Original Research Article

Body physique and dominant somatotype in elite and low-profile athletes with different specializations

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ABSTRACT

Background and objective: Somatotyping is helpful in sports in which the body shape could influence the resulting performance. The purpose of this study was to determine the somatotype of high profile Lithuanian athletes in kayaking, basketball and football and to compare between disciplines and with low level sportsmen of the same age.

Materials and methods: A total of 72 young male sportsmen aged from 18 to 24 years were divided into three groups (kayakers, basketball and football players). Each group contained almost equal numbers of low level and elite, international level sportsmen. Anthropometric measurements of the players were used to establish somatotypes.

Results: The greatest difference was observed in the mesomorphic component of elite kayakers compared to the low profile sportsmen. Mesomorphy could also be used to predict sport ability. The range of mesomorphy for elite footballers was from 0 to 4.6, for basketball players from 4.6 to 5.9, and for kayaking, from 5.9 and higher. Individual groups of elite sportsmen displayed different modes of somatotype. The kayakers were predominantly endomorphic; the basketball players mostly endomorphic and the footballers most often ectomorphic. No distinguishable patterns of somatotype were displayed by the low level sportsmen.

Conclusions: Morphometric characteristics of the athlete's body and the fractional somatotype can be used as guiders and markers of the chosen sport and method of training.

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1.   Introduction

Anthropometry has been shown to play an important role in athlete selection and performance criteria in sports. It is obvious that determination of the somatotype is especially supportive in sports in which the body may impact on the biomechanics of movement and the resulting performance [1,2]. Investigations of somatotypes in elite sportsmen play an important role in the study of the dynamics of development of a specific shape of the human body under the influence of various intensive purposeful training processes and competitive periods. It is well known that the anthropometric profile may indicate whether a player would be suitable to participate at the highest level in a specific sport [3–7]. Analysis of the literature has shown that there is a lack of information explaining the developmental pattern of high profile athletes in relation to different expressions of the human somatotype.

It is obvious that the structural appearance of a person, or body shape, is determined by his or her genotype as influenced by their environment [8–12]. The quantification of morphological characteristics of high profile athletes can be a key aspect of relating body structure to sports performance [13].

On the other side the quantified body physique of elite sportsmen has been shown to alter over time [14]. Analysis of the latest literature comparing anthropometric variables and somatotypes clearly illustrates that specific functional requirements produce differences in the anthropometric variables of the human body [15]. Another study showed the essential difference in the anthropometrical portrait between highly qualified, intermediate and junior surfers; however, it is difficult to compare their somatotypes because of the large age difference between groups [16]. It is also difficult to make accurate conclusions on the morphometric and somatotypic characteristics of elite athletes due to a lack of consistency between different studies, based on data received from different national groups of athletes and obtained during differing periods. Therefore, there is a gap in the literature in terms of determination of body physique and anthropometrical differences of contemporary elite Lithuanian sportsmen as well as between elite and low profile athletes of the same age.

The first objective of the study was to describe the body physique of modern elite sportsmen involved in kayaking, basketball and football. A further objective was to study differences in somatotypes between elite and low profile athletes involved in these sports.

2.   Materials and methods

Anthropometry and somatotype data were collected from 72 young male sportsmen aged 18–24 years, who were divided into three groups (kayakers, basketball and football players). Each group included lower ranked sportsmen, 11 people, and 13 elite, highly experienced athletes performing at international level. The low profile sportsmen who had no exceptional motor skills were students of the Lithuanian Sports University. They were selected in a randomized way.

The mean age of the elite sportsmen were 20.9 ± 0.9 years (kayakers), 24.0 ± 1.1 (basketball players), and 18.8 ± 0.6 (football players). The elite kayakers and basketball players were participants of united Lithuanian teams, trained for the World Cup in 2010; the elite football players were participants of the FIFA U-20 World Cup in 2011. All participating sportsmen had been training for at least 16 h per week for more than 6 years. There were clear differences between the best and the lower ranked sportsmen in number of training hours per week or number of competitions completed.

The research was approved by the Local Research Committee of the Lithuanian Sports University, Kaunas. Education was provided to and informed consent was obtained from each participant before their entry into the study. Participants were naive to the purpose of the experiment, and none of them reported any sensory or motor deficits.

The assessment of somatotype involved the measurement of 16 somatotype parameters using standard methods and licensed anthropometric instruments [17]. Anthropometric measurements of the athletes were performed according to techniques suggested by the Anthropometric Standardization Reference Manual [18] using the Heath-Carter protocol [19]. Somatotypes were calculated using the Heath-Carter decimal equations [19].

In somatotype calculations, triceps, subscapular, supraspinale and calf skinfold thickness, humerus bicondylar, femur bicondylar, biceps circumference, calf circumference, and body weight and height were used. For a quantitative description of each somatotype the endometric, mesometric, and ectometric indices were calculated. Basic statistics used the Student t test with two independent samples. Additionally, discriminant analysis was performed using SPSS 10. This analysis is useful in interpreting the potential discrepancies in morphometric measures [20]. A P value of <0.05 was considered as significant.

3.   Results

All athletes demonstrated a monomorphic somatotype, independently of sports qualification. Elite athletes, representatives of all three kinds of sport, showed partial changes in their somatotype in comparison to beginners (Table 1).

The greatest changes were observed in the mesomorphic indices with the largest change observed in elite kayakers compared to the low profile sportsmen. All sportsmen of the