PSYCHOPHYSIOLOGICAL CORRELATES OF MUSICAL THERAPEUTIC INFLUENCES AT YOUNG MEN WITH NEUROTIC FRUSTRATION

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Abstract

Research of age-related features in psychophysiological parameters dynamics under procedures of medical resonance therapeutic music (MPTM) at practically healthy young men of 15-18 years and young men of the same age group with neurotic frustration was carried out. Procedures MPTM made taking into account individual preferences in musical fragments, possess expressed anti stress effects. Effects of MPTM in essential degree are defined by individual preferences in musical fragments surveyed in a choice, and, on the other hand - depend on age and individual and typological features of recipients.

Keywords: psychophysiological correlates, medical resonance therapeutic music, neurotic frustration.

The influence of music and other audio information on person's organism has an extraordinary significance. It is known that specially selected music can influence on person's mood, call or redeem aggressiveness, optimize different autonomic functions and hormonal status [2,5,6,21,22].

Numerous studies have shown that, the activation of acoustic sensory inflow to the brain (in the form of music therapy procedures) is the effective way of non-drug rehabilitation technology and could be applied in complex treatment of patients with depression, stress-emotional disorders, for potentiation of mental capacity and so forth [1,3,4,5,8,11,20,25]. Special music compositions were offered, for example, medical resonance therapy music (MRTM). Hubner [23], whose efficiency was demonstrated in several clinical trials with neurotic disorders in young people [2,6,7,9].

The efficiency of procedures depends on context of music, genre, its tempo-rhythm, diversity of acoustic energy flow, and on the other hand by age, personality and individual typological features of the person [8,9,11,24,26].

However, despite of widespread usage of musical therapy, the physiological mechanisms of its perception (on conscious, subconscious level), specific neuro and physiological mechanisms of the music influence on functional state of the person remain largely unclear. These questions have received only sparse coverage. Among the available literature, we have not met scientific research on the impact of organized or leisure use of music on the psycho-

emotional sphere of healthy adolescents and young people with neurotic frustration, however, actually in this age music holds one of the most important places in the emotional life of person.

Based on above mentioned, the purpose of our work - the study of the dynamics of age-related features of psychophysiological correlates of medical resonance therapy music procedures in healthy young men of 15-18 years and boys of the same age group with neurotic frustration.

Materials and methods. According to clinical symptoms identified in boys with neurotic disorders is classified into classes of ICD 41.1- "generalized anxious disorder" and 43.2. - "adjustment disorder". The dynamic studies of 48 healthy young men and 48 young men with neurotic disorders, with division into 4 age groups were carried out: 15, 16, 17 and 18 years, in each age group there were 24 subjects. The investigation of subjective, electrophysiological, psychophysical and autonomic indicators during single presentations of chosen emotionally pleasant fragments of "medical resonance therapy music (MRTM) [25], compositions of Sonnen Simphonie ("Hymns of the Sun, No:1 - "Relaxation -B") on study population were carried out. Boys initially placed in an arm-chair in darkened room, where they were invited to conduct ratings of 5 musical fragments of music lasting 1.5-2 min on a 7-point scale. According to the results of assessments, the most emotionally pleasant (high rating) and the least emotionally pleasant (low rating) fragments of music were determined.

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MRTM procedure lasted 20 minutes, stereo sound music was provided with certificated CDs from the loud speakers of computer. Before and after the influence of music to young people, they registered electroencephalogram (EEG), offered computer optional tests of "state of health- activity-mood" (HAM) and of Ch. Spielberger for determination of personality level (PL) and state anxiety (SA) [19], measured the systolic (SYS), diastolic blood pressure (DIA) and heart rate, performed calculations of Kerdo vegetation index (KVI).

EEG was recorded on 8-channel electroencephalograph of "Neurosoft" (RF) firm in a quiescent state "eyes closed" unipolarly from 6 points of head F3, F4, C3, C4, O3, O4 according to international system of electrode placement "10-20". The constant time for recording EEG was 0.3 sec at 30 filters, calibration signal - 50 mV. Indifferent electrodes were placed on the earlobes. The duration of registration 180 sec. The EEG processing was performed using the automated processing package

"Brainsys" (2001). Power spectrum (mV 2) overall and for individual frequency band calculated based on the Fourier transforming. Epoch analysis - 8 sec. Additionally, for each EEG registration sphere the spectral power α -interval (7-13 Hz), the total capacity of α -rhythm (for all ages analysis) were calculated, but the statistical significance of their dynamics was considered individually.

