HUMAN BODY MODELLING AND KINEMATIC INVESTIGATION OF ROWERS

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INTRODUCTION

The human body, the describing the motion of an athlete, or the cognition of the structure of motion are important tasks all of the specialists working in the field of sports. The modelling of motion leads to the basis of motion itself: to the causes and to the effects.

To describe the characteristics of the motion of different kind of sportbranches the Hanavan human body model can be used (Hanavan, 1966).

Many factors contribute to an athletes success or effectiveness in sport performance. The area of study concerned with the physical measurements of the human body as they relate to physical development, exercise and sport performance is kinantropometrics (Hebbelinck and Ross 1974).

The size, weight, proportions, as factors relating anthropometric data concerns biomechanical advantage an individual may have due to a given anthropometric measure, certain anthropometric measures are more important for success in some events than others. The greater height has a biomechanical advantage in the case of basketball and rowing (Kreighbaum and Barthels 1985).

The aim of this study was to investigate the kinanthropometric differences between different kind of sport branches and one of the main factor of rowing performance.

METHODOLOGY

The examined sample was the group of 84 top-level athletes and the team of young rowers. The distribution of them according to branches of sport and the main characteristics are in the Table 1.

Table 1. Subjects

	AGE (year)	N	WEIGHT (kg)	HEIGHT (cm)
Rowers	22,18	15	81,18	183,24
Kayak	21,26	33	77,86	179,08
Canoe	20,02	25	75,29	175,88
Weightlifters	24,03	11	77,10	164,40
Young rowers				
Subject 1.	17,37		67,00	171,70
Subject 2.	16,97		85,50	190,90
Subject 3.	16,92		85,00	187,60
Subject 4.	16,77		85,00	194,30

The works of Weiner and Lourie (1969) were competent in determining the body measurements. The Hanavan's mathematical body model and the Clauser's regression equation (1969) were used to estimate the mass values of the segments.

The kinematic parameters of rowing on Concept II. rowing-ergometer were investigated by SELSPOT motion-analyzer system.

There were taken the blood-samples at five levels of the growing loads (150, 200, 250, 300, 350, watt) to control the lactate concentration during the exertion.

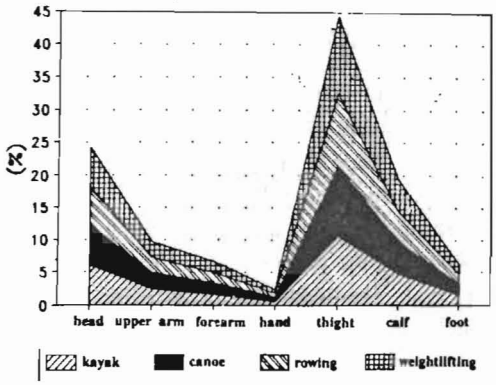

Figure 1. Weight of human body segments (%)

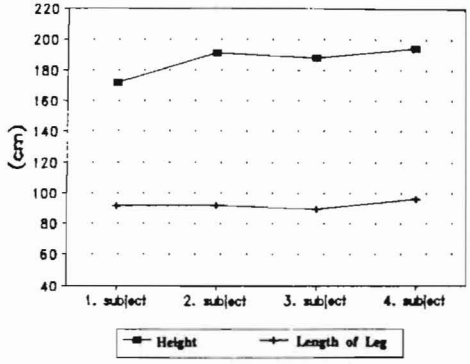

Figure 2. Height and length of lower extriminty

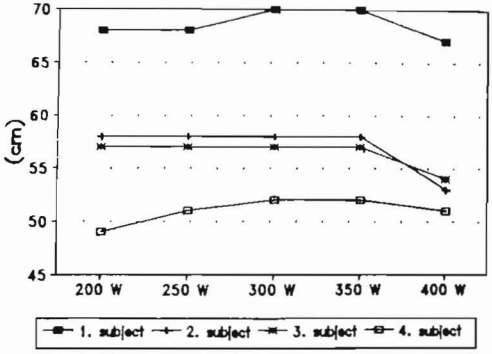

Figure 3. Length of leg-stretching under growing exertion

RESULTS

As far as three water sport-branches are concerned, that the kayakers and canoers have relatively high trunk, while the rowers have relatively high thigh-mass values.

It is suitable for the specially bigger active tigh'masses, requires by the given branch of sport. If the rowers use the proper techniques the great effort in stroke falls to the tigh-extensors.

The relatively higher active thigh muscle mass, necessary to the motion of the weihglifters, is reflected in the percentile value of thigh mass (Figure 1.).

The body mass distribution of young rowers are similar to the adult national representative team. (Table 2.) The percentage values of the thigh's mass of rowers are higher than the tight-mass of other paddlers of canoe and kayak. The higher tight-mass percentage is appeared in the case of the younger elite man-rower team.

Table 2. Similarities between the rowers segments'mass (%)

	Young rowers	National representative team
Upper	2,5	2,4
Forearm	1,5	1,6
Hand	0,6	0,6
Thigh	11,4	11,2
Lower Leg (calf)	5,5	4,8
Foot	1,6	1,5

However the anthropometric parameters of young rowers are different, their height are different, but the length of leg, which is one of the very important factors of the effectiveness of rowing, were very similar (Figure 2.)

The stretching of the leg shortened by growing loads mistakes of movement pattern by growing load because of the tiredness. During the growing load the tiredness appear after 5 the step (nearly 400-450 watt) on the rowing ergometer. It means, the leg stretching was shorter, in every case. (Figure 3.)

CONCLUSION

The Hanavan mathematical model and the Clauser et al. type regressional equations concerning the mass of parts of the body reflect the athletes in reality, specialized in branches of sport.

This model can be well used in analyzing the motion it gives help to describe the changes of motion-phase, or an equipment quickened by the sportsman.

Looking at this contributor of rowing performance there are not very much influences. In this point of view the selection of the team is fairly good, but the other contributing factors have importance in the success too.

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