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Personality profile and biofeedback quality in the loop of paced breathing and HRV

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Project Background

- The regulation state in our organism determines the health and quality of life.
- Heart rate variability (HRV) is the most powerful noninvasive method for testing regulation state of the organism.
- Paced breathing is effective and easy-to-use method to restore the balance of regulatory systems of the body via HRV parameters.
- Biofeedback is a process that enables to combine paced breathing and HRV for changing physiological activity for the purposes of improving health and life quality.
- The highest effectiveness was demonstrated by biofeedback in loop of paced breathing algorithm which starts from free breathing.

Topicality

- Human personality traits are correlated with the state of the autonomic nervous system and determine the distribution of the HRV spectrum.
- We should expect their indirect effect on the biofeedback quality.
- However, researches of the biofeedback effectiveness that based on personality profile are practically absent.
- This research was done under the KhNU scientific research "Development and research systems of automatic control of heart rate variability», state registration № 0109U000622.

Objective

- To establish the possible role of the individual features of the profile in biofeedback under the loop of paced breathing algorithm starting from free breathing and HRV in healthy volunteers.

An object of research

- 14 medical students aged between 18 to 27 years (10 women and 4 men)

Methods of research

- Personality profile of healthy volunteers was established by The Minnesota Multiphasic Personality Inventory MMPI (MiniMult) which contains of 71 questions, grouped in 3 evaluative and 8 basis scales.

- Then, each volunteer had 7 biofeedback sessions in the loop of paced breathing algorithm starting from free breathing.

- Monitor records RR-intervals of ECG were conducted by computer diagnostic complex "CardioLab2009" in the first standard lead.

