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Somatotype and Anthropometric characteristics of Indian Female Rowers

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Resumen

Introducción: se estudiaron dieciocho remeras indias de nivel nacional por su somatotipo y características antropométricas, ya que el rendimiento en el remo depende de las características físicas y antropométricas además de otros factores, incluida la habilidad. **Material y Métodos:** La altura y el peso se midieron de acuerdo con los métodos estandarizados por The International Society for The Advancement of Kinanthropometry (ISAK). El somatotipo se calculó utilizando el método de Heath-Carter (1967). **Resultados:** La altura y el peso promedio de las remeras de nivel nacional indio fueron 167,8 ± 4,1 (160,7-174,0) cm y 59,5 ± 6,5 (47,7-69,3) kg, respectivamente. El somatotipo medio de las remeras de nivel nacional indio fue 5,4 (±1,0)-3,2(±0,8)-1,6(±0,9) con un rango entre 3,8-1,8-1,6 y 6,9-4,6-4,9. **Conclusión:** Se observó un tipo de cuerpo medio endomorfico mesomórfico con menos musculatura en las remeras nacionales indias. La falta de musculatura y la menor altura pueden ser una de las razones, además de otros factores, del bajo rendimiento de las remeras indias en las competiciones olímpicas y otras competiciones internacionales.

Palabras Clave: Somatotipo, Antropometría, Endomorfia, Mesomorfia, Ectomorfia, Remeras Femeninas, Nivel Nacional

Abstract

Introduction: Eighteen national-level Indian Female Rowers were studied for their somatotype and anthropometric characteristics as performance in Rowing as performance level in rowing depends on physical and anthropometrical characteristics besides other factors including skill. **Material and Methods:** Height and weight were measured according to the methods standardized by The International Society for The Advancement of Kinanthropometry (ISAK). Somatotype was calculated using Heath-Carter (1967) method. **Results:** Average height and weight of the Indian national-level Female Rowers were 167.8 ±4.1 (160.7-174.0) cm and 59.5±6.5 (47.7-69.3) kg respectively. The average Somatotype of the Indian National level female Rowers was 5.4 (±1.0)-3.2(±0.8)-1.6(±0.9) with a range between 3.8-1.8-1.6 and 6.9-4.6-4.9. **Conclusion: Average** Mesomorphic Endomorh body type with less muscularity on average was observed for the Indian national Female Rowers. Poor muscularity and less height might be one reason besides other factors a reason for poor performance of Indian Female Rowers in Olympic and other International competitions.

Keywords: Somatotype, Anthropometry, Endomorphy, Mesomorphy, Ectomorphy, Female Rowers, National Level

Introducción

Rowing becoming the fastest event among water sports in the modern Olympic. More and more countries are participating in the competition. In India, Rowing is also becoming more popular, and people are showing more interest in participating in the game at different levels. Rowing is a water sport that requires a specific and appropriate physique for a good performance besides skill, tactics, physiological, psychological, and biomechanical factors (Hebbelinck et al. 1980, Carter et al. 1982, Mészáros and Mohácsi 1982a, Rodriguez 1986, Carter and Heath 1990, Bourgois et al. 2001, Eiben and Bodzsar 2002, Slater et al. 2005, Damjan et al. 2013b, Adhikari and McNeely 2015). Rowing demands a high force production during the game where muscularity plays an important role to generate

sufficient force for oar and boat movement. (Akça et al 2010, Adhikari and McNeely 2015). In Rowing, the shape and size of the rower is an important and crucial factor that influences the performance level (Adhikari and McNeely 2015). Somatotype reflects the total appearance of the body and gives significance to its overall morphological status. Thus, Somatotype is the overall morphological status of a sportsman (Ross et al, 1982). Hence, by a partial study of somatotype components of a sportsman, it is possible to see the organizational and functional integrity of the athlete's body. Somatotype also has a strong genetic basis. Somatotyping is an important tool for talent identification and making training programs as well as periodization of training programs (Adhikari and McNeely 2015, Jakovljević et al. 2022). In India, though Rowing is a popular game, there is no such study to date that shows the anthropometric and somatotype characteristics of rowers. Thus, the present study aimed to find out the somatotype characteristics of Indian female rowers.

