

**CONTROLLED BREATHING WITH INDIVIDUALLY SELECTED
FREQUENCY CHANGES TIME ORGANIZATION OF HEART RHYTHM IN
THE INFRADIAN RANGE**

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The effect of controlled breathing with an individually selected frequency (CBISF) on the infradian rhythm of the heart rhythm of 20 healthy female volunteers aged 19–22 was studied during a 50-day study. The results of the study indicate that a 50-day action of the CBISF can change the temporal organization of the heart rate in the infradian range, which can be one of the mechanisms of the physiological effect of the CBISF.

Controlled breathing with individually selected frequency has a significant influence on the infra-rhythmic rhythm of the studied parameters of heart rate variability, expressed in a significant change in the amplitudes of the studied rhythms and reliable phase shifts in all the isolated periods relative to the values of the control group. Perhaps this is due to the fact that the use of controlled respiration with a frequency selected individually based on preliminary recording of heart rate variability can be regarded as the introduction of a periodic component into an external signal in order to harmonize the system of vegetative management of the heart, and significant changes in the functional parameters of the cardiorespiratory system in Subjects registered in this study are related to the process of adjusting endogenous rhythms to an external rhythm given by controlled breathing with an individually selected frequency.

Thus, the repeated daily exposure to controlled respiration with an individually selected frequency can change the temporal organization of the heart rhythm of the body of the subjects in the infradian range. The results greatly expand the understanding of the infra-rhythmic rhythm of physiological systems, the biological activity of controlled respiration, clarify some mechanisms of the physiological effect of weak stimuli on the cardiovascular system.

Keywords: controlled breathing with individually selected frequency, heart rate variability, infradian rhythm.

References

1. Glass L. Synchronization and rhythmic processes in physiology. *Nature*, **410**, 277 (2001).
2. Glass L., Mackey M. C. *From clocks to chaos: the rhythms of life*, 214 (Princeton: Princeton University Press, 1988).
3. Mosekilde E., Maistrenko M. Yu., Postnov D. *Chaotic synchronization, applications to living systems*, 42 (E–Singapore: World Scientific, 2002).
4. Chernuh A. M. *Zadachi i perspektivy razvitiya issledovaniy po hronopatologii i hronomedicine*. Hronobiologiya i hronopatologiya. Tez. dokl. na Vsesoyuz. konf., 3 (M., 1981).
5. Chuyan E. N., Biryukova E. A., Ravaeva M. Y. [et al.] Osobennosti sistemy vegetativnogo upravleniya serdcem u ispytuemykh s razlichnym tipom vegetativnoj regulyacii. *Uchenye zapiski Tavricheskogo nac. un-ta im. V. I. Vernadskogo*, **22 (61)**, 1, 133 (2009).
6. Breus T. K., Chibisov S. M., Baevskij R. M. [et al.] *Hronostruktura ritmov serdca i faktory vneshnej sredy*, 232 (M., 2002).
7. Kuchuk T. P., Koryagina Y. V. Infradiannye ritmy pokazatelej funkcional'nogo sostoyaniya sportsmenov-yunoshej. *Sovremennye problemy nauki i obrazovaniya*, **6**, 88 (2006).
8. Baevskij R. M. *Matematicheskij analiz serdechnogo ritma pri stresse O. I. Kirilov*, 220 (M.: Nauka, 1984).
9. Chuyan E. N., Mironyuk I. S., Biryukova E. A. [et al.] Upravlenie dyhaniem modificiruet svyaz' variabel'nosti serdechnogo ritma volonterov s variaciyami geliogeomagnitnyh faktorov. *Fizioterapiya, bal'neologiya i reabilitaciya*, **14 (6)**, 35 (2015).
10. Vladimirkij B. M., Sidiyakin V. G., Temur'yanc N. A. [et al.] *Kosmos i biologicheskie ritmy*, 206 (Simferopol', 1995).
11. Nejman D. Prilivnye i lunnye ritmy. *Biologicheskie ritmy*, **2**, 43 (M., 1984).
12. Temur'yanc N. A., Chuyan E. N., Shekhotkin A. V. Infradiannayarimika funkcional'nogo sostoyaniya nejtrofilov i limfocitov krovi krysa s razlichnymi konstitucionnymi osobennostyami. *Biofizika*, **40 (5)**, 1125 (1995).
13. Temur'yanc N. A., Shekhotkin A. V. Izmenenie infradiannoj ritmiki degidrogenaza limfocitov krovi krysa pri ehpfizehtomii i dejstvii slabyh peremennyh magnitnyh polej. *Aviakosmicheskaya i ehkologicheskaya medicina*, **29 (3)**, 43(1995).
14. Putilov A. A. *Sistemoobrazuyushchaya funkciya sinhronizacii v zhivoj prirode*, 144 (Novosibirsk: Nauka, 1987).
15. Arushanyan E. B. *Hronofarmakologiya*, 424 (Stavropol', 2000).
16. Agulova L. P., Udal'cova N. V., Shnol' S. E. Korrelyaciya makroskopicheskikh fluktuacij v biologicheskikh i fiziko-himicheskikh processah s kosmofizicheskimi faktorami, *Ehlektronnaya polya v biosfere*, **1**, 224 (M.: Nauka, 1984).
17. Burlakova E. B., Konradov A. A., Hudyakov I. V. Vozdejstvie himicheskikh agentov v sverhmalyh dozah na biologicheskie obekty, *Izv. AN SSSR*, **2**, 193 (1990).
18. Deklaracijnij patent Ukrainu №38559, MPK 51 A 61N2/00/ na korisnu model' „Sposib korekcii funkcional'nogo stanu organizmu lyudini”/ Chuyan O. M., Biryukova O. A., Ravaeva M. YU. // Opubl. 12.01.2009 Byul. № 1.