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Somatotypy of algerian sportswomen, members of national teams

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Abstract :
This paper deals with the evaluation of the somatotype for selected sports. The method for determining and evaluating a somatotype according to Carter and Heath ischaracterised. The aim of the presentedpaperis to assessphysicalparameters of subjects groups in relation to selected sports (team sport, individual sport and combat sport). Based on the body constitution to determine the conditions for developing the physical condition and success in the appointed sports. The sampleconsist on 147 subjects of national teams, females, who are dedicatedathighlevel. The processesused for calculating the individual components : endomorphy, mesomorphy, ectomorphy are presented as well as a description of theseelements. The calculated components are subsequently put into a somatograph. The evaluation of a somatotype is of greatbenefit and offers a guideline with the selection of sportingactivities.
Key-words : somatotype, algerian sportswomen, national teams

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1. Introduction

The evaluation of a somatotype is of greatbenefit and offers a guideline with the selection of sportingactivities; itsubsequentlyhelpsassignathletesinto a suitable position wheretheywillbe able to best developtheir talents in view of theirbodily construction. In thisworkmany types of sports are evaluated : team sports, individual sports and combat sports. The selection of the presented sports was made with regard to the differentrequirements and demands of national teams. The aim of the presentedpaperis to assessphysicalparameters of subjects groups in relation to selected sports, based on the body constitution.The achievement of the highestsportingsummits, in addition to passingthrough the greatesttechnical and tacticalmastery, alsodepends on a multitude of factors as important as eachother(Bounemri and al. 2011).The use of morphologicalparametersis of greatinterestboth for the coaches during theindividualization of the training and for the selection of playerswithin the national team,particularlybecause of the relationshipbetweenthese profiles and performance (Wilmore,1983 ; Mimouni. 2015). Amongotherthings, the knowledge of morphological profiles in sport, allows us toindividualize the training of athletes, the controls of the effects of training on the body and the elevation of performance.

According to J.E.L Carter (2009) the concept of morphological optimization is a reflection of the selection procedures, the state of training, and the selection of young male and female sports talents. Sports models are quite rare and we cannot refer to those of male athletes, given their differences; «the physique of the man differs considerably from that of the woman… etc." (Mc Ardle, 1996).According to G.Olivier(1961) two facts dominate the morphology of the woman, both related to the functioning of the genital glands, as well as the development of the breasts and the inhibition of the hair. :

- Early puberty stops structural growth and changes proportions.
- The enlargement of the pelvis in relation to parturition gives the trunk a characteristic appearance.

In Algeria, a very few morphological studies were aimed at determining morphological profiles in the different sports specialties among our athletes of different algerian national teams (Bounemri S. and al. 2011).

In this sense, we propose to study the morphological characteristics of algerian womenathletes, members of national teams in order to develop a morphological profilespecific to each sport discipline (Sadouki K., 2017).

So we asked ourselves the following questions :

- What is the morphological profile of the algerian female elite?
- Are there morphological differences within our sample practising different sports ?

For this purpose, we assume that knowledge of morphological parameters, somatotypes andmorphotypes leads to the detection of shortages and deficiencies in sports training and helpsin the selection of young talents for each corresponding sport discipline, achieving a new generation of elite athletes.

Literature Review :

Several modelling studies have been carried out to determine the profiles of different sportdisciplines (Boulgakova, 1978 ;Pineau, 1987 ; Claessens, 1987; Asli and al. 2014). Often these profilesare established for male athletes. Analysis of theliterature has shown that there is a lack of informationexplaining the developmental pattern of high profile athletesin relation to different expressions of the human somatotype. The quantification of morphological characteristics of high profile athletes can be a key aspectof relating body structure to sports performance (Orhan and al. 2013). Analysis ofthe latest literature comparing anthropometric variables andsomatotypes clearly illustrates that specific functional require-ments produce differences in the anthropometric variables ofthe human body (Liiv and al. 2013).

2. Method and Materials

The aim of this research is to study the morphological characteristics of the Algerian sports team members in order to determine the somatotype profile of each sport.

Participants

The experimental population iscomposed of 145 adult Algerian athleteswho are members ofthe national women's teams practicingdifferent sports. This population isquiteheterogeneous in terms of physicalactivity. Theseathletes are qualified as well-trainedsubjects..