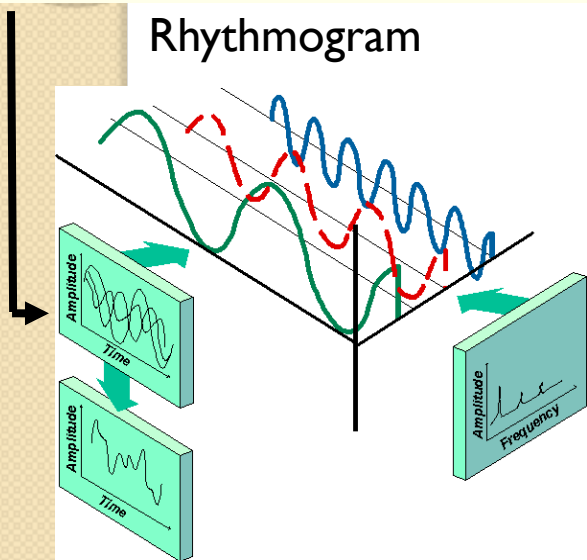- The respiration rate was managed by program module "Biofeedback".
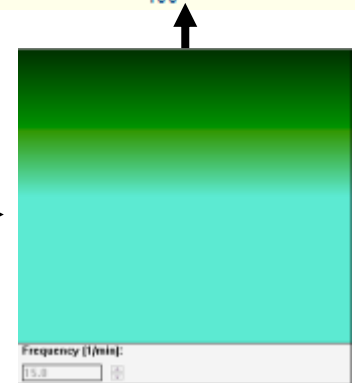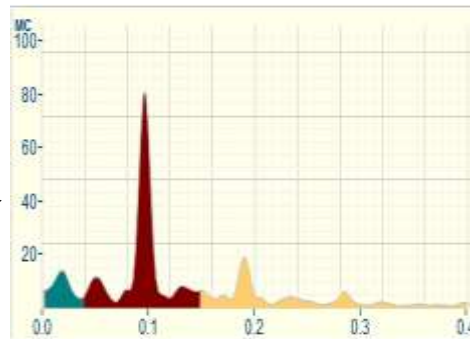
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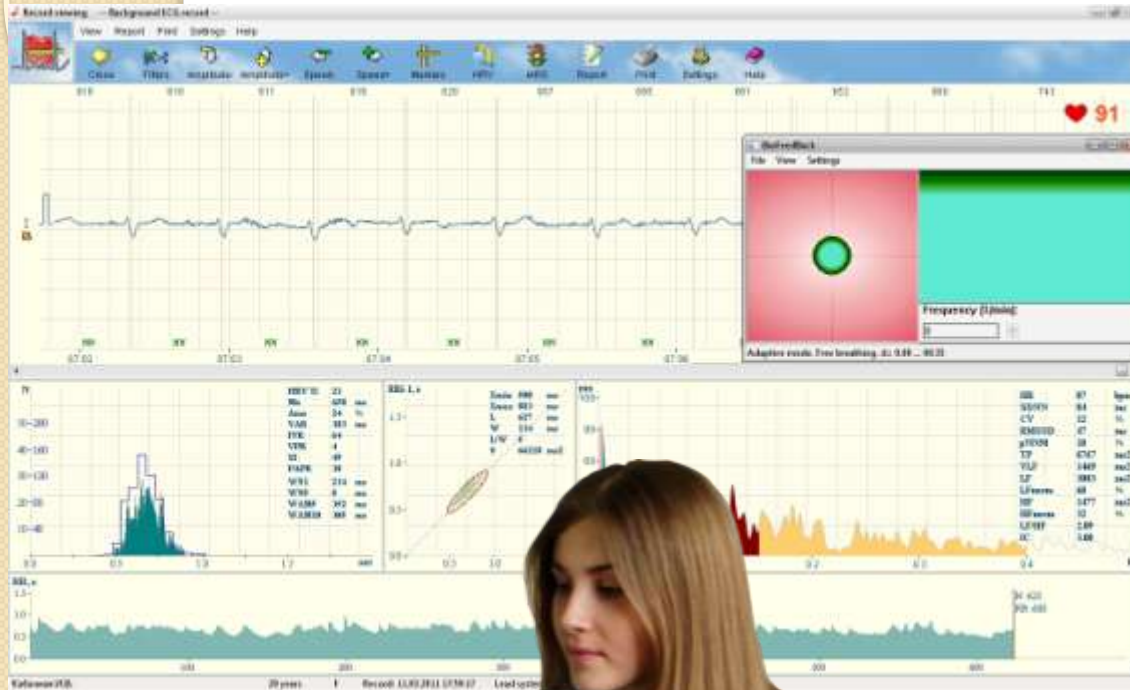
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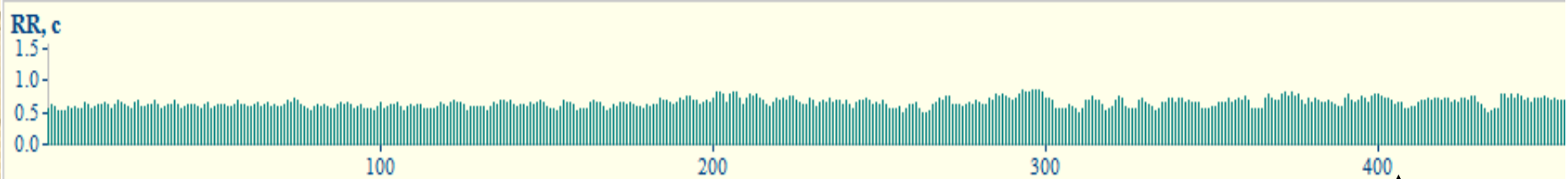
Rhythmogram

Fast Fourier transform

- Among the HRV parameters was estimated power of:
  - low frequencies (V, till 0.05 Hz), mainly associated with thermoregulation and humoral sympathetic part of autonomic nervous system;
  - middle frequencies (L, 0,05-0,15 Hz), mainly associated with sympathetic and parasympathetic links of vegetative balance;
  - high frequencies (H, 0,15-0,40 Hz), mainly associated with parasympathetic link of autonomic nervous regulation.

Methods of research

- Biofeedback quality was evaluated by BQI index that includes all the qualitative changes of the process.

- BQI index approximates to value "1" when biofeedback effectiveness is good and moves away from "1" when effectiveness worsens.

- Statistical processing of results was conducted by «Microsoft Excel 2003".

- Reliability of differences in the index BQI compared group was determined by U-Mann-Whitney test, in one group between sessions - T-Wilcoxon test.

Results and Discussion

- According to the results of MiniMult inventory, all volunteers were divided into two groups: the first (7 women and 3 men) - with normal (40-70 points) and second (3 women and 1 man) - with high values (> 70 points) at the scale Pt.

