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A RESEARCH TOWARD THE MEASUREMENT OF ASTRONAUT'S MENTAL WORKLOAD IN  
SPACE FLIGHT

**Abstract**

Over the past few decades, the extensive development of mental workload evaluation is aimed at improving the efficiency and safety of human-machine system in critical field, for example aerospace. As a powerful tool, Functional near infrared spectroscopy (fNIRS) is a portable and non-invasive optical brain imaging technology that provides a cerebral hemodynamic variation within the cortex in response to cognitive task. In this paper, we conducted two studies :1) 35 health participants took part in the space flight simulation experiment under ground condition, and 2) 2 astronauts performed standardized task during 30-day space flight in TianGong 2 Space Lab. The space flight simulation experiment showed that the mental workload of participants during performing standardized task (n-back) can be assessed with two-channel fNIRS device in sensitive prefrontal cortex. During TianGong 2 Space Lab, firstly, we discovered that the performance, subjective scale rating and hamodynamic signal of the astronauts were significantly changed during flight. The mental workload of first 7-10 days was higher than that of the rest time. Secondly, the mental workload evaluation model was established to classify multiple class mental workload during task, the on-obirt evidence showed that mean classification accuracy of mental workload evaluation model is 73.19