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## Psycho-Physiological Types of Adaptation in the Assessment of Professional and Sports Selection

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*Preliminary research allowed to determine the types of psycho-physiological adaptation on the basis of analysing the non-parameter algorithms of the automatic classification (Lapko, 1993); four types of psycho-physiological adaptation have been identified.*

*It is expected to elaborate previously determined basic criteria which integrate neuro-dynamic profiles of adaptation characterising the individual peculiarities of the central nervous system, its power and lability, indicators of the heart rate variability. As additional criteria we offer differentiated morphofunctional types of physical development and typological types of personality determined in accordance with Hans Eysenk's Personality Chart (1972). Such an approach will give an opportunity to consider the types of psychophysical adaptation in the unity of personal features and genetically natural potential providing individual and psychological peculiarities of the personality.*

*A brief characteristics of each type of psycho-physiological adaptation was given, thus contributing to understanding of the personality individual features and providing the opportunity to forecast behaviour reactions.*

*The studies have enhanced understanding of the types of psycho-physiological adaptation, determination of the forecasting criteria which allow to predict the behaviour in extreme situations, in terms of educational, industrial and sports activities. The types of psycho-physiological adaptation can be considered when assessing the socio-psychological adaptation of students, as well as the criteria for professional and sports selection.*

*Keywords: types of psycho-physiological adaptation, sprinter, stayer, mixed type, unsteady type, selection criteria.*

### Introduction

In modern world psychology the main part of research studies is devoted to the issues of psycho-physiological adaptation and is aimed at studying the psychological adaptation mechanisms in the conditions of acclimatisation. In psychological studies the basic characteristics of interpersonal relationships, their types and mechanisms of

appearance are determined. (Bodrov, 1995; Kolyshkin, 1997; Baker, 1969; Budd, 1973; Wallhoffer, 1976 et al.).

In recent years some authors (Efimova, 2003; Tiunova, 2006, Rodionov, 2004 et al.) consider psycho-physiological criteria as the basis for students' health and also as the correction of unfavourable psycho-emotional states in physical education and sports.

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However, it should be noted that at present neuro-physiological peculiarities of human individual adaptation are poorly known (Bekhtereva, 1974; Nebylitsyn, 1978; Soroko, 1978). In some publications different psycho-physiological types are determined by formal features (age, gender, interpersonal relationships, etc.).

“Psycho-physiological portraits” proposed by V.L. Bakaleynikova (1986) are defined by the functional features of the psychomotor activity, thus being more informative, but not solving the problem of the psycho-physiological adaptation in general.

Researchers have not been paying significant attention to the issues of classifying the types of adaptation. For the first time the ecological types of adaptation were identified by V.P. Kaznacheyev and S.V. Kaznacheyev in 1986. In other papers concerning the adaptation types the researchers refer to the authors mentioned above.

Nevertheless, in our opinion the psycho-physiological adaptation (PPA) should be founded not only on the basic mental functions, but on the physiological factors, compensative adaptive mechanisms of autonomic regulations of the heart rate and the central nervous system taking into consideration typological peculiarities of the personality, thus providing functional reserve of the individual's body. Such an approach coincides with the opinion of F.B. Berezin (1988).

Therefore, the types of the human psycho-physiological adaptation should be determined not only by the formed psycho-physiological features of the personality and parameters of autonomic homeostasis, but also by the state of the body physiological systems characterised by neuro-dynamic profiles determined genetically and fixed by the phenomic conditionality which provides mental and motor activity, types of individual's adaptive behaviour and has practical implication.

During our studies of the psycho-physiological adaptation in the process of educational activities and sportsmen training we identified contradictions between determining the types of adaptation and the existing variety of opinions regarding this issue. Absence of unambiguous opinions regarding the criteria of the PPA types has determined the direction of our further research in this field. As the basis for this work we took the validation of the PPA types from the point of view of the integrating role of the specific functional systems which not only provide adaptive reactions by interacting with each other, but also coordinate the activities of psycho-physiological functions.

#### **Methods of examination and conditions of the experiment**

**In the examination 12,000** first-year students of basic medical groups from different universities of Krasnoyarsk took part on the basis of the interuniversity valeological centre (KSTU – SibFU), as well as skilled sportsmen of different kinds of sports, among them 5 honoured masters of sports, 12 masters of sports of the international level, 53 masters of sports and 25 candidates for masters of sports. Physiological and psycho-physiological functions were studied in the laboratory and in the training camps. The morning examination was done from 9.00 to 12.00, the evening examination – from 16.00 to 18.00. One procedure of the examination lasted for 3 days, the diagnostics was carried out according to the stages of the developed pattern.

At the first stage the indicators characterising neuro-dynamic profiles were measured: omegametry (DLOP – dominant levels of omega-potential); methods for evaluating the functional state of the central nervous system: CFLF-critical frequency of light flashes, BEP – bio-energy potential, an analogue of galvanic skin response, MFM – the maximum frequency of movements

(tapping test); VMR – visual-motor reaction; Lüscher test using the author's expert system "LUSY". The certificate of registration of computer programmes No. 2002610463. Moscow, 2002.

At the second stage the indicators of the evaluation of autonomic regulation of the heart rate mechanisms were recorded using the hardware-software complex (Aldonin, 1998), Questionnaire of H. Eysenck.

