# ANALYSIS OF DC-POTENTIAL LEVEL IN ELDERLY PEOPLE WITH DIFFERENT LEVELS OF ANXIETY LIVING IN THE EUROPEAN NORTH OF RUSSIA

I.L. Fateeva[1], T.P. Shiryaeva[2], D.M. Fedotov[2,3], A.V. Gribanov[1]

[1] Northern (Arctic) Federal University named after M.V. Lomonosov, the High School of Natural Science and Technologies, the Laboratory of Human Biology and Biotechnical Systems, Arkhangelsk, Russia.

[2] Northern State Medical University, Department of Hygiene and Medical Ecology, Arkhangelsk, Russia.

[3] Novodvinsk orphanage for children with serious intellectual disabilities, Novodvinsk, Russia.

ILF: http://orcid.org/0000-0003-4506-5871, e-mail: irana1307@mail.ru, TPSh: http://orcid.org/0000-0001-9458-3224, e-mail: t.moroz@yandex.ru, DMF: http://orcid.org/0000-0002-4067-8364, e-mail: doctorpro@yandex.ru, AVG: http://orcid.org/0000-0002-4714-6408, e-mail: a.gribanov@narfu.ru

***Abstract:*** **The article presents the results of a study of the energy metabolism of the brain at various levels of personal anxiety in elderly people (60-74 years old). It was revealed that the majority of men (64%) are characterized by an average level, and for women (73%), on the contrary, a high level of personal anxiety. Statistical differences were found in the distribution of energy costs in the frontal, central and right-hemisphere regions of the brain in elderly men and women. The tendency to increase the total indicators of the DC-potential in elderly women has been revealed.**

***Keywords:*** **Elderly age, adaptation, personal anxiety, energy metabolism, brain, DC-potential.**

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**Introduction**. Adverse effects of climatic and environmental factors of the North can lead to the development of maladaptation processes and the formation of Polar stress syndrome [1, 2].

At the same time, the likelihood of developing this syndrome is largely related to the length of residence in the North and the elderly are one of the most vulnerable groups of the population. One of the most significant psychological symptoms of polar tension syndrome is a high level of psycho-emotional tension and anxiety [1, 2, 3].

Anxiety can provoke somatic and mental disorders, reducing the adaptive capabilities of the body. In this regard, the study of the brain as a regulating and coordinating center that provides perception and analysis of environmental parameters, the search for optimal programs of interaction with the environment and adaptation to it is very relevant [4, 5].

**Methods.** In a cross-sectional simultaneous study 45 men and 45 women aged 60-74 years permanently residing in the Arkhangelsk region took part. The average age in the group of men was 65.3 (63.2-66.8) years; in the group of women - 64.6 years (63.1-66.1)

The "Integrative Anxiety Test" (IAT) was used to assess personal anxiety. The distribution of levels of personal anxiety and the overall indicator of personal anxiety were analyzed [6].

To assess the energy metabolism of the brain, the hardware-software diagnostic complex "Neuroenergometer-KM" was used. The level of DC-potential level was measured, the source of generation of which is potentials of vascular origin, reacting to the concentration of hydrogen ions in the blood flowing from the brain. The level of DC-potential was registered monopolarly, the active electrodes were placed on the head according to the scheme 10-20, the reference one — on the wrist of the right hand. It is worth noting that level of DC-potential is a measure of assessing the intensity of energy-consuming processes in the brain [7].

The obtained data were subjected to statistical processing using the SPSS 21.0 for Windows application software package. The distribution of signs for normality was evaluated using the Shapiro-Wilk criterion, which showed their deviation from the normal law. To identify the differences between the compared groups by qualitative indicators, the Pearson's $\chi^2$ criterion was used. The median (Me) and the range of values from the 1st (Q1) to the 3rd quartile (Q3) were used for descriptive statistics of features. The critical significance level (p) when testing statistical hypotheses in the study was assumed to be $< 0.05$.

**Results**. It was found that elderly women (5,00 (3,0-6,00)) compared to men (7,00 (6,00-8,25)) were characterized by statistically higher stances according to the general indicator of personal anxiety ($p = 0,001$). In other components of anxiety such as emotional discomfort, asthenic component of anxiety, phobic component, anxious perspective assessment and social protection significant differences did not reveal, that assume similar structure of anxiety in both groups.

