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Determining the Somato-type Characteristics of Turkish Male National Boxers

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Abstract

The study aimed to determine the Somatotype characteristics of Turkish national male boxers, since the somatotype profile helps to establish an athlete's suitability for a sport. Twenty-five elite boxers (mean age 16.50±1.06 years; mean height 172±0.06cm and mean mass 64.62±9.88kg), who had some experiences in national and international tournaments participated in the study. Skinfold thicknesses, length and circumference measurements were conducted for all the boxers. Characteristics of somatotype were determined by using Heath-Carter and statistical analysis were made on computer using SPSS for Windows program. According to the results, Somatotypes were calculated as Endomorphy 3.42±1.03mean±SD; Mesomorphy 4.39±0.84 mean±SD and Ectomorphy 3.121±0.95mean±SD respectively. Thus, it was determined that boxers generally have a mesomorph structure.

Keywords: Boxing, Somatotype, Anthropometry, male boxere, meseomorph structure

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1. Introduction

It has been observed that achieving the desired targets in sports performance, minimizing branch-specific error margins and reflecting the desired technique to the field as much as possible depends on a certain level of maturity (Açıkada, 2004). To achieve success, physical and physiological fitness is an important criterion in performance sports. Athletes who do not include physical and physiological features suitable for the sports branch may experience some difficulties in revealing the expected performance. Boxing is primarily a skill sport, but combining this skill with other skills, intelligence and strength is the primary factor of success in boxing. In order for athletes to be successful in the desired branch, they must have a number of physical features for that branch. Therefore, anthropometric and somatotype features constitute an important place. Anaerobic and aerobic power, strength, flexibility etc., are among the anthropometric properties suitable for weight (Zorba et al., 1999). Body mass tracking is the most important determinant of sports branches in which athletes are divided into weight categories (Berkovich and Sina, 2016).

Anthropometry, in general, is a systematic technique that classifies the objective features of the human body according to its dimensions and structure features with certain measurement methods and principles (Özer, 1993). Issues such as the body profile suitable for which sports branch and how important this role has played in talent selection in infrastructure, have been discussed in studies conducted on anthropometric properties in the world (Lale et al., 2003). Body composition consists of a proportional combination of tissues such as muscles, nerves, bones, ligaments (ligaments), tendons, skin, minerals (Tüzün, 1998). General health, physical activity and work tempo can also be effective in shaping the body composition. Body composition is largely controlled by genes. However, it is important to remember that it is also sensitive to environmental effects, individual activity and nutrition. Genetic and non-genetic (environmental) factors play an important role in shaping the body structure and creating the difference between the human population (Gültekin, 2004).

Somatotype is a classification based on the physical structure elements made by considering the external features of the body structure and the values are obtained by anthropometric measurements. Somatotype refers to the morphological features of the body and it is classified into three main components: endomorph (fatty), mesomorph (muscular), ectomorph (weak) (Bektaş et al., 2007). Endomorphy refers to the roundness and, in a sense, obesity of the body. Mesomorphy which is the second component is characterized by a clearly muscular structure and a rectangular shaped body, while Ectomorphy refers to distinctive features such as thinness, weakness and leanness (Carter and Heath, 1990). Body type plays an important role in the selection of individuals for competition in sports (Acklandet al. 2009). Consequently, the quantitative expression called somatotype, consists of a three-digit rating, each defining a particular component of physics. The first digit identifies the relative fat of a physique and it is called endomorphy. The second number describes the relative musculoskeletal robustness of a physique and it is called mesomorph, while the third number explains the relative linearity or fineness of a physique and it is called ectomorphy (Tshibangu,2016).

As a result of the effects that body size and proportion have on the outcome of sports, body composition became an important factor affecting physical performance (Maud and Foster, 1995). The relationship between performance and somatotype has been studied by Taner, Stepnicka, Carter, and De Garay. In these studies, performance tests such as strength, rapid force, force and speed have shown that the mesomorphic score is positive and the endomorphic score is negative. Although somatotype data provides general information as a hint for the future prediction of sports ability, they cannot be used alone without other data (Carter and Heath, 1990). So, the aim of this study is to determine the somatotype characteristics of the Turkish national male boxers and to calculate their body fat percentages and body mass indexes.