At the third stage in order to determine the morphofunctional types of physical development (MFTPD) the anthropometric parameters (height, weight, lung capacity, hand dynamometry and circumference of the chest) were measured. The massiveness of the skeleton was calculated by the largest circumference of the chest and in accordance with the calculation formulas.

Complex assessment of the PPA was done using the author's expert system "KOMPFA". The certificate of computer programmes' registration in the Specific Fund of Algorithms and Programmes of the Ministry of Defence of the Russian Federation No. ОФАП – 1824 No. r.p.50200200003, Moscow, 2002.

For students the measurements were made during 4 semesters (the 1<sup>st</sup> -2<sup>nd</sup> year students) to determine the duration of the adaptation periods. For sportsmen the measurements were done at the beginning, in the middle and at the end of the training process.

Statistical processing of the experimental data and mathematical modelling were done using the dialog package of "NPCL" programme developed by G.S. Vysotskaya (1998) at the Information and Computing Centre of the Siberian Branch of the Russian Academy of Sciences and "STATGRAF" package.

### **Results and discussion**

Our preliminary research allowed to determine the typical features of the psycho-physiological adaptation types (Table 1).

At the evaluation of psycho-physiological mechanisms of adaptation the determining criteria were: psychomotor function and autonomic homeostasis (Moskovchenko, 1999, 2000, 2004). Moreover, each of the types differed from each other by the quantitative criteria of the studied features. Two types were designated in accordance with the classification of V.P. Kaznachejev (1986) as a "sprinter" and a "stayer", the other two were classified by the author. The intermediate type was classified as a "mixed" type, and the type with unstable neuro-dynamic profile as an "unsteady" type.

Our further research relied on the theory of functional systems (Anokhin, 1980; Sudakov, 1983); on the structural and functional organisation of the brain systems in ensuring the mental and motor activity of the human within the framework of the theory (Aladzhalova, 1979, Bekhtereva, 1974), as well as on the role of ultraslow physiological processes of the brain (Sychev, 1980; Ilyukhin, 1982; Moskovchenko, 1997, 2004). We also considered the methodology offered by V.P. Kaznachejev (1980, 1986) regarding the mutual influence of psycho – and somatotype, which will allow to reveal not only different behavioural responses in the structure of the adaptive mutations, but also health hidden reserves.

Basing on the mathematical modelling with implementation of the nonparametric algorithms of automatic classification, for the first time it became possible to identify a previously unknown pattern in the selection of quantitative criteria, six neuro-dynamic profiles and five morphofunctional types of physical development which differ from each other by the reproduction of the generated adaptive programmes.

The morphofunctional types of the physical development (MFTPD) have been differentiated as follows: I type – disharmonious, with the asthenic body type; II type – harmonious, with the normosthenic body type; III type – harmonious,

Table 1. Typical features of the psycho-physiological adaptation types

| Types of the psycho-physiological adaptation | Criteria of assessment of power and lability of the nervous system, psycho-motor skills and autonomic coefficient by Lüscher X, $\pm$ d |                              |                          |                              |                                                          |                                                              | Indicators and oscillations of the variation pulsemetry |                            |  |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------|------------------------------|----------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------|----------------------------|--|
|                                              | CFLF, Hz                                                                                                                                | BEP, relative unit.          | MFM 1 strike/10s         | VMR, ms                      | Weight category by cytotoxic lymphocytes, units          | $\Delta X, c$                                                | AM <sub>0</sub> / $\Delta x$                            | Tension index              |  |
| Sprinter                                     | 48-60<br>$\pm$ 1.02-1.34                                                                                                                | 1-1.4<br>$\pm$ 0.002-0.01    | 75-90<br>$\pm$ 3.32-4.34 | 150-200<br>$\pm$ 5.65 -6.21  | 1-1.6<br>$\pm$ 0.02-1.2                                  | 0.23-0.45<br>0.20-0.30<br>$\pm$ 0.02-1.33<br>$\pm$ 0.02-1.21 | 120-140<br>100-115<br>$\pm$ 5.89-6.76<br>$\pm$ 4.25-5.8 | 60-90<br>$\pm$ 2.18-2.54   |  |
| Stayer                                       | 35-48<br>$\pm$ 1.52-1.77                                                                                                                | 0.85-1<br>$\pm$ 0.54 -0.98   | 50-65<br>$\pm$ 1.71-1.65 | 200-250<br>$\pm$ 7.26-8.56   | 0.95-0.80<br>$\pm$ 0.01-1.02                             | 0.25-0.40<br>0.40-0.45<br>$\pm$ 2.32-2.89<br>$\pm$ 2.43-1.94 | 120-140<br>$\pm$ 3.45-4.81                              | 100-120<br>$\pm$ 1.67-2.51 |  |
| Mixed type                                   | 40-50<br>$\pm$ 1.27-1.44                                                                                                                | 1.0-0.85<br>$\pm$ 0.12-0.58  | 70-85<br>$\pm$ 2.02-1.34 | 180-220<br>$\pm$ 1.03-2.62   | 1-2.0<br>0.8-0.99<br>$\pm$ 0.02-0.62<br>$\pm$ 0.01-0.72  | 0.20-0.38<br>0.30-0.40<br>$\pm$ 0.01-0.2<br>$\pm$ 0.02-0.46  | 100-120<br>125-140<br>$\pm$ 2.66-3.48<br>$\pm$ 4.02-5.4 | 60-130<br>$\pm$ 1.09-4.26  |  |
| Unsteady type                                | 32-37<br>$\pm$ 1.52-1.58                                                                                                                | 0.84-0.50<br>$\pm$ 0.02-0.37 | 40-59<br>$\pm$ 1.89-1.94 | 250-345<br>$\pm$ 13.42-18.76 | 2.1-3.0<br>0.7-0.8<br>$\pm$ 1.65-1.80<br>$\pm$ 1.33-1.34 | 0.17-0.29<br>$\pm$ 0.01-0.02                                 | 140-180<br>$\pm$ 2.59-3.71                              | 120-190<br>$\pm$ 3.48-5.35 |  |

