Manual for “Alfa” Device
Centre of human capacities
Stockholm

Manual for Users of "Alfa" Device

All life processes of the human organism are reflected in its pulse which is synchronized with the heart rhythm. The heart rate reflects all rhythms of the whole organism with the help of the pulse. But at the same time receiving commands of the brain and nervous system such rhythms affect the organism. Even light body burden results in changing of such rhythms. Reading dynamics of heart rates the status of the organism can be objectively assessed and changing of such status can be forecasted. Working rate of the "heart pendulum" is individual for each person like a fingerprint.

With the modern advanced technology we can easily measure the activity of different regulating systems of the organism. The technology is based on what is called in the doctors' language heart rate variability (HRV) or changes of heart rate. HRV is well-known to all physiologists of the world. The conception of the method is far from new. In Chinese and Indian (Vedic) medicine the level of heart is traditionally assessed based on the pulse. The pulse, of course, gives us an idea of heartbeats but not only that.

As rhythms of all organs are synchronized, in case of a change of one rhythm all other rhythms are affected. Predominance of the sympathetic (activating) or parasympathetic (inhibitory) nervous system is immediately reflected in the heart rate. Horizontal condition and blood circulation processes affect heartbeats, too. With computer technologies ictuses can be read through hypersensitive electrodes which sense not only heartbeats but also overtones defining different ictuses and rates of the organism. Thus, reading the heart rate the device can assess how different levels of regulatory processes function. The HRV method is based on processing of the so-called PP-intervals of the heart rate which turn into harmonic oscillations (Fourier analysis).

Devices based on analysis of PP-intervals of the pulse are well-known in the world. "Alfa" device is the most modern in the sphere and has been developed by the Russian scientific company "Dinamika". It differs from other devices as it is mobile, easy to use and ensures easy use and quick assessment of status of the organism. "Alfa" gives an opportunity of continuous control and following the results of treatment and training and determination of correct dosage.

Delivery Set

1. ECG registration module. Model DIN72;
2. Cardiograph electrodes Skintact F 9024 AS;
3. USB interface cable;
4. Medical wallet;
5. Software on compact disks;

The registration module is fed from the computer through the optically coupled USB interface.

Note: In some notebook models power line disturbances when recording ECG appear at mains-fed operation. To eliminate disturbances it is recommended to deenergize the altering-current adapter for the period of recording and to use battery supply. In case of occurrence of power line disturbances in the stationary computer it is recommended to use grounding.

At some notebooks the power line disturbance may be caused by the printer connected through the USB interface. To eliminate disturbances it is recommended to disconnect the printer from the computer for the period of recording ECG.

Technical characteristics

Input voltage range	0.03- 5mV
Input impedance, not less than	5 MOm
Inner noise level at the input, not more than	10 mkV
Common mode-rejection ration at frequency of 50 Hz, not less than	110 dB
Direct current in circuit of the patient, not more than	0,1 microamperes
Bandwidth	0.03- 500 Hz
Time constant	3.2 s
Input signal sampling frequency	1000Hz
Quantization register length	12
Data transfer rate through RS232C channel in series	115 Kb

Concerning electrical safety the device corresponds to State Standard (GOST) P 50267.0 and State Standard 50267.25 (IEC 601) for products of II protection class, BF type.

Preparation for work

Installation of Software

1. Insert the compact disk "Alfa" in the CD-ROM of your computer.2. Uruchom instalatora.
2. Start set up.
3. In the windows opened successively accompanying the set up process click on "Next".
4. Click on "Finish" to complete the set up.

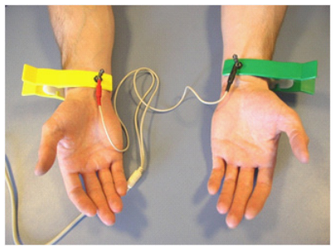
Connection of the ECG registration module

1. Connect the electrodes to the lead cable and fix plugs securely with screws.
2. Connect the interface cable to the computer through a free USB-port. Connect the interface cable to the distant module.

Connection of the ECG registration module to the patient

The electrode pads are placed on the inside of patient's wrists.
The electrode with the red plug is placed on the right arm, the one with the green plug – on the left arm. The skin at the point of contact is recommended to be moistened with water.

In some cases if the R wave amplitude is too low, the red electrode is placed on the right wrist and the green one on the left ankle richly moistened with water.



