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Somatotype Characteristics of Indian National Canoeists and Kayakers

Debaarati Chakrabarti [1], Anup Adhikari [2,*]

[1] Anthropometrist, SAI, India
[2] Anthropometrica, Toronto, Canada
* Corresponding authors email: dranupadhikari@yahoo.com
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Resumen

Introducción: El rendimiento en Canotaje y Kayak depende de diferentes factores y el Somatotipo es uno de los factores más importantes de estos. El presente estudio tuvo como objetivo averiguar el somatotipo de los piragüistas y kayakistas de nivel nacional indio que participaron en competiciones de nivel nacional e internacional. **Métodos:** Se estudió el Somatotipo de 27 Canoistas y Kayakistas de nivel nacional. Todos los sujetos fueron seleccionados de diferentes centros de formación de deportes acuáticos de todo el país. De 27 atletas, 11 eran atletas masculinos (siete piragüistas y cuatro kayakistas) y 16 eran atletas femeninas (6 canoistas y 10 kayakistas). Se siguió el método de Heath-Carter (1967) para el Somatotipado. **Resultados**: Se observó un somatotipo promedio de 3,4(±0,9)-5,0(±0,8)-3,4(±2,1) para los piragüistas y kayakistas masculinos mientras que para las mujeres fue 5,9(±1,6)-4,7(±1,1)-2,0(± 1.1). Por lo tanto, los canoistas y kayakistas nacionales indios masculinos tenían en promedio un somatotipo mesomorfo equilibrado, mientras que las contrapartes femeninas eran endomorfas mesomórficas. La musculatura media de los piragüistas y kayakistas masculinos y femeninos fue moderada. **Conclusiones:** El somatotipo mesomorfo ectomorfo es el tipo de cuerpo ideal para un deportista de deportes acuáticos. Además de las características del somatotipo, la musculatura de un atleta representa la fuerza muscular que es un factor importante para el buen desempeño en los deportes acuáticos y genera la energía necesaria para remar. La musculatura moderada de los canoistas y kayakistas indios, tanto masculinos como femeninos, podría obstaculizar el buen desempeño en escenarios internacionales como los Juegos Olímpicos y los Juegos de la Commonwealth. Por lo tanto, los piragüistas y kayakistas indios deberían mejorar su musculatura con un entrenamiento y una nutrición adecuados.

Palabras Clave: Deportes acuáticos, Canotaje, Kayak, Somatotipo, Muscularidad

Abstract

Introduction: Performance in Canoeing and Kayaking depends upon different factors and Somatotype is one of the most important factors of these. The present study aimed to find out the somatotype of Indian national level Canoeists and Kayakers who participated in International and National level competitions. **Methods:** 27 national level Canoeists and Kayakers were studied for their Somatotype. All subjects were selected from different water sports training centers across the country. Out of 27 athletes, 11 were male athletes (seven Canoeists and four Kayakers) and 16 were female athletes (6 Canoeists and 10 Kayakers). Heath-Carter method (1967) was followed for Somatotyping. **Results:** Average somatotype of 3.4(±0.9)-5.0(±0.8)-3.4(±2.1) was observed for the male Canoeists and Kayakers whereas that of females was 5.9(±1.6)-4.7(±1.1)-2.0(±1.1). Thus, the male Indian National Canoeists and Kayakers were with Balanced mesomorph somatotype on average whereas the female counterparts were Mesomorphic endomorph. The average muscularity of both male and female Canoeists and Kayakers was moderate. **Conclusions:** Ectomorphic mesomorph somatotype is the ideal body type for a sportsman in Water sports. Besides Somatotype characteristics, the muscularity of an athlete represents muscular strength which is an important factor for good performance in water sports and generates the required energy for paddling. Moderate muscularity of both

male and female Indian Canoeists and Kayakers could hinder good performance in international arenas like the Olympics and Commonwealth Games. Thus Indian Canoeists and Kayakers should improve their muscularity with proper training and nutrition.

