2F2 Changes in anthropometric characteristics and physical working capacity during a weight reduction of long distance relay runners.

Kaori INOSHITA[1], Tatehiro TOYOSHIMA[2], Tomoho ISHII[3], Makoto OHNO[1], Shoichi NAKANO[3]

[1]Graduate School of Nippon Sport Science Univ., [2]Reitaku Univ., [3]Nippon Sport Science Univ.

Purpose The purpose of this study is to investigate changes of anthropometric characteristics, cross-sectional areas of muscle and subcutaneous fat of thigh, muscular strength and maximal oxygen uptake ($\dot{V}O_2max$) during the weight reduction of athletes.

Method Five male collegiate long distance relay runners aged 19.0±0.9 years participated in this experiment. Body composition of the subjects was analyzed by measuring their skingfold thickness (triceps, subscapular and abdominal) and using bioelectrical impedance spectroscopy (BIS) 4000C. The cross-sectional areas of muscle and subcutaneous fat of the thigh were measured by a magnetic resonance imaging (MRI). Isometric and isokinetic muscular strength of knees were measured using a Biodex machine in the condition of extension and flexion. The incremental maximal work test was performed for the subjects to invesitigate their $\dot{V}O_2max$ using a treadmill.

Results The average weight reduction of the subjects was 2.4±0.7kg, which corresponded to 4.2±1.1% of their initial weight. The fat free mass (FFM), fat mass (FM), and skinfold thickness (subscapular, abdomen) had significantly decreased after the weight reduction. Also the cross-sectional areas of muscle and subcutaneous fat measured by MRI significantly reduced. However, the peak torque of the knee extension and flexion, $\dot{V}O_2max$, and endurance work time remained steadily.

Conclusion These findings indicate that the body weight reduction of 4.2% has little influence on the physical working capacity of long distance relay runners, in spite of the reduction of FFM and FM.

Key words: weight reduction, body composition, MRI, muscular strength, $\dot{V}O_2max$

2F3 The relationships between heat loss responses and exercise intensity at the onset of dynamic exercise in a warm environment

Shuji YANAGIMOTO and Narihiko KONDO

Laboratory for Applied Human Physiology, Faculty of Human Development, Kobe University

Purpose: To investigate how heat loss responses change by increasing exercise intensity at onset of dynamic exercise in a warm environment, we measured sweating and cutaneous blood flow responses at three relative intensities of cycle exercises.

Methods: The study was conducted in an environmental chamber (ambient temperature of 35°C and relative humidity of 50%) to produce slightly sweating and cutaneous blood flow responses at rest by rising skin temperature. After resting in the condition for 60 min, eighteen subjects performed cycle exercises at 30%, 50% and 70% maximal oxygen uptake for 60 sec in a random order, with at least 10 min of rest in between. Body temperatures (esophageal and local skin temperatures), heart rate, arterial blood pressure, rating of perceived exertion, oxygen uptake, sweating rate (SR: chest, forearm, thigh and palm) and skin blood flow (chest, forearm and palm) were measured continuously throughout the experiment. Cutaneous vascular conductance (CVC) at each site was calculated by the ratio of skin blood flow to mean arterial pressure.

Results and Discussion: Heart rate, rating of perceived exertion, mean blood pressure, oxygen uptake and SR at the mean value of chest, forearm and thigh (0.08 ± 0.02, 0.21 ± 0.04 and 0.27 ± 0.04 mg/cm^2/min) significantly increased, while CVC at the mean value of chest and forearm (-6.3 ± 4.0, -19.1 ± 3.9 and -28.6 ± 4.8 %) significantly decreased, with increasing exercise intensity. Since esophageal and mean skin temperatures were essentially constant throughout the experiment, suggesting that changes in non-thermal factors mainly caused the increasing SR and the decreasing CVC at the onset of dynamic exercise in a warm environment. The both increase in SR and reduction in CVC were also liner related to changing exercise intensity. In addition, the slope of regression line between SR and exercise intensity was greater on the chest than on the forearm, thigh and palm, while that in CVC was lower on the palm than on the chest. The results indicate that the intensity-dependent responses of sweating and cutaneous blood flow are linear from 30% to 70% maximal oxygen uptake at onset of dynamic exercise in a warm environment, and there are regional differences in these responses.

Keywords: cutaneous blood flow response, exercise intensity, sweating response