To reduce disturbances when recording ECG it is necessary to observe the following rules:

1. During the whole examination the patient shall be as comfortable, quiet and relaxed as possible. It is not recommended to talk to the patient, to let telephone calls draw his attention, etc. It is also not recommended to show him the computer display with the ECG being registered.

2. The patient's arms shall be motionless and relaxed. If the patient is sitting, his hands shall be on his knees, if he is lying down, his arms shall rest at his sides.

3. The radius of 1.5-2 m of the patient should be free from disturbances from other people.

Short Information on "Alfa":

"Alfa" gives an analysis of the client's status quickly and objectively with the help of the following procedures:

- ECG registration;
- evaluation of vegetative system condition by variance analysis
- evaluation of hormonal regulation and energy resources of the organism by neurodynamic analysis
- evaluation of psychoemotional status by examination of biorythms of the brain
- evaluation of adaptation level of the organism and biological age by fractal analysis
- analysis of the results
- analiza wyniku

Procedure of Work

Program Start

Click twice with the left mouse button on the "Alfa" icon on the desktop.

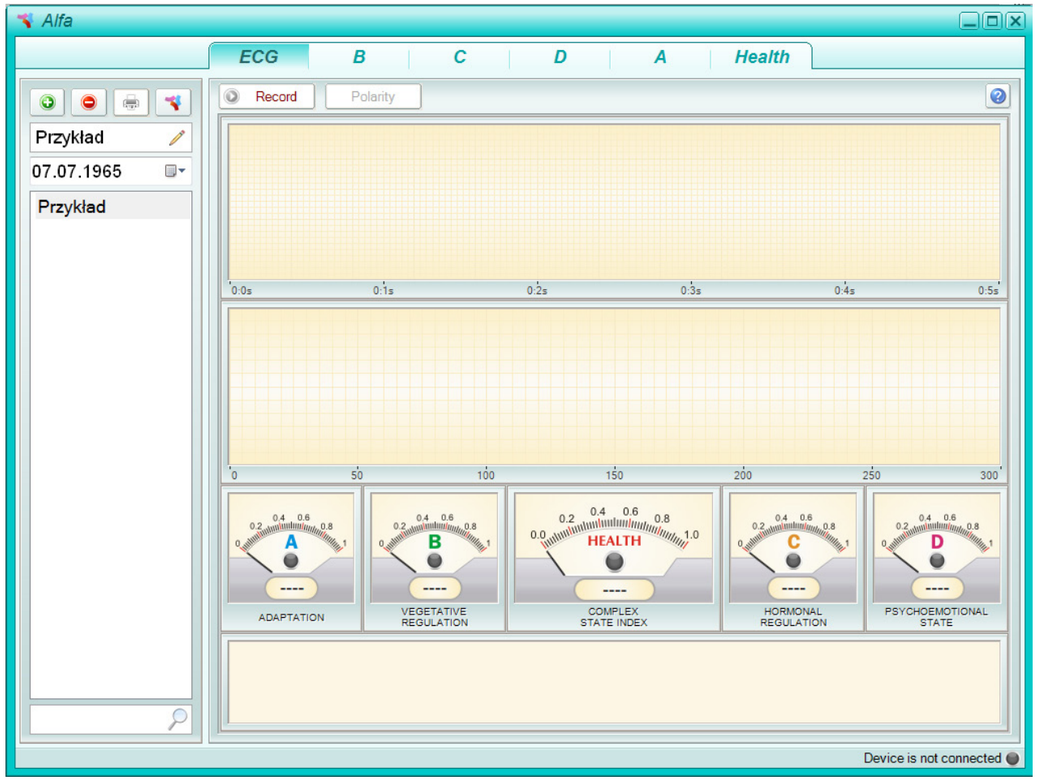
In the right bottom corner of the main window a green light should be on, it means that the device is ready for work.

