Chapter 36

Interrelation of Multimedia Simulation of Images of Elements with the State of Meridians and the Quality of Adaptation of the Vascular Hemodynamic Factor Based on the Results of the Analysis of Arterial Pulsations Recorded during Blood Pressure Measurement Using the Oranta-AO Information System

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Abstract

Introduction: The concept of integrative medicine is a combination of Western medicine and natural medicine, including Eastern medicine. Accordingly, Traditional Chinese Medicine (TCM) is becoming increasingly widespread in the world as an alternative.

Objective: The purpose of our study was to determine the interdependence between organs when they are exposed to the five elements. Hypothetically, the element of "Water" was identified with a video image of a stream flowing, "Fire" with a video image of flames burning, and "Metal" with a video image of bells sounding.

Materials and Methods: During the study, a group of seventy practically healthy people was examined. The study were divided into four groups. The first group included indicators taken at rest (baseline), without any external influences. The second group included indicators taken after a five-minute video clip of water flowing in a stream, which was identified with the element of Water, the third group included flames in a fireplace, which was identified with the element of Fire, and the fourth group included bells ringing, which was identified with the element of Metal.

Results: Visual analysis of oscillograms. In the oscillogram registered before the experiment, at the beginning of the oscillogram, there is a large number of small oscillations, which disappear after listening to the musical composition "Water" for 2 minutes. This tendency was observed in all the identified cases. The figure shows the Fourier transform decomposition of arterial oscillograms of patient B (21 years old), before

and after listening to an audiovisual composition with a recording of water flowing in a stream for 2 minutes.

Are shows that the main frequency spectrum that was sensitive to listening to a musical composition with a recording of water flowing in a stream for 2 minutes ranged from 6 to 14 Hz (Alpha and Theta rhythms).

Summarizing the results of the influence of the factors noted above made it possible to conclude that the reaction of the cardiovascular system, even in the case of a relatively similar initial state and the influence of the same factors, is not unambiguous, which objectively confirms the need for further research.

Conclusions: The element of Metal (watching the video clip of the Bell) affected the meridians LI, LV, PC, which are inherent in the corresponding elements of Metal, Fire and Wood. This influence also caused negative changes in the indicators M1, M2, M3, M4, M6, M7. However, there was no effect on Water.

As a result, 100 variants of decision trees were built. In each of them, an algorithm for differentiating the states of patients in the initial state and after viewing three multimedia compositions ("Water," "Fire," "Metal") is proposed.

The presence of a group of indicators with strong correlations and cases of significant correlation recorded synchronously in ECG and AOG confirms the validity of the indicators proposed for AOG analysis and their interpretation. This enables the validation of the proposed methods for AOG analysis by the authors.

These approaches can be utilized as an additional preventive and rehabilitative component to enhance the nation's health level and to individualize the proposed methods

1. Introduction

Despite the considerable advancements in traditional medicine, a significant number of unresolved issues persist, spanning from the accurate diagnosis of diseases to effective treatments. In this context, integrative and holistic medicine has been gaining noteworthy attention from the scientific community (Ernst et al. 1995 & Staroverova et al., 2013). The concept of integrative medicine is a combination of Western medicine and natural medicine, including Eastern medicine. Accordingly, Traditional Chinese Medicine (TCM) is becoming increasingly widespread in the world as an alternative (Hua, 1985; Shang et al., 2007). It should be noted that the history of Chinese medicine is more than 5000 years old (Yingshan, 2011).

The emphasis laid down in the fundamental works of Bien Chue (407-310 B.C.) and his followers (Hua, 1985; Flower et al., 2016; Ahn A.C., et al. 2008; Alvarsson et al., 2010). Namely, the use of the Image of the patient's organs (zangxiang in Chinese) for diagnosis and treatment, over time, lost its importance in TCM. Only recently, Professor Xu Mingtan has become a modern successor of the Bien Chue school, a scholar and teacher. He inherited the school's knowledge and founded the Bien Chue School of Image Medicine, an independent system of diagnosis and treatment of diseases. However, many medical journals published in China are not available in Europe. The disadvantage of Western medicine is that it treats diseases from a microscopic point of view, so often the result of such treatment is immune response disorders and a significant number of side effects. Meanwhile, Chinese medicine

studies a biological object from a macroscopic point of view, maintains immune balance, and has no side effects.

The theory of "Ying Yang, Wu Xing" is widely used in traditional Chinese medicine, but many scholars have a number of unresolved issues related to this area (Lehmann, 2015; Vakulenko et al., 2015, 2019 - 2022). The concept of Wu Xing demonstrates that all processes in the universe are in continuous motion and have the nature of five elements: wood, metal, fire, earth, and water (Giovanni, 2014). This theory is used by Chinese medicine to explain physiological and pathological processes in the body, justifying the close relationship between organs. According to the Yin/Yang doctrine, each of the five elements of Wu Xing has a "yin" and "yang" component, so there is a "yin" and "yang" organ, respectively. Thus, the Wood element is represented by the liver and gallbladder. Fire contains two elements: basic (heart, small intestine) and functional (pericardium, triple heater). Earth includes the spleen, pancreas, and stomach. The Metal element includes the lungs and large intestine, and the Water element includes the kidneys and bladder. At the same time, all parenchymal organs are attributed to Yin, and cavity organs to Yang.

Chinese medicine explains the relationship of internal organs and tissues to each other in the five elements theory. Accordingly, when one organ is damaged or affected, there is a reaction from other organs (mutual generation and mutual overcoming). Mutual generation means that Wood gives rise to Fire, Fire gives rise to Earth, Earth gives rise to Metal, Metal gives rise to Water, Water gives rise to Wood. Each preceding meridian organ "mother" influences the next "son" in a clockwise direction. In the opposite direction, the rule of "grandfather-grandson" works in the opposite direction: Wood destroys Earth, Earth absorbs Water, Water destroys Fire, Fire melts Metal, Metal destroys Wood.

From the perspective of Western medicine, it is difficult to interpret this concept. There are practically no studies in this area in domestic scientific sources. Some researchers have studied the application of the theory of five elements in herbal medicine (Giovanni, 2014), in acupuncture. According to Chinese medicine, each organ, apart from its characteristic functions, has additional ones.

The information capabilities of the blood pressure measurement procedure are endless. From 2010 to 2023, the authors of the study went from an idea to the development and implementation of an information system for conducting scientific research aimed at studying, substantiating and implementing into practice methods for analyzing arterial pulsations recorded during blood pressure measurement in 2000 patients (more than 4000 AO).

