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Body Composition and Somatotype Profiles of Rowers*

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Abstract

Purpose: The aim of this study was to examine the body composition and somatotype profiles of rowers. Method: 15 male rowers having at least 4 years rowing training from two different rowing clubs in Sinop participated voluntarily in this study. In athletes, conditions such as being healthy, not having chronic or acute disease and having no limitation of mobility were sought. In body 120 Body Composition Analyzer was used to assess the body composition components and Skinfold caliper-tape measurement was used to determine somatotype profiles. Mean and standard deviations of the participants were calculated by using SPSS 22.0 V. package program. Results: Mean values of body composition of the rowers were respectively; body fat ratio %15.94±6.84, body fat mass 11.73±5.76 kg, skeletal body mass 34.207±5.98 kg, basal metabolic rate 1674±211.65 kcal and total body water 44.36±7.10 l. Somatotype profiles values of athletes were found endomorph 2.01±0.71, mesomorph 4.75±0.82 and ectomorph 2.70±0.71 body type. Conclusion: This study supports that rowers have the body composition proportional to the normal fat percentage and the mesomorph body type associated with high muscle strength as somatotype.

Key words: Rowing, body composition, somatotype.

INTRODUCTION

Rowing is a sports branch bases on humankind's struggle against seas and streams by using simple tools. Defined as 'the most perfect sport in existence' by Pierre de Courbertin (3), organizer of the Modern Olympic Games, rowing is the fastest branch among the water sports which bases upon the principle of moving the boat with the help of shovel. In rowing, to enable an athlete reach the highest performance level, structural and physiological factors of the body must be considered at first, technical and tactical understanding should be developed later (2).

Metric measurements of the human body and proportions among them have engaged the attention of many artists and scientists from ancient times up to now, so numerous studies have been conducted. In the course of time, these studies performed through society in general were specified and metric measurement of human body parts, especially in athletes, commenced to be made (10). Body composition is highly appealing and intensely-assessed physical characteristic in exercise and sport physiology. It has been broadly known that body type and composition have substantial effect on athletic performance and exercise also has potential to change the body composition alike (13).

When structure of the body composition examined, it seems to be consisting of the balanced combination of the fat, bone, muscle cells, other organic substances and extracellular fluids. Personal differences can be identified precisely by the assessment of all these structures. The key factors leading to these differences' occurrence are; physical activity, gender, age, nutrition and health problems (25,11). Just as in the various sport branches, physical characteristics such as body weight, shape and composition are important for performance also in rowing. Proper technique, however, is crucial for high-level performance. In addition, body size and proportions are complementary factors for success (4).

Somatotype (body type), a classification defined as based on physique components, assessments are obtained by anthropometric measurements. Somatotype is used in definition of the individual's present morphological condition through three numbers. Each of these three numbers represents one of the three basic components of body composition (23). Determining muscularity, fatness and slenderness relationships via scientific methods Sheldon, built up an atlas in 1954 and classified people in regard to fatness, muscularity and slenderness traits. These classifications are endomorph, mesomorph and ectomorph (22). Endomorphy indicates the relative adiposity of the individual. Increase in value of this component describes that adiposity level also increases which signifies the nutrition status and energy stores of the organism. Mesomorph describes the development in musculo-skeletal system. This component can be regarded as relative lean body mass (LBM) is dominant. Ectomorph describes the relative slenderness of the body (24,20).

With the occurrence of scientific background - especially depending on the development in sports sciences - which is required for preparing proper training programs, the era that competitions were won by the brute force became outdated, in rowing and also in other sports branches with strength-oriented. Therefore, becoming successful for the athletes can only be possible if they have high level of strength and endurance, besides outstanding technique and body type. The development process of rowing in our country is not at the level of desired, however it is accepted as an interesting sport branch by dint of its distinctive elements (15). On the other hand, the requirement of high level of training and body type in addition to its distinctive difficulties and interesting features are considered as disadvantages that make people not tend towards to rowing.

By force of the requirements relating to rowing, body composition and body type are obvious to be important for rowing together with many factors determining the performance. Based on above mentioned information, the aim of this study was to investigate the body composition and somatotype profiles of rowers.

MATERIAL AND METHOD

For the project work entitled The Investigation of Body Composition and Somatotype Profiles of Rowers, an application was made to Sinop University Human Research Ethics Board. In accordance with the Human Research Ethics Board decision dated 12/04/2017 and numbered 2017/14, it was decided that this research was compliance with the Human Research Ethics Board Guideline and there was no inconvenience ethically.

