The influence of microgravity on memorized arm movements

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Abstract

To investigate sensory and motor functions in microgravity, goal-oriented arm movements were performed by 9 cosmonauts in weightlessness. The ability to reproduce predefined motor patterns was examined pre-, in-, and post-flight under two different paradigms: In a first test, the cosmonaut had to reproduce passively learned movements with eyes closed, while in the second test, the cosmonaut learned the pattern with eyes open.

The different learning paradigms affected the metric parameters of the memorized stimulus pattern while the influence of the different gravity levels resulted in significant offsets and torsions of the reproduced figures.

In comparing the inflight condition with preflight, intact proprioceptive afference seemed to play an important role for reproducing movements from motor short-time memory correctly.

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and
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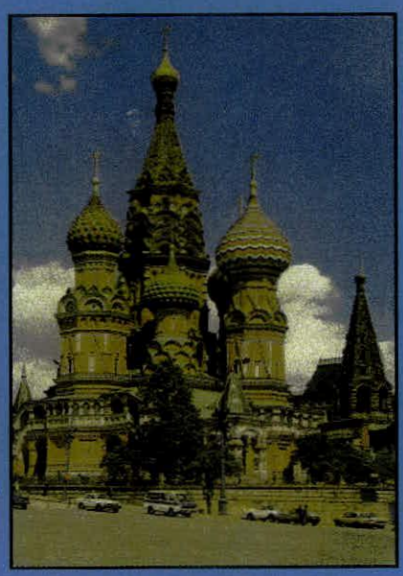

THURSDAY, JUNE 10TH

EFFECTS OF GRAVITY ON INTERACTION OF SENSORY SYSTEMS
(Chairs, V.R. Edgerton & I. Kozlovskaya)

09:00 Support Afferentation in the Organization of Postural Muscle System
I. Kozlovskaya

09:20 Role of Loading in the Spinal Control of Posture and Locomotion
R. Edgerton

09:40 Gravity Related Organization of the Neural Control of Walking in Human an Nonhuman Primates
G. Courtine

10:00 The Influence of Microgravity on Memorized Arm Movements
F. Gerstenbrand

10:20 Load-Dependent Regulation of Neuromuscular System
Y. Ohira

10:40 Destabilization of Balance Control by Head Movements in Astronaut Testing
W.H. Paloski, N.J. Newby, and E.Y. Hwang

11:00 – 11:15 MORNING BREAK

11:15 The Critical Role of Gravity in Determining Adaptation of the Gain of the Ya and Pitch Angular Vestibulo-Ocular Reflex
S.B. Yakushin, Y. Xiang, T. Raphan, and B. Cohen

11:35 Motor Control and Segmental Stiffness in the Lumbo-Pelvic Region: Ensurin Joint Protection Against Antigravity Forces
C.A. Richardson, J. Hides, and C.J. Snijders

11:55 Velocity of Head Movements and Sensory Motor Adaptations during and afte Short Spaceflight
F. Hlavacka and L.N. Kornilova

FREE PAPERS: NEURO-SENSORY SYSTEMS

12:15 Effects of Vestibular and Support Afferentation Upon Characteristics of Visu Pursuit during Exposure to Microgravity
L.N. Kornilova, Ch. Mueller, V. Temnikova, M. Alekhina, and I. Kozlovskaya

12:25 Sensory Motor Reflex Development in Hypergravity
R. Wubbels, V. Bouet, A. Gramsbergen

12:35 Microgravity Reveals Invariant Temporal Relationships Between Focal and Equilibrium Components of Whole Body Reaching
J. Patron, P.J. Stapley, and T. Pozzo

12:45 Postponed Potentiation as a Facilitation Mechanism of Rat Adaptation to Repeated Hypergravity and Microgravity Effects
I.B. Krasnov

12:55 – 14:30 LUNCH

14:30 A Mathematical Model of the Response of Semicircular Canal and Otolith to Head Rotation under Gravity
V.V. Alexandrov, T.B. Alexandrova, T.G. Astakhova, N.V. Kulikovskaya, V.I. Kurilov, S.S. Migunov, and N.E. Shulenina

14:40 Locomotor System Development in Hypergravity
V. Bouet, J. Ijkema-Paassen, R. Wubbels, and A. Gramsbergen

14:50 GABA and Glutamate Exocytotic Release and Uptake by Rat Brain Synaptosomes under Extremal Conditions
T. Borisova N. Pozdnyakova, N. Krisanova, and N. Himmelreich

15:00 Sensitivity and Growth of Fish Otoliths
A.V. Kondrachuk

15:10 Activation of the Sensorimotor Cortex by Vibrotactile Stimulation of the Foot: An fMRI Study
S.M. Golaszewski, C.M. Siedentopf, F. Koppelstaetter, E. Gallasch, M. Verius, S.R. Felber, D. Zur Nedden, I. Koslovskaya, F. Gerstenbrand

15:20 Can Be Organized an Acoustical Vertical?
J.A. Altman, M.Yu. Agaeva, and I.Yu. Kirillova

15:30 The Mechanisms of Spatial Orientation in Conditions of G Stress
I.V. Bukhtiarov, O.A. Vorobjov, M.N. Khomenko, and I.B. Ushakov

15:40 – 15:55 AFTERNOON BREAK

15:55 Structurally-Functional Shifts in the Ventrolateral Nucleus of the Thalamus of Rats at the Prolonged Hypokinesia, as a Model of Gravitational Pathology
B.A. Nashbullin, A.I. Gozhenko, and S.I. Dolomatov

16:05 Learning with Simulation Only - Artificial Skills
B. Johannes, V.P. Salnitski, K.M. Goeters, P. Maschke, D. Stelling

16:15 Physiological Reactions of Primates to 9-D Immersion and Head-Down Immobilization
V.I. Korolkov, V.P. Krotov, Y.V. gordeev, A.O. OLazarev, V.I. Lobachik, T.E. Burkovskaya, M.A. Dotsenko, G.N. Durnova, A.D. Kaplansky, I.N. Chistyakov, and O.N. Vasilieva

16:25 The Robot and the Satellite for Tele-Operating Echographic Examination
Ph. Arbeille, J. Ayoub, P. Vieyres, M. Porcher, J.L. Boulay, V. Moreau, and G. Poisson

16:35 Contemporary Conception of Anti G Protection of Cosmonauts in Flights Aboard "SOYUZ" Space Vehicles
A.R. Kotovskaya, I.F. Vil Viliams, Y.Yu. Lukjanuk

16:45 Impact of Magnetic Storms and Other Helio-Geophysical Factors on Human's Health, Safety and Reliability of Functioning in Aeronautics and Other Systems of Extreme Risk
A.I. Mikhailov, G.V. Shilov, P.M. Shalimov, Y.I. Gurfinkel, and V.L. Voeikov