In 2021, clinical trials were conducted, and the Oranta-AO information system was certified as a medical device for implementation in various fields of medicine, rehabilitation, sports, education, in a telediagnostic information system and tele-rehabilitation with feedback.

The results of the research are reflected in publications (Selskyy et al., 2018; Romaniv et al., 2022; Martseniuk et al., 2007, 2018, 2020, 2021, 2022; Mintser et al., 2020 & Vakulenko et al., 2015, 2017 - 2022) and in sections of the monograph Arterial oscillography: New capabilities of the blood pressure monitor with the Oranta-AO information system (Vakulenko D. et al., Chapter 1-43, 2023). This Chapter presents a fragment of the results of our latest research.

2. Objective

The purpose of our study was to determine the interdependence between organs when they are exposed to the five elements. Hypothetically, the element of "Water" was identified with a video image of a stream flowing, "Fire" with a video image of flames burning, and "Metal" with a video image of bells sounding.

It was the prospects of using Image Medicine, formed by the Bien Chue school (Ahn et al., 2008) and the holistic approach to the body from the perspective of the Ying Yang concept and the five elemental elements that prompted us to evaluate the relationship between the Image initiated by watching a video and the function of the meridians, brain, heart, blood vessels, muscles, and the psycho-emotional state of a person.

Another task in this study was to investigate the influence of multimedia factors on the adaptive capacity of the cardiovascular system. to conduct a comparative analysis of the dynamics of spectral parameters of the arterial oscillogram and electrocardiogram under the influence of multimedia factors.

3. Materials and Methods

During the study, a group of seventy practically healthy people was examined, including the students of TNTU named after I. Puluj and I. Horbachevsky TNMU in Ternopil, Ukraine, aged 19-23 years (boys and girls). The participants in the experiment were previously introduced to all the study conditions and willingly consented to undergo the examination. The registration of the relevant parameters was performed at the same time of day 10.00-13.00. The influence of the elements (in the form of viewing and listening to multimedia compositions of Water (Relaxing River Sounds), Fire (Crackling Fire Sounds), Metal (Bell sound) for 5 minutes and a break for examination for 10 minutes after each exposure) on the state of the meridians and morphological parameters of the arterial oscillogram was studied (Bilge et al. 1998; Clinton, 2013; Vakulenko et al., 2015, 2019 – 2022; Martseniuk et al., 2007, 2018, 2020, 2021, 2022 & Mintser et al., 2020).

The state of the meridians was studied by the method of electropuncture computer diagnostics (Ahn et al., 2008) using the hardware and software complex "Computer Diagnostics Jing-Lo." This method and equipment are embraced in certain regions of the world and employed for the purpose of familiarization.

The electrical conductivity of twenty-four representative points located on the distal parts of the upper and lower extremities was studied, which allows to estimate the resistance in twelve meridians on the right and left, which are associated with internal organs (24 attributes). To record arterial oscillograms, blood pressure was measured using an electronic blood pressure monitor BAT 41-2 (manufactured by ICTECHNO) during the period of increasing compression. Their further analysis was carried out using special computer programs proposed by the authors of the paper (Chamos et al., 2013). Due to the lack of similar studies, for the morphological analysis of the oscillogram, the authors used the information (9 attributes) implemented in plethysmography and rheography (Martseniuk et al., 2007, 2018, 2020, 2021, 2022 & Mintser et al., 2020), as well as the authors' logical-visual, scientific, theoretical conclusions based on the results of the analysis of 4273 oscillograms of 890 healthy and sick

people (23 nosologies) (Selskyy et al., 2018; Romaniv et al., 2022; Martseniuk et al., 2007, 2018, 2020, 2021, 2022; Mintser et al., 2020 & Vakulenko et al., 2015, 2017 - 2022).

To study the adaptive capacity of the cardiovascular system to the influence of external factors, we examined 68 people aged 18-22 years.

To solve the tasks set, we analyzed synchronously recorded arterial oscillograms before and after listening to different musical compositions (Wu-Xing circle). At the same time, during the entire experiment, electrocardiograms were also recorded (20 minutes): before the pressure measurement for 1 minute, during the pressure measurement - 7 times, and while listening to 5 musical compositions. After listening, each of the subjects had their blood pressure measured (with ABPM recorded and ECG recorded simultaneously). After that, ECG was recorded for another 1 minute. The obtained indicators were subject to correlation analysis.

Statistical analysis of the data was performed using the software package "OscEcgReoPuls." The statistical significance of differences between the arithmetic mean and relative values was assessed using Student's t-test (t) for a normally distributed data set. For samples that deviated from the normal distribution law, the Wilcoxon method was used.

Additionally, we used the set of algorithms Random Forest Classifier (Coates, 2012; Martseniuk et al., 2007, 2018, 2020, 2021, 2022) to identify significant indicators and their limits.

4. Results

The results of the study were divided into four groups. The first group included indicators taken at rest (baseline), without any external influences. The second group included indicators taken after a five-minute video clip of water flowing in a stream, which was identified with the element of Water, the third group included flames in a fireplace, which was identified with the element of Fire, and the fourth group included bells ringing, which was identified with the element of Metal. Thus, twelve meridians were analyzed (Table 1).

Since arterial oscillometry was performed in parallel with the Riordan method, oscillographic parameters were grouped in a similar way. For the morphological analysis of oscillograms, 9 criteria were used (Table 2), each of which (in order of increasing deviations from the accepted norm) was evaluated on a scale from 1 to 7 points. These indicators include: M1 - quality of adaptation (at the beginning of compression); M2 - quality of adaptation (throughout compression); M3 - rhythmicity disorder (quantitative assessment of rhythmicity disorder of pulsations); M4 - vascular elasticity (number of oscillations with maximum amplitude); M5 - vascular tone (shape of the upper extremes of oscillations at the beginning of compression); M6 - response of striated muscles to compression - muscle tone (assessment of the oscillogram by the presence of small oscillations); M7 - level of excitability (assessment by the amplitude, number and presence of extreme (with uneven increase in amplitudes) oscillations); M8 - assessment of the dynamics of changes in the area of the ascending part of oscillations; M9 - assessment of the dynamics of changes in the area of the descending part of oscillations (Martseniuk et al., 2007, 2018, 2020, 2021, 2022).