To add a new patient

Press the button 

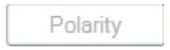
Type the patient's name and surname Przykład 

Enter the date of birth: 07.07.1965



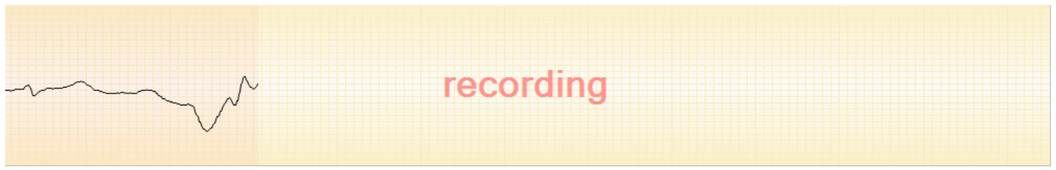
ECG Recording

Make sure that the electrodes are on the patient and press the button 

Check polarity and change it if necessary with the button 

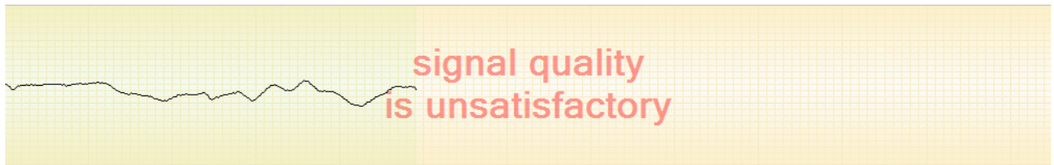
Fix the convenient signal scale moving the mouse in the window with the right button pressed.

In case of stable signal ECG recording starts automatically.



(recording)

Otherwise the following message appears:



(bad signal)

The signal may be bad for the following reasons:

A. Bad contact of electrodes with the patient's skin – to moisten the patient's skin at the area of contact with water, and also contact points of electrodes.

B. The patient is overwrought, moves or moves his fingers – the patient shall be relaxed and motionless.

C. Strangers walk in immediate proximity of the patient – the examination shall be performed in a separate room, it is necessary to exclude any movement around the patient.

D. A power line disturbance appears in the cardiogram – when using a notebook deenergize the altering-current adapter and use battery supply for the time of recording. Disconnect the printer and other devices using mains supply from the notebook.

E. Low R wave amplitude, algorithm of fixing R waves works unstably – it is recommended to take the electrode from the left wrist to the left ankle.

It is impossible to make an analysis of patients with the cardiostimulator as such data will be false.

During recording control the quality of the recorded signal. Disturbances will be red in the rhytmogram.
In case of disturbances stop recording by releasing the button (record) 

Remove the cause of disturbances and start recording again.

On the right above the ECG window the pulse rate and number of recorded RR intervals are displayed.

On indicators at the bottom of the display normalized values of current indicators of the functional status. If when recording significant changes of such indicators are observed it means that the patient is not motionless. To obtain correct results of the investigation it is required that the patient is not distracted.

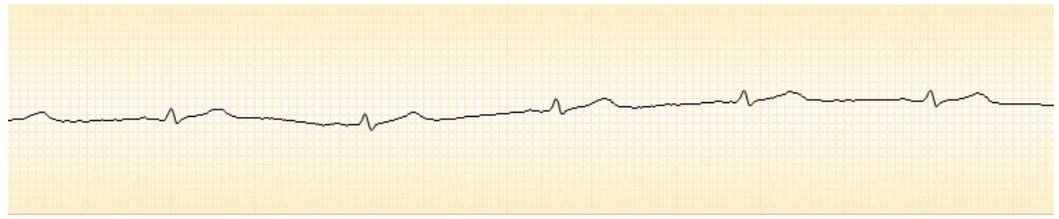
If necessary comments to the performed examination may be typed in the bottom window under the indicators.

Attention!
In case if the patient has ciliary arrhythmia or expressed extrasystole the indicators of the functional status will be calculated incorrectly. The indicators of the functional status in all regimes may be determined only if the patient has no heart rate disturbance!

Recording stops after 300 RR intervals are recorded. The program goes into the mode "ECG viewing".

ECG viewing

ECG



RR-interval is a time period between two subsequent heartbeats.

Time in minutes and seconds from the moment of registration is plotted along the horizontal axis, ECG amplitude is plotted along the vertical axis. Scaling of the diagram is performed by moving the mouse with the right button pressed. The diagram is moved with the mouse with the left button pressed.

ECG Diagram

ECG is a method of registration of electrical heart activity. Contraction causes weak magnetic impulses which are registered by electrodes attached at wrists. In this case not only amplitude-time characteristics of the cardiogram are registered, the heart rate is fixed to a high precision which carries full information on other rhythms of the human organism.