Statistical data processing was carried out using the program "Statistic for Windows" 6.0. Considering the paucity of comparison groups, for assessment of the accuracy of differences for paired and unpaired samples nonparametric U-Mann-Whitney was used.

Results and discussion. It was found that, in all age groups of young men dedicated clinical subgroups with neurotic frustrations have significant differences in the estimates of psychophysiological and psychological indicators of their healthy peers (table 1). So, (excluding subgroup of 15 years old) relative depression α -rhythm

Table 1.

Autonomic indicators of healthy young boys and with boys of neurotic frustrations from 15-18 age groups and under influences of FM

Spec.m		Heart rate		SYS		DIA		PP	
before	after	before	after	before	after	before	after	before	after
314.8±55.9	406.7±73.1 <0.05	68.7±2.2	69.0±3.1	120.4±3.3	117.9±3.4	82.9±1.9	78.6±2.6	37.9±1.9	39.2±1.2
254.9±31.5	310.3±44.5 <0.05	71.0±1.6	69.2±1.7 <0.01	121.6±3.7	119.2±3.2	84.2±2.2	79.0±2.2 <0,05	39.8±2.6	41.3±1.5
325.8±61.2	359.6 ± 63.7	67.1±1.3	67.9±1.3	116.7±4.0	114.6±3.6	80.4±3.5	78.3±2.9	35.4±1.7	37.0±1.4
286.3±73.4	321.4±52.9	67.3±1.3	72.0±2.2	117.9±3.8	117.1±3.6	85.0±2.8	80.0±3.2 <0,05	39.3±4.4	37.0±1.6
372.2± 69.3	362.3 ±52.4	70.3±2.1	68.3±1.6	116.7±4.3	112.9±3.5	78.8±1.9	74.5 ±2.0 <0,05	37.3±2.7	38.3±1.8
267.2±46.1	311.8±45.9	71.5±2.5	70.8±1.9	120.8±4.4	113.4±2.8 <0.05	80.0±2.3	73.7±2.2 <0.01.	40.4±2.3	38.4±1.3
309.0±46.2	320.0±49.5	69.4±1.8	67.3±2.1 <0,05.	113.0±3.7	110.4±4.1	79.6±2.4	78.3±3.3	33.3±2.9	38.8±2.7
248.6±69.1	275.1±58.4	68.1±1.5	66.8±1.8	114.6±3.2	111.4±3.7	80.8±2.5	75.0±3.0 <0.05	35.0±2.6	35.4±1.8

Note: Power spectrum mV2, PF- pulse frequency, SYS- systolic blood pressure, DIA- diastolic blood pressure, PP -pulse pressure, 1- indicators till MRTM, 2 - after the procedure, P- accuracy of differences in the healthy group and after MRTM, P1- in subgroups with neurotic frustrations.

mainly in anterior leads, lower values of self-esteem scores of general health, mood, increased values of situational anxiety SA (in subgroups of

18 years old) were revealed in them. At the same time, according to autonomic indicators group of healthy young boys did not differ significant-

ly from the group of neurotic frustrated ones.

The presentation of individually selected part of music led to complex psychophysiological rearrangements of fundamentally similar in all age groups, as well in healthy young men and in subgroups of young men with neurotic frustration - increase of spectral power of alpha rhythm in all recorded leads, mainly in the frontal and central (excluding subgroups of 17 and 18 years old), decrease of SA level, increase figures of self-esteem, activity, some decrease in SYS and significant decrease in DIA, optimization of VIK indicators in the normtonic range. Such rearrangements generally show the efficiency of MRTM for correction of psychological emotional state of young men in 15-18 years. Comparing the obtained complex changes of EEG, autonomic features and indicators of mental status, we can assume that MRTM having influence on integra-

tive brain processes and emotional status of study people, levels up disfunction of non-specific regulatory systems, revealed during neurotic frustrations of adolescences [2,10,11,17].

