JPHSM: Volume 1: Issue 1, December-2018: Page No: 16-22

Journal of Physical Health and Sports Medicine

Research Article Open Access

Circus Student-Artists Anthropometric characterization; Preliminary study

Hassen HAKIM[1*], Frédéric PUEL[1], Nicolas FORESTIER[2] and William BERTUCCI[1]

[1]Laboratoire Performance Santé Métrologie Santé (PSMS EA 7507), Université de Reims Champagne-Ardenne, France.
[2]Laboratoire Interuniversitaire de Biologie de la Motricité (LIBM), Université Savoie Mont Blanc (USMB), France.

***Correspondig Author:** Hassen HAKIM, Laboratoire Performance Santé Métrologie Santé (PSMS EA 7507), Université de Reims Champagne-Ardenne, France, 34 Boulevard Victor Hugo 51100 Reims/France. Tel: +33686622883; Email: hakimhassen@yahoo.fr

***Received Date:** Dec 08, 2018 / **Accepted Date:** Dec 18, 2018 / **Published Date:** Dec 19, 2018*

Abstract: The purpose of our study was to establish a circus student-artist anthropometric characterization allowing for their classification among the different activities or sports discipline and to know if they present specific morphological adaptations due to their practices.

Methods: Thirty healthy adults (13 women and 17 men, 22.5±2 years, 170.1±6.4 cm, 64.5±7.5 kg) participated voluntarily in this study. These student-artists were divided into two groups: 15 aerials (dangling trapeze, stated trapeze, outfielders, Chinese mast, aerial fabrics, aerial webbing, smooth rope, and flying rope) and 15 non-aerials (banquine, bascule, carried acrobatic, cyr wheel, acrobatics, and acrobatic juggling). Biometric measurements of all body segments were collected.

Results: There was a significant difference in body anthropometric measurements between the two groups (height, arm span and waistline). Non-aerials were characterized by a slightly prominent vertical development of the skeletal frame and showed a mesomorphic-ectomorphic somatotype, while the aerials presented a balanced mesomorphic type.

Conclusion: The circassians showed an anthropometric adaptation according to their activity types but in general, and all activities combined, they remain smaller than the average man. This could be an anthropometric feature to meet the specific functional requirements of this activities type.

Keywords: Anthropometric characterization; Circus student-artists; Aerial; Non-aerial

Cite this article as: Hassen H, Frédéric P, Nicolas F, et al. 2018. Circus Student-Artists Anthropometric Characterization; Preliminary study. J Phy Hea Spt Med. 1: 16-22.

Circus Student-Artists Anthropometric characterization; Preliminary study

JPHSM: Volume 1: Issue 1, December-2018: Page No: 16-22

Introduction

For decades it has been scientifically proven that the morphological aspect has a very important impact on sports performance, the predisposition to an activity more than another and determines in a few cases the categories of competitions [1]. Therefore, the need to learn about anthropometric characteristics and to have reference values specific to sport is a crucial step when studying a well-defined sport population in order to establish specific anthropometric profiles and to be able to locate them among other sports and disciplines.

Problematic

In the current study, the objective was to establish and study the anthropometric features of student-artists of the National Center for Circus Arts of Châlons en Champagne (France) so as to provide a more specific outline of the morphological and functional biotype best suited to the specific technical requirements of circus artists. This assessment and characterization combined with field observations will broaden our knowledge on the conditioning and physical condition of student-artists.

Method

Subject

Thirty healthy adults (13 women and 17 men, 22.5±2 years, 170.1±6.4 cm, 64.5±7.5 kg) registered in the Higher National Diploma of Circus Artist in National Center for Circus Arts of Châlons en Champagne (France) participated voluntarily in this study. These student-artists were divided into two groups: 15 aerials (dangling trapeze, stated trapeze, outfielders, Chinese mast, aerial fabrics, aerial webbing, smooth rope, and flying rope) and 15 non-aerials (banquine, bascule, carried acrobatic, cyr wheel, acrobatics, and acrobatic juggling).

