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The article was received at editors 26.10.2015

Koval Ye.S., Tonkovtseva V.V., Bekmambetov T.R., Yarosh A.M. Essential oil of *Lavándula Angustifólia* and its effect on psychophysiological state of elderly people breathing it in low concentration // *Bull. of the State Nikit. Botan. Gard.* – 2015. – № 117. – P. 33 – 37.

Lavándula Angustifólia essential oil (EO) in concentration 0,1 mg/m³ and its effect on psychophysiological state of elderly people were investigated in terms of the research. Improvement of psychoemotional state and simple mental processes stimulation were the most pronounced results of *Lavándula Angustifólia* EO effect on human higher nervous activity. This essential oil possesses the hypotensive effect what makes possible to put it into practice for work with people suffering from hypertension.

Key words: *essential oil, aroma session, aromatherapy, Lavándula Angustifólia, psychorelaxing record, mental capacity, psychoemotional state.*

UDK 612.776.1:796

PHYSIOLOGICAL OBJECTIFICATION OF RECREATIONAL MEASUREMENTS. AROMA IMPACT AS A STUDY CASE

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Introduction

Nowadays having definite achievements in the field of medicine and biological researches, including areas of balneology and recreational medicine, scientists debate concept of personalized approach [11, 12], what is capable to improve quality of diagnostics, correction and treatment. Development of this direction is important in the field of natural correctional and therapeutic factors, as standartization of their usage making individual rehabilitational programs needs more attention, while physiological mechanisms hasn't been investigated enough. All of these require modern diagnostics facilities that make possible to reveal effect on a certain patient, directly in given recreational conditions and develop the optimal correctional program for him. For instance, effect of health path, organized in the zone with blooming flowers is supposed to be different from the one organized in the steppe landscape.

Complex impact of recreational factors combinations is polymodal and provokes synergetic effect, especially in case of aroma influence [8]. Like essential oils (EO), being preformed natural factors, as flower aromas during blooming are multicomponent substances, and their impacts are grounded by complex influences of all substances, but not separate chemical mechanisms. Synergism influence has the following construction: if two or three EO components affecting even in small dosages, but simultaneously, they demonstrate extra activity in comparison with their effects working in consecutive order.

Phenomena of synergism complicates forecast of findings what are results of interaction of some recreational factors and human body combinations with various basic level of adaptive systems work.

In this way objectification of recreational interactions, that mix multidirectional mechanisms affecting on human body, will make it possible to get more efficiency in terms of personalized approach, arrange correctional and medicine measurements.

But diagnostic facilities with a wide range of informative study parameters are possible to approach the field of recreation (for instance forest, park, mountains) with its unique effect (combination of affecting parameters and mechanisms) on human body; the problem lies in inconvenience of equipment and necessary of power source [7].

One of such devices, which solves all these problems is a portable program and technical complex "FAZAGRAF®" [3, 5].

Objective of our research article is to differentiate effects of single impact on human body and various initial parameters of combined effects of aroma influence and physical activity while walking along alleys of Nikita Botanical Gardens in Yalta in the period of rose blooming, what was compared with the same physical activity but in urban landscape.

Objects and methods of the research

A group of 35 conditionally healthy people, 15 of them were 17-years old young men, 10 17-years old girls and 10 women of 37-43 years. Study parameters were fixed sitting during the rest before recreational procedure and during the 5th minute of recreation period after procedure. Conditions for walking in both landscapes (park and urban) were the same: similar temperature and climatic regimes, speed and duration (40 minutes).

Registration and analysis of ECG in a phase space were organized applying program and technical complex "FAZAGRAF®", which works due to original informative technology of processing the electric cardiosignal in phase space also including concepts of cognitive computer graphics and methods of automatic recognition of images (fig.1). Ring electrodes of the complex make it possible to registrate signal quickly and don't complicate testing in recreational conditions.