Table 2. Types of psycho-physiological adaptation

| Types of psycho-physiological adaptation | Features of the typological peculiarities, extraversion-introversion scale | Neuro-dynamic profiles of adaptation    | Morphofunctional type of physical development | Functional state of the CNS |           |                                 |
|------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------------|-----------------------------|-----------|---------------------------------|
|                                          |                                                                            |                                         |                                               | Lability                    | Mobility  | Level of energetic mobilization |
| Sprinter                                 | Extravert, choleric, sanguine                                              | Steady, hyper steady                    | II, III                                       | Very high                   | Very high | High or good                    |
| Stayer                                   | Introvert, phlegmatic, melancholic                                         | Steady, hyper steady, hypo steady       | III, IV, I                                    | Good                        | Good      | High or good                    |
| Mixed type                               | Extravert, introvert                                                       | Steady, hyper steady, hypo steady       | II, III, IV                                   | Very high                   | High      | Very high                       |
| Unsteady type                            | Neurotic character                                                         | Unsteady, hypo-unsteady, hyper-unsteady | I, IV, V                                      | Medium or low               | Low       | Medium or low                   |

with the muscular body type; IV type occupies an intermediate position between II and V types, and have not been associated with any classical notion characterising any body type; V type – disharmonious, with the hypersthenic body type.

High reliability between MFTPD ( $p < 0.001$ ), its variability depending on the place of residence for one and the same socio-demographic group has been determined, thus forming the basis for consideration of the morphofunctional types as the component of the morphofunctional properties of the body determining the adaptive functions of adaptive capacity.

According to some authors (Kaznacheyev, 1986; Kuraev, 2002; Moskovchenko, 2004, et al.) the morphofunctional parameters are a genetic factor and are fixed by phenotypic conditionality providing mental and motor activity at the individual level, which serve as the basis for considering MFTPD in assessing the PPA types (Table 2).

Such interdependence characterises general biological significance of adaptive functional reserves of the body, provides various adaptive reactions to environmental conditions, industrial,

educational and sports activities, reflects behavioural reaction to any kind of influences.

To the “sprinter” type persons with II and III MFTPD are referred, with the steady or hyper steady neuro-dynamic profile. The normosystolic tone – eutonia (an indicator of the balance of the autonomic nervous system, heart rate variability) was observed among 80 % – 20 %. Parasympathetic and moderately sympathetic influences predominate indicating the reserve capacity of the body and corresponding with the data of R. Baevsky (1986). The “sprinter” type is mostly typical for extroverts-leaders with high motivation, as in the activity itself, so in the choice of the profession.

Fairly high lability and mobility of the nervous processes contribute to the rapid switching from one type of activity to another one; balance and strength of the nervous processes allow to get quickly mobilised for work of any type in normal and extreme conditions. The “sprinters” easily withstand short-term stressful effects and are able to quickly switch for new adaptive programmes.

For the “sprinter” the features of sanguine and choleric temperament are typical; both types are

characterised by a strong nervous system but with its various mobility or lability, various degrees of energy mobilisation. Long-term dynamics has demonstrated that the “sprinters” with II and III MFTPD, the sanguine temperament and the steady neuro-dynamic profile are more adapted to the ecological, climatic and zone conditions, stressful situations. Sportsmen are able to maintain difficult-to-coordinate movements during competitions, even if they are tired. Such qualities as persistence, energy, innovation, competitive spirit, emotional stability, assertiveness, cooperation, capability to show realism in their claims dominate in the structure of the motivation for the sports activity.

The “sprinter” is characterised by high levels of social and psycho-physiological adaptation which allows to meet the requirements of the higher educational institution (for students) successfully, contributes to sports activity and self-realisation of the person.

To the “stayer” type the persons with a stable, hypo- or hyper steady neuro-dynamic profile refer. High correlation has been noted for the persons with a phlegmatic temperament with IV MFTPD ( $r = 0.72$ ) and for the persons with a melancholic temperament with I ( $r = 0.86$ ), insignificant correlation respectively with II ( $r = 0.46$ ) and IV ( $r = 0.38$ ) MFTPD. In the stayers’ group the autonomic balance – eutonia has been observed in 43 % of cases, among phlegmatic persons sympathicotony prevailed in 37 % of cases, while among melancholic persons in 20 % an increased parasympathetic influence – vagotonia was noted.