Protocol

Biometric measurements of all subjects were collected, by a researcher in human biomechanics, referring to External Anatomical Articular Landmark in accordance with the De Leva [2], measuring table: head (vertex, 7th cervical), trunk (7th cervical, greater trochanter), arm (acromion, head of radius), forearm (head of radius, head of ulna), humerus breadth (the width between the medial and lateral epicondyles of the humerus with the elbow flexed to 90 degrees), hand (head of ulna, the apex of the major finger), thigh (greater trochanter, tibial lateral condyle), shank (tibial lateral condyle, lateral malleolus), femur breadth (knee bent at a right angle, we measure the greatest distance between the lateral and medial epicondyles of the femur) and foot (lateral malleolus, floor). The waistline was measured at the last floating ribs. The upper limbs refer to the sum of arms, forearms and hands. The lower limbs refer to the sum of thighs, shanks and feet. Arm span was measured in a position with arms horizontally outstretched in the extension of the body with the back against the wall. Segments measurements were carried out using a wooden board (*robé+ medical*), caliper (*Harpenden*), a square and a measuring tape (*HOLTEX+*). Weight was obtained using a digital scale measuring to the nearest 100g.

The method of obtaining the anthropometric somatotype was by means of following equations [3]:

- The equation to calculate mesomorphy is:
(mesomorphy=0.858×humerus breadth
+0.601×femur breadth
+0.188×arm circumference
+0.161×calf circumference-0.131×height+4.5.)
- Two different equations are used to calculate ectomorphy according to the height-weight ratio (HWR), which is equal

to the height divided by the cube root of weight:

If HWR is greater than or equal to 40.75 then
ectomorphy=0.732 HWR-28.58
If HWR is less than 40.75 but greater than 38.25 then
ectomorphy=0.463 HWR-17.63
The preceding equations, derived from data used by Heath and Carter [4], use metric units. For ethical reasons, we were not able to measure the skin folds, and therefore the endomorphy was not calculated.

Statistics

All data are presented as mean±standard deviation. The assumption of normality and sphericity of the data was verified by the Shapiro-Wilk test. All data followed a normal distribution and the paired T test was used to evaluate the differences between the two groups (aerial and non-aerial student-artists). The significance level was $p \leq 0.05$.