During such procedure we obtain a graphic display of the electrical heart activity – cardiocomplex characterizing the quality of functioning of the cardiac muscle.

The first step of ECG processing is R waves (distance between two subsequent heartbeats) fixing. Having fixed R waves and calculated interval between them automatically we receive the so-called "rhythmogram" of RR intervals.

Rhythmogram

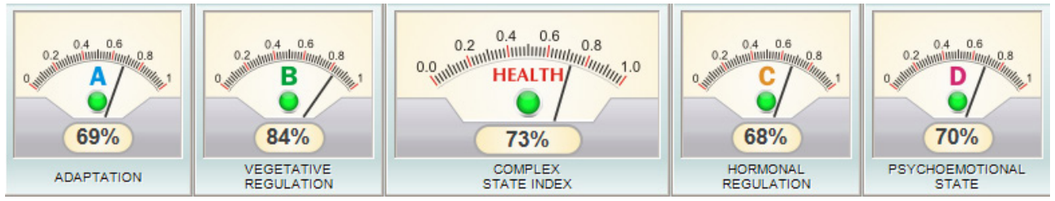
The rhythmogram is a curve in which the number of RR intervals is plotted along the horizontal axis and the length of intervals in seconds is plotted along the vertical axis.

Exactly rhythmogram reflects changes of the heart rate affected by regulatory systems of the organism. Having determined the degree and depth of such affect on the heart rate the quality of functioning of such systems may be assessed.

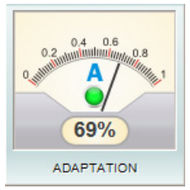
Artifacts, in other words, extrasystoles or disturbances are pink in the rhythmogram.
The optimal form of the diagram resembles a wave more than a line.

The size of the diagram may be changed by pressing the right mouse button and it is moved with the left mouse button.

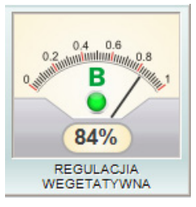
Indicators of Functional Status



Human organism includes four regulating systems which synchronize and manage all its functions. The first system is cardiovascular system.



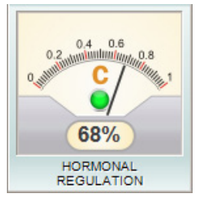
The first indicator of functional status ADAPTATION reflects adaptation of cardiovascular system, i.e. ability of organism to adapt to vital activity and load as a result of influence of different factors: ambient temperature, traumas, infectious diseases etc.



The next level of regulation is VEGETATIVE REGULATION. Vegetative nervous system is responsible for ability of organism to respond quickly to any changes of internal and external environment.

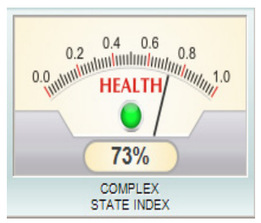
Vegetative nervous system consists of two parts, sympathetic and parasympathetic divisions, activity of which has opposite character. Somewhat more simply, it may be said that sympathetic nervous system manages energy-consuming processes, and parasympathetic system manages energy-saving processes

When increase in performance is necessary, sympathetic nervous system increases frequency of heart contractions, blood pressure etc. When it is time for rest, parasympathetic system becomes active; it decreases frequency of pulse and blood pressure. Thus, the organism finally tries to find balance, homeostasis.



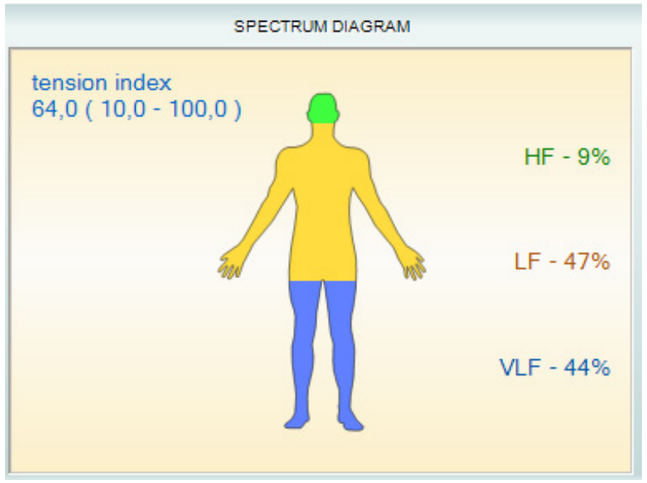
The next level of regulation is HORMONAL REGULATION. Endocrine system creates certain hormonal profile, which helps the organism to bear external and internal influence and adapt to such influence. That is functioning of hormonal system which determines how optimal the organism uses its energetic and physiological resources. Indicator of hormonal regulation of endocrine system is the exact reflection of the quality with which the endocrine system resolves its tasks.

