ASPECTS OF SPATIAL PERCEPTION DURING INFLIGHT ADAPTATION TO MICROGRAVITY

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Introduction: In judging the quality of goal-directed arm movements (GDAMs) in weightlessness which were learned either actively with eyes open or passively with eyes closed, it is not only the accuracy of amplitude but above all the spatial characteristics of the pointing movements that proved to be of interest.

Previous experiments with GDAMs in the horizontal plane showed loss of subjects' spatial orientation to the targets. There was no improvement during the whole exposure to weightlessness.

Methods: Experiments were carried out to investigate sensory motor functions in cosmonauts:(age range 31-47) that received one short-term (inflight time one week), eight long-term (inflight time 4-8 months, MV=5.3 months) and one super-long-term (14 months) exposures to weightlessness. The ability to reproduce defined motor patterns was examined pre-, in-, and post-flight under two different performance conditions: In a first test the cosmonaut closed his eyes and his outstretched arm was passively moved to trace three times a visually presented pattern by the second cosmonaut. Still with eyes closed, the test person tried to repeat actively the movement sequence (the shape of an isosceles triangle) from memory. In a second test the test person actively traced the figure on the LED's matrix for three times with open eyes and repeated it with eyes closed.

Results: The different learning situations had an effect on metric parameters of the memorized stimulus pattern while the change in the gravitational force operated mainly on spatial characteristics of the reproduced triangles.

Reproductions of actively learned movement sequences (information stored from visual, afferent and efferent signals) were significantly larger in area and the lengths "up" and "down" from those passively learned (information stored from peripheral feedback). The influence of the different gravity levels resulted in significant offsets and torsions of the reproduced figures.

Conclusion: In comparing the inflight condition with the preflight one, intact proprioceptive afferentation seems to play an important role for reproducing correctly movements from motor short-time memory.

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