The “stayer” type is characterised by relatively low or high values of the dominant level of the omega potential (DLOP). At low values (12-19 mV) it is a hypo steady type with good adaptation in favourable social conditions, in extreme situations adaptive responses were reduced, psycho-physiological processes became unsteady resulting in disorganization of behaviour,

unnecessary anxiety appeared with and without a reason. At high values of DLOP (44-48 mV) it is a hyper steady type. Individual adaptation depended on the mental states, motivation and conditions of the social environment. Often emotional reaction to educational or other activities was higher due to overestimation of own capabilities. During training it is necessary to use not only the method of the story, but also the method of the show. In extreme conditions high probability of failure of adaptive mechanisms appears that can lead to disorganization of behaviour, especially during decision making.

The “stayer” with the average DLOP (20 – 40 mV) is characterised by high mobility of nervous processes, but by high lability, or vice versa. The “stayers” are capable of performing various actions for a long period of time and in any situation, but at a slower pace if compared with the “sprinters”. They endured quite good short-term stressful effects at positive socially significant conditions (constant support, approval, advice). Socio-psychological adaptation in extreme conditions is impeded, prolonged exposure to inadequate conditions led to the breakdown of adaptation. As a rule, the “stayers” were active in the personal life. The “stayer” with a melancholic temperament is characterised by social passivity, he tries to avoid responsibility seeking protection from unnecessary conflicts.

To the “mixed” type the persons with a choleric, sanguine and phlegmatic character are referred, with a stable, hypo- or hyper steady neuro-dynamic profile, but with a tendency to periodic disturbance of homeostatic systems (instability of the omega gram maintenance in the amplitude-time structure from day by day). A significant proportion – 75 % consisted of the eutonic persons, among 25 % the dominant influence of the sympathetic or parasympathetic link in the regulation of the sinus heart rate was observed. II, III and IV MFTPD indicated the

harmony of the morphotype. The “mixed type” with a sanguine temperament is characterised by good mobility and high lability of the nervous processes, or vice versa. They were able to perform a variety of actions equally well in all conditions, as in the fast, so in the slow pace. High emotional stability allowed to adapt to prolonged exposure to extreme factors in unfavourable conditions.

The “mixed type” with a choleric temperament is characterised by good mobility of the nervous processes, they are highly active, impulsive, but the elements of incoherence were present in activities, they could not concentrate on the essential part. Excessive impulsivity in prolonged unfavourable conditions often led to mistakes, disorganization of behaviour, overstrain of adaptive mechanisms. Persons with a phlegmatic temperament endured the stressing effects quite well at the positive socially significant conditions. If these conditions were violated the psycho-physiological adaptation decreased. Therefore, one can conclude that for the “mixed” type the social status plays an important role in the process of psycho-physiological adaptation.

The “unsteady type” includes all those who had low (8-16 mV) or high (42-48mV) DLOP values, with stable violation of chemometabolic processes (transition of  $\omega$ -potential from the initial level to the value up to 25 % after functional loading) indicating unsteady adaptive capacities of the body at physical or mental workload, which displayed the reduction of mental and physical functions of the body reserves in extreme conditions and was accompanied by a decrease of efficiency, intolerance to long-term exercise, instability and insecurity in education or sports activities. Significant physical activities led to rapid depletion of the central regulatory mechanisms and disruption of adaptation. For the persons of the “unsteady type” significant correlation is marked with I ( $r = 0.82$ ), IV ( $r = 0.79$ ) and V ( $r = 0.66$ ) MFTPD at ( $p < 0.05$ ) and, respectively,

insignificant correlation with II ( $r = 0.26$ ) and III ( $r = 0.38$ ) type at ( $p < 0.005$ ). We judged about the degree of adaptation mechanisms strain by the expressed changes in the autonomic balance of sympathetic and parasympathetic influence.

The “unsteady type” is characterised by medium or low lability of the nervous processes and the middle or the low level of energy mobilisation. Individuals with low values of DLOP were able to perform long-term repetitive actions at the medium pace and in the familiar environment. In extreme situations (a test or an exam) the concentration of attention and speed of information processing were maintained for a short period of time, then a tendency to quick tiredness appeared, which led to errors. Among persons with a high value of DLOP social and psycho-physiological adaptation was impeded due to manifestations of slow response and increased anxiety, excessive suspiciousness, which resulted in difficulties in emotional contacts. In this case high levels of neuroticism were observed. During long-term stressful effects the failure of adaptive mechanisms was noted, which often led to disorganisation in educational activities, unpredictability in behaviour (protest, rigidity). This type is not promising for sports.

We judged about the degree of the first-year students’ adaptation to the university conditions by the time period of establishing interpersonal relationships in a group, with students of the same year, in a sports team, by manifestation of organisational skills. The time period served as a system-forming factor characterising the outcome of adaptation.

The success of psycho-physiological adaptation depends on how the student will be able to establish himself as a personality within the group of students, in his interpersonal relations, value orientations, beliefs and internal motivation to study. If the adaptation was successful the student was a quicker learner in terms of self-discipline, self-control, he was able to organise

his educational activities, thus contributing to the development of the cognitive activity and intellectual area.