The characteristics of the sample are represented in the tables below :

Table 1: Individual sports

	Number of athletes	Average age (years)	Practice (years)	Average weight (kg)	Average height(cm)
Athletics	11	24.09	11.54	56.18	165.85
Rowing	2	23	5.75	58	164.6
Chess	6	19.67	9.83	56	164.65
Gymnastics	2	13	6.75	37	142.15
Swimming	8	19.88	14.5	60.87	168.31
LawTennis	3	20.33	14	62.66	161.5
Table tennis	3	21	10	68.2	153.3
Archery	7	27.43	3	68.28	162.12
Sail	6	14.5	4.58	46	155.95
Cycling	7	17.86	7	51.86	161.5

Table2 : Team Sport

	Number of athletes	Average age (years)	Practice (years)	Average weight (kg)	Average height(cm)
Basket ball	12	23.15	11.53	67.09	173.44
Hand ball	12	23.42	12.83	68.5	170.11
Volley ball	13	22.54	12	67.46	172.8

Table 3 : Combat sports

	Number of athletes	Average age (years)	Practice (years)	Average weight (kg)	Average height(cm)
Fencing	10	25.00	10.7	60.9	163.58
Judo	14	23.86	11.85	64.14	163.35
Karate	11	22.23	11	56.33	162.26
Wrestling	10	21.1	9.1	62.35	161.6
Taekwondo	8	22.75	7.75	58.25	163.66

We used the anthropometric method which allowed us to have the measurements of themorphological characters of the body, such themeasurements of lengths, diameters and circumferences of the segments as well as thecalculation of the indices specific to each discipline.
To establish the somatotypes, weused the Heath-carter Antropometric Somatotype (Duquet and Carter, 2001 ; Heath and Carter, 1990 ; Philipaerts, 2002). The technique of somatotypingisused to appraise body shape and composition. The somatotype isdefined as the quantification of the presentshape and composition of the human body.

The Heath-Carter method of somatotypingis the mostcommonlyusedtodaywiththree components :

Ectomorph: the slim and thintype, fragility, weakbones and musculature, anterodorsaldiameterssmall, slopedshoulders, a relatively short torso, relatively long limbs, a flat and narrow thorax, roundedarms, weakthighs and arms, fragile and long fingers, weak dry skin. (Carter and Heath, 1990).

Endomorph: The chunky type with a large number of fat cells, roundedshapes, the appearance of softer musculature, the circumference of the waistislargerthanthat of the thorax, a large head, a wide face, short neck, roundedfeatures of the shoulders, relatively short and weaklimbs and fingers, relativelystrongbones. (Carter and Heath, 1990).

Mesomorph: the muscular type with a strongskeleton, sharp musculature relief, broadshoulders and thorax, muscularlimbs, good posture, medium fastenergeticexpenditure. Reacts to strength training withrapid accumulation of muscle mass (Carter and Heath, 1990).

The assessment of somatotype involved the measurementof 16 somatotype parametersusing standard methods andlicensedanthropometric instruments (Ross et al. 1991).Anthropometricmeasurements for thisworkwereperformedusing basic anthropometric techniques established by Weiner and Lourie (1981); Ross and Marfell-Jones (1988) and ISAK (2000). The following table illustratesthe differentmeasurementstaken on all sports teams :

Table 4 : The different measurements performed on the subjects.

Mensuration	Nomination
Total parameters	Age, Height, weight
Hauteurs du corps	Body heights of morphological landmarks relative to the ground
Body widths	Biacromial, bicretal, antero-post thorax, trans. chest, diameters of the thigh, leg, arm, forearm, hand, head and neck
Body Circumferences	Circumferences of the body Chest (resting,maximum breathing, maximumexhalation),abdomen,pelvis,arm (contracted,relaxed), forearm, thigh,leg,head,neck.
Skinfolds	Skin folds Scapular, pectoral, bicipital, tricipital, forearm, hand, belly, supra-illiac, thigh, leg

Somatotype werecalculatedusing the Heath-Carter decimalequations (Carter J.E.L ; Heath B. 1990).In somatotype calculations, triceps, subscapular, supras-pinale and calf skinfoldthickness, humerusbicondylar, femurbicondylar, biceps circumference, calf circumference, andbodyweight and heightwereused. For a quantitativedescription of each somatotype the endometric, mesometricand ectometric indices werecalculated.

