Y. O. OSIISKYI

ACTIVITY AUTONOMIC NERVOUS SYSTEM IN PATIENTS WITH PSYCHOLOGICAL DISORDERS

(INFORMATION 4)

Senior teacher of the department of psychology of the Vinnytsia institute
of the University "Ukraine"

В статті розглядаються аспекти функціонування вегетативної нервової системи (ВНС) у осіб з психологічними розладами за умов різної стресової напруженості довкілля. Показано, що для осіб з психологічними розладами характерні дисбаланс роботи ВНС і нижча чутливість барорецепторів.

Ключові слова: вегетативна нервова система, чутливість барорецепторів, психологічні розлади, постуральне тестування.

The article holds the examination of the aspects of functioning of the autonomous nervous system (ANS) in individuals with psychological disorders under the conditions of a different stress tension of the environment. It is shown that individuals with psychological disorders have ANS disbalance and lower sensitivity of baroreceptors.

Key words: autonomous nervous system, sensitivity of baroreceptors, psychological disorders, postural testing.

В статье рассматриваются аспекты функционирования вегетативной нервной системы (ВНС) у лиц с психологическими расстройствами в условиях различной стрессовой напряженности окружающей среды. Показано, что для лиц с психологическими расстройствами характерны дисбаланс работы ВНС и сниженная чувствительность бароцепторов.

Ключевые слова: вегетативная нервная система, чувствительность бароцепторов, психологические расстройства, постуральное тестирования.

Introduction.

The understanding of the way psychic processes are running is important for the concept of autonomous nervous system, which is also called as the vegetative nervous system (VNS), underlining its exceptional role in the regulation of the functioning of the internal organs [4,5,8]. Interestingly, the doctrine of the composition and function of VNS, as well as its divisions: sympathetic and parasympathetic is known for more than a century, while the exact algorithm of its functioning is still unknown.

Understanding the tight interconnections between the psychic activity and the functioning of internal organs, a wide range of researches provides persistent studies in search for the mechanisms that are engaged during their mutually-dependent influences on one-another. In one of the studies, particularly, it has been proved that there is a difference between the hostile and non-hostile men in the tasks on the identification of auditory elements, as well as in the responses of VNS. It turned out that the hostile individuals demonstrated a better hearing with their left ear; and higher responsiveness of cardiovascular system after the influence by the cold. The non-hostile men demonstrated a better hearing with their right ear and lower responsiveness of the cardiovascular system to the influence by the cold. These results testify to the hypothesis about the prevailed activation and functionality of the right hemisphere of the brain in hostile individuals, and left – in non-hostile [3, 6]. The aspect of mutual dependence of VNS activity and the emotional state was demonstrated in the work that revealed that the level of hostility affects skin sensitivity, sensomotor learning and vegetative tonus of the organism. Thus, hostile individuals demonstrated higher skin sensitivity and lower ability for sensomotor learning within the left part of the body, and the prevalence of tonus of the sympathetic nervous system. The subjects of the research with low hostility demonstrated higher skin sensi-

tivity in the right part of the body, decreased sympathetic tonus and high ability for sensomotor learning in the left part of the body [7].

Such interdependency of psychic and somatic structures suggests new targets for the contemporary researches. Among them - search for high-informational, low-invasive methods of diagnostics and correction of psychological disorders. The key aspect of this issue, in our opinion, may be the understanding the function of the baroreceptor response system of the organism.

The work was implemented according to the syllabus of ScRW of the Vinnytsia social-economic institute of the University "Ukraine".

Goals of the research. The goal of our research was to study circadian oscillations of the sensitivity of baroreceptors, as well as the oscillation of the frequency of heart contractions (FHC) and the arterial pressure (AP) in individuals with psychological disorders during the execution of the postural test.

The object and the method of research. The research was made on the basis of the department of psychology of the Vinnytsia institute of the University "Ukraine" and is based on the observation of 61 student with psychological disorders, who were divided according to their course. This division formed three groups : first – 23 individuals (students of the first course), second – 18 (of the third course) and the third – 20 (of the fifth course). The control group was composed of 17 practically healthy individuals. The control and the research groups were statistically equal in relation to gender and age.