The fourth and the highest system of regulation is PSYCHOEMOTIONAL one. Its work is closely connected with functioning of our brain. On the one hand, it strongly depends on the activity of the three other systems; on the other hand, it independently determines their functioning.



The Complex Health Indicator represents a quintessence of all previous indicators and serves as a conditional mathematical representation of health status of person under test. It reflects general quality of physiological processes in the organism and the degree of their balance.

Vegetative regulation



Application of spectrum analysis allows to quantitatively estimate different frequency components of fluctuations of heart rate and visually represent them at the spectrum chart.

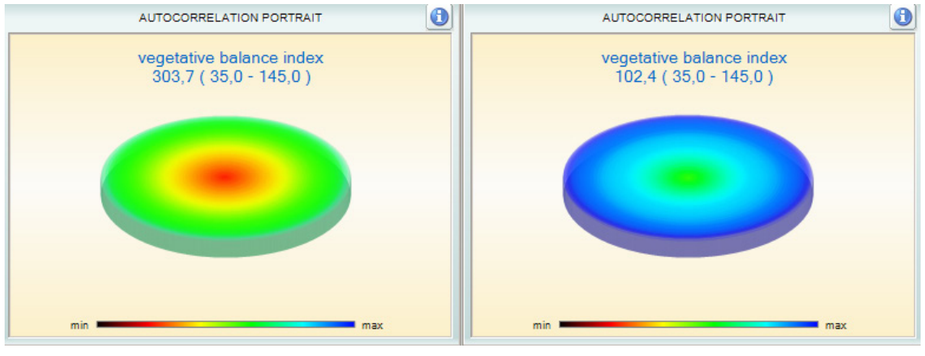
High Frequencies (HF - High Frequency): 0.15 - 0.40 Hz. High frequencies characterize influence of parasympathetic division of vegetative nervous system. Sportsmen and well trained people have power of HF which significantly exceeds the power of HF of untrained people, and shall dominate over power of low frequencies. Decrease of power of HF of sportsmen may witness tension in the heart functioning regulation system or overtraining. Significant increase of the HF may indicate sinus rhythm disturbance.
Normal HF is 15-20%. It should be known that some people have parasympathetic nervous system dominating since the very birth. They are called parasympathicotonics, and their normal indicators are 35-40%.

Low Frequencies (Low Frequency - LF): 0.04 - 0.15 Hz. Low frequencies characterize functioning of sympathetic nervous system. Normal LF is 30-50%. It should be remembered about people for which sympathetic nervous system dominates since the very birth, LF is 60-75%, and it shall be taken into consideration in the analysis.

Very Low Frequencies (Very Low Frequency - VLF): 0,003 - 0, 04 Hz. Very low frequencies determine influence of central nervous system and are a sensitive indicator of management of metabolic processes, and they reflect energy-deficient status. Normal value is 15-35%.

Stress index:
Tension index reflects a degree of centralization of heart rate management. This index is exceedingly sensitive to increase in influence of sympathetic nervous system.
Normal values: 10-100.
Light load (physical or emotional) increases the tension index by 1.5-2 times. In case of insignificant load it growths by 5-10 times. Patients with constant tension of regulatory systems (psychic stress, stenocardia, circulatory inefficiency) have tension index at rest equal to 400-600 units. Patients with acute myocardial infarction may have tension index reaching 1000-1200.