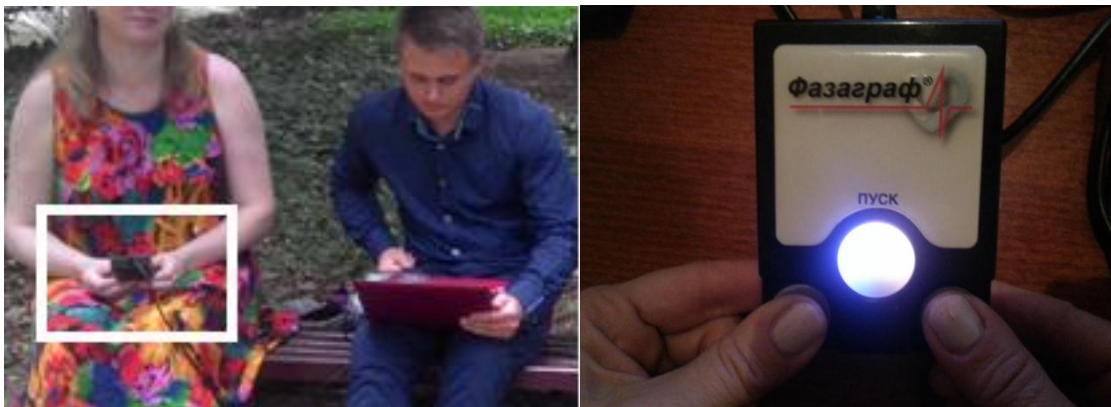


Fig.1 Registration of single-channel ECG under conditions of recreational measurement applying ring electrodes PTC "FAZAGRAF®"

The following parameters were analyzed: HR (bpm), T-wave symmetry (β_T , units), standard deviation β_T (SD β_T , ms), mode range (AMo,%), vagosympathetic balance factor (LF/HF).

Statistic research results processing was conducted applying software package STATISTICA 6.0 (StatSoft, Inc., USA). Goodness-of-fit test by Kolmogorov-Smirnov were

used to assess divergence of factors distributions. Authenticity of differences between like factors in independent samples was estimated due to nonparametric U-criterion Mann-Witney. Authenticity of differences between like parameters of tested people before and after recreational procedures was defined by nonparametric T-criterion Wilcoxon. In case of standard distribution parametric t-criterion by Student was applied.

Results and discussion

It's a well-known fact that any deviation from optimal functioning of any system including physiological is a result of control and regulatory mechanisms deformation, what reduces efficiency of physical and mental activity.

As a result of this research extra sensory factors like blooming rose flavor in terms of recreational procedure had various effect on functional state of tested people. In this way physical load that is walk combined with aroma effect had the most productive result in group of girls and women (table 1).

Table 1
Change of cardiohaemodynamics and variability of HR parameters before and after recreational procedure held in Botanical Garden, (M±m, n=35)

C	Condition parameters									
	HR, bpm		β_T , units		CKO β_T , ms		AMo, %		LF/HF, units	
	before	after	before	after	before	after	before	after	before	after
Y	74,4 ±2,6	68,2 ±3,1	0,65 ±0,05	0,65 ±0,02	0,063 ±0,007	0,046 ±0,003**	34,8 ±2,6	30,4 ±2,9	2,86 ±0,53	1,68 ±0,28**
G	72,3 ±4,5	60,55 ±0,9* *	0,67 ±0,05	0,60 ±0,02	0,106 ±0,044	0,088 ±0,037	31,4 ±2,1	24,3 ±2,2**	2,27 ±0,42	0,44 ±0,18***
W	78,1 ±3,4	75,7 ±3,4	0,83 ±0,03	0,74 ±0,01**	0,091 ±0,013	0,054 ±0,008**	50,1 ±2,04	39,9 ±4,1*	2,1 ±0,70	2,1 ±0,38

Notes: C-contingent; Y-youth, young men of 17 years old (n=15); G-girls of 17 years (n=10); W-women of 37-40 years old (n=10); authenticity before and after recreational procedure on the level * - $p < 0,05$; ** - $p < 0,01$; *** - $p < 0,001$

Centralization of HR control by AMo in girls and women groups became 20% less ($p < 0,01$; $p < 0,05$), on the background of stable parameter of vagosympathetic balance of women and increasing of parasympathetic effect of girls – more than 5 times ($p < 0,001$). It's well-known that natural flavors, being a component of oil-bearing plants are capable to optimize HR, an indicator of not only heart state, but mechanisms of its central and autonomous control, what is changeable in case of physical and psychoemotional load [1, 2, 9, 10]. Nowadays variability of HR as an integral mark of control mechanisms, providing homeostasis, is paid much attention. There is an opinion that unnecessary periodicity and disorder in system functioning, including HR control, could be predict development of various heart pathologies or forecast aggravation of human state. That's why record of individual reactions to recreational procedures during sanatoria and health period of treatment and rehabilitation gains a great importance for optimization of recovery, especially for patients with cardio pathology.