In order to study the function of vegetative system and the response of the indices of the cardiovascular system to the body position change, we provided postural testing, which initially involved a 10-minute lying, and then – 5-minute calm standing [1]. During the entire testing, we provided a continuous measurement of the systolic blood pressure (SBP), and diastolic blood pressure (DBP) and FHC. In order to reach exact time gradation of the indices, we conducted the measurement with the use of the device ABPM-04 of the Hungarian company "Meditech" for the 24-hour-monitoring of the AP, which had been programmed for the measurements during the postural test [9]. At the same time, we assessed the sensitivity of baroreceptors, employing the method of measurement of spontaneous oscillations of SBP and the intervals of R-R. For this purpose, in parallel with AP measurement, we continuously, during the test performance, conducted the recording of the heart rhythm by means of the assessment system of the heart rate variability: HRV 1,5; JSC "Solvaig", 1998. After this, by means of the computer software for the transcription of the rythmcardiograms we assessed the oscillation of the intervals R-R during the change of body position and correlated with the dynamics of SBP in the identical time periods. The sensitivity of baroreceptors was measured employing special formula [4].

The received control indices of the sensitivity of baroreceptors, generally would not statistically differ from the findings of other researchers, according to the standard methodology of assessment [10].

The testing was conducted twice in every group: at the beginning of the academic year, in September, and in the end, in May.

The final statistical and mathematical assessment was conducted with the usage of a set of programs, including "Statistica 5.0" and "Microsoft Excel, 2002", and we also used guidance from the book by S.N.Lapach, A.V.Chubenko and P.N.Babych (2002) [2]. Student's t-test was also provided. Before the provision of the Student's test, we had initially provided the assessment of the equality of the groups under analysis using the Fisher's

criterion, and estimated the norm-relation of the selected data (using Microsoft Excel). All requirements for the adequate assessment of the Student's criterion we fulfilled.

Results and discussion.

It was interesting to note the data, which were received during the measurement of the major indices of the cardiovascular system in lying and standing positions (see Table 1).

Generally, we found that the individuals with psychological disorders demonstrated statistically valuable difference in the response of systolic and diastolic blood pressure in relation to orthostatic loading in comparison with that of the control group. Thus, the value of DBP in individuals of the control group at the beginning of the academic year, in September, in the state of lying and standing positions were on average 72±9,4 and 76±8,5 mm of the mercury column (mm.mer.col.) accordingly. The difference in the increase, which reflects the activation of the sympathetic activity under the change of the body position from horizontal into the vertical one – 4 mm.mer.col. At the same time, the analogical values in the individuals with psychological disorders of the first research group were accordingly 77±8,3 and 84±9,2 mm.mer.col., the difference is 7,0 mm.mer. col. $p<0,05$. Analogous results were received in the other research groups, which, in our opinion, may suggest a higher sympathetic readiness in the individuals with psychological disorders. Eventually, this may point to the inclusion into pathological mechanisms of formation of psychological patterns of responses to the environmental factors and the vegetative nervous system.

Таблиця 1

Results of the postural testing of the individuals with psychological disorders at the beginning and at the end of the academic year (M±m)

Index	Control group(n=17)		Experimental group 1 (n=23)		Experimental group 2 (n=18)		Experimental group 3 (n=20)	
	lying	standing	lying	standing	lying	standing	lying	standing
September								
(SBP) САТ, мм.рт.ст.*	114±11,2	108±10,4	117±8,9	112±9,6	121±12,2	118±11,4	120±11,7	117±10,5
(DBP)ДАТ, мм.рт.ст.*	72±9,4	76±8,5	80±7,3	86±9,2	82±6,7	88±8,3	84±7,5	87±7,1
(FHC)ЧСС, уд./хв. °	65±8,1	82±9,6	72±8,8	86±9,8	74±8,4	87±8,7	74±7,8	89±8,3
May								
(SBP)САТ, мм.рт.ст.*	114±11,5	109±9,3	121±7,6	117±9,2	119±10,2	116±9,5	116±9,3	114±8,8
(DBP)ДАТ, мм.рт.ст.*	74±9,2	78±8,1	79±8,2	88±7,8	85±8,1	87±7,4	81±8,3	83±7,4
(FHC)ЧСС, уд./хв. °	68±8,8	84±9,2	78±9,4	91±9,1	76±8,9	89±9,5	76±8,2	92±8,7

