High mountain climbing gives a large amount of stress on both climbers’ physiological and psychological conditions. Body composition, muscle force and psychological conditions before and after climbing were examined in climbers who scaled 8,000m or higher twice for two years.

Methods
Examinations were conducted on four climbers, A (26 years old), B (27), C (28) and D (29). They scaled Mt. Lhotse (8,516m) in the first year and Mt. Annapurna I (8,091m) in the second. Body composition (body weight and body fat using the skin fold thickness method), isokinetic muscle force in extension/flexion of knee (60°/sec, 180°/sec) and trunk (60°/sec, 120°/sec), and dorsiflexion/plantar flexion of ankle (60°/sec, 180°/sec) using the Cybex machine were measured four times in total before and after climbing. Profile of Mood States (POMS) tests were conducted at the same time.

Results
Body weight decreased 2.2-7.2% in all of the four subjects, compared before and after climbing. The percent of body fat showed no consistent tendency: that of some subjects decreased and others increased. Knee muscle force in extension/flexion (60°/sec) decreased 4.9-24.9% and 17.0-26.3%, respectively. Trunk muscle force in extension/flexion decreased 11.4-27.4% and 11.4-21.7%, respectively. On the other hand, ankle muscle force in dorsiflexion/plantar flexion showed no consistent tendency: those of some subjects decreased and others increased. The results of POMS tests after descending the mountains varied individually. Subject A showed a low value in activity but steady profile during two years of the study; B generally showed a good profile; C generally showed higher scores than the average and decreased the values in depression and anger year in year, resulting in overall improvement of profiles after climbing; D consistently showed high value in activity after climbing during three years of the study but fatigue increased.

Discussion
Mountain climbers lose weight when climbing mountains at high altitudes due to a negative energy balance. Climbers’ body fat and lean body mass particularly decrease simultaneously at altitudes of 6,300 meters and above. In our research, it showed muscle mass in four climbers have decreased chiefly as weight loss through reductions of muscle force in extension/flexion of trunk and knee. This results indicated their intramuscular protein served as their source of energy during their climb at 8,000 meters and above because of their low food intake. This suggests that the strengthening of relatively large muscle groups such as the trunk and the knee is important before climbing mountains at high altitudes. In addition, it is necessary to consider the supplementation of proteins to avoid the depletion of intramuscular protein during high-altitude mountain climbing. Psychological stress during high-altitude mountain climbing was examined through POMS tests, but stable profiles were shown although there were some changes in vigour and degrees of fatigue before and after two climbs. This was believed to have reflected being able to reach the top and safely getting back down twice.

Conclusion
More decreases in muscle mass could be seen than in weight loss and muscle force after high-altitude mountain climbing. But, mood states comparing before climbing with after climbing indicated no significance changes.

Keywords: Altitude, Muscle Force, Mood