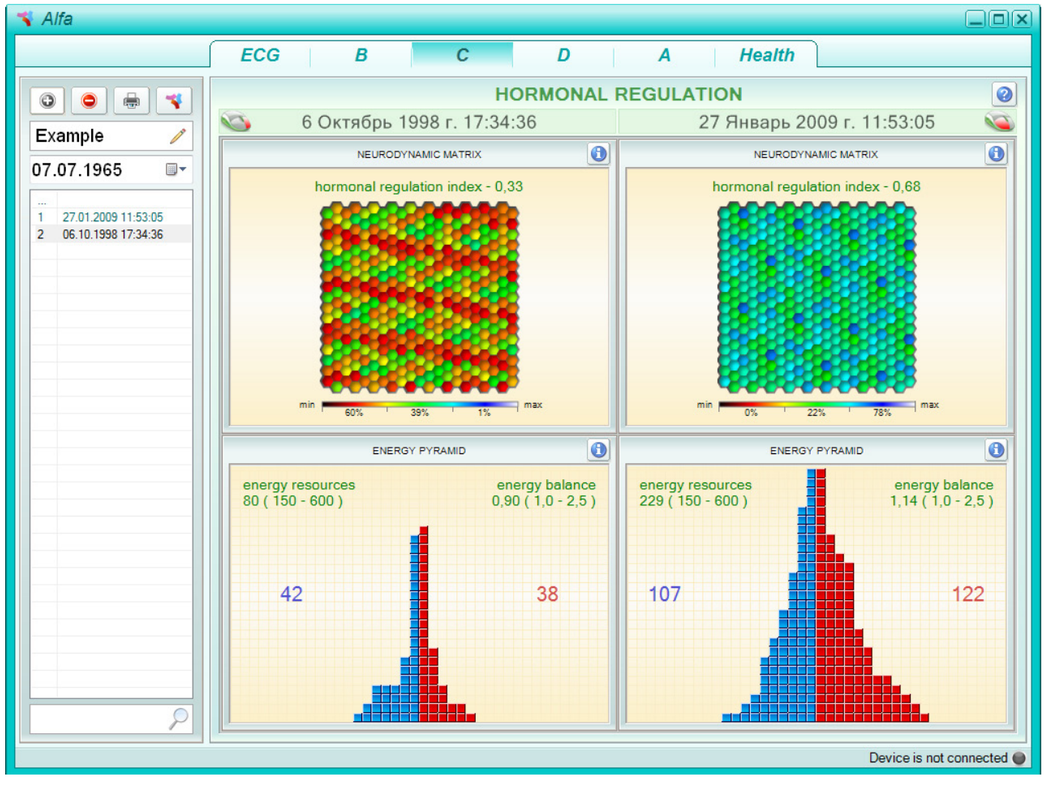
Index of Vegetative Balance:
Index of Vegetative Balance indicates correlation between activity of sympathetic and parasympathetic divisions of vegetative nervous system and the degree of involvement of central nervous system in this process. The more red color is seen in the centre of the circle, the higher is the degree of involvement of central nervous system into the processes of regulation.

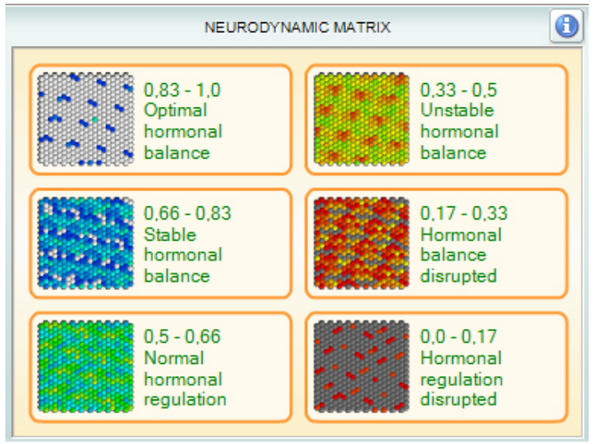


Hormonal regulation.

Neurodynamic matrix is a complete set of biorhythms of organism extracted out of rhythmogram. Separate color elements of the matrix represent rhythms of certain systems of organism. Color tone shows how much each rhythm is synchronized with the other rhythms. White color indicates optimal synchronization. Red color indicates desynchronization.

Research has shown that synchronization of rhythms and hormonal balance are related to each other, and improvement of synchronization is reflected thereby upon improvement of hormonal balance.