The sprinter (66.8 %) and the mixed (60.0 %) types had the shortest period of adaptation, from 3 to 6 months, i.e. by the time of the first examination session students had set personal relationships in the group, had shown organisational abilities in different events. However, the sprinters in 33.2 % of cases and the mixed type in 40 % of cases during that period of time adapted to the university conditions, but nevertheless set not only positive but also negative (conflict, lack of tolerance) interpersonal relationships, some of them formed informal groups.

The stayers required the period of adaptation from 6 to 12 months, i.e. they got adapted within the first year of studies. Phlegmatic persons were characterised by a low level of commitment to interpersonal relationships, and they preferred a small circle of communication, their low social activity did not contribute to the development of organisational abilities, except for those who were engaged in sports sections. Melancholic persons experienced a necessity for interpersonal relationships, but due to the weakness of the nervous system they did not take the initiative and like phlegmatic persons they sought to limit their social circle, occupying a neutral position in the group, they displayed sympathy with friends, were drawn to extroverts, but displayed the fear of rejection. The “unsteady type” could not adapt quickly. Adaptation time varied in the range from 12 to 34 months. The person referred to the unsteady type feels uncomfortable, relationships with classmates may be conflicting and ultimately may lead to social and psychological maladjustment. As a result, the student can not reveal his individual capacities, does not fulfill his potential. Hence, the lack of success in studies appears and as a result, the student is dismissed from the university.

The research carried out has shown that the “sprinters” and the “mixed” types adapt equally quickly. Successful adaptation at the end of the semester was observed among the “stayers”. The “unsteady” type is less adaptive, only 68 % out of this group were able to pass the winter session in due time.

The PPA types gain the most significance during the sportsmen training, which has been proved as the result of the long-term experiment on the members of the teams of the Krasnoyarsk Territory and the country in various kinds of sports (Table 3).

During the sportsmen training it is important to consider personality peculiarities and behaviour in competitive conditions. Under prolonged stress effects (long-term training in camps and a lot of starts in different climatic and zone conditions) sportsmen often get a breakdown of adaptive mechanisms. The breakdown of adaptive mechanisms is accompanied by the decrease in efficiency, the disorder of psychomotor functions resulting in the psycho-emotional discomfort and the decrease of sports results.

Timely information about the types of psycho-physiological adaptation allows to adjust the load modes promptly, to optimise the training process, to select remediation activities, to conduct sessions of mental regulation, thus mobilising functional reserves of the body, and, therefore, allows to avoid the disruption of adaptation and achieve superior results.

From the analysis of the table we can conclude that the type of psycho-physiological adaptation is directly connected with the sports qualification and the results of the sportsman. The utmost results were achieved by the sportsmen-sprinters of the sanguine type.

### **Conclusion**

**We have identified** four types of the psycho-physiological adaptation: the “sprinter”,



Table 3. Achievements of the sportsmen – participants of the experiment

| Family name, first name | Kind of sports      | Type of the temperament | Type of psycho-physiological adaptation | Mobility of the nervous processes | Sports qualification                        | Sports achievements                                                                                  |
|-------------------------|---------------------|-------------------------|-----------------------------------------|-----------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------|
| Chagiyev B.             | Greco-Roman style   | Sanguine                | sprinter                                | high                              | Master of sports of the international level | Champion of Europe, of the international tournament named after Poddubny                             |
| Sartakov A.             | “-“                 | Phlegmatic              | stayer                                  | high                              | Master of sports of the international level | Champion of the international tournament named after Poddubny                                        |
| Satiyev B.              | freestyle wrestling | Sanguine                | sprinter                                | high                              | Honoured master of sports                   | World champion, champion of Europe, Olympic champion 2000, 2004.                                     |
| Madosyan G.             | “-“                 | Choleric                | mixed                                   | good                              | Master of sports                            | Silver winner of Yarygin tournament                                                                  |
| Fedotkina S.            | skating             | Sanguine                | sprinter                                | high                              | Honoured master of sports                   | Russian champion, silver champion of the Olympiad                                                    |
| Kuts V.                 | underwater swimming | Sanguine                | mixed                                   | high                              | Master of sports of the international level | Champion of the USSR, RF, winner of international championships, octuple record breaker of the world |
| Goncharova T.           | “-“                 | Choleric                | sprinter                                | high                              | Master of sports of the international level | Champion of the RF, the USSR, Europe, sextuple record breaker of the world                           |
| Andronov E.             | “-“                 | Sanguine                | spinter                                 | high                              | Master of sports of the international level | Champion of the world, Europe, the RF, octuple record breaker of the world and Europe.               |

the “stayer”, the “mixed” and the “unsteady” types by using the nonparametric methods of the classification. Using the types of PPA gives the university faculty an opportunity to obtain objective information on psycho-physiological adaptation of a student and, consequently, to solve not only socially important issues, but also to expand the range of issues which allow to remove the psycho-emotional strain and motivate an individual for maintaining and improving health, increasing the reserve

capacity of the body. The obtained experimental data regarding the PPA types are of a great practical value in sports activities where it is very important to take into account personality peculiarities.

These PPA types belong to one of the prognostic criteria of the psycho-physiological adaptation to extreme conditions, educational, vocational and sports activities, but may also serve as a criterion for sports and professional selection.