Table 1. Dynamics of electrical conductivity values in representative points under the influence of multimedia simulation of the elements "Water," "Fire," "Metal" (the measurement performed on the hardware and software complex "Computer Diagnostics Jing-Lo" is accepted in some medical communities, *it is provided for reference*)

	Initial state	The impact of "Water"	The impact of "Fire"	The influence of Metal
		indicator	indicator	indicator
Metal				
Lung Meridian (LU) right	-9,22±1,54	-7,33±3,373	-6,02±1,51	-3,52±2,78
Lung Meridian (LU) left	-9,78±2,90	-6,89±2,73	-1,33±2,16**	0,88±2,45
Large Intestine Meridian (LI) right	-20,67±4,92	-25,89±4,19	-27,33±6,35	-31,75±4,31
Large Intestine Meridian (LI) left	-18,22±4,50	-26,33±5,11	-14,22±5,58**	-25,13±4,29***
Eath				
Stomach Meridian (ST) right	12,44±5,97	3,44±7,53	-2,56±7,40	-1,13±8,39
Stomach Meridian (ST) left	5,11±3,75	0,89±5,84	2,44±4,70	2,88±6,31
Spleen Meridian (SP) right	9,78±4,65	19,11±4,36*	14,44±5,25	11,63±5,39
Spleen Meridian (SP) left	13,78±3,44	20,22±2,86*	14,01±3,89	13,02±4,67
Fire				
Heart Meridian (HT) right	2,22±4,36	5,44±4,88	6,78±3,75	6,13±4,19
Heart Meridian (HT) left	7,33±4,94	6,89±6,61	10,56±3,80	13,50±4,02
Small Intestine Meridian (SI) right	-6,33±4,14	0,11±1,93*	8,33±5,16**	4,63±2,68
Small Intestine Meridian (SI) left	0,33±2,53	6,02±2,68*	7,22±4,63	7,88±2,99
Water.				
Bladder Meridian (BL) right	9,11±4,37	19,44±5,81*	11,33±6.38	13,25±4,46
Bladder Meridian (BL) left	15±4,54	10,78±8,14	13,56±3,55	14,88±4,72
Kidney Meridian (KI) right	4,11±4,23	6,56±7,59	-2,44±5,63	4,88±4,94
Kidney Meridian (KI) left	9,89±3,56	1,05±3,72*	10,33±5,29**	9,50±6,32
Fire				
Pericardium Meridian (PC) right	-10,89±3,56	-8,11±5,11	-4,56±2,63	-3,50±3,80
Pericardium Meridian (PC) left	-4,22±4,13	-4,67±3,35	-0,89±3,08	6,63±2,74***
Triple Heater (San Jiao) Meridian (SJ) right	-24,33±4,49	-24,22±4,89	-26,89±5,89	-23,75±5,40
Triple Heater (San Jiao) Meridian (SJ) left	-16,44±2,82	-22,44±2,12*	-24,02±6,35	-24,12±6,18
Tree				
Gallbladder Meridian (GB) right	4,55±4,50	-1,11±6,33	-9,11±6,74	-9,22±5,20
Gallbladder Meridian (GB) left	2,89±4,655	-0,67±5,590	-5,44±4,81	1,13±4,63
Liver Meridian (LV) right	11,78±6,83	14,44±6,05	12,67±5,01	6,63±10,17
Liver Meridian (LV) left	8,89±6,73	14,09±6,19	15,11±4,81	5,88±4,22***

Significant changes between the initial state and "Water" *.
Significant changes between "Water" and "Fire" **.
Significant changes between "Fire" and "Metal" ***

Figure 1 shows the arterial oscillograms of volunteer G, in the initial state and after viewing the multimedia images "Water," "Fire," and "Metal."

Example 1 Prior to the experiment (among 96 cases), arterial waveforms were observed from among the recorded waveforms (12 cases) of Figure 3 a, with small oscillations and different intensities.

For example, we used the oscillograms of examinee No. 11, 23 years old, a healthy person (Figure 3).

Visual analysis of oscillograms. In the oscillogram (Figure 2a) registered before the experiment, at the beginning of the oscillogram, there is a large number of small oscillations, which disappear after listening to the musical composition "Water" for 2 minutes (Figure 3.b). This tendency was observed in all the identified cases.

The figure shows the Fourier transform decomposition of arterial oscillograms of patient B (21 years old), before and after listening to an audiovisual composition with a recording of water flowing in a stream for 2 minutes.

Figure 3 shows that the main frequency spectrum that was sensitive to listening to a musical composition with a recording of water flowing in a stream for 2 minutes ranged from 6 to 14 Hz (Alpha and Theta rhythms).

Table 2. Dynamics of morphological analysis of oscillographic parameters under the influence of multimedia simulation of the elements "Water," "Fire," "Metal" (with percentage change)

	Initial state	The impact of "Water"		The impact of "Fire"		The influence of Metal	
		Indicator.	%	indicator	%	indicator	%
M1	3.14±0.422	2.26±0.109*	-28	2.65±0.420	-16	4.42±0.266***	+29
M2	1.72±0.183	3.02±0.339*	+43	1.23±0.009**	-28	3.65±0.213***	+53
M3	1.14±0.086	4.24±0.236*	+27	2.36±0.331**	+52	3.36±0.289***	+66
M4	2.18±0.338	2.46±0.297	+11	2.420±0.066	+10	2.76±0.127***	+21
M5	1.47±0.016	1.428±0.056	-3	1.522±0.109	+3	1.501±0.103	+2
M6	2.81±0.381	2.53±0.194	-10	1.65±0.068**	-41	2.16±0.065***	-23
M7	1.05±0.033	1.078±0.040	+3	1.027±0.028	-2	1.16±0.042***	+9
M8	5.76±0.351	5.84±0.262	+1	5.97±0.206	-3	6.19±0.261	+7
M9	4.575±0.145	4.565±0.222	-0,2	3.93±0.146**	-14	3.82±0.152	-16