Notes: 1. * - change of the index is valid in comparison with the value of its analog in the control group ($p<0,05$); 2. ° - change of the index is valid in comparison with its value in "lying" position ($p<0,05$).

The confirmation of this assumption was found in the difference in the distribution of the analyzed values of the cardiovascular system in different research groups during the period of exams. While in the individuals of the first research group (I-st course) the values of SBP,DBP and FHC possessed a marked tendency to growth in May, both in lying and standing positions, in the individuals of the second (III-rd course) and, especially the third research group (V-th course) we noticed vivid decrement dynamics of SBP and DBP under the relational tendency to grow of the FHC. In our opinion, together with other factors of the regulation of the indices, their circadian oscillations in various periods of the academic year may be the reflection of a kind of a course of psychological processes during the growth of stress-related tension of the environment in May. Additionally, if the individuals of the first course respond to it with the increase of the sympathetic readiness, the individuals of the third, and especially of the fifth courses demonstrate non-adequate response to the body position change, which may testify to maladjustment and deepening of the dysfunction of the vegetative nervous system. This may also be testified by the insufficient, for the dynamics of the postural test performance, the growth of DBP in standing position in May in the individuals of the third research group, the difference of which in relation to the lying position was in average 2 mm.mer.col. It is noticeable that in the individuals of the first research group this difference in May was 7 mm.mer.col., and in the individuals of the control group – 4 mm.mer.col.

Another important thing within the context of the research is the dynamics of the sensitivity of baroreceptors (SBR) (fig.). It is known that baroreceptors, as they are taken by the contemporary scientists, are the central elements of the regulation of the cardiovascular system [5,11]. The assessment of their sensitivity is considered to be one of the most valid methods for the evaluation and the prognosis of the course of the wide range of pathological states and the function of the cardiovascular apparatus [4]. According to our working hypothesis, their sensitivity also depends on the stress-related tension of the environment, as well as on the peculiarities of the course of psychological responses in specific individuals.

It was asserted during the comparison of the received values of SBR (during the postural test) in the individuals with psychological disorders at various periods of the academic year (fig.1).