## References

Aldonin G.M. Sinergetika v tekhnicheskoy proektirovani [Synergetics in the technical design] / Aldonin G.M. – Krasnoyarsk: KSTU, 1998. – p. 248.

Anokhin P.K. Uzloviye voprosy teorii funktsionalnoi sistemy [Central questions of the theory of functional systems] / Anokhin P.K. – Moscow: Nauka [Science], 1980. – p. 196.

Baevsky R.M. Prognoz sostoyaniy na grani normy i patologii [Forecast of the states on the verge of the norm and pathology] / R.M. Baevsky. – Moscow: Meditsina [Medicine], 1979. – p. 295.

Bakaleynikova V.L. Fiziologiya cheloveka: Tom 12: Psikhomotorniye funktsii u rabochikh starshego vozrasta, zanyatykh fizicheskim trudom [Human physiology: Vol.12. : Psychomotor function among senior workers occupied in physical labour activities / V.L. Bakaleynikova – 1986. – No. 6. – pp. 987-991.

Berezin F.B. Psikhicheskaya i psikhofiziologicheskaya adaptatsiya cheloveka [Mental and psycho-physiological adaptation of the human] / F.B. Berezin. – Leningrad: Nauka [Science], Leningrad subdivision, 1988. – p. 150.

Bekhtereva N. P. Neurofiziologicheskiye aspekty psikhicheskoy deyatel'nosti cheloveka [Neuro-physiological aspects of the human mental activity] / N.P. Bekhtereva – 2 ed. – Leningrad: Meditsina [Medicine], 1974. – p. 117.

Bodrov V.A. Psikhologichesky stress: razvitiye ucheniya i sovremennoye sostoyaniye problemy [Psychological stress: development of the studies and the modern state of the issue / V.A. Bodrov. – Moscow, 1995. – p. 335.

Vysotskaya G. S. Neparаметрические системы классификации в задачах исследования медико-биологических процессов [Nonparametric systems of classification in the tasks of the research of biomedical processes: author's abstract: Candidate of Engineering sciences / G.S. Vysotskaya. – Krasnoyarsk, 1998. – p.24.

Efimova I.V. Psikhofiziologicheskiye osnovy zdoroviya studentov [Psycho-physiological basis of the students' health] / I.V. Efimova, E.V. Budyka, R.F. Prokhodovskaya. Irkutsk. IrSU, 2003. P. 124.

Ilyukhina V.A. Sverkhmedlennyye fiziologicheskiye protsessy i mezhsistemnyye vzaimodeystviya v organizme [Ultraslow physiological processes and intersystem interactions in the body] / V.A. Ilyukhina, Z.G. Khadaeva, L.I. Nikitina et al. – Leningrad: Nauka [Science], Leningrad subdivision., 1986. – p. 188.

Kazin E.M. Avtomatizirovannyye sistemy v kompleksnoi otsenke zdoroviya i adaptatsionnyye vozmozhnosti cheloveka [Automated systems in the comprehensive assessment of the human health and the adaptive capacity], E.M. Kazin, A. D. Riftin, A. I. Fedorov et al. // Chelovecheskaya fiziologiya [Human physiology]. – 1990. – Vol.16 .- No. 3. – pp. 94-101.

Kaznachev V.P. Sovremennyye aspekty adaptatsii [Modern aspects of adaptation] / V.P. Kaznachev. – Novosibirsk: Nauka [Science], 1980. – p. 191.

Kaznachev V.P. Adaptatsiya i konstitutsiya cheloveka [Human adaptation and physique / V.P. Kaznachev, S V. Kaznachev. – Novosibirsk: Nauka [Science], 1986. – pp. 40-85.

Kolyshkin V.V. Osobennosti psikhofiziologicheskikh mekhanizmov adaptatsii v zavisimosti ot laberal'nogo fenotipa cheloveka [Peculiarities of the psycho-physiological mechanisms of adaptation depending on the laberal phenotype of the human: Author's abstract ... Doctor of Biology / V.V. Kolyshkin. – Tomsk: Siberian State Medical University, 1997. – p. 42.

Kurayev G.A. Issledovaniye mekhanizmov formirovaniya, razvitiya i sokhraneniya psikhofiziologicheskogo zdoroviya uchashchikhsya v dinamike obucheniya [Investigation of the

mechanisms of formation, development and preservation of the psycho-physiological health of the students in the dynamics of learning / Kuraev G.A., Morozova G.I. // *Valeologiya [Valeology]*. 2002. No. 3. pp. 60-65.

Lapko A.V. *Neparametricheskiye metody klassifikatsii i ikh primeneniye [Nonparametric classification methods and their application]* / A.V. Lapko. – Novosibirsk: Nauka [Science], 1993. – p. 152.

Moskovchenko O.N. *LUSY: psikhodiagnosticheskaya elspertnaya sistema [LUSY: psycho-diagnostic expert system]* / O.N. Moskovchenko, L.F. Nozhenkova // *Scientific workshop on finite mathematics*. – Krasnoyarsk: Computational Centre of the Siberian Branch of the USSR Academy of Science, 1991. – Vol. 1. – p. 1 – 14.

