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

Author: Dr. Uwe Hoffmann
German Sports University Cologne, Germany, u.hoffmann@dshs-koeln.de

Dr. Jessica Koschate
German Sports University Cologne, Germany, J.Koschate@dshs-koeln.de
Mrs. Natalya Lysova
FSC RF-IMBP, Russian Federation, fomin-fomin@yandex.ru
Mr. Lutz Thieschäfer
German Sports University Cologne, Germany, l.thieschaefer@dshs-koeln.de
Dr. Uwe Drescher
German Sports University Cologne, Germany, Drescher@dshs-koeln.de
Prof. Elena Fomina
State Scientific Center of Russian Federation, Institute of Biomedical Problems, Russian Academy of Sciences, Russian Federation, fomin-fomin@yandex.ru

CARDIOVASCULAR REGULATION IN RESPONSE TO EXERCISE – FIRST RESULTS FROM ISS COSMONAUTS

Abstract

Purpose: The aim of this study was to investigate changes in cardiovascular and respiratory regulation during treadmill exercise before, during and, after an ISS mission with respect to different modes of treadmill training during the mission. **Methods:** Until now 4 cosmonauts were tested with mission durations ranging between 139 to 197 d. All cosmonauts were tested pre and post mission (R+7d to R+10d). Two cosmonauts were tested inflight as well. The test protocol consisted of treadmill running for 5 min at 3 km h^{-1}, randomized changes between 3 and 6 km h^{-1} for further 10 min, 5 min at 6 km h^{-1} followed by incremental increases in speed until exhaustion. Respiratory gas exchange and heart rate (HR) were measured. For the preliminary evaluation, HR and ventilation (V'_E) data were analyzed during the steady state phases (3 vs. 6 km h^{-1}), kinetics described were described as CCF_{max} (see Hoffmann et al. Eur J Appl Physiol 113:1745-1754, 2013 for details). Peak values of treadmill speed, HR and oxygen uptake were determined from incremental exercise. During the training sessions throughout the missions, treadmill training mode (active walk, slow/fast running and passive walk/running) was chosen ad libitum by the cosmonauts and was logged regularly. **Results:** Peak treadmill speeds were found decreased (up to 13%) and three subjects showed a higher peak HR after the mission (5 – 8%). Changes in HR kinetics were heterogeneous, whereas V'_E kinetics were found faster after the missions. No systematic influences from the preferred training was observed. **Conclusions:** In this study treadmill exercise was proven applicable for cardiorespiratory kinetics testing in cosmonauts. Although no systematic influences were detected, further data will be helpful to detect differences in training modes as countermeasures for long-term exposure to weightlessness. The missing differences in kinetics suggest a stability in daily life fitness whereas less favorable peak values indicate a loss in exercise capacity.