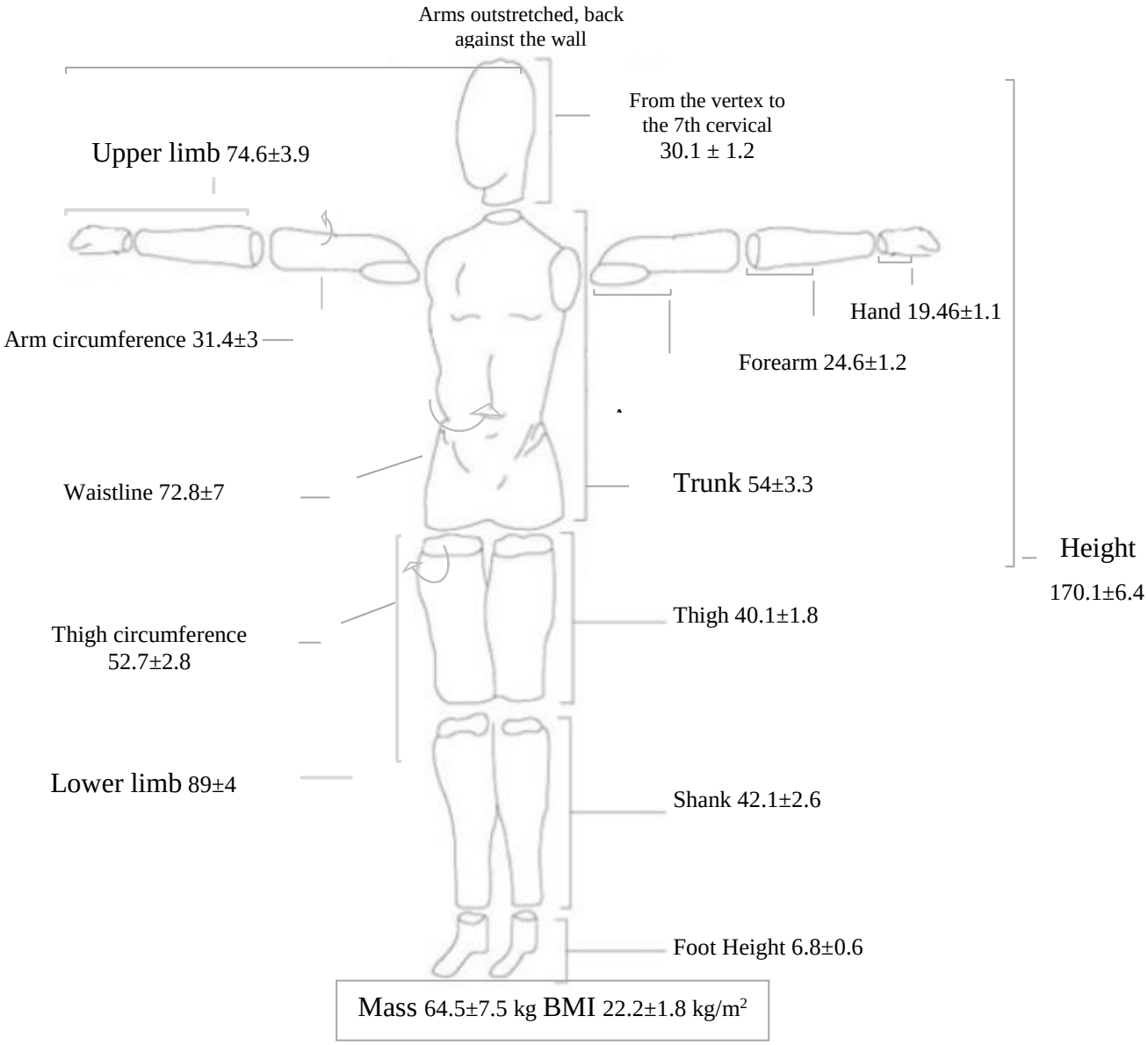
Results

Anthropometric measurements showed significant differences between the measurements of the two groups about the height (aerials: 167.5±4.1; non-aerials: 172.4±7.3; $p<005$), the arm span (aerials: 170.4±5; non-aerials: 177±9.8; $p<0.05$) and the waistline (aerials: 70.1±8; non-aerials: 75.5±4.7; $p=0.05$). Also, a significant difference in arm circumference was observed in non-aerials between left arm (LAC) and right arm (RAC) (LAC: 31.93±3.26; RAC: 32.46±3.26; $p<0.05$), but not in the aerials. The other measurements did not show any significant differences and are presented in table 1. These results allowed us to establish a specific anthropometric profile of a National Center for Circus Arts of Châlons en Champagne student-artist as described in Figure 1.

No statistically significant differences emerged from comparisons between the average values for the two somatotype features of the two groups (Table 2).

JPHSM: Volume 1: Issue 1, December-2018: Page No: 16-22

Figure 1: Anthropometric characteristics of student-artists.



The values of Anthropometric measurements (cm)

JPHSM: Volume 1: Issue 1, December-2018: Page No: 16-22

Table 1: Average of Anthropometric measurements of student-artists by type of activity.

Measurements	*Aerial*	*Non-aerial*	Significant difference (p≤0.05)
Height (cm)	167.5±4.1	172.4±7.3	p=0.01*
Mass (kg)	62.5±5.8	66.4±8.7	p=0.11
BMI (kg/m²)	22.2±1.6	22.3±2	p=0.80
Arm span (cm)	170.4±5	177±9.7	p=0.04*
Trunk (cm)	53.7±3.5	54.3±3.3	p=0.44
Waistline (cm)	70.1±8	75.5±4.7	p=0.05*
Upper limb (cm)	73±2.9	76.1±4.3	p=0.06
Arm (cm)	29.9±1.7	31.9±3.4	p=0.21
Arm circumference (cm)	30.9±2.4	31.9±3.4	p=0.27
Forearm (cm)	24.1±1.2	25.1±1.2	p=0.02*
Hand (cm)	19±0.8	19.9±1.3	p=0.07
Lower limb (cm)	88±3.8	90±4.1	p=0.30
Thigh (cm)	40.3±2.1	39.9±1.6	p=0.62
Thigh circumference (cm)	53.1±2.6	52.4±3.1	p=0.65
Shank (cm)	41.1±2.3	43±2.6	p=0.10
Calf circumference (cm)	37.4±1.7	37±2.3	p=0.64
Foot height (cm)	6.6±0.6	7.1±0.6	p=0.05*
*significant differences between the two groups (p≤0.05).			

Table 2: The two treated components of somatotype.

Somatotype	*Aerial*	*Non-aerial*	Significant difference (p<0.05)
Mesomorphy	3.8±1	3.3±1.3	P=0.40
Ectomorphy	2.4±0.7	2.7±1	P=0.49
Values are mean±SD.			