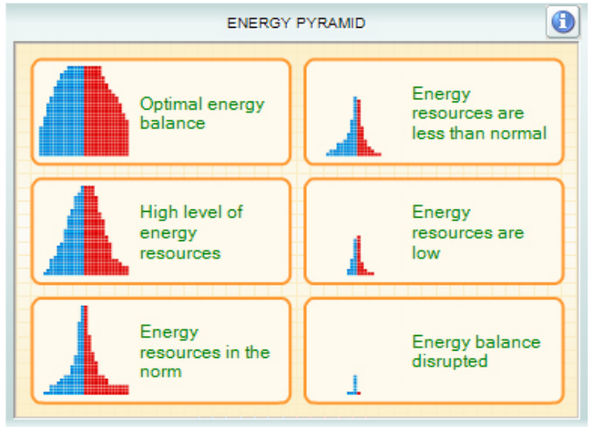




Energy Pyramid:

"Energy Pyramid" is a dynamic representation of energy balance in the systems of management of different functions of organism. Blue part corresponds to the period of energy storage; red part corresponds to the period of energy consumption by different organs and systems of organism.

The sum of values of blue and red indicators shows general quantity of energy resources of the organism. The higher value of this indicator , the more adaptive capacity has the organism, and the better it resists stress and copes with different loads.



Energy balance will be normal if the period of energy consumption by different organs is more than the corresponding period of energy storage. In other words, for successful energy exchange in organism, the area of the right part of the pyramid shall be more than its left part, and the indicator of energy balance shall exceed 1.0

Psychoemotional status

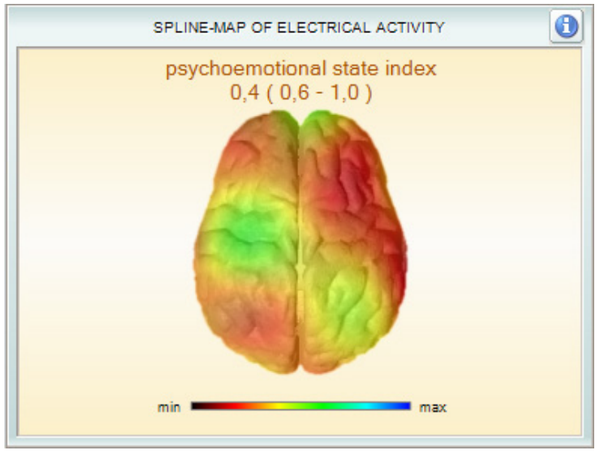
Hypothalamus is the main regulating mechanism of the organism. Hypothalamus is related to functions of the brain and brings direct influence on them. Functions of the brain in their turn manage other processes of regulation in organism.

It was stated by an experimental approach that researching different indicators of organism such as electrical activity of the brain, rhythmic activity of the heart, respiratory frequency, fluctuations of the blood sugar level, level of the hormones etc., The process of changing of these indicators may be described. Analysis of these data showed that the dynamics of these processes has properties of similarity.

In other words each physiological process has its own unique rhythm and these rhythms are similar and are reflected in heart rates.
It means that having researched one rhythm by methods of fractal analysis structure and dynamics, other rhythms may be detected.

Discovery of fractal analysis offers an opportunity to find a key, giving ability to decipher information underlying in combination of rhythms of registered cardiosignals and to build a spline-card of electric activity of cerebral cortex, which is a gauge of current psychoemotional status of the person under test.

Colors of spline-card correspond to different levels of electric activity, and their distribution is a gauge of the current psychoemotional status of the person. Indicator of psychoemotional status demonstrates us how deep the influence of stress situations on a human organism is.



Brain activity waves

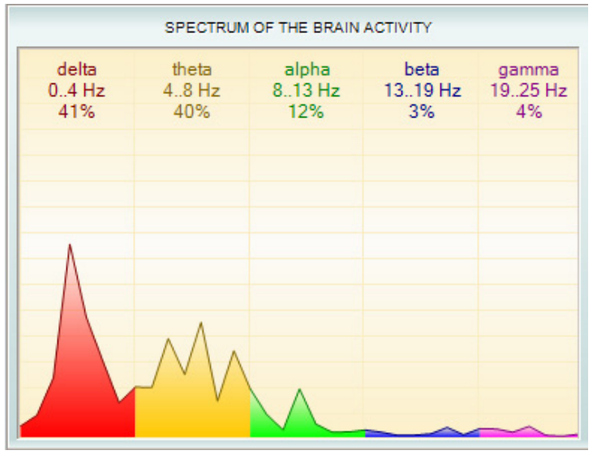
Our brain radiates waves of different frequency. There is a direct correlation between activity of a person, his level of concentration of attention and frequency of cerebral fluctuations. In normal awake state all waves are active. Depending on what we are doing and depending on our psychoemotional status, certain fluctuations are more active than the other ones.

