Paper ID: 88660
interactive
student

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Interactive Presentations - IAF HUMAN SPACEFLIGHT SYMPOSIUM (IP)

Author: Ms. Asahi Haraguchi
Kyoto University, Japan

ADAPTIVE PROCESS OF JUMPING IN SIMULATED REDUCED GRAVITY DURING GOAL-DIRECTED MOVEMENT TASK

Abstract

Introduction : With the Artemis program, a human-crewed lunar mission is planned for the next few years. Because the lunar surface is a low gravity environment with only one-sixth the gravity of Earth, walking on the lunar surface is known to be a hopping gait that resembles repeated small jumps. To complete the mission safely on the lunar surface, it is necessary to quickly adapt to the hopping gait. Therefore, this study aimed to investigate how small jumping movements adapt to low gravity.

Methods : In the experiment, participants performed several small jumping movements while their body weight was partially supported by a lift, simulating the gravity condition on the moon. For the jumping motion, the initial position was when the knee joint was at an angle of approximately 120 degrees, and the target height of jump was when the subject's heel was 15 cm upward. The cursor corresponding to the subject's three-dimensional body position was displayed on the VR screen, and the subject performed the task with looking at that. First, the subjects performed 80 jumps in 1G, and then performed 96 jumps in simulated 0.16G using weights of 84% of the subject's body weight. After that, we removed weight again and performed another 48 jumps at 1G. During the experiment, we measured the performance error from target height, ground reaction force, and electromyographic activities of the lower limb muscles.

Result : As a result, in the initial stage of exposure to the 0.16G, the performance error from the target height increased for all subjects. On the other hand, at the end of 0.16G state, the error became smaller, suggesting that the jumping in 0.16G improved. As this error decreased, the peak of the ground reaction force became smaller. Furthermore, muscle activity in the lower limbs also changed, however no common changes were observed between subjects.

Conclusion : From these results, it is thought that to adapt small jumping movements in low gravity, different muscle activity is required. These results can be used to develop methods for training of astronauts before Artemis mission.