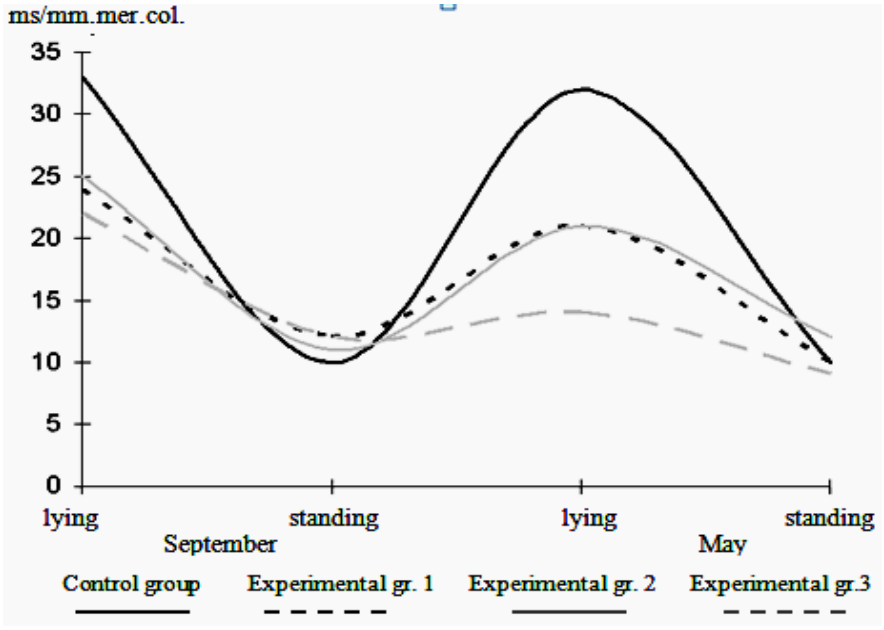

Fig. 1. Oscillation of baroreceptors' sensitivity in individuals with psychological disorders at the beginning and at the end of the academic year.

Thus, we found a typical curve of the sensitivity change of baroreceptors during the transition from the horizontal to the vertical position in the individuals of the control group. During the analysis of SBR in the individuals with psychological disorders we noticed statistically valuable dif-

ference in comparison with the values of the control group, $p<0,05$. For example, the value of SBR at the beginning of the academic year in the individuals of the first research group in the lying and standing positions was accordingly 24±4,7 ms/mm.mer.col. and 12±1,8 ms/mm.mer.col., and in the individuals of the control group - 33±6,2 ms/mm.mer.col. and 10±3,1 ms/mm.mer.col., accordingly ($p<0,05$). Similar tendencies were also found during the analysis of the received data in the other research groups.

There is an interesting characteristic of the data of SBR at the beginning and in the end of the academic year. On the average, we fixed the decrease in sensitivity of baroreceptors in May in the individuals with psychological disorders. The maximal decrease of SBR was typical for the individuals of the third research group (5-th course), which was in May (14±2,4) ms/mm.mer.col in lying position and (9±1,1) ms/mm.mer.col. – in the standing position in contrast to the September values, accordingly (22±4,1) ms/mm.mer.col. and (12±2,6) ms/mm.mer.col. The difference of the indices is statistically valuable, $p<0,05$. Analogical specifics were also found in other research groups.

We would like to conclude that lower sensitivity of baroreceptors is typical for the individuals with psychological disorders in comparison with the individuals, who had no such disorders. In graphical equivalent it is typical for them to demonstrate flattening of the sensitivity curve (according to the data of the postural test). Taking into account our findings, we would like also to distinguish that SBR depends on the stress-related tension of the environment and the presence of psychological disorders in an individual, which condition the peculiarities of its response to the external factors: both factors are the reasons for the decrease of sensitivity. In this view, we would like to mention that the decrease of the SBR, according to the literature, is estimated with the growth of the risk of development and the progress of a range of cardiovascular pathology, including sudden heart death, arterial hypertension, etc. [4, 8].

The possible factor for the decrease of the SBR may also be, in our opinion, the accumulation of stressful influences of the environment on the organism with the shift "resetting" of the threshold of sensitivity of the mechanisms of psychoemotional perception of the environment with the fixation of unfavorable pathological stereotypes of behavior, which under the conditions of psychological 'memory' construction and 'encumbering' with unfavorable behavioral algorithms, may become a firing cause of initiation of a range of 'idiomatic' diseases, including essential hypertension. This assumption was made on the basis of the results of the assessment of SBR in the individuals with psychological disorders of all courses. Namely the individuals of the fifth course (third research group) demonstrated a statistically valuable maximal decrease of SBR, at the beginning and at the end of the academic year. However, this assumption requires further research.

Conclusions.

1. In the course of the postural test, it was found that lower sensitivity of baroreceptors and inadequate dynamics of SBP, DBP and FHC are typical for the individuals with psychological disorders.

2. The sensitivity of baroreceptors depends on the stress-related tension of the environment: the increase of the latter is the cause of the sensitivity decrease.

Further research is expected to focus on the study of other issues of circadian changes of sensitivity of baroreceptors, arterial blood pressure and the frequency of heart contractions in individuals with psychological disorders.

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