The purpose of the present research is to develop the optimal prescription for preventing muscle atrophy in space.

The project was consisted of following two points;
1) to make up exercise mode for preventing muscle atrophy of antigravity muscles such as knee extensor and plantarflexors during bed rest,
2) to evaluate an activation level of each muscle group during daily life by using portable EMG apparatus and make clear individual differences on training effects.

Results of the present study are as follows;
1) By using the specially designed training apparatus the atrophy and depression of antigravity muscle as knee extensors (KE) and plantarflexors (PF) were prevented effectively, i.e. physiological cross-sectional area and specific tension of KE and PF were not changed during bed rest due to resistance training.
2) Many individual differences for training effects were observed, i.e. the more muscle area and the higher maximal strength the more muscle atrophy and deterioration were observed.
3) It was considered that the individual differences observed training effects may be due to the differences in activation level during daily life. In this study, we tried to quantify the intensity and duration of spontaneous activities of either lower or upper limb muscles during daily living on the basis of long-term EMG recording. As the results, there was no significant difference in the total active time between the upper and lower limb muscles. On the other hand, the appearance frequency of the muscle active tended to be higher in the upper
The thigh muscles than in the arm muscles.

From these results, it might be assumed that, as compared to the upper arm muscles, the thigh muscles are active with less frequency, but their activity levels are higher. The findings here were obtained under spontaneous activities of either lower or upper limb muscles during daily living.

The EMG analysis technique presented in this study can apply to quantify the muscular activity under the unloaded condition and/or space flight, and may provide useful information concerning the differences between muscles in the changes of muscle size and function in microgravity environment.

9. Publication list