Acquired results got their confirmation from study [20], that indicates the decrease of sympathetic influence, noticed in teenagers with neurotic frustrations until the impact of functional music and trend to equilibration between sympathetic and parasympathetic systems in the periphery which reflects interoperability between ergodic and trophotropic devices in suprasegmental departments of autonomic nervous system [5].

Along with this, in different age groups the nature of changes psychophysiological indicators in dynamics of procedures MRTM differed and depended probably on the characteristics of person in selection of music as well from individual features of study people (table 2).

Table 2.

The indicators of psychophysiological indicators in healthy young men and boys with neurotic frustrations in the dynamic of MRTM procedures ($M \pm m$)

general state		activity		mood		VIK		SA		PA	
before	after	before	after	before	after	before	after	before	after	before	after
4.8±0.2	4.6±0.2	4.7±0.3	3.6±0.8	4.4±0.4	4.7±0.4	16.5±8.1	16.6±7.9	41.5±3.4	37.5±2.3	41.2±2.5	38.7±2.5
									<0.05		
4.8±0.2	4.9±0.3	4.9±0.3	5.0±0.3	5.3±0.2	5.3±0.3	-13.7±2.3	-9.7±3.5	39.8±2.1	36.7±2.1	36.7±2.1	36.4±2.4
									<0.05		
5.1±0.1	4.7±0.2	4.8±0.1	4.6±0.2	4.9±0.2	5.1±0.2	-14.2±3.7	-5.8±5.3	39.9±1.8	34.4±1.8	39.5±2.0	38.8±2.0
5.3±0.2	4.9±0.2	5.5±0.2	4.8±0.2	4.0±0.4	4.2±0.4	-22.3±3.2	-1.6±3.3	45.5±3.1	44.3±2.8	39.9±1.6	4.8±1.9
			<0.05				<0.05				
5.2±0.2	4.9±0.2	4.9±0.2	4.6±0.2	4.8±0.3	5.0±0.3	-11.4±3.7	9.1±4.2	41.3±3.2	39.1±2.9	38.7±2.1	38.1±1.6
	<0.05						<0.001		<0.01		
5.3±0.2	4.7±0.1	4.8±0.2	4.6±0.2	5.2±0.3	5.1±0.3	-11.9±1.4	-9.6±3.0	42.1±2.0	43.0±3.5	40.8±2.0	42.6±1.8
	<0.05										
4.9±0.1	4.9±0.2	4.8±0.2	4.6±0.2	4.9±0.3	5.1±0.2	-15.4±4.1	-4.7±6.7	38.9±2.3	33.9±2.3	36.8±2.3	36.0±2.4
									<0.01		
5.0±0.1	5.1±0.2	5.1±0.3	4.7±0.2	4.8±0.2	4.8±0.2	-19.2±3.6	-4.0±2.8	44.2±3.7	40.3±3.8	38.2±2.7	37.9±1.8

Note: general state, activity, mood, VIK, PA - personal and SA- situational anxiety, H- healthy, N- nervous, before and after statistical difference P for healthy and P1 for nervous people of the same age group.

So, there is significant increase at the indicators of spectral capacity of alpha rhythm from 314.8 ± 55.9 till 406.7 ± 73.1 ($p < 0.05$), and decrease in situational anxiety from 41.5 ± 3.4 till 37.5 ± 2.3 ($p < 0.05$) with minimum changes in psychological indicators of healthy boy aged 15 years. In the subgroup of boys with neurotic

frustrations there was significant increase in spectral capacity of alpha rhythm from 254.9 ± 31.5 till 310.3 ± 44.5 ($p < 0.05$), at the same time there was decrease in DIA from 84.2 ± 2.2 till 79.0 ± 2.2 ($p < 0.05$). The indicators of situational anxiety were decreased from 39.8 ± 2.1 till 36.7 ± 2.1 ($p < 0.05$) and extraordinary situation

from 71.0 ± 1.6 till 69.2 ± 1.7 ($p < 0.01$), associated with significant decrease in heart rate and DIA.