Material and Methods

Eighteen Female national-level rowers were studied for their somatotype characteristics. All the rowers were national and international level and participated in national and international level competitions.

Anthropometric Measurements

Anthropometric measurements were measured in the morning before the practice session and in the same session on the same day following the standard methods described by The International Society for Advancement of Kinanthropometry (International Standards for Anthropometric Assessment, ISAK 2019). Technical Error of Measurement (TEM) was followed to avoid the measurement error. Consent was taken from each rower before taking the measurements.

Stature was measured with a stadiometer and body mass was measured with a digital weighing scale. Skinfold thicknesses were measured with a Harpenden skinfold caliper (CESCORF, Brazil) Anthropometric tape and sliding caliper (CESCORF, Brazil) were used to measure circumferences and bone diameter respectively.

Somatotype

Heath – Carter [1967] method was followed for somatotype rating. The following equations were used for calculating somatotype components.

Endomorphy = ─ 0.7182 + 0.1451 × ∑SF ─ 0.00068 × ∑SF 2 + 0.0000014 × ∑SF 3

where ∑SF = (sum of Triceps, Subscapular and Supraspinale skinfold) multiplied by (170.18/Height in cm).

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 are used to calculate ectomorphy according to the height -weight ratio (HWR) :

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

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

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

Results

Table 1. Average height and weight of Indian national level female Rowers (n=18)

Category		Height (cm)	Weight (kg)	Endomorphy	Mesomorphy	Ectomorphy
Female (n=18)	Mean	167.8	59.5	5.4	3.2	1.6
	SD	4.1	6.5	1.0	0.8	0.9
	Min	160.7	47.7	3.8	1.8	1.6
	Max	174.0	69.3	6.9	6.9	4.9

Table 2. Height, Weight and Somatotype of Indian National level female Rowers (Individual)

Rowers	Height	Weight	Somatotype
F1	171.1	60.3	4.3-3.6-3.6
F2	164.6	60.1	4.2-3.9-2.2
F3	171.0	69.3	6.9-4.1-1.9
F4	169.1	61.0	6.7-4.6-2.9
F5	174.0	67.5	6.8-2.7-2.7
F6	169.1	57.3	4.7-2.7-3.6
F7	166.2	56.8	5.0-3.0-3.1
F8	165.0	57.0	5.9-2.9-2.8
F9	166.9	48.7	4.8-1.8-4.9
F10	160.7	48.4	6.1-2.5-3.7
F11	171.7	65.0	3.8-3.2-2.7
F12	164.0	63.4	5.0-4.6-1.6
F13	166.3	64.9	6.9-3.5-1.7
F14	161.9	54.4	6.6-2.4-2.7
F15	162.6	47.7	4.7-2.9-4.3
F16	170.9	59.1	4.5-2.5-3.6
F17	173.1	67.0	5.3-2.9-2.7
F18	172.0	62.8	5.1-4.0-3.1

Table 3. Physical characteristics and Somatotype of Female Rowers of different countries