Tabl. 1 presented data on absolute values in the distribution of DC-potential level of the brain in elderly men and women living in the European North of Russia (Tabl. 1).

Significant differences were found between the groups in the indicators of DC-potential level in the frontal (Fpz), central (Cz) and right temporal (Td) leads ($p = 0.05$; $p = 0.02$; $p = 0.05$, respectively). It was found that the total values of the DC-potential (Sum) of the brain of women (175.60 mV) compared with men (155.03 mV) were higher, although they did not have statistical differences.

| DC-potential | Women (n=45) | Men (n=45) | P |
|---|---|---|---|
| Fpz | 11.22 (3.86-18.59) | 5.64 (3.29-8.78) | 0.05 |
| Fd | 11.45 (1.65-20.77) | 7.34 (3.50-14.66) | 0.33 |
| Fs | 12.50 (0.47-25.76) | 10.20 (5.87-15.67) | 0.63 |
| Cd | 14.45 (6.22-28.39) | 16.20 (10.44-22.04) | 0.91 |
| Cz | 12.80 (2.82-18.64) | 19.09 (10.84-27.80) | 0.02 |
| Cs | 17.54 (6.21-29.61) | 18.32 (10.41-22.27) | 0.85 |
| Pd | 13.85 (7.39-25.61) | 10.86 (7.46-21.75) | 0.36 |
| Pz | 13.23 (2.28-22.32) | 5.64 (3.29-8.78) | 0.29 |
| Ps | 22.53 (6.89-25.24) | 7.34 (3.50-14.66) | 0.20 |
| Oz | 10.14 (5.30-23.88) | 11.62 (9.08-22.73) | 0.59 |
| Td | 7.89 (4.49-19.11) | 13.54 (8.92-23.26) | 0.05 |
| Ts | 15.96 (9.11-21.46) | 13.06 (5.48-21.41) | 0.69 |
| Sum | 175.60 (74.16-257.38) | 155.03 (109.3-219.91) | 0.82 |

Tabl. 1. Indicators of the distribution of the DC-potential level of the brain in elderly women and men in mV (Me (Q1-Q3)).
Note: (Fpz- frontal central lead; Fd- right frontal lead, Fs- left frontal lead, Cz-central lead; Cd- right central lead; Cs - left central lead, Pz- central parietal lead, Pd- right parietal lead; Ps- left parietal lead; Oz- occipital lead, Td- right temporal lead, Ts- left temporal lead).

**Discussion.** Significant differences in the overall level of personal anxiety indicate that older women have a predisposition to persistent manifestations of emotional stress, increased psychological fatigue (asthenia), and a sense of incomprehensible threat [8]. This can probably be explained by a greater degree of reduction in women's adaptive capabilities compared to men with increasing stressful social and physiological load.

The study of DC-potential level indicators revealed differences in the energy exchange of the brain in elderly men and women. A tendency was found to increase the total energy expenditure of the brain in women (by 11%) compared to men, which may indicate stress in the brain of elderly women.

The obtained indicators of the DC-potential level of the brain of elderly women indicate a redistribution of energy costs. Thus, the indicators of DC-potential level in the frontal (Fpz) lead were lower in women than in men by almost 50%, which probably indicates the development of regulatory disorders in which the activity of the third structural and functional block is disrupted. In turn, this can cause a decrease in motivational arousal and an increase in emotional tension [9]. Indicators of DC-potential level in the right temporal (Td) and central (Cz) leads in elderly women, on the contrary, were statistically higher than in men. It is generally believed that an increase in activity in the central and right temporal regions of the brain corresponds to an ascending nonspecific activating effect of the limbic-reticular complex or an increase in the activity of the modulating system of the brain, which is accompanied by nervous excitement and anxiety [10].

**Conclusion.** Based on the conducted studies, it was revealed that older women living in the conditions of the North are more characterized by a high level of personal anxiety compared to men. The distribution of the level of constant potential in older women indicates a change in the energy supply of the brain with a concomitant decrease in the activity of the third structural and functional block and activation of the ascending activating system of the brain.

**Conflict of interest.** There is no conflict of interest.

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