StatisticalAnalysis : The statistical technique is a mathematicalanalysiscarried out on the data collected to allowus an objective interpretation of the results of the tests recorded on the subjects. For betteraccuracy of the calculatedresults, weused EXCEL 2003 and STATISTICA 0.6

Results of somatotypes of Algerian womenathletes:

Individual sports: Based on somatotype calculations, we look that :
- the swimmers are endo-mesomorphic
- the tenniswomen are meso-endomorphic

- the cyclists, athletes, windsurfers and rowers are mesomorphic
- the table tennis, archery and chessathletes are endomorphic;
- Ecto-mesorphicare the gymnasts.

Fig N°1: Heath-Carter Mean Values of Individual Sports Components

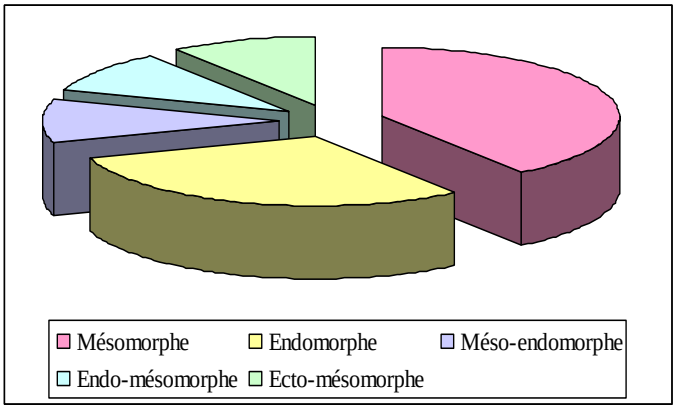


Table N° 4 : Mean values of Heath et Carter components :

	Endomorphy	Mesomorphy	Ectomorphy	Morphotype
Cyclism	2.70±0,97	1.50±0,45	3.10±0.98	Mesomorphic
Athletics	2,50±0,55	3.30±0,40	3.00±1.01	Mesomorphic
Rowing	3.00±1,77	2.40±1,06	2.50±1.41	Mesomorphic
Table Tennis	6.00±0,29	4.80±1,13	0.50±0.28	Endomorphic
Law Tennis	4.50±1,041	4.10±0,66	1.20±1.44	Méso-endomorphic
Archery	6.40±1,44	4.90±0,57	0.70±0.61	Endomorphic
Chess	4.70±2,10	2.90±0,37	2.90±1.18	BalancedEndomorphic
Gymnastics	1.70±0,71	3.80±0,17	2.60±1.06	Ecto-mesomorphic
Sailing	3.10±1.26	3.60±0.42	3.30±2.04	Mesomorphic
Swimming	3.4±0,68	4.5±0,92	2.7±1.06	Endo-mesomorphic

Individual groups of elitesportsmen displayed different modes of somatotype. The rowers, the sailors, the cyclists and the athletes were predominantly mesomorphic; the tennis-tble players and the archery players mostly endomorphic ;the swimmers, most often endo-mesomorphic. The gymnasts were ecto-mesomorphic.

Team sports:

The somatotypes of the Algerian womenathletes, show that the basketball players and the volleyball players are of the endomorphic type and the handballers of the meso-endomorphic type.

Fig N°2: Heath and Carter Mean Values of Team Sports Components

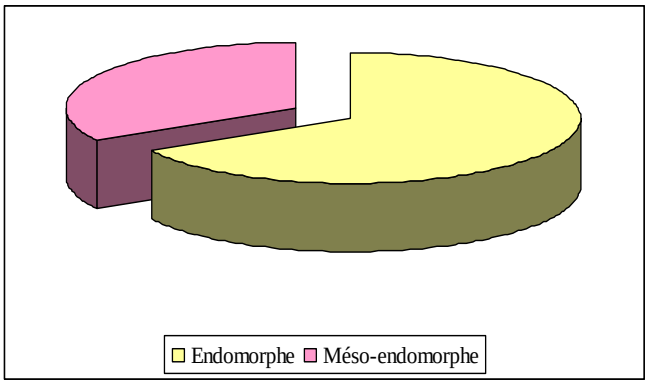


Table 5: Mean values of components according to Heath and Carter somatotype:

	Basketball	Volleyball	Handball
Endomorphy	3.7±1,21	4.1±0,61	3.8±1,47
Mésomorphy	0.9±0,59	1.8±0,61	4±0,51
Ectomorphy	2.7±1.00	2.5±0.47	1.9±0.87
Morphotype	Endomorphic	Endomorphic	Endo-mesomorphic

Mesomorphy could also be used to predictsport ability. The range of meso-endomorphy for elite handballers was 3.8-4 ; th range of endomorphy forbasketballplayers was3.7 and for volleyball players 4.1.

Combat sports:

Somatotypyresultsshare combat sports in two groups :

• Endo-mesomorphs: includesfemalewrestlers;

• Meso-endomorphicincludes and fencers, judokates, karatekas and taekwendoists.

Fig N°3: Mean component values according to Heath and Carter of combat sports

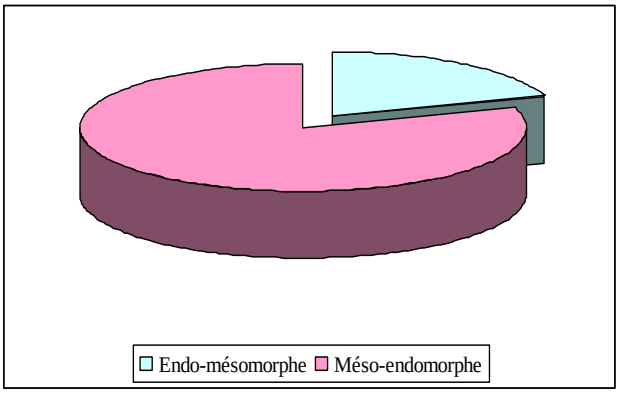


Table N°6: Meanvalues of componentsaccording to Heath and Carter

	Endomorphy	Mésomorphy	Ectomorphy	Morphotype
Karate	3.00±0,63	2.70±0,72	2.40±0.95	Meso-endomorphic
Taekwondo	3.10±1,19	2.50±0,41	2.30±0.82	Meso-endomorphic
Judo	3.50±1,38	3.00±0,48	1.30±0.66	Meso-endomorphic
Fencing	3.90±1,52	3.30±1,36	1.90±1.13	Meso-endomorphic
Wrestling	3.80±0,88	5.10±0,80	1.30±0.61	Endo-mésomorphic

Discussion :

Studies on the anthropometriccharacteristics of athletes have a long history, but there are fewpublishedreviews on the womensomatotype of combat sports, team sorts and individual sports. Practitioners and professional coaches can gain guidance fromimprovedunderstanding of the ideal body constitution and the impact of high-intensity training sincepreadolescence on body build. The presentpaperisdesigned to providethis information.

The somatotypingmethodisespeciallyhelpful in sports in which the body coulddirectly influence the biomechanics of movements and the performance'sresults. The resultsemphasize the need for a specific somatotype to reach an elitelevel in sport and the need to integrate the somatotype analysisbetween the scientific instruments for selecting talent.

All combat sports are meso-endomorphic, with a highmesomorphy in wrestlers. The teamsportathletespresent an important component endomorphic. Wethinkthat the charge of training are low to develop the muscular component.

In indivudual sport, the swimmers are endo-mesomorphic, the tenniswomen are meso-endomorphic, the cyclists, athletes, windsurfers and rowers are mesomorphic, the table tennis, archery and chessathletes are endomorphic and the gymnasts are ecto-mesomorphic.