Research Group

This study was carried out with trained rowers, aged between 18-24. 15 male rowers having at least 4 years rowing training from two different rowing clubs in Sinop participated voluntarily in this study. In athletes, conditions such as being healthy, not having chronic or acute disease and having no limitation of mobility were sought. The subjects were contacted via their coaches the day before measurements, and they were asked- at least four hours prior to measurements- not to eat anything, drink anything including caffeinated drinks, consume alcohol the day before and exercise on measurement day.

Measurements

Body height and weight: Subjects weights were measured via scales with 0.01 kg of sensitivity (InBody 120). They were weighed wearing only their shorts with bare feet, and values were recorded in 'kg'. Statures were measured through subject was

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standing straight on scale and the measurer lowered the ruler until it touches top of the head. It was important that subjects stood completely upright and their chins were parallel with the ground. Values were recorded in 'cm'.

Body Composition: Body compositions of the subjects were measured by using Inbody 120 Bioimpedance Body Composition Analyzer. Body composition analysis; is a process of adipose tissue, muscle tissue, body water and soft tissue measurements through sending mild electric current to the body with electrodes contacting hands and bare feet, by using body analysis device. Using 'Tetrapolar 8-Point Tactile Electrodes', the analysis device can measure bone mineral density, body water and skeletal muscle mass besides separate adipose measurement for each part of the body (16). Subjects complied with device operation instructions. Subjects were asked to stand on metal surface of the device in bare feet while holding the hand electrodes with two hands both. Measurements for each athlete lasted 1-2 minutes and detected values were printed out as result sheet from bioelectric impedance analysis device. Athletes' body weight, body mass index, basal metabolic rate, body fat percentage, body fat weight, skeletal muscle mass and total body water measurement values were recorded.

Somatotyping: Somatotype values of the subjects were determined with the Heath-Carter method of somatotyping (6). Subjects' skinfold was measured with skinfold caliper whereas measuring tape was used for girth and breadth measurements.

Endomorphy: - 0.7182+0.1451 (X) – 0.00068 (X2) + 0.0000014 (X3)

X= Triceps + Subskapular + Suprailiac Skinfold

Mesomorphy: 0.858x (humerus breadth) + 0.601x (femur breadth) + 0.188x (biceps girth-triceps skinfold thickness) + 0.161x (calf girth-calf skinfold thickness) – 0.131x (height) + 4.5

Ectomorphy: (Height-Weight ratio) x 0.732 – 28.58

Height Weight Ratio = Height (cm) / 3 √ weight (kg)

Statistical Analysis

To discover general characteristics of the subjects in statistical analysis of the obtained data, descriptive statistics were used and represented as n, %, mean, standard deviation, minimum and maximum. All calculations were analyzed by using SPSS 22.0 V. statistical package program.

Table 1. Age, height, mean body weight and standard deviation values of subjects

Physical Characteristics of Subjects					
	n	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Age (year)	15	18.00	24.00	20.80	2.37
Rowing Experience	15	4.00	8.00	5.28	2.21
Height (cm)	15	170.00	194.00	175.12	7.72
Body Weight (kg)	15	67.74	81.14	72.18	5.80
BMI (kg/m²)	15	18.50	27.00	21.26	1.17

15 male rowers who had been exercising regularly in rowing sport at least four years participated in this study voluntarily. Athletes' some values were found as; mean age was 20.80±2.37 year, mean of rowing experience was 5.28±2.21 year, mean height was 175.12±7.72 cm, mean body weight was 72.18±5.80 kg and mean BMI was 21.26±1.17 kg/ m^2 (Table 1).

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Table 2. Mean values of rowers related to body composition

	Body Composition				
	n	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Body Fat Ratio (%)	15	7.10	29.80	15.94	6.84
Body Fat Weight (kg)	15	4.20	22.50	11.73	5.76
Skeletal Muscle Mass (kg)	15	24.40	44.90	34.207	5.98
Basal Metabolic Rate (kcal)	15	1327	2058	1674	211.65
Total Body Water (l)	15	32.50	57.20	44.36	7.10

When examined the body composition values of rowers in table 2, it was found that body fat ratio was %15.94±6.84, body fat weight was 11.73±5.76 kg, skeletal muscle mass was 34.207±5.98 kg, mean basal metabolic rate was 1674±211.65 kcal and total body water was 44.36±7.10 l.