Significant changes between the initial state and "Water" *.
Significant changes between "Water" and "Fire" **.
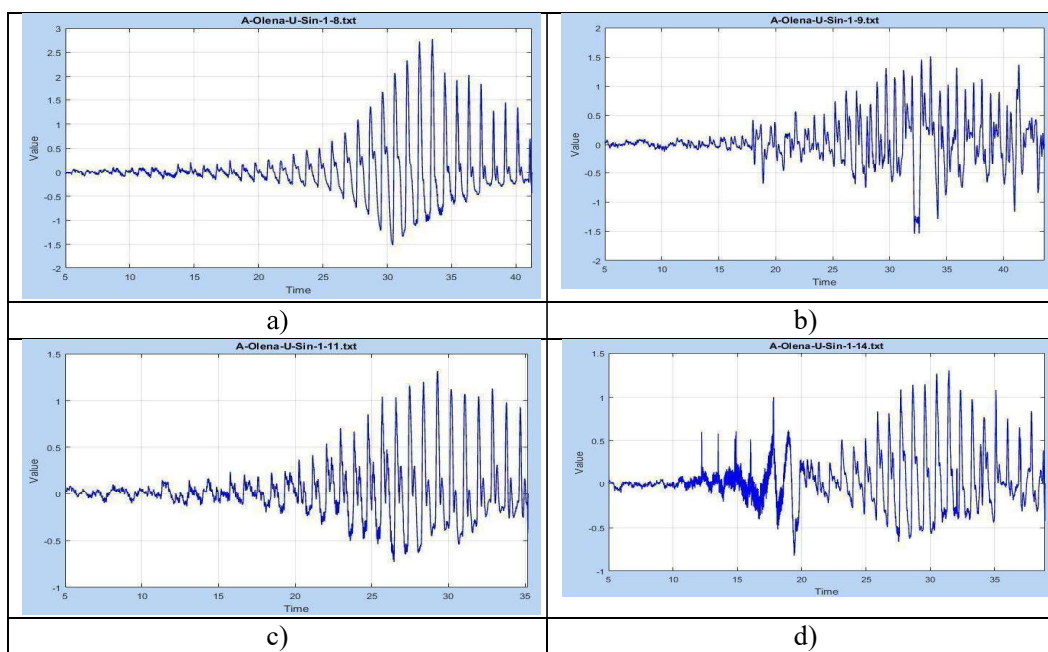Significant changes between "Fire" and "Metal" ***

Figure 1. Arterial oscillograms of volunteer G. A) - at rest, after viewing the composition "Water," b) - after viewing the composition "Fire," c) - after viewing the composition "Metal."
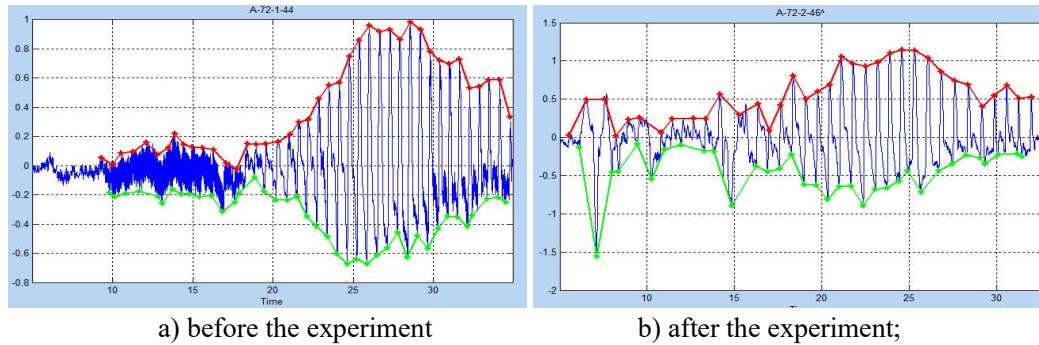
| a) before the experiment | b) after the experiment; |

Figure 2. Arterial oscillograms before and after listening to the song "Water" for 2 minutes.
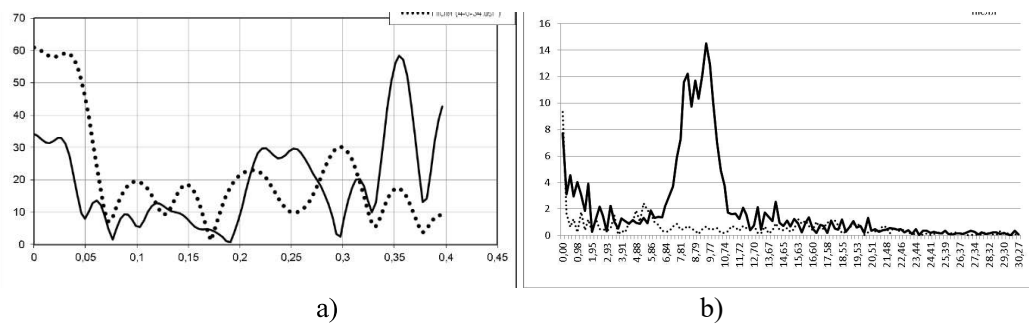

| a) | b) |

Figure 3. The dynamics of changes in the frequency spectrum of the oscillogram calculated by the Fourier transform before (straight line) and after (dotted line) listening to the audiovisual composition of patient B (21 years old) with a recording of water flow in a stream for 2 minutes: a) in the range from 0 to 0.4 Hz; b) in the range from 0 to 30.27 Hz.

The dynamics of changes in the instantaneous frequency and instantaneous phase of the oscillograms calculated by the Gilbert-Huang transform before and after listening to the audiovisual composition with a recording of water flowing in a stream for 2 waves is shown in Figure 4.

Example 2: Consider the arterial oscillograms of patient B (20 years old) after listening to the musical compositions "Wood," "Fire," "Earth," and "Metal" shown in Figure 5.

The arterial oscillograms shown in the figure indicate the dynamics of the reaction of the vessels of the upper arm to listening to musical compositions. It should be noted that according to the Wu-Xing concept, the organs associated with the Fire principle include the heart, and the tissues include blood vessels. Patient B showed sensitivity to the influence of the above composition, which led to an increase in the tonic tension of the smooth muscles of the upper arm vessels, which returned to its original state only after listening to the musical compositions "Earth" and "Metal."