16-year-old healthy adolescences, the procedure of MRTM brought to trend on increasing spectral capacity of alpha rhythm (45.6%), but autonomic parameters changed with different directions and were not accurate. The decrease in DIA from 85.0 ± 2.8 till 80.0 ± 3.2 ($p < 0.05$), activity from 5.5 ± 0.2 till 4.8 ± 0.2 ($p < 0.05$), VIK from 22.3 ± 3.2 till 11.6 ± 3.3 ($p < 0.05$), the change of alpha rhythm in frontal and central leads, as well as the normalization of indicators was identified in adolescences with neurotic frustrations after functional music.

In subgroup of 17-year-old healthy young men after influence of functional music, there were no any changes in EEG features, however there was decrease in the indicators of DIA from 78.8 ± 1.9 till 74.5 ± 2.0 ($p < 0.05$), normalisation of indicators of VIK from 11.4 ± 3.7 till 9.1 ± 4.2 ($p < 0.001$) and worsening of subjective evaluated well-being from 5.2 ± 0.2 till 4.9 ± 0.2 ($p < 0.05$) and SA from 41.3 ± 3.2 till 39.1 ± 2.9 ($p < 0.01$). After MRTM in individuals with neurotic frustrations there were no any significant changes in dynamics of EEG values, autonomic parameters with some decrease in values of SYS from 120.8 ± 4.4 till 113.4 ± 2.8 ($p < 0.05$), DIA from 80.0 ± 2.3 till 73.7 ± 2.2 and general state from 5.3 ± 0.2 till 4.7 ± 0.1 ($p < 0.05$).

Upon presentation to 18-year-old healthy young men most emotionally pleasant music, the values of spectral power in alpha range did not changed, but there was a significant decrease in heart rate from 69.4 ± 1.8 till 67.3 ± 2.1 $p < 0.05$, as well as significant decrease in SA from 38.9 ± 2.3 till 33.9 ± 2.3 $p < 0.01$.

Upon presentation to 18-year-old boys with neurotic frustration the MRTM procedures, there was increase in spectral power of alpha- rhythm in all leads, simultaneously the DIA values decreased from 80.8 ± 2.5 till 75.0 ± 3.0 ($p < 0.05$), but there is accurate changes in average score of self-esteemed general state and well-being [14,15].

In order to analyse the causes of various psychophysiological responses surveyed on MRTM, the retrospective analysis of preferred music pieces was performed. It was found that, boys of younger age groups (15-16 years) in the vast majority prefer to listen to melodies, but tempo

musical compositions (75% of healthy and 88.1% young men with neurotic frustrations), which has some influence on synchronizing limbic-reticular structures of the brain and show itself in increasing of alpha-rhythm power, reducing amplitude of the fast oscillations and in some sedation effects in healthy people - reducing the level of situational anxiety, the experience of positive emotions, normalisation of autonomic sphere. However, young men with neurotic frustrations with an initial emotional and autonomic generation of listening such compositions causes only a minimum increase in alpha-activity, some normalisation of autonomic indicators while maintaining and even improving the value of subjectively experienced emotional stress, anxiety [12,13,16,18].

Boys of older age groups (17-18 years old) preferred selection of more energetic, with a clear tempo-rhythm, a moderate level, which is obviously associated with tonic effect and showed itself in a mixed trend alpha rhythm, increasing the amplitude and rapid fluctuations of EEG indicators. However, at the same time the positive changes in the autonomic sphere, decrease of hemodynamic indicators, as well as of the levels of situational anxiety (the normalisation of emotional background) was observed. Part of young men aged 17-18 with neurotic frustrations chosen tempo musical compositions, harmonising with melodic, lyrical melodies. Perhaps these music compositions to the greatest extent were in line with their initial negative emotional background with high level of anxiety. Following the procedures of MRTM this led to multidirectional shifts of the EEG values, some optimization of the autonomic status while maintaining or even increasing the level of situational anxiety reflecting the maintenance and circulation of excitations in the corticothalamic and corticolimbic neural circles (perhaps due to emotional experiences of musical composition subjects).