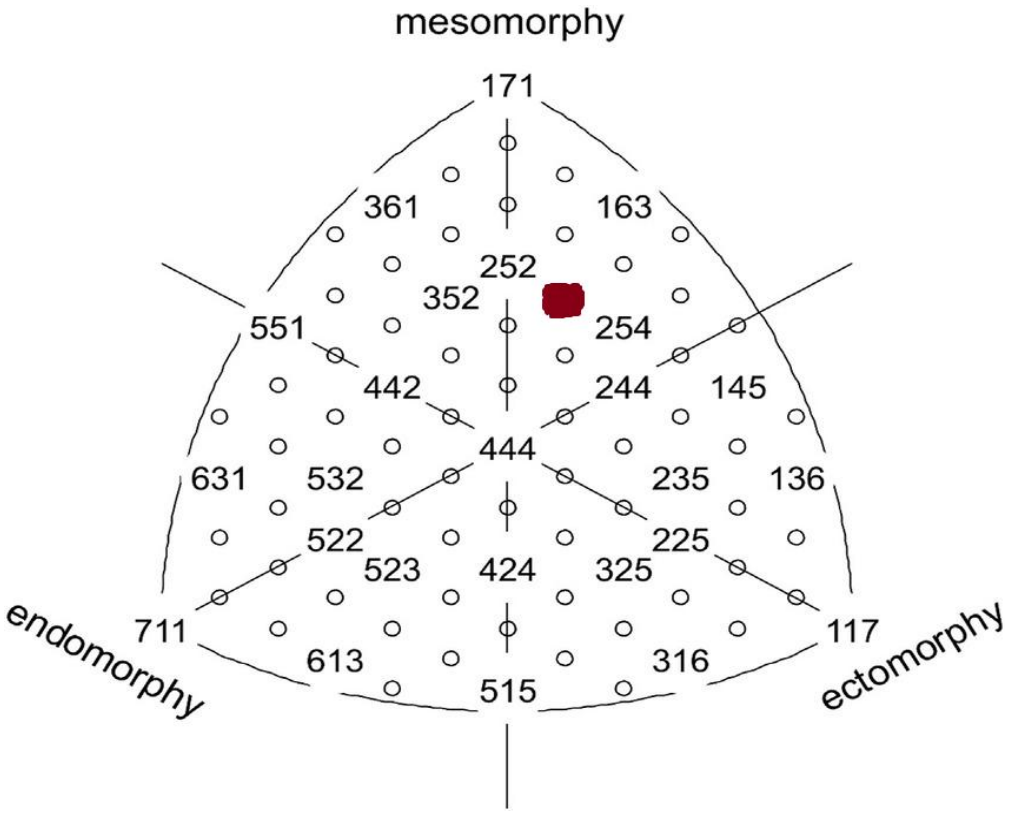


Figure 1. Somatochart

Participating subjects' endomorph, mesomorph and ectomorph values were detected as 2.01±0.71, 4.75±0.82 and 2.70±0.71, respectively. In our study, it seemed that rowers had mesomorph body type at most with the numeric values of 4.75±0.82.

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DISCUSSION AND CONCLUSION

In this study, body composition and somatotype profiles of the rowers were analyzed and obtained data were evaluated within the scope of literature.

15 male rowers who had been exercising regularly in rowing sport at least four years participated in this study voluntarily. Correspondingly, rowers who had been training regularly in Sinop province and improving their performances by taking part in competition comprised study group of our research. Athletes' some values were found as; mean age was 20.80±2.37 year, mean of rowing experience was 5.28±2.21 year, mean height was 175.12±7.72 cm, mean body weight was 72.18±5.80 kg and mean BMI was 21.26±1.17 kg/ m^2 (Table 1).