Delta (0.1-4 Hz). Delta waves mean sleep.

Theta (4-8 Hz). State before sleep. Presence of certain quantity of theta waves in combination with alpha waves may suggest creative abilities. High level of theta waves suggest good contact with subconsciousness.

Beta (13-19 Hz). State of consciousness and activity.

Gamma (19-25 Hz) - Altered state of consciousness.



Analysis of resources

Indicator "Level of Organism Adaptation" shows quality of functional status of organism.

The higher the level of adaptation is, the quicker, more painlessly and more effectively our organism will respond on different types of load. Percentage display shows the alevel of the resource of cardiovascular system without participation of auxiliary regulatory systems.

Forecast of physical condition

If the indicator "Level of Adaptation" is lower than the "Complex Health Indicator" (CHI), this points to the fact, that you live a too tensed and stressful life (high tempo of living, stresses, overtraining which leads to depletion of your resources). Ultimately it leads to decrease of health index indicator. If the "Level of Adaptation" is higher than the "Complex Health Indicator", it means that in the nearest 10 days well-being will improve and accordingly CHI will increase.

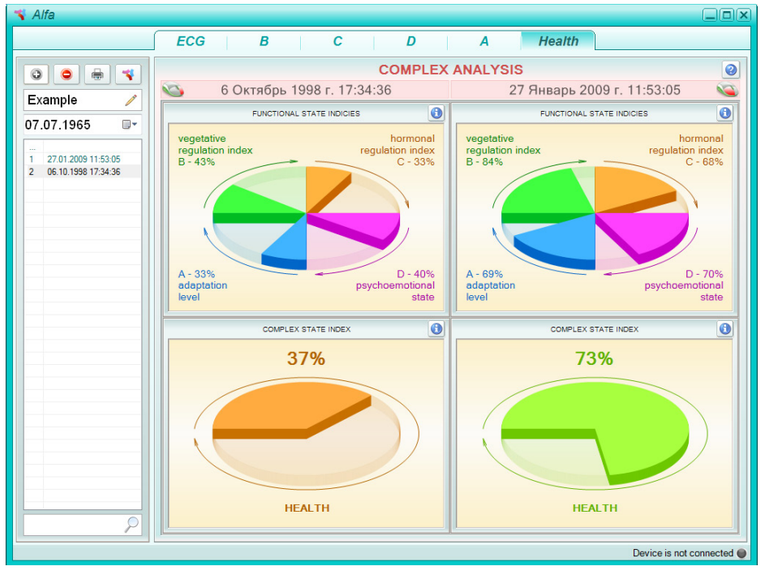
Gerontological Curve

Using a notion "gerontological curve" we may determine biological or genuine age of a human which as a rule is inconsistent with the chronological age.

Reference gerontological curve is received by statistic analysis of biorhythms of more than 10 000 patients belonging to different age groups. It serves as a graphical representation of tempo of accumulation and expenditure of living resources in an organism of an average human and corresponds with the life cycle of the duration of 100 calendar years. People may be younger or older than their chronological age. Genuine, biological age reflects viability of organism.

Complex Analysis

Complex analysis of health reflects quality of physiological processes of organism and level of their balance. It serves as a conditional mathematical representation of "health status of a person".



Main advantages of the "Alfa» device:

"Alfa" device is a perfect instrument to examine:
- Health status, state of your internal resources and to what extent your organism is full of energy;
- Dosage of different therapeutic interventions;
- Choose the correct method of training; and evaluates effects of different food supplements;
- Evaluates mental activity.

NOTE

The program provides possibility of comparison of two examinations.
Selection of examination is performed in a list of entries in the left part of display. In the left part of the window a result of examination selected by the left button of mouse is displayed. In the right part of the window a result of examination selected by the right button of mouse is displayed. On default in the left part of the window a result of penultimate examination is displayed, and in the right part a result of the last examination is displayed.
Reference standards for different states are displayed with the help of "I" button in any mode.

Människans Resurser AB
Cenrtrum Rezerwowych Mozliwości Człowieka
Hantverkargatan 42 B,Stockholm

mail@mr-ab.se
www.mr-ab.se