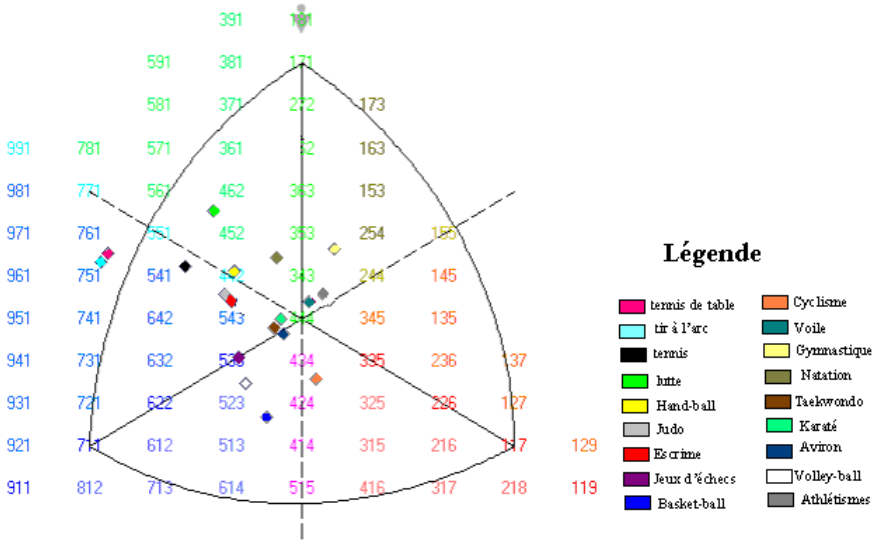
It wasinterestingthat the athletes of the elite groups,demonstrated agreatervariability of somatotypes. Probablyitmaybe dueto the large variety of individual somatotype ratios of highprofile athleteswhobelong to the samekind of sport.

Thus, thisstudy, as well as those of otherauthors has founddifferent somatotype ratios atwhich sportsmen excel indifferent sports. The resultsemphasize the necessity for a specific somatotype to reach a high profile in the selected area of sport as hasalsobeen stressed by otherauthors (Massida and al. 2013, Wilber and al. 2012, Sodhi. 1991). Furthermore, theresults show the needs and requirements for suchmorphometricorientedstudies in these and other sports with animportance of differentiation by age and sex. While the classic Heath Carter protocoliswidelyusedin elite and mass sports (Purenović-Ivanović et al. 2014, Ramirez-Velez et al. 2014), future experimentalwork in this area isdesirable to enrich data fromotherkinanthropometricapproaches. For instance body size measurementsmaybeadvantageous to calculate vertical andcircumferentialproportionality (shapes) of the body whichought to bespecific

to some sports. Additional informationabout arm lengths and hand span as well as leglengthswouldbefurthermoreuseful for a large variety ofsport and athleticpursuitsincluding; basketball, volleyball, and rowing.

Plotting the somatotype : Traditionally, the three-number somatotype rating isplotted on a two-dimensionalsomatochartusing X,Ycoordinatesderivedfrom the rating. The coordinates are calculated as follows: X = ectomorphy – endomorphy Y = 2 x mesomorphy - (endomorphy + ectomorphy) These points on the somatochart are calledsomatoplots

Fig N°4 Somatotype of algerianathleteson the somatocarte:



Conclusion

The high performance of trained by athletesmakesitnecessary to evaluate the body capacity and the individualcharacteristics of eachathlete. The resultscan serve as a basis for more accurate andpurposelyfocused management of the training process.Morphometricparameters of the body and the athlete'scorevalues of the partial somatotype indices canbeuseful markersof the correctness of the chosen coaching techniques.The resultsobtained show the need for similarstudies inother sports with a greaterdifferentiation of athletes in termsof age, sex, and initial individualmorphometric indices.

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Tableau 1

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Figure 1

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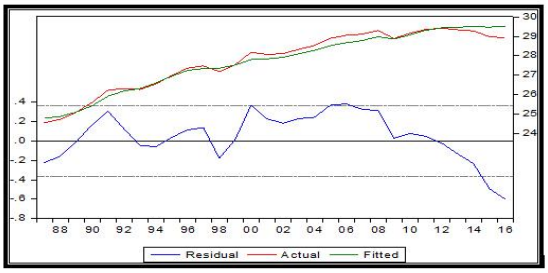

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4. Résultat et discussion

Discuter les résultatsobtenus ……..

5. Conclusion

La conclusion comprendun bref résumé des résultats obtenus par le chercheur en proposant des solutions et en formulant des recommandations et des perspectives futures en fonction de la nature de l'étude donnant naissance à un éventuel travail dans la même continuité du premier …….

Conflitd'intérêt(doitêtreécrit)(taille 12)

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