Example 3: For example, we demonstrate the values of blood pressure, heart rate and other indicators obtained by their mutual calculation of examinee #8 (22 years old), who is practically healthy are present in Table 3.
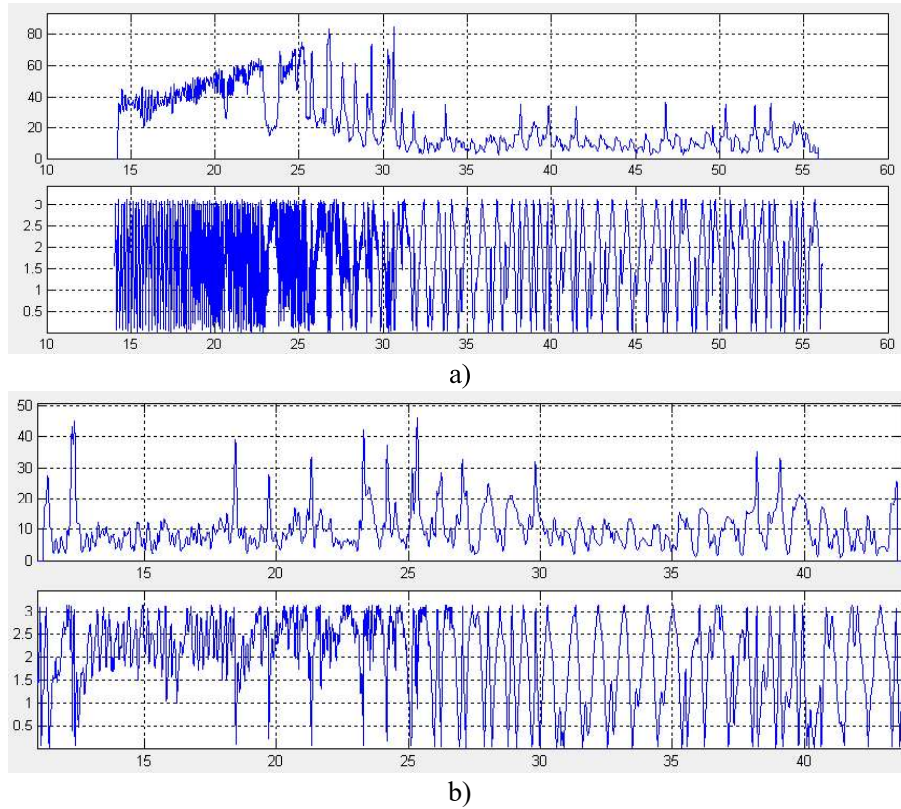
a)

b)

Figure 4. The dynamics of changes in instantaneous frequency and instantaneous phase of the oscillograms calculated by the Gilbert-Huang transform before and after listening to an audiovisual composition with a recording of water flowing in a stream for 2 minutes: a) before the experiment, the frequency (upper graph) and phase (lower graph) spectrum; b) after the experiment, the frequency (upper graph) and phase (lower graph) spectrum.
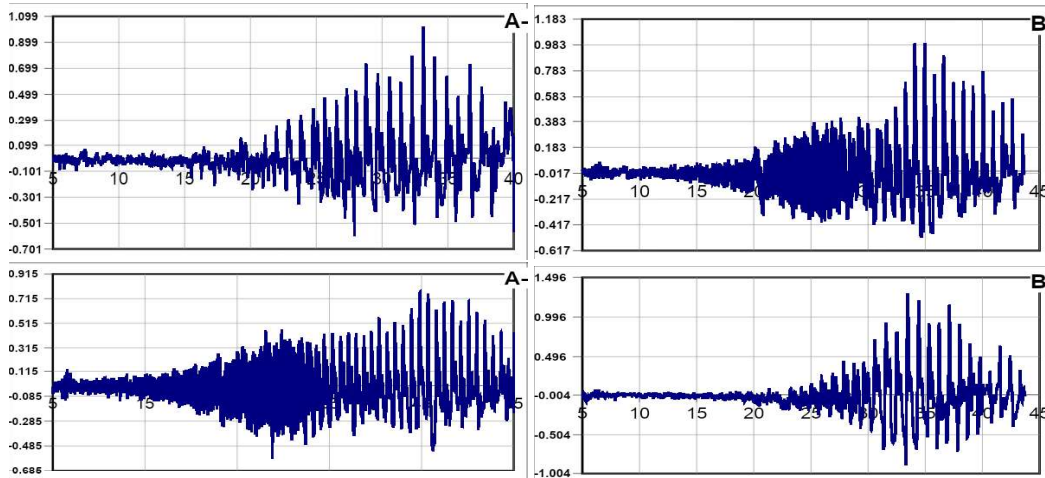

Figure 5. Arterial oscillograms of patient B (20 years old) after listening to the musical composition "Wood" a, "Fire" b, "Earth" c, "Metal" d.

Table 3. Indicators of blood pressure, heart rate and derivatives obtained from
their mutual calculations

Indicators.	To. experiment	After the experiment
Systolic pressure (mm Hg)	102	116
Diastolic pressure (mmHg)	64	60
HR	81	89
Credo Index	21	25
Indes Robinson	82	93
Golden section	1,59	1,9
Pulse pressure	38	56

As we can see from the table, the adaptation of the body to watching a video with a fire in the fireplace caused an increase in systolic and pulse pressure, the tone of the sympathetic link of the autonomic nervous system, the Robinson index, and a shift from the state of equilibrium of the "golden section" towards its growth. The results of the study are confirmed by the analysis of oscillograms (Figure 6).
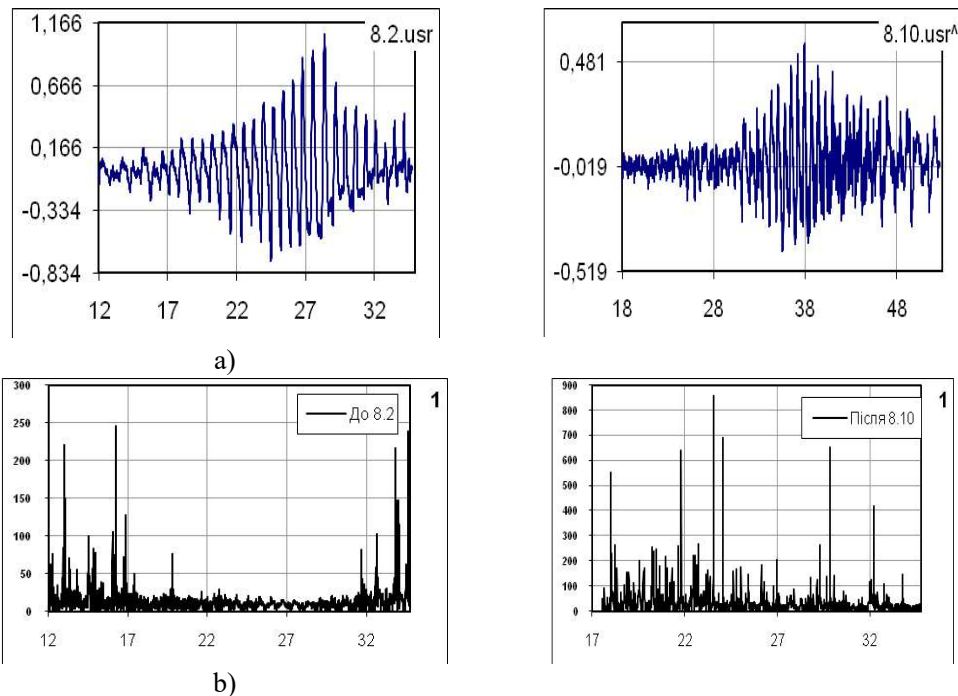

Figure 6. a) - oscillograms recorded in patient K before (left) and after (right) watching a video with a fire in the fireplace. b) - instantaneous frequency spectrum of the presented oscillograms obtained by the Gilbert Huang transform.

