

The Influence of Simulated Microgravity on Sensorimotor Performance
Matched Arm Position Pre-, In- and Post- Dry Water Immersion

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Abstract

Results previously obtained in Dry water immersion (DWI) experiments suggest that proprioception is seriously disrupted when subjects are exposed to extended periods of sensory deprivation. In DWI experiments a water-filled pool is covered with a thin foil on which the subject is lying in supine position as motionless as possible. The aim of this study was to examine the proprioceptive function under this simulated microgravity condition. It was supposed that in an arm matching test the incomplete representation of the arm due to degraded proprioceptive feedback will cause errors in matching the arms. Experiments were performed with four healthy volunteers (age ranged from 24 –30 years) pre-, during (12 hrs, 24 hrs, 36 hrs) and post -immersion (48 hrs, 49 hrs). ZEBRIS CMS-50, an ultrasonic distance measuring system, recorded the absolute coordinates of the moved arms (setting arm, matching arm). Every 12 hours in DWI the subject was blindfolded and got in touch with a platform which was lifted. Immediately the setting arm was passively and slowly moved by the experimenter into one of three arm positions (45°, 90°, 135°) which were indicated by a large goniometer. The radial error represents the absolute deviation of the matched arm from the position of the setting arm in the moment of matching. It was shown that the matchings in-immersion and post-immersion are more variable than those pre-immersion, especially in the position 135°. The Radial Error depended significantly on position and phase (pre-, in-, postimmersion) but not on person or setting arm right or left. It was significantly largest in the post-immersion phase. Thus a simple task which is used in neurological examination and which can be performed correctly without difficulty under normal conditions, was impaired as soon as important information is lacking.

Key words : Dry water immersion, arm-matching-test, sensory deprivation

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