Method

Twenty-five elite boxers (mean age 16.50±1.06 years; mean height172±0.06cm and mean mass 64.62±9.88kg) from Seka Sports Educational Center, who have had some experiences in national and international tournaments were made to participate voluntarily in this study. These boxers were those who have not had any form of extremity injuries before. The study was conducted in accordance with the Declaration of Helsinki. The subjects were informed about the research including its potential risks and benefits before the study, and the written consents of all participants were obtained. All participants were asked to refrain from alcohol, caffeine and ergogenic aids the day before the test. No warm-up time was given to the participants.

Anthropometric Measurements Procedures

In order to determine the somatotype values, anthropometric measurements were taken while there were clothes on the boxers that would not affect the measurements. All measurements were taken at once at 10:00am in the morning before training and recorded on athletes measurement charts. They were taken in accordance with the techniques stipulated by the Anthropometric Standardization Reference Manual (ASRM) and the International Biological Program (IBP) (Weiner and Lourie, 1969).

Holtain skinfold caliper, which provides 10g/sq m pressure at every angle, was used for skinfold measurements. They were measured at right triceps, subscapula, suprailiac, calf and thigh. Participants stood and were instructed to relax their right limbs during all measurements. For all lower extremity measures, they were instructed to shift their weight to their left legs.

Triceps Skinfold Thickness: While the subject was standing with his arms hanging sideways, the skin in the muscle iron was folded in the vertical plane from the middle point between the acromion and olecranon in the posterior midline of the right upper arm, and the measurement was made with the caliper in the right hand.

Subscapula Skinfold Thickness: While the subject was standing with his arms hanging sideways, measurement was made by holding the skin fold at an angle of 45 degrees diagonally under the inferior angle just below the scapula.

Suprailiac Skinfold Thickness: While the subject was standing with his arms hanging sideways, measurement was made by holding the skinfold at an angle of 45 degrees above the iliac crest on the midaxillar axis.

Medial Calf (Calf) Skinfold Thickness: The subject was made to stand vertically and medially from the widest part of the right calf, with the soles of the feet touching the ground and legs bent at an angle of 90 degrees.

Thigh Skinfold Thickness: The subject was sitting with the knees bent at an angle of 90 degrees. Measurement was made by holding the skinfold.

Length measurements were taken with Martin type anthropometer. Weight measurements were done with ±100gr sensitive digital scale (Tanita BF-556 Body Fat Monitor). Circumference measurements were done with tape measure (calf, biceps) and width measurements were done with sliding caliper. They were measured at biacromial, bicondylar, biiliac, femur bicondyler. Lastly, Body Mass Index (BMI) was obtained by dividing body weight by the square of the height (Body Mass Index = Body Weight (kg) / Height square (m^2)).

Determining Somatotype

In order to find the somatotype values of anthromopetric measurements, the rates of Heath and Carter (Carter and Heath, 1990) were used, which was developed to determine the somatotypical characteristics and can be used in every field.

- **Endomorphy** =- $0.7182 + 0.1451 * x – 0.00068 * x^2 + 0.0000014 * x^3$ (x = “triceps” skinfold thickness + “suprailiac” skinfold thickness + “subscapula” skinfold thickness)

Height Corretion Formula= x * 170.18 / height (cm)

- **Mesomorphy** = [0.858 + 0.601 * elbow width-“bicondylarhumerus” (cm) + 0.601 * knee width -“bicondylarfemur” (cm) + 0.188 * arm circumference (cm) + 0.161 * thigh circumference (cm)] – [height (m) * 0.131] + 4.50
- **Ectomorphy** = (Height-mass ratio) * 0.732 – 28.58 (Height-mass ratio = Height/3√Mass)

Data Analyses

The variables data from the antropometric tests were analyzed by using the SPSS v.21.0 (SPSS Inc., Chicago, IL, USA) software program. The results were presented as mean± SD (Standard Deviation).The initial power analysis indicated that twenty-five participants were required to reach a statistical power of 80%.

RESULTS

The results obtained from the National Boxers' somatotype values and anthropometric measurements are shown in the Tables 1 and 2 below. According to the results, Endomorphy values were mean±SD3.42±1.03; Mesomorphy values were 4.398±0.84 and Ectomorphy values were 3,121±0,95 (Table 1).