As we can see from the figure, after watching the video with the fireplace. the duration of the 1st phase of compression increased, the maximum amplitudes increased from 28 s to 38 s, which indicates a strain on the adaptive capacity of the examinee's body.

The nature of the pulsations was evaluated before and after the experiment according to the following criteria (Table 4).

Table 4. The nature of the pulsations to be analyzed

The nature of the pulsations to be analyzed	Survey period	
	Before the experiment	After the experiment
The vast majority of	Up to 20 Hz	Up to 150 Hz
Average number of	70-100 Hz	200-250 Hz
Maximum oscillations	220-250 Hz	500-850 Hz

4.1. Example 4

An analysis of the dynamics of changes in arterial oscillograms under the influence of musical compositions when listening to the sequence of principles of the Wu-Xing circle of traditional Chinese medicine (TCM) was carried out. The experiment involved 96 people aged 18 to 24 years. For 20 minutes, 7 musical compositions performed on folk Chinese instruments, which are used to balance the elements according to the Wu-Xing concept, were listened to in turn in the following sequence: "Water," "Wood," "Fire," "Earth," "Metal," "Water." The arterial oscillograms of patient B (20 years old) after listening to the musical compositions "Water" (Relaxing River Sounds), "Fire," (Crackling Fire Sounds), "Earth" and "Metal" (Bell sound) are shown in Figure 7.

The arterial oscillograms shown in the figure indicate the dynamics of the reaction of the vessels of the the upper arm to listening to musical compositions. It should be noted that according to the Wu-Xing concept, the organs associated with the Fire principle include the heart, and the tissues include blood vessels.

Patient B showed sensitivity to the effects of the above composition, which led to an increase in the tonic tension of the smooth muscle of the the upper arm vessels, which returned to its original state only after listening to the musical compositions "Earth" and "Metal" (Figure 7).

The study of the influence of musical compositions consistent with the influence of the principles of Wu Xing from traditional Chinese medicine, the same as the principles of Wu Xing, indicates a peculiar reaction that tends to the reactions of the body described in TCM under the influence of these elements.

Music is one of the most powerful types of intervention in regulation. It can be successfully used in all cases of its disorders. Using oscillometry technologies, it is possible to select and offer the patient the music that is most appropriate for health, will improve it and create a favorable basis for other purely medical interventions (Mementaler et al., 2011; Gale et al., 2014).

Summarizing the results of the influence of the factors noted above made it possible to conclude that the reaction of the cardiovascular system, even in the case of a relatively similar initial state and the influence of the same factors, is not unambiguous, which objectively confirms the need for further research.

An ensemble of Random Forest Classifier algorithms and data mining technologies were built for the differential diagnosis of patients' conditions under the influence of multimedia compositions. To study the conductivity of meridians, 100 variants of decision trees were built. In each of the constructed trees, an algorithm for differentiating the states of patients in the initial state and after viewing three multimedia compositions ("Water," "Fire," "Metal") is proposed. An example of one of the decision trees is shown in Figure 8.
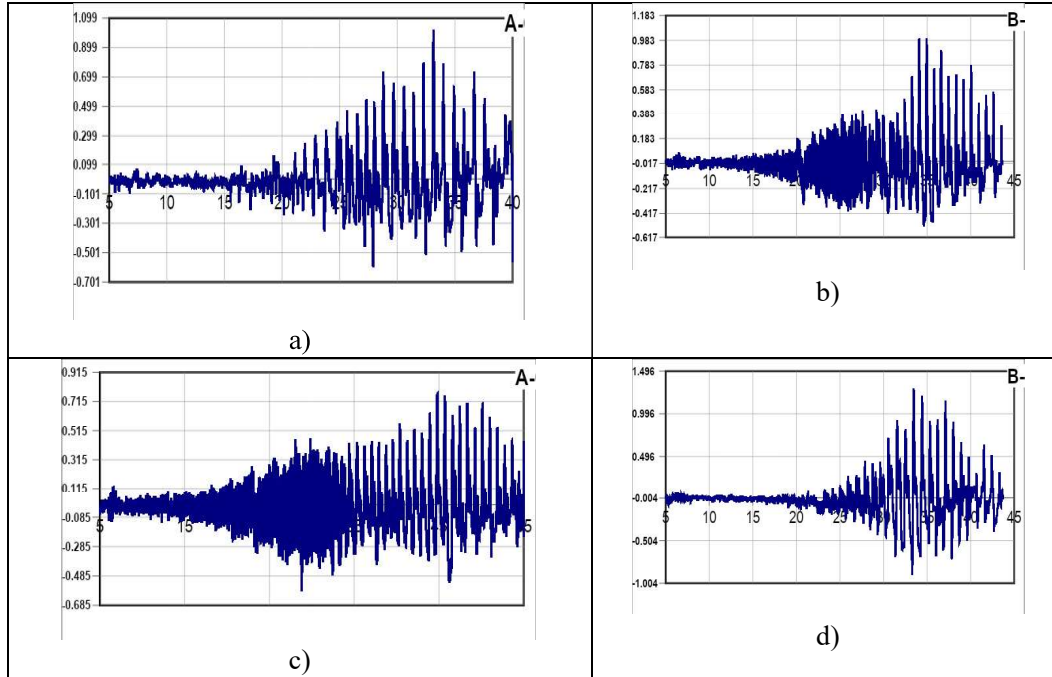
Figure 7. Arterial oscillograms of Patient B (20 years old) after listening to the musical composition "Tree" a, "Fire" b, "Earth" c, "Metal" d.
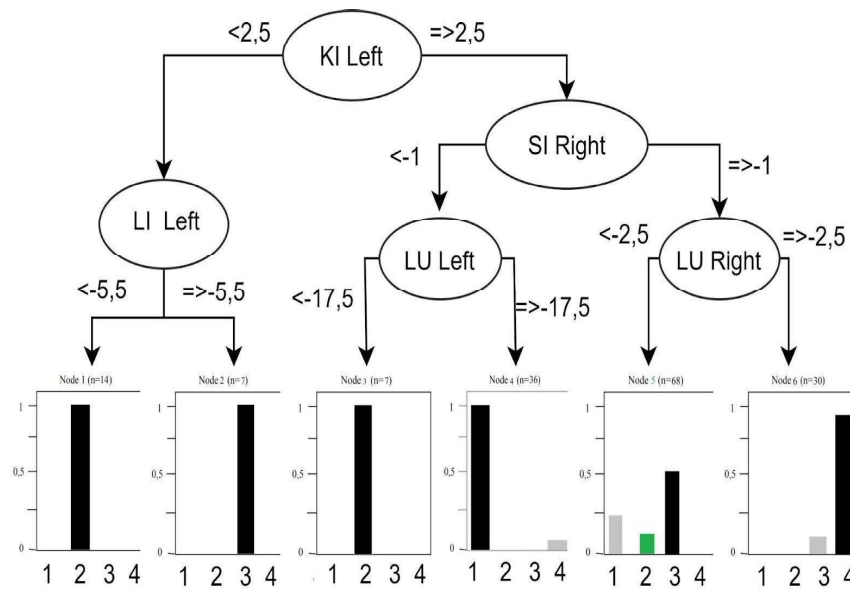