Keywords: Water sports, Canoeing, Kayaking, Somatotype, Muscularity

Introducción

Canoeing and Kayaking are two famous sports throughout the world and are the part of Summer Olympics under the discipline Canoe Sprint. In canoeing, the athlete paddles on one side kneeling on one knee whereas in Kayaking athlete paddles on both left and right sides in a sitting position. Athletes have to compete to finish a linear course of 200m, 500 m, and 1000 m. Flatwater sprint racing and Slalom are part of Olympic sports besides other competitive disciplines. On the other hand, White water racing, canoe sailing, and freestyle are non-Olympic competitions played in different countries (Hamano et al, 2015). Canoeing and Kayaking are "upper body sports," demanding specific morphological-functional characteristics on this part of the athletes (Mann and Kearney, 1980; Ackland et al, 2003). Canoeing and Kayaking are sports where physical characteristics, body size, and shape (somatotype) are very important factors besides other factors like Physical, Physiological, Mechanical, technical, and skill factors. In physical factors, body shape and size, height, weight, and segmental length including good muscle mass are very important to generate sufficient energy and force during paddling and gain more mechanical advantages. Long arms with greater shoulder width are very advantageous to create a more mechanical force to drive the canoe and kayak forward pushing the flatwater back. In India, Canoeing and Kayaking are very young sports compared to other sports. It started in 1986 under the Sports Authority of India Special area games projects. The performances of Indian Senior athletes in water sports like Canoeing and Kayaking are not significant in comparison with international standards. The position of Indian Kayakers and Canoeists based on performance were very poor, especially in the Olympics, though it is a popular sport in India. But, the performances of Kayakers and Canoeists under 23 yrs of age are good at Asian levels. In Canoe Sprint Indian U-23 team is in 4th rank at the Asian level (U23 Canoe and Para Canoe Asian Championship 2023). Though Canoeing and Kayaking are very popular water sports games in India, to date there is no such study on the somatotype of Indian Canoeists and Kayakers especially on national level players. Thus, the aim of the present study was to find out the somatotypes of Indian National level Canoeists and Kayakers and compare them with their international counterparts.

Materials and Methods

Participants

11 male and 16 female national-level canoeists and Kayakers were studied in the present study. All were active members of the Indian national team and active in regular practices.

Anthropometrical measurements

Anthropometric measurements were measured on the same day for each player in the same session to avoid technical error of measurement (TEM) with an accredited anthropometrist, accredited by ISAK (International Society for the Advancement of Kinanthropometry). The method described in the International Society for The Advancement of Kinanthropometry manual (ISAK 2019) was followed. Stature was measured with a stadiometer graduation up to 1 mm and body mass was measured with an electronic weighing scale. Skin fold thicknesses were measured with a Harpenden Skinfold caliper (Bety International, UK). Anthropometric tape (CESCORF, Brazil) was used for measuring girth while a sliding caliper (CESCORF, Brazil) was used to measure bone diameters.

Somatotype

Heath - Carter (1967) method was followed for somatotype rating. The following equations were used for calculating somatotype:

Endomorphy = — 0.7182 + 0.1451 × ΣSF — 0.00068 × ΣSF2 + 0.0000014 × ΣSF3

where ΣSF = (sum of triceps, subscapular and supraspinale skinfolds) multiplied by (170.18/height in cm). This was called height-corrected endomorphy and was the preferred

method for calculating endomorphy)

Mesomorphy = 0.858 × humerus breadth + 0.601 × femur breadth + 0.188 × corrected arm girth + 0.161 × corrected calf girth ─ height × 0.131 + 4.5

Three different equations were used to calculate ectomorphy according to the height -weight ratio (HWR):

If HWR was greater than or equal to 40.75 then, Ectomorphy = 0.732 × HWR ─ 28.58

If HWR was less than 40.75 and greater than 38.25 then, Ectomorphy = 0.463 × HWR ─ 17.63

If HWR was equal to or less than 38.25 then, Ectomorphy = 0.1

Results

Table 1. Physical Characteristics and Somatotype of Male and Female Canoeists and Kayakers of different studies.