Planning health resort treatment including aromatherapy age factor should be considered. In our research in spite of unidirectional increasing of variability of heart rate and trophotropic effect of parasympathetic division of nervous system, women and girls had different cardiohemodynamic modifications. According to table 1, after single recreational procedure after 40-minute walk during recreational period HR of girls 27,3% reduced ($p <$

0,01). Women having steady HR values before and after procedure, myocardium function improved according to parameters of T-wave symmetry, which 10,0% reduced ($p < 0,01$). Metabolic processes while providing myocardium with oxygen form functional myocardium reserve to be able to realize mechanical heartbeats in case of extra load, for example physical activity. Big role in this process goes to repolarization of ventricles, as its disorder can cause electrical inhomogeneity of myocardium and worsening of contractile force, strain of functional state and reduction of adaptive abilities. It is known that a shape of T-wave depends upon duration and value of transmembrane action potential along different myocardium zones [4].

Increasing of myocardium reserve of women was proved by reduction of CKO β_r - 40,3% on average ($p < 0,01$). Perhaps activity of humoral control in a body of mature women takes part in control processes of microvasculature better than in immature organism of girls.

Gender peculiarities of reaction to olfactive stimulation revealed before were proved in this research. In spite of that reaction, homotype with girls, of activity increasing of parasympathetic division of vegetative control, effect on young men for 42,3% ($p < 0,01$) became apparent by reduction of variability β_r - 27,0% ($p < 0,01$).

To differentiate effects of aroma treating and walk, scientists organized conditions of the same physical load but in urban landscape without extra sensory influence. According to table 2 and figure 2, authenticity of differences after recreational procedures in urban conditions and botanical garden, confirm importance of natural aromatic stimuli and minimizes physical load effect as it is.

Table 2

Change of cardiohaemodynamics and variability of HR parameters before and after walk held in the city conditions, (M \pm m, n=35)

C	Condition parameters									
	HR, bpm		β_r , units		CKO β_r ,ms		AMo, %		LF/HF, units	
	before	after	before	after	before	after	before	after	before	after
Y	71,3 $\pm 2,3$	73,4 $\pm 3,0$	0,662 $\pm 0,017$	0,671 $\pm 0,025$	0,061 $\pm 0,005$	0,058 $\pm 0,004$ *	32,6 $\pm 2,4$	33,6 $\pm 1,6$	2,77 $\pm 0,65$	2,47 $\pm 0,27$*
G	80,2 \pm 3,9	76,2\pm 3,7***	0,707 \pm 0,048	0,780\pm 0,031**	0,091 \pm 0,042	0,093 \pm 0,017	31,3 \pm 3,5	31,3\pm 2,1**	2,03 \pm 0,26	3,04\pm 0,79***
W	77,2 \pm 3,0	85,7\pm 1,4**	0,810 \pm 0,029	0,843\pm 0,01***	0,090 \pm 0,023	0,089\pm 0,013*	49,1 \pm 2,04	69,2\pm 5,1***	2,0 \pm 0,78	2,9\pm 0,19**

Notes: C-contingent; Y-young men of 17 years old (n=15); G-girls of 17 years old (n=10); W-women of 37-40 years old (n=10); *italicized data* – authenticity of differences after recreational procedure in Botanical garden in comparison with the same procedure in the city conditions on the level * - $p < 0,05$; ** - $p < 0,01$; *** - $p < 0,001$

It's also important to note that in women group parameter LF/HF after graduated walk under the city conditions became 45,0% more ($p < 0,01$), but having the same activity in botanical garden it remained stable.