Figure 8. Decision tree based on the data on meridian conductivity by the Nakatani method obtained on the hardware and software complex "Computer Diagnostics Jing-Lo" (70 people).

4.1.1. Comparative Analysis of the Dynamics of Spectral Parameters of Arterial Oscillogram and Electrocardiogram under the Influence of Multimedia Factors

The musical composition "Water" was listened to at the beginning and at the end of the experiment (Figure 9) in the interval up to the moment of diastolic blood pressure), that is, at the beginning of compression (Martseniuk et al., 2018, 2022 & Vakulenko et al., 2015, 2019).

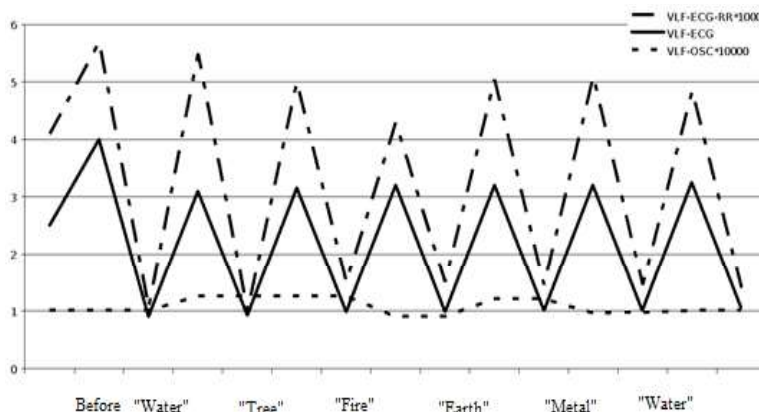For example, we demonstrate the indicators of AOG and HRV ECG (Figure 9).

Figure 9. Changes in spectral power indices (subject P, 20 years old) in the frequency range from 0.003 Hz to 0.04 Hz (VLF) obtained from R-R ECG, ECG intervals multiplied by 1000 and oscillograms (multiplied by 10000) recorded by while listening to music compositions.

As can be seen from the figure, patient P. is characterized by synchronous dynamics of VLF spectrum power indicators on the AOG and R-R intervals of the ECG while listening to music.

The study of the influence of musical compositions showed that the dynamics of the studied indicators tends to have the same directional changes after listening to musical works of the "Water," "Wood," "Earth," "Water" directions, and the opposite - "Fire."

4.2. Discussion

Assessing the influence of Water on the state of the meridians, a significant increase in the indicators of the right and left spleen and pancreas meridians (SP), which relate to the Earth element, was noted. These data are in line with the fact that according to the Wu-Xing theory, Water acts on the Earth in a counter-intuitive, i.e., stimulating way. The Fire element reacted ambiguously to the influence of Water. Under this influence, the state of the heart meridians (HT) did not actually change, but the left Yang channel of the three heaters (SJ) significantly decreased and the small intestine channel (SI) increased. Since Water extinguishes Fire, such an imbalance in the heart channel can be explained by the above fact. Also, watching video fragments with Water suppressed the corresponding Water element, changing the left Yin kidney channel (KI) and, on the contrary, stimulated the right Yang bladder channel (BL). There was a tendency to activate the LV channel (Wood element).

It is known that oscillometric indicators characterize the state of the vascular system, in particular vascular tone, which determines the parameters of systemic hemodynamics and is

regulated by myogenic, humoral and neurogenic mechanisms. As a result, from the point of view of Chinese medicine, three elements are most responsible for blood vessels: Earth, Fire and Water. Thus, the spleen and pancreas channel controls the muscle wall of blood vessels, and the pericardial channel controls the activity of the autonomic nervous system through the influence on the sympathetic nervous system, the channel of the three heaters - through the influence on the parasympathetic nervous system. Meanwhile, the kidney channel affects the endocrine glands, brain, and spinal cord.

Under the influence of Water, a significant decrease in the M1 index was noted, which corresponds to the state of improvement of peristaltic regularity of the vascular wall at rest, without the active involvement of neuro-reflex mechanisms of regulation (to the values of diastolic pressure). It is obvious that Water activated the Earth (spleen meridians were activated, myogenic mechanism of vascular tone regulation was activated), which influenced the improvement of M1. In addition to smooth muscle cells, this indicator characterizes the activation of the endothelium, which also regulates vascular tone.

At the same time, M2 and M3 indicators deteriorated. 4.65. In fact, the quality of adaptation during compression changed and the neuro-reflex mechanisms of adaptation did not fully work, and the rhythmicity of pulsations was disturbed. It can be assumed that M1 characterizes the state of vascular smooth muscles to a greater extent, when compression is applied, the nervous regulation of vascular tone begins to dominate, for which the Fire element is responsible. Under the influence of the Water element, the Fire element has a depression in the SJ channel, which is manifested by a decrease in the influence of the parasympathetic nervous system. Moreover, changes in the kidney and bladder channels undoubtedly caused disorders of humoral and central nervous system influence on vascular wall tone. Other oscillometric parameters were intact to water exposure.