Studies	Rowers	Age (yr)	Height (cm)	Weight (kg)	Endo -morphy	Meso -morphy	Ecto -morphy
Hebbelinck et al(1980)	Montreal Olympic,1976	23.8 ± 2.7	174.3 ± 4.8	67.4 ± 5.3	3.1 ± 0.8	3.9 ±0.9	2.8 ± 0.8
Carter et al 1982	Montreal Olympic,1976	23.1 ± 2.3	175.8 ± 4.4	68.3 ± 5.8	3.2 ± 1.0	3.9 ± 0.5	2.9 ± 0.6
Carter and Heath,1990	North American	–	179.2	66.6	3.0	4.0	4.0
Meszaros and Mohacsi,1982	Hungarian		NA	NA	3.5	5.0	3.0
Slater et al. 2005	Australian Lightweight Female	<23	170.0 ±5.3	57.4±1.6	2.5±0.6	3.3±0.9	3.7±0.9
	Australian Open Female	>23	170.3 ±3.5	57.9±1.1	2.4±0.7	3.3±0.7	3.7±0.6
Bourgois et al. (2001)	World Jr. Rowing Championship	17.5 ±0.8	175.2	70.1	3.1	3.4	2.6
Rodŕguez (1986)	World Championship	24.1±3.7	167.1	57.1±2.0	2.4±0.8	3.0±1.1	3.5±1.0
Adhikari and McNeely (2015)	Canadian	28.6±3.4	178.1 ±6.1	76.5± 8.0	3.1±0.5	4.1±0.6	2.3±0.7
Ackland et al (2002)	Junior		174.7±6.2	69.5±6.2	3.4	3.7	2.6
Arslanoglu et al. (2020)	Turkey	20.80+2.37	175.12+7.72	72.18±5.8	2.01±0.71	4.75±0.82	2.7±0.71
Present study	Indian National Female Rower	18-23	167.8±4.1	59.5±6.5	5.4±1.0	3.2±0.8	3.0±0.9

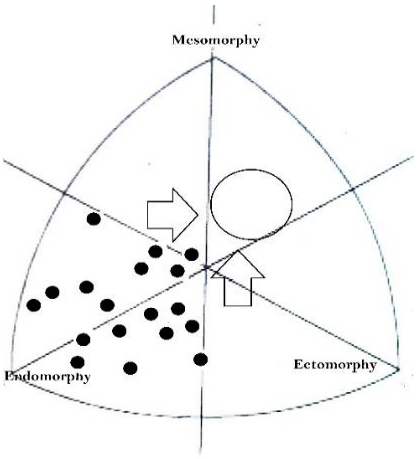

Figure 2. Somatotype of Indian female Rowers

Discussion

The average height of the Indian national-level Female Rowers was 167.8 ±4.1 (160.7-174.0) cm with a range in between 160.7 cm and 174.0 cm. When compared with International level Rowers from different countries, Indian female rowers were shorter than their international counterparts (Table 3). Even most of the Indian Rowers were comparatively lighter than their international counterparts of different countries (Table 3). Success in Rowing depends on the rower's physical characteristics including height and weight besides other physiological, biomechanical, and psychological factors during competition. Thus, shorter height along with corresponding short limbs might be a reason for poor performance of Indian Female Rowers in the International arena like Olympic and Commonwealth Games.

Ectomorphic Mesomorph body type with high mesomorph component may be one of the important and required Physical demands for good performance in Rowing. For generation of more power during rowing, sufficient muscle mass with rich ATP-CP system along with developed anaerobic and aerobic power are needed (McArdle and Katch 2010). In the present study, average somatotype of the Indian national female Rowers was Mesomorphic Endomorph with below-average mesomorphic component (Table 1). All Rowers were in Endomorphic zone of the Somatochart, of which 50 percent of them were in Ectomorphic Endomorph zone with very poor muscularity whereas 50 percent female Rowers were in Mesomorphic Endomorph with less muscularity. In average all Rowers had less muscularity. Thus, poor performance of Indian Female rowers in all events might be due less muscularity along with required body type in terms of Somatotype. Foe better performance, one has to select ideal anthropometric body type during selection trial at the time of inclusion in the game otherwise improvement in performance scenario in Olympic and other international arena by Indian female Rowers cannot be possible.

Conclusion

Thus, it might be concluded that for change the present performance scenario of Indian female Rowers in Olympics, anthropometrical aspects should be considered first at the beginning of inclusion and training.