Country	Sex	Age (yr)	Ht(cm)	Wt(kg)	Somatotype
Turkey[1]	M	21.5±2.16	178.9±6.8	77.4± 8.1	2.9 (±0.9)-5.2(±1.3)-2.2(±0.9)
Greece[2]	M	23.7±4.6	176.9±4.5	59.6±5.8	3.0 -4.6-1.7 *
Greece [3]	F	22.7±3.1	165.8±7.2	65.9±10.1	3.9-3.8-1.7*
Poland [4]	M	18.7±1.4	184.9±5.8	78.1±4.9	2.3 (±0.6)-3.7(±0.5)-3.1(±0.7)
Poland [5]	M	18.2±1.5	176.9±6.9	75.5±8.0	2.7 (±0.6)-4.7(±0.5)-2.2(±0.5)
Europe [6]	M	24.3±4.8	179.8±5.1	74.8±6.2	1.3(±0.3)-5.5(±0.9)-2.7(±0.8)
Lithuania[7]	M	20.9±0.9	unavailable	unavailable	3.5(±0.99)-6.20(±0.9)-2.8(±0.85)
Britain [8]	M	26 ± 5	182.9 ± 5.6	84.5 ± 4.9	2.6(± 0.8)-4.9(±0.9)- 2.1(± 0.7)
Spain [9]	M	13.7±0.6	168.7±6.6	59.9±9.3	2.7–4.8–3.1
Spain [10]	M	13.6±0.6	163.7±8.7	55.1±12.1	2.6–4.5–3.2
India [11] (Present study)	F	17.5±1.7 (15-21)	168.1±4.4 (162.2-176.6)	66.4±8.1 (54.4-79.0)	5.9(±1.6)-4.7(±1.1)-2.0(±1.1) (2.5-8.4) - (3.0-7.3) - (0.5-3.9)
India[12] (Present study)	M	18.4±2.4 (16-23)	179.1±7.2 (168.8-191.5)	73.0±6.7 (59.0-81.0)	3.4(±0.9)-5.0(±0.8)-2.9(±1.0) (2.2-4.9)-(3.3-6.3)-(1.5-4.5)

*Somatotype was estimated from the Figure obtained in the published article as values were not in Tabular form.

**Turkey [1](AKCA & MUNIROGLU,2008), Greece [2] and Greece [3] (Diafas et al.,2011),

Poland [4,5](Hagner-Derengowska et al.2014), Europe [6](Coufalová et al.,2021), Lithuania[7](Gutnik et al, 2015), Britain [8](Van Someren, & Palmer, 2003), Spain [9,10](Alacid et al,2015).

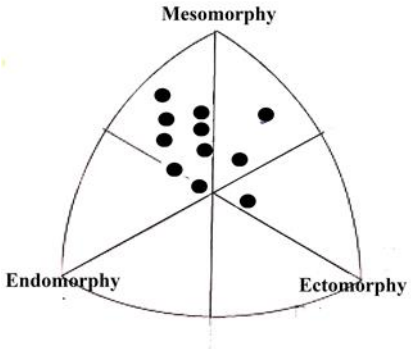

Figure 1. Somatotype of Indian National Male Canoeists and Kayakers (n=11)

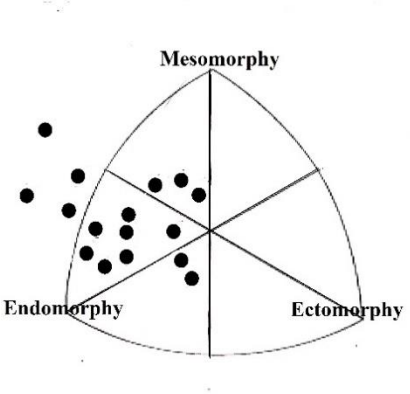

Figure 2. Somatotype of Indian National Female Canoeists and Kayakers (n=16)