Table 1. Descriptive Statistics of Skinfold Measurements (Mean±SD) and Somatotypes

	Mean	**Std.Dev.**
Triceps (cm)	9.792	2.852
Subscapula (cm)	10.011	3.443
Suprailiac (cm)	15.529	6.953
Calf (cm)	12.27	3.183
Humerus bicondylar(cm)	6.751	0.415
Femur bicondylar(cm)	9.57	0.588
Biceps circumference(cm)	29.2	1.742
Calf circumference(cm)	35.085	2.799
Endomorphy	3.427	1.039
Mesomorphy	4.398	0.846
Ectomorphy	3.121	0.954

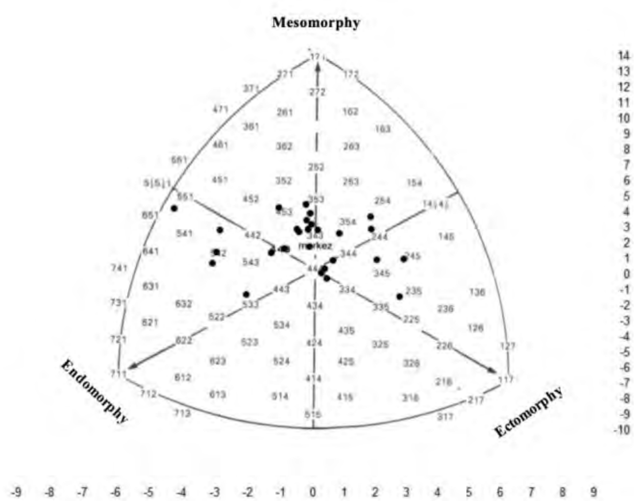
Table 2. Descriptive Statistics of Anthropometric Measurements (Mean±SD) and BMI values.

	Mean	Std. Dev.
Throcanter Major	31.677	1.934
Triceps	8.692	2.5
Subscapula	9.211	2.438
SupraIliac	10.548	5.641
Calf	11.103	2.945
Thigh	12.497	3.762
Body Mass Index (kg/m²)	21.389	2.186
Fat Percentage %	8.638	3.405

The body Mass Index of the boxers were found as 21.38±2.18kg/m² and Fat percentage was 8.63±3.4% (Table 2).

According to the measurement results, it was determined that the boxers generally had a mesomorph structure (Figure 1).

FIGURE 1. Mesomorph Structure



Discussion

It has been observed that some parameters such as height, weight, somatotype and body composition, which are called structural and which are generally inherited, affect skills and functional factors in sports branches (Lale *et al*., 2003). Boxing is defined as the struggle of two boxers on a ring of certain sizes, using their techniques, skills, strength and intelligence in accordance with the rules, to gain an upper hand. During this struggle, the body systems need to work at the maximum rate in order to meet the increasing energy need and to resist the fatigue that occurs. Thus, structural (anthropometric) and functional (physiological) features are expressed as important determinants of boxing performance. This study is designed to determine boxers'somatotypes and there had been some studies about boxers' body composition and anthropometric structures in the literature.

Using the relational scanning model, Devecioglu and Pala (2010) carried out a study to determine the contribution levels of the body compositions of the university boxers to the sportive success. A total of 129 boxers from 28 different nationalities participated in the study. When the relationship between boxers' BMI values and their sportive success was examined, it was observed that 52.3% of the successful boxers and 48.2% of the unsuccessful boxers were in the range of "15.80–21.4718kg/m^2" Body Mass Index. It has been observed that the "Average BMI Values Ratio Based on Country Rank" of boxers are in the range of "15.80-21.4718kg/m^2" body mass index with a rate of 48.3% in successful countries and 50.0% in unsuccessful countries. When considering the relationship between Boxers' FAT values and their sportive achievements, it was observed that the successful boxers had 86.4%, and the unsuccessful boxers had 84.7% fat percentage which ranged from 1.40–11.00. It has also been observed that the "Average FAT Values Ratio According to Country Ratings" of boxers are in the range of "1.40–11.00" fat percentage in successful countries with a rate of 86.2% and in unsuccessful countries at 85.0% (Devecioğlu and Pala, 2010). Akgul and Çakmakçı (2017) also investigated the effects of 6-weeks period of training for competition on body composition of elite boxers. In their study, training sessions were conducted for 9 elite boxers for 6-weeks. When the pre-test and post-test parameters were compared, the body weight and BMI in the pre-test were lower than those of the post-test ($p<0.05$). However, there was no significant difference between the pre-test and the post-test for BMR, FAT, FMASS($p>0.05$).

