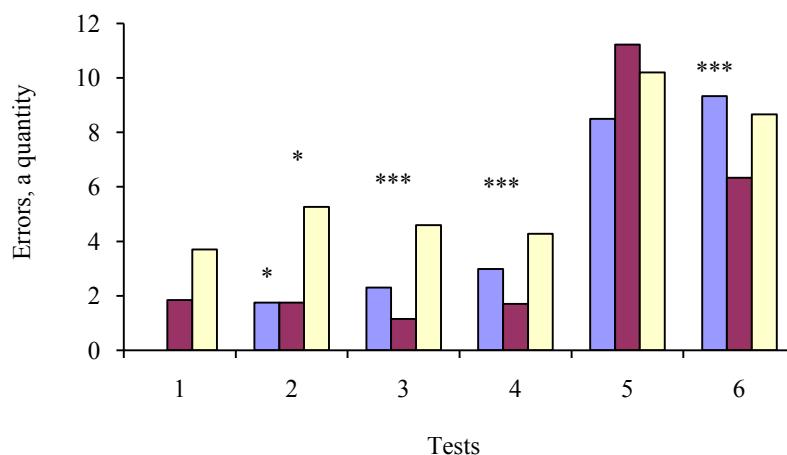


Fig.5. Quantity of errors in fulfillment of tests for determination of latent response time of elite athletes, specializing in speed climbing ($n=10$), climbing on complexity ($n=10$) and mountaineers ($n=6$)

- 1 - errors at 1st stage of test “level of functional mobility of nervous processes” in forced rhythm mode, %;
- 2 – errors at 2nd stage of test “level of functional mobility of nervous processes” in forced rhythm mode, %;
- 3 - errors at 3rd stage of test “level of functional mobility of nervous processes” in forced rhythm mode, %;
- 4 - errors at 4th stage of test “level of functional mobility of nervous processes” in forced rhythm mode, %;
- 5 - errors at 5th stage of test “level of functional mobility of nervous processes” in forced rhythm mode, %;
- 6 – errors in test “strength of nervous processes”, %;

* - differences are confident at $p<0.05$;

*** - differences are confident at $p<0.001$;

The obtained data supplement results of researches by S.S. Iermakov [5] Ye.P. Ilyin [6], G.V. Kotobeynikov [4], N.V. Marchenko [14], V.S. Lizogub [13] about specific features of nervous system of different sports specializations’ representatives with facts about peculiarities of nervous system’s manifestations of rock-climbers and mountaineers.

Psycho-physiological abilities of rock-climbers and mountaineers have been determined for the first time in the present work. For the first time peculiarities of morpho-functional development of rock-climbers, specializing in passing of different kinds of distances have been determined as well as the same of mountaineers.

Conclusions:

1. It has been proved that mountaineers and rock-climbers reproduce time interval of 30 seconds more precisely than interval of 1 minute, which was accelerated in their subjective sense.

2. It has been found that rock-climbing (speed climbing) and in some cases rock-climbers (climbing on complexity) manifest confidently better results in tests for response quickness in complex conditions.

3. It has been state that rock-climbers have higher indicators of mobility and strength of nervous processes, comparing with mountaineers. This fact is connected with specificity of training and competition activity of rock-climbers, which require total concentration in conditions of maximal or close to maximal force efforts.

The prospects of further researches imply studying of structure of different specialization rock-climbers’ complex preparedness and development of theoretical methodic principles of training process construction in rock-climbing.

References:

- 1 Bajkovskij Iu.V. O koncepcii klassifikacii vidov sporta i vidov deiatel'nosti po stepeni ekstremal'nosti [About 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: upbringing, education, training], 2011, vol.3, pp. 76-79.
- 3 DvoenosoV V.G. *Teoriia i praktika fizicheskoj 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 psikhofiziologichnikh staniv sportsmeniv* [Diagnostics of psychophysiological state of athletes], Kiev, 2008, 64 p.
- 5 Iermakov S.S. *Fiziceskoe vospitanie studentov tvorceskih special'nostej* [Physical Education of the Students of Creative Profession], 2004, vol.3, pp. 8-24.

- 6 Il'in E.P. *Psikhologiya individual'nykh razlichij* [Psychology of individual differences], Sankt Petersburg, Peter, 2004, 701 p.
- 7 Baribina L.M., Kozina Z.L., Tikhenko V., Tolstobrov A. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2009, vol.3, pp. 14-19.
- 8 Kozina Z.L., Barybina L.N., Grin' L.V. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2010, vol.5, pp. 30-35.
- 9 Kozina Z. L., Baribina L.M., Korobiejnikov G.V., Mishchenko D. I., Cikunov O. A., Kozin O. V. *Avtors'ke pravo i sumizhni prava* [Copyright and Related Rights], 2002, vol.25, p. 15.
- 10 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.
- 11 Kravchuk T.A., Zhmakina T.N. *Fizkul'turnoe obrazovanie Sibiri* [Physical education of Siberia], 2005, vol.1, pp. 50-54.
- 12 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.
- 13 Lizogub V.S. *Fiziologichnij zhurnal* [Journal of physiological], 2010, vol.56(1), pp. 148 - 151.
- 14 Makarenko N.V. *Fiziologichnij zhurnal* [Journal of physiological], 1999, vol.45(4), pp. 125–131.
- 15 Sharafutdinov D.R. *Teoriia i praktika fizicheskoj kul'tury* [Theory and practice of physical culture], 2012, vol.5, pp. 35-37.
- 16 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.
- 17 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.

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