

## 68. STUDY ON THE ENERGY METABOLISM IN SKIING.

SHINKICHI OGAWA.

*Tokyo University of Education.*

MINORU ISHIMODA.

*Tokyo Jikeikai School of Medicine.*

TOSHIO WATANABE, HIDEKO DADAKI AND MASAKI WATANABE.

*Ochanomizu University.*

TOSHIHIRO ISHIKAWA, KINICHI HIROTA AND HIDEJI MATSUI.

*Tokyo University.*

The energy metabolism in skiing is measured on walking, ascending and descending, designating such as speed that examinees would feel no strain in action.

Although there appears a large degree of difference in metabolism due to the technical difference between the skilled and the unskilled skiers in case of ascending or walking the same slope, there is no difference observed between the two if the skis are equipped with the seal skin or are carried over the shoulder in ascending.

There is no increase in metabolism observed in case the degree of slope increases, because the examinees decrease the speed of motion to adjust the intensity of motion. Sometimes it is noticed that increase in degree of slope results in less intensive motion.

The intensity of motion in descending the slope of  $10^\circ$  is not much different from that in ascending, but the amount of energy required to descend a certain distance is far less than that required to ascend the same distance.

The following are the results of the experiments. Snow is dry and surface is soft.

1) Level walking. Two male and two female examinees are chosen who are skilled and unskilled skiers

	speed/sec.	kcal/100m	R. M. R.
With seal skin	0.85—1.00m	5.4—10.6	3.9—5.7
Ski alone	1.00—1.07	5.1—11.1	3.3—6.5
Ski carried	0.96—0.98	8.6—10.9	4.9—6.3

2) Ascending the slope of  $5^\circ$

	speed/sec.	kcal/100m	R. M. R.
With seal skin	0.76—0.81m	9.9—13.5	5.3—6.5
Ski alone	0.64—0.78	10.8—19.8	6.0—7.4
Ski carried	0.72—0.80	10.7—16.5	5.4—7.4

3) Ascending the slope of  $15^\circ$

	speed/sec.	kcal/100m	R. M. R.
With seal skin	0.65—0.68m	13.4—21.4	5.1—8.5
Ski alone	0.28—0.67	13.6—36.2	2.9—10.0
Ski carried	0.60—0.61	12.6—20.6	5.2—9.1

4) Straight descending the slope of 10°. Examinees, 3 male and 1 female (half skilled and well trained skiers)

Measured value 8.9–11.1 m/sec. 1.0–1.9 kcal/100 m. R.M.R. is 5.9–10.9 kcal/100 m is the amount of energy required after the amount of metabolism in rest conditions is deducted.

## 69. OBSERVATION ON KNEES AND FEET OF MOTOR-BOAT RACER.

YOSHITO KITAMURO, SHIGEFUMI HICHIJO  
YOSHISHIGE SATO AND SHIGEKI USHIKUBO.

*Department of Plastic Surgery, Tokushima University School of Medicine.*

The speed boat racers are considered to be placed under a special working condition because of their peculiar position on board and consequently the direct shocks are received by knees and insteps. In order to study the influence of the above mentioned condition on the knees and insteps, visual and x-ray examinations are conducted on 110 professional speed boat racers who participate in Naruto Boat Race for 80 to 1000 times during their 8 months to 4 years of career. Their ages are between 18 and 38.

The visual change on the soft tissue is chiefly circumscribed swellings with callosity on the skin. They are rather hard and elastic and sometimes fluctuation and pain-fullness on pressure are proved. These findings are often found in knees, and such locations as Chopart's joint and cuneometatarsal articulation and sometimes in metatarsopharangeal joint. The number of occurrence increases as the number of participation in race increases.

The abnormality of the bones detected by X-ray are osteophytosis and hyperostegeny and they are found in tubercle of the tibia, talonavicular joint, cuneonavicular joint and metatarsopharangeal joint, and more of them are found with a significant difference from elsewhere in tubercle of the tibia and cuneometatarsal joint.

The occurrence rate of the tissue swelling callosity and bone abnormality increases remarkably as the number of participation increase over 200 times and 600 times. As for the frequency of the tissue swelling and bone abnormality, the former is a little higher than the latter. The tissue swelling which appears to be rather serious is not necessarily accompanied by bone abnormality.