After revising the Fire element, the organs belonging to the Metal element (Fire suppresses Metal) became the target. There was an imbalance under the influence of Fire: the left "Yang" meridian of the large intestine LI (left) and the left "Yin" meridian of the lungs (LU) increased. The influence of Fire caused significant changes in the SI right channel (channel activation), which belongs to the element of Fire. The arteries and vessels of the upper extremities are directly connected to the small intestine meridian. It is a known fact that Fire has an oppressive effect on the element of Water, and therefore on the corresponding organs, which was manifested by the activation of the KI channel of the left kidney (element of Water). However, there was no significant effect of Fire on the Earth element. The above changes contributed to the improvement of the oscillometric parameters M2 and M3, M6 and M9. Obviously, Fire stimulated blood vessels and kidneys (activation of the central nervous system and endocrine organs to regulate the tone of the vascular wall). In this case, the quality of adaptation during compression (M2), caused by neuro-reflex mechanisms (activation of the KI channel), improved, and the rhythmicity of pulsations was restored (M3). There was an improvement in vascular tone (M6), which was assessed in the oscillogram by the presence of small oscillations caused by high-frequency contraction of the striated muscles of the shoulder in response to compression (changes in the SI right channel). The positive dynamics of changes in the area of the descending part of the oscillations (M9), which characterizes the quality of adaptation in response to shoulder compression mainly by the vascular component, indicated changes in the SI right channel.

Watching the video fragment "The Bell" suppressed the left meridian LI, which belongs to the element Metal, and the left liver meridian (LV), which belongs to the element Wood. The

Wu-Xing theory indicates the suppressive effect of Metal in relation to Wood. Metal stimulated the left pericardial meridian (PC), which is explained by the oppressive effect of this element on Fire. Since the pericardium is responsible for sympathetic inertia, its excessive stimulation obviously worsened the oscillometric parameters: M1, M2, M3, M4, M6, M7. However, there was no significant effect of Metal on Water. Thus, this video fragment "Bell" negatively affected both the quality of vascular wall adaptation at the beginning of compression and during compression, caused a violation of the rhythmicity of pulsations (M3) and vascular elasticity (M4). Since the tonic tension of the vascular wall and the degree of its passive stretching are caused by a nerve-reflex effect, the stimulation of the pericardial meridian (PC), which is responsible for the activation of the sympathetic nervous system and caused an imbalance in the above indicators, plays a significant role.

Analyzing the constructed decision tree, based on the measurements of meridian conductivity, with further analysis of indicators (attributes) in four groups for groups in the initial state, after viewing the multimedia compositions "Water," "Fire," "Metal" (70 people) (Figure 9). You can see that the first place in terms of informativeness is occupied by the conductivity index KI on the left. When the values of this indicator (KI left) < 2.5, it is recommended to estimate the value of the conductivity of the meridian LI on the left. If LI on the left is < -5.5, then (56 people) belong to the e group of patients who viewed the multimedia composition "Water," where 63 of them will belong to the group of patients who viewed the multimedia composition "Water" with probability P=100%. With LI on the left ≥ -5.5, 7 patients belong to the group that viewed the Fire multimedia with a probability of P=100%. If KI values on the left are ≥ 2.5, it is recommended to evaluate the value of SI meridian conduction on the right, and if SI values on the right are < -1, it is necessary to additionally evaluate the value of LU on the left. If the value of LU on the left is < -17.5, 7 people are included in the group that viewed the multimedia composition "Water" with a probability of P=100%. With the value of - LU on the left ≥ -17.5, 56 people belong to the group that was in the initial state (before the experiment) and 7 people to the group that watched the multimedia composition "Metal" with a probability of P=90%. In the case of conductivity values in the SI meridian on the right ≥ -1 and LU on the right < -2.5, 56 people belong to the "Fire" group, 14 people to the group before the experiment, and 7 people to the group after watching the "Water" multimedia composition with a probability of P=72%. With LU values on the right ≥ - 2.5, 63 people belong to the group that watched the "Metal" multimedia composition, and 7 people - to the group that watched the "Fire" multimedia composition with a probability of 90%.

It should be noted that despite the comparison of different influences, where the meridian conductivity indicators are used as a means of evaluation, there is a rather low error in the differentiation of the studied groups from 0 to 33%. The easiest way to differentiate the group was after watching the multimedia composition "Water" P=0%, and the largest error of differentiation was in the initial condition P=33%.

Conclusion

Thus, the revision of the Water element caused significant changes in the SP, SJ, SI, KI, BL meridians, i.e., it had a significant effect on the elements of Earth, Fire, Water, and a tendency to stimulate the Wood. After this revision, changes in oscillometric indicators were also

revealed: improvement of M1 and deterioration of M2, M3. The element of Fire significantly changed the state of the meridians LI, LU, SI, KI, which belong to the elements of Metal, Fire, Water. This fact contributed to the improvement of M2, M3, M6 and M9. However, no impact on the Earth was observed.

The element of Metal (watching the video clip of the Bell) affected the meridians LI, LV, PC, which are inherent in the corresponding elements of Metal, Fire and Wood. This influence also caused negative changes in the indicators M1, M2, M3, M4, M6, M7. However, there was no effect on Water.

As a result, 100 variants of decision trees were built. In each of them, an algorithm for differentiating the states of patients in the initial state and after viewing three multimedia compositions ("Water," "Fire," "Metal") is proposed. The interpretation of one of the decision ensemble trees was carried out, it was shown that the easiest way to differentiate the group after watching the multimedia composition "Water" P=0%, and the largest error of differentiation was in the initial state P=33%.

Analyzing the above facts, we can argue that there is an inextricable relationship between all five primary elements (Wood, Fire, Earth, Metal, Water) and the mechanisms of adaptation to shoulder compression through the nervous and cardiovascular systems. Earth acts directly on the muscle wall of blood vessels, Fire - on the activity of the autonomic nervous system through the sympathetic and parasympathetic links. At the same time, Water regulates the activity of the cardiovascular system through the central nervous system and humoral factors. Besides, each of them is connected to the others through productive and destructive processes that require further study and rethinking of the understanding of vital processes from the standpoint of a systemic approach (the psychosomatic model of Chinese medicine).

It should also be noted that there is a correlation between multimedia simulation of images of the elements, the state of the meridians and the quality of vascular adaptation during compression. This confirms Bien Chue's theory of the relationship between the image and the functional state of the body. As a result, an alternative way of influencing the state of the meridians and vascular tone with the help of multimedia compositions and images is proposed, despite acupuncture, cauterization, the effects of herbs, nutrition, etc.

The presence of a group of indicators with strong correlations and cases of significant correlation recorded synchronously in ECG and AOG confirms the validity of the indicators proposed for AOG analysis and their interpretation. This enables the validation of the proposed methods for AOG analysis by the authors.

These approaches can be utilized as an additional preventive and rehabilitative component to enhance the nation's health level and to individualize the proposed methods in (Vakulenko et al., 2015, 2019 - 2022).

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