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EXERCISE CAN MAINTAIN BRAIN FUNCTION BY FNIRS USING VFT IN CONFINED ENVIRONMENT LIKE ISS IN JAPAN - SINGLE CASE EXPERIMENTAL ABA DESIGN -

Abstract

Over the past few years, the number of Japanese astronauts who are recruited for a long-term staying at the International Space Station has increased. The method that can be used to measure the stress triggered under such conditions is still argued. Therefore, we inspect the stress-related index measurement under the confined environmental stress. We carried out measurements and experiments in order to evaluate the stress accumulation in the long-term confinement environment facilities (space residence environment simulation) of the JAXA (Japan Aerospace Exploration Agency) enforcement. Research participants (all adult males) stayed in "the confinement environment adaptation training facilities", and each subject(N=8) was installed and confined in the Tsukuba Space Center for 15 days in 2017. During the confinement environment stay, we tried to simulate the conditions that an astronaut experiences in the International Space Station and the astronaut selection examination and make a comparison the effect of exercise between intervention period and control periods with single case experimental ABA design. Intervention period (5 days) had regular 15 min. exercise by an aero bike in every day. On the other hand, control period (each 5 days before and after the intervention period) had been prohibited any exercise for all days. fNIRS (functional Near Infrared Radioscopy, a portable 22ch type made by Shimazu Seisakusho) was used to measure an index of the frontal brain function using the VFT (Verbal Fluency Test). These ethical issues were approved both from the University of Tsukuba Medical Ethics Committee (No.1022) and from the JAXA Ethical Review Board. We have no COI with regard to our

presentation. In the results of the confinement experiments, fNIRS measurements showed no difference between intervention period and control periods statistically analyzed by the generalized linear mixed model. This result mean that the exercise in this confinement environment have an effect of maintaining good frontal brain function with considering the learning effect of repeated fNIRS measurement. Previous studies showed an exercise by an aero bike had a significant good effect on frontal brain functions by fNIRS using STROOP test in daily life. Our result coincides these previous studies and clarified the same effectiveness in the confined environment. It could be speculated that this type of exercise is useful to astronauts in the ISS for maintaining good frontal brain function. This study was supported by the JSPS Grant in Aid for scientific research (15H05935).