Discussion

Anthropometric measurements showed us that non-aerial student-artists are significantly taller, wider in terms of arm span, and do not as thin a waistline as aerial ones. They were able to expand their right arm circumferences, therefore their right biceps, compared to their left arms, this not being observed in the aerials. This demonstrates specific muscular adaptations due to the activity types. The non-aerial group showed a mesomorphic-ectomorphic somatotype while the aerial presented a balanced mesomorphic type. This characterization is similar to that performed by Giampietro et al. [5], who observed a greater development of the vertical physical build of karate atthletes. This study shows that elite athletes was also highlighted by the average somatotype (mesomorphic-ectomorphic) as compared to that found for amateurs athletes (i.e., balanced mesomorphic). They mention that a slenderer physique may affect karate performance positively, so that long-limbed and small- to medium sized subjects are most likely to achieve the best sporting results. This

better symmetry in the aerials can be explained by the fact that they solicit in the same way both arms when they are on their apparatus and that their smaller bodies are easier to control, unlike non-aerials who often have a favorite side that they solicit more than the other. They tend, once a successful technique has been established, used the repeatedly preferred leg and hand to ensure consistency and reliability of performance [6]. Sadeghi et al. [6], identified that once limb preference is developed, the dominant or preferred limb has been conditioned for mobilization during the movement, while its counterpart acts as a stabilizer.

This observation shows the unilateral adaptation specific to non-aerial activities induced by the partial use of a limb as active and its opposite as a supporting limb during the execution of different exercises (balances, turns, imputations) by student-artists [7,8]. These results could have practical implications for training and, depending on the type of activity, show that student-artists adapt according to their morphological and physiological predispositions, which was the basis of their preselection and one of the main factors allowing the adaptation to workload of circassian activities.

In terms of general segmental characteristics, student-artists, all specialties combined, rank below standard norms put in place by De Leva [2], regarding the length of arm, forearm, trunk and thigh, above the standards for the leg and in the standards for the hand. These specific anthropometric characteristics are important determinants for a successful performance in contemporary artistic and acrobatic activities [8].

Conclusion

Circassians show a morphological adaptation according to the nature of their specialties. It can be concluded that aerial artists are smaller, thinner and less wide than non-aerials, and that in terms of general anthropometric characteristics, circassians, all specialties combined, have the arms, forearms, trunk and thighs smaller than the standards of the common man. These could be good criteria for screening and identifying talents among young contemporary artists.

Acknowledgment

We thank Mr. Frederick Dutent for his assistance in the writing and grammatical correction of this article. We also thank the National Circus Arts Center (CNAC), both the staff and the students, for their hospitality and collaboration, we finally thank the "*Région Grand Est"* and *"Châlons-en-Champagne Agglo".*

References

1. Claessens AL, Veer FM, Stijnen V, et al. 1991. Anthropometric characteristics of outstanding male and female gymnasts. J Sports Sci. 9: 53-74. Ref.: https://bit.ly/2GmBuHI
2. De Leva P. 1996. Adjustments to Zatsiorsky-Seluyanov's segment inertia parameters. J Biomech. 29: 1223-1230. Ref.: https://bit.ly/2QAmlaz
3. Carter JEL. 2002. Part 1: The Heath-Carter anthropometric somatotype-instruction manual. HtthcmvwsomatotypeorgHeath-CarterManual Pdf Retrieved 31 Janu-Uary. 3-4.
4. Heath BH, Carter JEL. 1967. A modified somatotype method. American Journal of Physical Anthropology. 27: 57-74. Ref.: https://bit.ly/2Er4o7a
5. Giampietro M, Pujia A, Bertini I. 2003. Anthropometric features and

bodycomposition of young athletes practicing karate at a high andmedium competitive level. Acta Diabetol. 40: 145-148. Ref.: https://bit.ly/2GkeRUA

6. Sadeghi H, Allard P, Duhaime M. 1997. Functional gait asymmetry in able-bodied subjects. Hum Mov Sci. 16: 243-258. Ref.: https://bit.ly/2EB9PRZ
7. Douda H, Laparidis K, Tokmakidis S. 2002. Long-term training induces specific adaptations on the physique of rhythmic sports and female artistic gymnasts. Eur J Sport Sci. 2: 1-13. Ref.: https://bit.ly/2EyoQnq
8. Douda HT, Toubekis AG, Avloniti AA, et al. 2008. Physiological and anthropometric determinants of rhythmic gymnastics performance. Int J Sports Physiol Perform. 3: 41-54. Ref.: https://bit.ly/2SRLxWU