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EFFECTS OF ISOLATION AND CONFINEMENT WITH OR WITHOUT SLEEP DEPRIVATION ON  
ATTENTION NETWORK AND OPERATION PERFORMANCE OF COMPLICATED TASK**Abstract**

Objective: To provide the experimental reference for astronaut selection, training and orbital psychological support, we investigated the changes of the emotion, attention network and operation performance of complicated task under isolation and confinement environment (ICE) with or without sleep deprivation (SD), which astronauts may undergo during the spaceflight. Methods: Twelve healthy male volunteers were randomly divided into 4 groups, and each group had 3 men. Two groups underwent 72h ICE without SD (ICE), and then recovered beyond 7 days. After that, they underwent 72h ICE with SD (ICE+SD). Other two groups underwent the identical environments in the opposite order. The sleepy level, mood state and operation performance of manual controlled rendezvous and docking (RVD) were evaluated. Before and after experiment, the attention network functions were tested. Meanwhile, the functional magnetic resonance imaging (fMRI) technology was used. Results: (1) Under ICE, there were no changes in sleepy level and positive emotion with the time extended. But under ICE+SD, the sleepy level obviously increased ( $p < 0.05$ ), and the positive emotion obviously decreased ( $p < 0.05$ ). (2) Comparing with pre-experiment, the attention network functions were markedly attenuated in the post-experiment under ICE+SD ( $p < 0.05$ ). However, there were no changes under ICE. (3) Under ICE+SD, The fMRI data indicated that the functional links between the dorsal encephalic attention network and other encephalic regions weakened, but the links enhanced between the ventral encephalic attention network and the others. (4) Compared with the operational performance under ICE, the success rate of manual controlled RVD decreased evidently ( $p < 0.05$ ), and the consumed fuel, control deviation in position and angle increased markedly ( $p < 0.05$ ). Conclusion: 72h isolation and confinement with sleep deprivation has negative effects on the human emotion, attention network function and operation performance of complicated task. The sleep deprivation could be the main factor. Key words: isolation, confinement, sleep deprivation, mood state, attention network, fMRI, manual controlled rendezvous and docking, operation performance