Moskovchenko O.N. *Diagnostika i prognozirovaniye psikhofiziologicheskogo sostoyaniya cheloveka (modifitsirovanniy tsvetovoi test M. Lushera) [Diagnosis and forecast of the psycho-physiological condition of the human (modified M. Lüscher colour test): Monograph]* / O.N. Moskovchenko. – Krasnoyarsk, 1995. – p. 172.

Moskovchenko O.N. *Otsenka fizicheskogo i psikhofizicheskogo sostoyaniya organizma studentov (opyt primeneniya integralnoi kompleksnoi sistemy) [Assessment of the physical and psycho-physical condition of the students' body (experience of applying the integrated complex system)]* / O.N. Moskovchenko // *Problems of development of physical education and sports in Siberia and the Far North*. – Omsk, 1995. – pp. 32-35.

Moskovchenko O.N. *Tipologicheskiye osobennosti lichnosti (aspekty differentsialnoi psikhofiziologii) [Typological personality peculiarities (aspects of differential psychophysiology)]* / O.N. Moskovchenko // “*Vestnik*” of Krasnoyarsk State Technical University. Collection of scientific papers: information in education. – Krasnoyarsk, 1996. – Vol. 2. – pp. 153-159.

Moskovchenko O. N. *Sovremenniy puti otsenki adaptivnykh vozmozhnostei sportsmenov kak kriteriy sportivnoi perspektivnosti [Modern ways of assessing the adaptive capacity of the sportsmen as the criterion for the sports perspective]* / O.N. Moskovchenko / *Physical education in Siberia*. – Omsk, 1997. – No. 1 (5). – pp. 93-105.

Moskovchenko O.N. *Kompiyuternaya otsenka sotsialno-psikhofiziologicheskoi adaptatsii pervokursnikov v zavisimosti ot individualno-tipologicheskikh osobennostey [Computer assessment of the social and psycho-physiological adaptation of the first-year students depending on the individual and typological peculiarities]* / O.N. Moskovchenko, N.A. Novokhodko, T.A. Katsina et al. *Valeologiya [Valeology]* – 1999. – No. 2. – pp. 11-19.

Moskovchenko O.N. *Rol' adaptatsionnykh protsessov v otsenke urovnya fizicheskogo sostoyaniya studentov i sportsmenov [The role of the adaptive processes in assessing the physical condition of the students and sportsmen]* / O.N. Moskovchenko // *Aktual'niye voprosy bezopasnosti zdoroviya pri zanyatiyakh sportom i fizicheskoi kulturoi [Topical issues of the health safety in sports and physical education]* / Materials of III International Scientific Conf., April 14-15, 2000 – Tomsk, 2000. – pp. 72-77.

Moskovchenko O.N. *Individualnoye zdoroviye cheloveka: aspekt biologicheskoi, psikhofiziologicheskoi i sotsialnoi adaptatsii [Human health: the aspect of the human biological, psycho-physiological and social adaptation]* / O.N. Moskovchenko / *Valeologiya [Valeology]* – 2000. No. 4. pp. 8-13.

Moskovchenko O.N. *Avtomatizirovannaya sistema “KOMPFA” [Automated system “KOMPFA”]* / O.N. Moskovchenko, A.G. Popov. // Registered in the Specific Fund of Algorithms and Programmes of the Ministry of Defence of the Russian Federation No. ОФАП – 1824 No. r.p.50200200003 Moscow, 2002.

Moskovchenko O.N. Ekspertnaya sistema «LUSY» [Expert system “LUSY”] / O.N. Moskovchenko, L.F. Nozhenkova / ROSPATENT Certificate of the computer programme registration No. 2002610463. – Moscow, 2002.

Moskovchenko O.N. Individualniye osobennosti morfofunksionalnykh tipov fizicheskogo razvitiya k klimaticheskoi adaptatsii [Individual peculiarities of the morphofunctional types of physical development to the climate adaptation] / O.N. Moskovchenko // “Vestnik” of KrasGAU: Scientific technical journal. Krasnoyarsk, 2004. Vol. 5. pp. 102-108.

Moskovchenko O.N. Kompyuternaya diagnostika v otsenke psikhofiziologicheskikh tipov adaptatsii [Computer diagnosis in the evaluation of psycho-physiological types of adaptation] / O.N. Moskovchenko. “Vestnik” of KSU, 2004. No. 4. pp. 138-142.

Moskovchenko O.N. Metodologicheskiye osnovy avtomatizatsii testa Lushera dlya diagnostiki psikhofiziologicheskogo sostoyaniya cheloveka [Methodological fundamentals of automation of Lüscher test for the diagnosis of the psycho-physiological state of the human] / O.N. Moskovchenko / Valeologiya [Valeology] 2004. No. 2. pp. 20-27.

Moskovchenko O.N. Omegametriya – metod ekpress-diagnostiki v otsenke adaptivnykh vozmozhnostei organizma cheloveka (prikladniye aspekty). Soobshcheniye pervoye. [Omegametry as a method of express diagnosis in assessing adaptive capacities of the human organism (application aspects). First message/ O.N. Moskovchenko / Valeologiya [Valeology] 2004. No. 2. pp. 14-19.