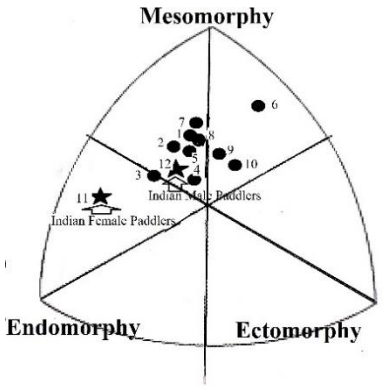

Figure 3. Somatotype of Canoeists and Kayakers of different countries including India. Turkey [1], Greece [2,3], Poland [4,5], Europe [6], Lithuania [7], Britain [8], Spain [9,10].

Discussion

Performance in sports depends on the physical characteristics as well as body shape and size (somatotype) of the athletes in most of the sports especially in water sports where body shape and size have a great impact on creating force during paddling. Different studies revealed that the nature and level of performance influence the degree of association with Somatotypes (Carter, 1970; Carter & Heath, 1990). Somatotype quantification of an athlete might have an impact on the performance level and improve the understanding of biomechanical limitations and physiology of performance (Carter 1990). Male Canoe and Kayak paddlers at Montreal (1976) Olympics exhibited a somatotype of 1.5 (± 0.5)- 5.2 (± 0.8)- 3.1 (±0.9) (Carter,1984). Alacid et al. (2015) worked on elite young Kayakers and Canoeists in Spain and reported an average somatotype of 2.7–4.8–3.1 for the young Kayakers, whereas that of Canoeists was 2.6–4.5–3.2. They observed that the young Spanish male paddlers (13 and 14 yrs. old) were less lean, and less muscular than the Olympic sprint (1.6–5.7– 2.2) and Slalom (1.7–5.4–2.5) paddlers (Ackland et al.,2003; Ridge et al.,2007).

The average somatotype of Indian national male Canoeists and Kayakers was 3.4(±0.9)-5.0(±0.8)-2.9(±1.0) with a range of 2.2-4.9 for Endomorphy, 3.3 -6.3 for Mesomorphy and 1.5 to 4.5 for Ectomorphy whereas that of Indian national female Canoeists and Kayakers was 5.9(±1.6)-4.7(±1.1)-2.0(±1.1) with a range of 2.5-8.4 for Endomoprhy , 3.0 -7.3 for Mesomorphy and 0.5-3.9 for Ectomorphy. Male Canoeists and Kayakers were Balanced mesomorph in average whereas Female Canoeists and Kayakers were Mesomorphic Endomorph in average (Table 1, Fig 1 and Fig 2). The average mesomorphy component of Indian national male Canoeists and Kayakers were more than Greek, Polish, British, and Spanish paddlers but less than Turkish, European, and Lithanian paddlers. The average muscularity in terms of Mesomorphy component of Indian Female paddlers was higher than the paddlers of Greece (Table 1). But the Indian national female paddlers were more endomorphic than the paddlers of different countries (Table 1). Most of the Indian female paddlers were with higher endomorphy components with less muscularity which was reflected in the somatochart (Fig 2). Indian male paddlers were with moderate muscularity but most of them were slightly with fatty characteristics (Fig 1). It is well known that in athletic performance Ectomorphic Mesomorph body type is preferable to other body type characteristics for good performance (Carter and Heath, 1990). But Indian national paddlers did not have such characteristics whereas the international paddlers had (Fig 3).

Thus, from the above study, it could be concluded that both male and female Indian paddlers should improve their muscularity along with reducing fatty characteristics to improve their performance in the International arena besides other factors like physiological, psychological, mechanical, tactics and skill both at personal and group level.

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Conflicts of Interest

The Authors Have No Conflicts of Interest to Declare That They Are Relevant to The Content of this Article.

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