References

Ackland, T., Kerr, D., Hume, P., Norton, K., Ridge, B., Clark, S., Broad, E., Ross, W. (2002). Anthropometric normative data for Olympic rowers and paddlers, *Sport Medicine Australia,* Melbourne, Australia.

Adhikari, A., McNeely, E. (2015). Anthropometric Characteristics, Somatotype and Body Composition of Canadian Female Rower, *American journal of Sports Science*. 3(3): 61-66. https://doi.org/10.11648/j.ajss.20150303.15

Akça, F., Akalan, C., Koz, M., Ersoz, G. (2010). İnvesgation of oxygen consumption and lactact e profiles in Turkish Elite Jjunior Rowers*. Spormetre The Journal of Physical Education and Sports Sciences,* 13(2): 77-80.

Arslanoğlu, E., Acar, K., Mor, A., Baynaz, K., İpekoğlu, G., Arslanoglu, C. (2020). Body Composition and Somatotype Profiles of Rowers. *Turkish Journal of Sport and Exercise /Türk Spor ve Egzersiz Dergisi,* 22(3): 431-443.

Bourgois, J., Claessens, A.L., Janssens, M., van Renterghe, B., Loos, R., Thomis, M., Philippaerts, R., Lefevre, J., Vrijens, J. (2001). Anthropometric characteristics of elite female junior rowers, *Journal of Sports Sciences.* 19 (3): 195-202. https://doi.org/10.1080/026404101750095358

Carter, J.E.L., Aubry, S.P., Sleet, D.A. (1982). Somatotype of Montreal Olympic athletes. *In Physical structure of Olympic athletes, Part I. the Montreal Olympic games Anthropological project*, Basel, Karger, 16: 53-80. https://doi.org/10.1159/000406781

Carter, J.E.L., Heath, B.H. (1990). Sport and Physical Performance, in Somatotyping -Development and Applications, *Cambridge University Press*, Cambridge, 266-267.

Damjan, M., Grgantov, Sc. Z., Mirjana, M., Erceg, Sc. M., Hrvoje, S. (2013b). Somatotype Differences in young Croatian Rowers and soccer players, *International Journal of Scientific Research.* 2(10).

Eiben, O.G., Bodzsar, E.B. (2002) Children and youth at the beginning of the 21st centuries: Humanbiologia Budapenstinensis. 27: 59-165

Hebbelinck, M., Ross, W.D., Carter, J.E.L., Borms, J. (1980). Anthropometric Characteristics of female Olympic rowers. *Canadian Journal of Applied Sport Sciences*, 5(4): 255-262.

Jakovljević, V., Bošnjak, G., Pašić, G., Tešanović, G. (2022). Roll of Somatotype in Sport selection. Acta Kinesiologica, 16(1): 84-92. https://doi.org/10.51371/issn.1840-2976.2022.16.1.11

McArdle, W.D., Katch, F.I., Katch, V.I. (2010). Exercise Physiology: Nutrition, Energy, and Human Performance, *Lippincott Williams & Wilkins*, USA.

Mészáros, J., Mohácsi, J. (1982a). The somatotype of hungarian male and female class I paddlers and rower. *Anthropologiai Közlemények*, 26(1-2). 175-179.

Rodriguez, F.A. (1986). Physical structure of international lightweight rowers. *Kinanthropometry III, London*. 255–261.

Ross, W.D., Ward, R., Leahy, R.M., Day, J.A.P. (1982). Proportionality of Montreal athletes. *In Physical Structure of Olympic Athletes, Karger,* 16: 81-106. https://doi.org/10.1159/000406782

Slater, G.I., Rice, A.J., Mujika, I., Hahn, A.G., Sharpe, K., Jenkins, D.G. (2005). Physique traits of lightweight rowers and their relationship to competitive success, *British Journal of Sports Medicine.* 39: 736-741. http://dx.doi.org/10.1136/bjsm.2004.015990

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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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