Nebylitsin V.D. Osnovniye svoystva nervnoi sistemy cheloveka kak neurofiziologicheskaya osnova individualnosti [Basic properties of the human nervous system as the neuro-physiological basis of the individuality] / V.D. Nebylitsin // Estestvennonauchniye osnovy psikhologii [Natural science fundamentals of psychology]. – Moscow, 1978. – pp. 295-336.

Rodionov A.V. Prakticheskaya psikhologiya fizicheskoi kultury i sporta [Practical psychology of physical education and sports / A.V. Rodionov – Makhachkala, “Yupiter”, 2002 – p.160 .

Soroko S.I. Neurofiziologicheskkiye mekhanizmy individualnoi adaptatsii cheloveka v Antarktide [Neuro-physiological mechanisms of the individual human adaptation in Antarctica] / S.I. Soroko. – Leningrad: Nauka [Science] Leningrad subdivision, 1984. – p. 148.

Sudakov K.V. Teoriya funktsionalnykh sistem [Theory of functional systems] / K.V. Sudakov. – Moscow: Meditsina [Medicine], 1996. – p. 65.

Sychev A.G. Otsenka adaptivnykh vozmozhnostei organizma po dannym galvanometrii: metodicheskkiye rekomendatsii [Evaluation of the adaptive capacities of the body according to the data of the galvanometer: instructional guidelines] / A.G. Sychev, N.I. Shcherbakova, O.N. Moskovchenko et al. – Krasnoyarsk: KrPI, 1988. – p. 28.

Tiunova O.V. Diagnostika lichnostnykh svoystv i psikhicheskikh sostoyaniy u sportsmenov: metodicheskkiye rekomendatsii [Diagnosis of the personality features and psychological states among sportsmen: instructional guidelines] // O.V. Tiunova, A.Yu. Samokhina, A.V. Gortinskaya – Moscow, Federal State Educational Institution, RKonsultant, 2006. – p. 32 .

Atkinson, J.W. Motivational Determinants of Risk-taking Behavior/ J. W. Atkinson // Psychol. Review. 1957. Vol.64. P. 359-372.

Bartels, M. Genetic and Environmental Influences on the Development of Intelligence / M. Bartels, M.J.H. Reitveld, G.C.M. Baal, van, D.I. Boovsma// Behavior Genetics. 2002. Vol. 32, № 4. July. P. 237-249.

Budd, G. M. Australian physiological research in the Antarctic and Sybantarctic, with special reference to thermal stress and acclimatization / G. M. Budd // Polar human biology. – London, 1973. – P. 15-40. Burd R. Our navy explores Antarctica / R. Burd // National Geograph. Mag. – Vol. 92. – № 4. – P. 429-433.

Eysenk, H. J. Conditioning, introversion-extraversion and strength of nervous system / H.J. Eysenk, A. Levey // Biological Basis of Individual Behavior. – N.Y. – 1972. – P. 100.

Ries, W. Das Alter in farbpsychologischen Sich. Psychoexperimentelle Untersuchungen mit Luscher-Test-Zeitschr. Fur Festtsuchtigen im Luscher farbiss / W. Ries. – 1959. – №. 16. – P. 11.

Selye, H. The story of the adaptation syndrome / H. Selye. – Monreal, 1952. – 225 p.

Uusitalo, A.L.T. Heart rate and blood pressure variability during heavy training and overtraining in the female athlete/ A.L.T. Uusitalo, A. J. Uusitalo, H. K. Rusko. – Int. J. Sport Med. – 2000, V. 21, № 1. – P 45-53.

Wallhoffer, H. Stress and autogenes Trejning / H. Wallhoffer // Therapiewoche. – 1976. – N. 28. – P. 7.

## **Психофизиологические типы адаптации в оценке профессионального и спортивного отбора**

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*Предварительными исследованиями были выделены четыре типа психофизиологической адаптации на основе анализа непараметрических алгоритмов автоматической классификации (А.В. Лапко, 1993). Предлагается дополнить ранее выделенные базовые критерии, которые интегрируют нейродинамические профили адаптации, характеризующие индивидуальные особенности центральной нервной системы, ее силу и лабильность, показатели вариабельности сердечного ритма. В качестве дополнительных критериев предлагаются дифференцированные морфофункциональные типы физического развития, а также типологические особенности личности, определенные по шкале экстра-интроверсия Н. Eysenk (1972). Такой подход правомерно позволит рассматривать типы психофизиологической адаптации в единстве личностных свойств с генетически природными задатками, обеспечивающими индивидуально-психологические особенности личности. Приведена краткая характеристика каждого типа психофизиологической адаптации, что способствует пониманию индивидуальных свойств личности и позволяет спрогнозировать поведенческие реакции.*

*Проведенные исследования позволили расширить представление о типах психофизиологической адаптации, выделить прогностические критерии, которые позволяют прогнозировать поведение в экстремальных условиях, в условиях учебной, производственной и спортивной деятельности. Типы психофизиологической адаптации правомерно рассматривать при оценке социально-психологической адаптации студентов, а также в качестве критериев профессионального и спортивного отбора.*

*Ключевые слова: психофизиологические типы адаптации, спринтер, стайер, смешанный тип, ненадежный тип, критерии отбора.*

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