

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Human Physiology in Space (2)

Author: Dr. Anna Chernikova

SSC RF Institute of bio-medical problems RAS, Russian Federation, anna.imbp@mail.ru

Dr. Irina Funtova

SSC RF-Institute of Biomedical Problems RAS, Russian Federation, funtova.imbp@mail.ru

Dr. Elena Luchitskaya

Institute for Biomedical Problems, Russian Federation, e.luchitskaya@gmail.com

Dr. Vladimir P. Katuntsev

Federal Scientific Clinical Centre of the Federal Biomedical Agency of Russia, Russian Federation,
vpkat@yandex.ruCARDIOVASCULAR AUTONOMIC BALANCE IN COSMONAUTS IN ATTITUDE TO THEIR
POSITION IN A CREW**Abstract**

Introduction. The main responsibility for the overall mission success and safety of crew and Station during long-term flights at the International Space Station (ISS) is usually placed on crew commanders. These features are the objective reasons for the emergence of significant psycho-emotional loads during flight and we must take this fact into account. Our report presents an assessment of cardiovascular autonomic balance in 26 crew-members at Russian segment of ISS, 9 of which worked as flight commanders.

Methods and Materials. To assess the autonomic status heart rate variability (HRV) analysis method was used. It is proved to be informative about functional conditions, health, emotional stresses, aging and more. The studies were conducted monthly using on-board devices "Pulse" and "Pneumocard" during the 7-29 missions to the ISS. The standard HRV analysis in time and frequency domain was performed for the 5-minute series of R-R intervals obtained at rest position before, during and after space flight. For each of mentioned above stages of flight mean values of HRV parameters were calculated, separately for crew members, who were commanders and flight engineers. Flight data were averaged over all months of the flight.

Results. Comparison of HRV in the preflight period showed no significant intergroup differences. When comparing the flight data statistically significant group differences were found on almost all HRV variables. In the group of crew commanders heart rate was significantly higher (68 bpm vs. 61 bpm). The pNN50, reflecting parasympathetic activity, were more than 2 times lower (5,2% and 13,8%) in commanders group. The total spectral power of HRV (TP) was almost two times lower (1567 s² vs. 2564 s²). The absolute power spectrum in the HF and LF bands were also significantly lower in the crew commander. Thus, a group of crew commanders during the execution of space flight differs significantly by the shift of autonomic balance toward sympathetic dominance. In the post-flight period (+ 3 + 4 days of readaptation) there were no significant differences between groups of commanders and flight engineers, although we can observe the trend towards the predominance of sympathetic influences in the activity of regulatory mechanisms.

Conclusion. The high responsibility of crew commanders in the course of long duration expeditions to the ISS may be a reason of significant psycho-emotional loads, which affects the autonomic balance. This additional load factor should be considered when designing prevention of adverse effects of microgravity.