Conclusion. Based on above mentioned, the research dedicated to the study of age characteristics of psychophysiological dynamics and correlates of autonomic procedures of medical resonance therapy music (MRTM) in healthy young men of 15-18 years-old and in boys of the same age group with neurotic frustrations allow to identify the following: the MRTM procedures, arranged with the account

of individual preferences in music compositions have strong anti-stress identified in the optimization of the emotional state and the normalisation of autonomic regulation of cardiovascular functions. It can be assumed that, the complex influence of the frequency characteristics of a number music and their emotional perception have a synchronizing effect on the limbic-reticular structure, leading to activation of the spectrum of δ -rhythm mainly in the front of the brain, reducing the activity of suprasegmental ergotropic sympathetic influences in the regulation of visceral functions and normalizing emotional background of surveyed youth of 15-18 years. At the same time, the revealed polymorphism of subjective, autonomic and EEG - reactions tested on the same type of music effects demonstrates the ambiguity of emotional attitude of young people of different age groups to their presentation. It depends on the source, previously formed at subjects of dynamic stereotypes and is particularly apparent in the subgroups of young people with limited neurotic frustrations. On the other hand, the effects of MRTM materially deter-

mined by individual preferences of study people in selection of music compositions. The selection of more energetic melodies, with accurate tempo-rhythm, clearly associated with tonic effects and identified with the increase of amplitudes and indicators of fast oscillations EEG, with normalisation of hemodynamic indicators and elimination of situational anxiety was dominated in the group of 17-18-year-old boys. In this case, the young men aged 15-16 prefer listening to melodious, but tempo musical compositions, resulting in sedation, experience of positive emotions and levelling of autonomic disorders (more pronounced in healthy, but with maintenance of high level situational anxiety in young men with neurotic frustrations).

We can also assume that, the influence of different music compositions of MRTM also depends not only on their frequency and rhythmic characteristics, but also on individual characteristics of surveyed young men (for example, from the type of nervous system, personal accentuations, health status, age, etc.) that offers prospects of continuing research.

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XÜLASƏ

SƏRHƏD POZULMALARI OLAN GƏNC OĞLANLARDA MUSIQİNİN TERAPEVTİK TƏSİR EFEKTLƏRİNİN PATOFİZİOLOJİ KORRELYATLARI

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15-18 yaşlı sağlam və bu yaş qrupuna müvafiq nevroitik pozulmalarla olan gənclərdə tibbi rezonans terapevtik musiqinin (TRTM) prosedurlarının psixofizioloji korrelyatlarının dinamikasına təsiri öyrənilmişdir. Fərdi qaydada tərtib olunmuş musiqili fraqmentlər TRTM prosedurlarının ifadəli antistressor effektlərini aşkar etmişdir. TRTM effektlərinin təsirləri müayinə olunanların musiqili fraqmentlərin seçimi ilə təyin olunması onların yaş və fərdi-tipoloji xüsusiyyətlərindən asılılığını təsdiq edir.

Açar sözlər: tibbi rezonans terapevtik musiqi, psixofizioloji korrelyatlar, nevroitik pozulmalar.

РЕЗЮМЕ

ПСИХОФИЗИОЛОГИЧЕСКИЕ КОРРЕЛЯТЫ ЭФФЕКТОВ МУЗЫКАЛЬНЫХ ТЕРАПЕВТИЧЕСКИХ ВОЗДЕЙСТВИЙ У ЮНОШЕЙ С ПОГРАНИЧНЫМИ РАССТРОЙСТВАМИ

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Проводилось исследование возрастных особенностей динамики психофизиологических коррелятов процедур медицинской резонансной терапевтической музыки (МРТМ) у практически здоровых юношей 15-18 лет и юношей той же возрастной группы с пограничными расстройствами. Процедуры МРТМ производится с учетом индивидуальных предпочтений в музыкальных фрагментов, обладающие выраженной антистрессовым эффектом. Эффективность процедур музыкотерапии в существенной степени определяются индивидуальными предпочтениями в музыкальных фрагментов опрошенных в выборе, а с другой стороны, от возрастных, личностных и индивидуально-типологических особенностей человека

Ключевые слова: психофизиологические корреляты, медицинская резонансная терапевтическая музыка, невротические расстройства.

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