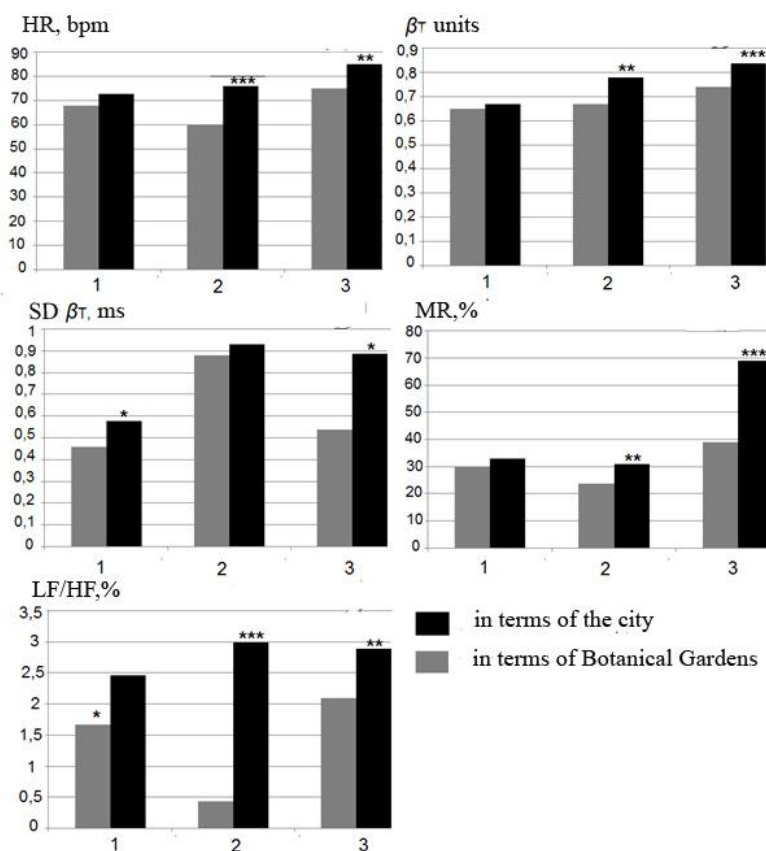


Fig.1 Comparative characteristics of parameters variations of cardiohaemodynamics and variability of heart rate after recreational procedure held in Botanical garden and urban landscape

Notes: 1 – young men of 17 years old (n=15); 2 – girls of 17 years old (n=10); women of 37-40 years old (n=10); authenticity of parameters differences after recreational procedure in urban landscape in comparison with parameters fixed after recreational procedure in Botanical garden * - $p < 0,05$; ** - $p < 0,01$; *** - $p < 0,001$; A – HR (bpm), B – T-wave symmetry (β_T , units), C – standard deviation β_T (SD β_T), D – mode range (MR, %), E – coefficient of vagosympathetic balance (LF/HF).

Therefore aroma influence including liminal and subliminal concentrations, under natural conditions of park zone, activating mechanisms of adaptation and homeostasis, had a systematic effect on organism, optimized cardiovascular system, favored renewal of vegetative control balance of HR what increases stress resistance of patients and reduces aftereffects of physical load.

Conclusions

1. Centralization of HR control according to AMo parameter in groups of women and girls became 20,0% less ($p < 0,01$; $p < 0,05$), on the background of stable parameter of vagosympathetic balance of women and increasing parasympathetic effect of girls – 5 times more ($p < 0,001$).

2. In the group of girls after single recreational procedure after 40-minute walk during recreational period reduction of HR value was registered – 27,3% less ($p < 0,01$). As to women, having stable before and after procedure HR there was improvement of myocardium function according to T-wave symmetry, what became 10,0% less ($p < 0,01$) and reduction of SD β_T - 40,3% on average ($p < 0,01$).

3. LF/HF of young men became 42,3% less ($p < 0,01$), what caused reduction of variability βT – 27,0% less ($p < 0,01$).

4. Authenticity of differences after recreational procedures in botanical garden and city confirms importance of natural aromatic stimuli and minimizes independent effect of physical load; partitive and autonomous PTC “FAZAGRAPH®” makes it possible to registrate informative parameters of SSS in case of physiological objectification of recreational factors effects on human body.

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The article was received at editors 26.10.2015

Minina Ye.N., Tonkovtseva V.V., Phynogentov P.V. Physiological objectification of recreational measurements. Aroma impact as a study case // Bull. of the State Nikit. Botan. Gard. – 2015. – № 117. – P. 37-42.

In terms of the research effect of a single aroma impact and exercise on human body with different initial parameters was analyzed for the first time. The combined effect was registered during walks along Nikita Botanical Gardens (Yalta) paths while rose blooming what was compared with the same physical activity but within urban landscape. Importance of natural aroma stimuli is underlined in the article, portable and autonomous PTC “FAZAGRAF®” fixes informational parameters of cardiovascular system within physiological objectification of recreational factors effect on human body.

Key words: *aroma impact, variability of the heart rate, symmetry of T-wave, PTC “FAZAGRAF®”, recreation.*