Scale	m±sd in group with	
	normal "Pt" scores (40-70)	high "Pt" scores (>70)
Hs	52,52±11,08	61,60±7,43
D	38,91±8,28	50,55±16,09
Hy	36,49±17,94	50,72±4,30
Pd	28,98±9,27	43,20±4,91
Pa	26,58±7,78	44,00±12,70
Pt	49,60±10,90	**78,81±3,95**
Se	47,67±11,43	66,56±10,18
Ma	40,03±8,95	44,82±4,62

Results and Discussion
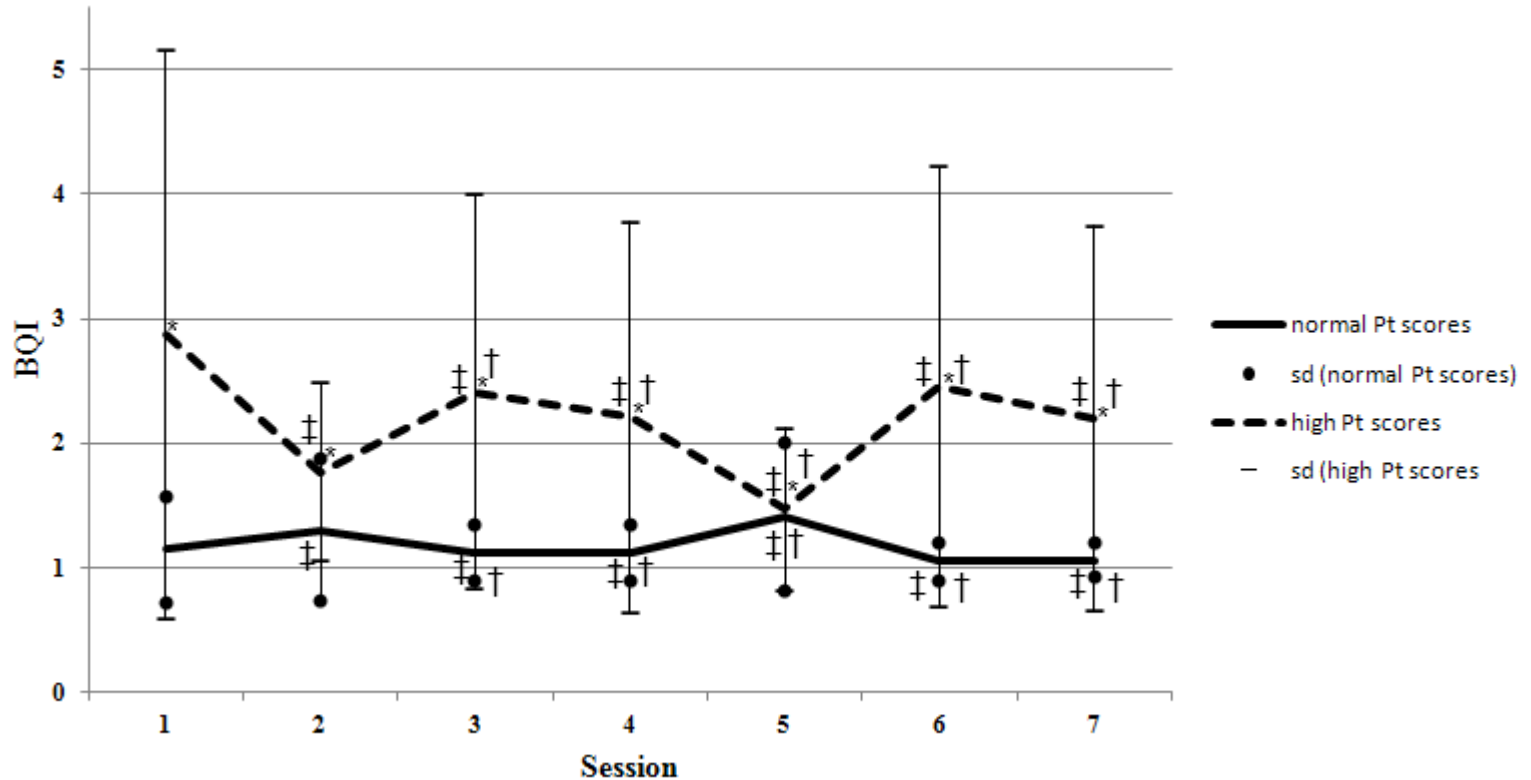
† - p>0,05 comparing biofeedback session results in groups 1 and 2 to their initial values;
‡ - p>0,05 comparing to previous sessions in the same group;
* - p>0,05 comparing groups on current session.

Conclusions

- Personality profile has a significant effect to the biofeedback quality in the loops of paced breathing and HRV.
- In biofeedback volunteers with high psychasthenia scores (>70) show worse results than volunteers with normal scores (40-70).
- For achieving high performance of body's regulatory system optimizing in biofeedback through the use of paced breathing the personality profile of the individual must taken into account.

Thanks a lot for your attention!

Take care of your health!