Limited availability of studies about rowing is encountered when literature is reviewed. In a study conducted by Bourgois et al. (5), junior rowers participating World Junior Rowing Championships were assessed and it was found as mean age 17.8 year, mean height 187 cm and mean weight 82.2 kg. Cosgrove et al. (8) discovered mean height of 180.5±4.6 cm in their study with 13 male rowers while Hanel et al. (12), determined mean age was 19, mean body weight was 81 kg and mean height was 186 cm. In study performed by Parkin et al. (17), over 19 rowers with ages varied 19 to 26, mean height was found 1.88±0.04 similar to literature. Mean age of 17.05, mean height of 183.94 cm and mean body weight of 75.86 kg were found in study carried out with Turkish Junior Rowing National Team consisted of 18 athletes (9). Shephard, in similar research, showed that rowers were 10% taller and 27% heavier than general population. 180.8 cm of mean height and 71.88 kg of mean weight in elite rowers at national level were identified by Akça et al. (2). It has been suggested that long arms and legs in addition to becoming tall-bodied provide some advantages in rowing sport. Our research results can be said to show similarity with rowers competing at national level, but become under the level of national teams.

When examined the body composition values of rowers in our study, it was found that body fat ratio was %15.94±6.84, body fat weight was 11.73±5.76 kg, skeletal muscle mass was 34.207±5.98 kg, mean basal metabolic rate was 1674±211.65 kcal and total body water was 44.36±7.10 l. Furthermore, athletes' somatotype components were assessed and it was found that athletes were in mesomorph body type (2.01±0.71 – 4.75±0.82 – 2.70±0.71) which is one of the essential physique traits for rowing sport.

Claessens reported that test battery was used for determining the anthropometric profile of junior rowers, therefore, body mass, body type, extremity length-girth and subcutaneous fat assessments were performed. In another study, male rowers competing at the Australian Rowing Championships were recorded as mean height was 180.7 and mean weight was 71.2. Besides, athletes who had lower body fat and higher levels of muscle mass achieved better rowing performance outcomes (19). In thesis study made by Çetinkaya (9), significant relationship was found between fat ratio of elite rowers and sedentary, but there was found no significant difference in pectoral, triceps, femur and fat measurement segments of the body as a result of comparison between elite athletes and sedentary. In another study in which body type of children were evaluated, effects of extremity length and girth measurements on rowing performance were observed. Hereby, the group with better rowing performance were found 5.9 cm taller and 2.7 kg heavier compared to the other group, besides extremity length and girth measurements of the group with better rowing performance were detected as longer and broader (15). Open age and U23 rowers' somatotype values were assessed in a study carried out in 2005. Somatotype profiles were defined respectively as endomorph, mesomorph and ectomorph; U23 rowers were 1.4, 4.4, 3.6 and open age rowers were 1.4, 4.8, 3.4 (19). In another study researchers examined somatotypes, it was reported that 296 male and female rowers, assessed during 2000 Olympic Games, displayed high level of mesomorph characteristics (1). Data of 509 club level rowers aged 11-16 and 29 elite male rowers were compared in a study with high population. Researchers reported that subcutaneous fat and body fat percentage values decreased with aging, endomorph rating went down until 14 years, mesomorph rating was higher in all age categories, and in comparison of 15-16 aged rowers' body types

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with elite rowers; their body types were similar to each other while body compositions were different. Moreover, researchers highlighted these characteristics could be used as criterion for selection of rowers by the coaches from the early ages (14).

Knowing physical characteristics of successful athletes is a crucial data in sports orientation period. Especially physique which contains body type and body composition has an important role in rowers' performance. Specific to rowing, athletes with very good and mean performance are known to have better physical and physiological properties compared to general athlete population. Besides, defining those who are inclined to rowing sport among the new starters can only be possible by knowing their body composition and body type.

The findings obtained support the fact that body composition values of rowers are in normal level and athletes represent mesomorph body type as somatotype profile. In conclusion; it was explored that athletes in this branch of sports show body composition in proportion to normal fat percentage and mesomorph body type traits associated with high muscle power.

In sports, especially, such as rowing that requiring continuous muscle power and endurance, it has been observed lower and upper extremity muscles of the athletes grow in volume through muscle hypertrophy. Thanks to this strength gain, no physiological determinants depending on overstrain reactions in rowers were reported despite high training load (21). In this context, normal or low body fat ratio and showing mesomorph traits in terms of somatotype profiles in rowers are anticipated result. Abiding by this result, whether an athlete has mesomorph body type traits must be taken into consideration in the process of athlete selection for rowing branch.

Considering the fact that rowing is a developing branch of sports, these above mentioned results may contribute to the literature not only through promotion or development of the branch but also through sports orientation. Further studies, by means of data from our research, conducted with elite athlete group are to contribute to the literature by finding out the national level norm values related to athletes' body composition and somatotype profiles.

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