The research conducted by Halperin *et al*., (2016), which aimed at examining the profile of a professional boxer (23 years old and 80 kg) with boxingspecifics- muscle function, aerobic capacity and body composition tests, and to quantify how these measures varied during an 8-week preparation phase leading to a state-Title Bout fought in the 76.2-kg class showed a performance decrease in isometric mid-thigh pull (8%), isometric bench-press (5%), counter movement jump (15%) and impact forces in 3 of

4 punches (4%–7%). Whereas, the measures of dynamic and isometric muscle function remained depressed or unchanged in the post competition, with the punching forces (6%–15%) and aerobic power (6%) increased. Data suggest that the athlete may have super-compensated following rest as fatigue dissipated and further adaptation occurred. Kumar (2016), compared the body composition variables among low and high weight category of boxers. A total of 30 male samples of 17-25 years of age were selected from all Indian competitions. The samples were divided into two categories, 15 were from the low weight category while the remaining 15 were from the high weight category. A significant difference was found in the body composition variables in low weight and high weight category of boxers. So, it can be concluded that the low weight category have low level of body fat percentage, visceral fat and BMI with respect to high weight category. Chaabèneet al., (2015), said that high-level male and female boxers showed a propensity for low body fat levels. To help support the overall metabolic demands of a boxing match and to accelerate the recovery process between rounds, athletes of both sexes require a high level of cardiorespiratory fitness. In this present study, Body Mass Index of the boxers were found as 21.38±2.18kg/m^2 and Fat percentage was 8.63±3.4% (Table 2). The results are similar to the ones found in the literatüre, even though it can be said that the boxers had low levels of body fat percentage, but the study was not evaluated according to the training effects and weight differences. So, this could be regarded as the limitations of the study.

The objective of this study is to determine the somatotype characteristics of Turkısh male natıonal boxers. Raković et al., (2015) indicated that the somatotype components in many sports were not homogeneous, not even in the groups that are singled out by the quality. The results show that there were significant differences within the same sport and in terms of the playing position. This was especially reflected in ball sports, team sports, while in individual groups somatotypes were becoming more homogeneous as a higher level of athletic performance was reached. The results of many comparisons done on the somatotypes of athletes in various sports were shown in a research review, the findings obtained indicate the differentiation of sports according to the somatotype, and these findings are important in the selection of talents in the field of professional sports. Boxers showed increases in endomorphy and mesomorphy and a decrease in ectomorphy as body weight increases: 1.5-5.0-3.0 (<60 kg), 2.0-5.5-2.5 (60 - 79.9 kg) and 2.5-6.0-2.0 (80 - 89.9 kg) and these values were obtained in high level male boxers (Tshibangu, 2019).

Catikkas et al., (2013) investigated the kinanthropometric attributes of different combat sports like karate, taekwondo, judo and kickboxing. Forty-eight national male athletes from four different combat sports participated in the study (age, 20.3±3.19 years); height, 174.3±7.15cm; weight, 67.35±10.55kg. Results which revealed the body mass index as 22.00±2.66kg/m2; body fat percentage as 12.20±3.07%; endomorphic component as 2.9±1.30; mesomorphic component as 4.25±1.30 and ectomorphic component as 3.10±1.30 were found. The results found in this study are predominantly of Mesomorphic component in nature. Although BMIs were found to be normal, body fat percentages were low. Podrigalo et al., (2019) mentioned that higher body mass index in athletes demonstrates the prevalence of muscular component of somatotype. The Erismann and Pignier indexes, shoulders width index illustrated the best development of muscles in athletes and kickboxing athletes in comparison with karate athletes, and taekwondo. Therefore, it was determined in this present study that the boxers generally have a mesomorph structure (4.398±0.84), which is characterized by a clearly muscular body type and a rectangular shaped body. This means that the boxers have an athletic posture and structure.

CONCLUSION

In conclusion, many reasons of professionally dealing with boxing are to evaluate the leisure time positively by doing sports, to study at the level of universities related to sports in the future, to increase the level of professional boxing. In this context, youth who are engaged in boxing should be included in physical education classes as part of their education in schools as sports-specific studies as of the period of specific movements. In the present study, it was designed to determine somatotypes from anthropometric parameters of elite boxers. A mesomorphic body structure and low fat mass were found from the body composition variables of the boxers. So, it can be concluded that the low level of body fat percentage, muscular body type and standard BMI results will be advantageous to boxers in their performances. For this reason, boxing training should be planned in the light of this information and training plans should be made to create performance advantages.

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