Somatotype profile, anthropometric variables, physical aptitude and motor behavior of juvenile athletes of female volleyball time from Ponta Grossa - PR

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ABSTRACT: This research aims to discover a somatotype profile according to the corporeal composition and to the physical performance through physical and motor tests respectively, in female athletes of the juvenile volleyball team from Ponta Grossa city (PR). 11 athletes with 15.9 years of mean age composed the sample. The participants can be characterized by having an endomorph-ectomorph somatotype profile alike to other studies found in the international literature on female volleyball athletes. Related to the physical fitness and motor performance we found mean values of 0.18m for hip flexion on a bank; 22.3 and 29.0 repetitions for arm flexion and abdominal resistance, respectively; 1.75m for horizontal jump; 6.59 sec for the square test of agility, and 1,840m for the 12 min running test. Relating the collected data in relation to the official performance of the team on competitions, we notice that to possess an ideal body somatotype similar to high performance patterns is not enough for the team to succeed on its sporting performance, if the variables that support their physical conditioning are not correlated in an efficient way for this acquisition.

Keywords: somatotype, physical fitness, volleyball.

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INTRODUCTION

Through the theory of the evolution is evident that the human physical phenotype, originating from of phylogenetics inheritances and of the adaptation process to the demands of the environment, it was molded to survive and to pass genes for the future.

This anatomical structure-function has become nowadays the object of study of many sciences, the social sciences emphasize its symbolic and relational aspect, as the biological and health sciences realize as the behavior and potential.

The Physical education while a science ruled into two very different epistemological roots the behavior while income and health and a symbolic as an education and socialization ultimately produce a comprehensive vision a little more global than in other areas of the knowledge.

This duality of the object of study on the Physical Education in I begin motivated a discomfort and certain “schizophrenia” feeling in the earliest science of the human movement, today raisin to have great value starting from the new perspective multidisciplinary of the scientific method.

In our civilizing process many taxonomies for the body was created and recorded. In ancient Greece, Hippocrates described these forms body in two names: “hábitus ptísicus” lean individual with predominance in the longitudinal axis and “hábitus appópticus” individuals with greater dominance in the axle transversal1, 2.

Later other taxonomies appeared. The Belgian mathematician Quetelet, was the first specialist to measure the human body allowing to quantify it. Soon afterwards Viola in 1919, based on statistical studies to measure, classify and to generalize the corporal forms.

From this union, was possible to analyze and understand the individuals’ aspects of body composition obtained with more scientific.

From studies of Viola, Nicola Pende proposes the concept of “Full Biotype” defining personality as expressed by the way, temperamen moral and functional, volatile character, intelligence, results of the inheritance morphological, physiological and psychological1.

Pende, considered that the biotype was related to characteristics of the individual physical fitness, and to the linked with cognitive and affectionate behavior, that for his/her time, they also influenced in the formation of the corporal structure. This more philosophical concept than I inform will suffer a great impact with the modern discoveries inform.

Pende considered that the biotype was related to physical characteristics of individual skills, and the factors related to their cognitive and affective behavior, which in turn, also influenced the formation of the body structure. This concept more philosophical concept than scientific suffer a major impact with the modern scientific discoveries.

In 1940 Sheldon, Steven and Tucker presented a progress in that philosophical discussion when showing hereditary components in the embryonic tissue origin allowing create bases for the concept of individuality biological2. Starting from then the perception of body starts to assume the distinction among what should be body or psyche in greek or mind in english.

Sheldon 1940 proposes the concept soma-type to replace the complete biotype of complete, as a way to separate aspects as the physical characteristics, big part originating from of a genetic inheritance of the own individual’s psycho-social characteristics. The current vision of soma-type of Carter and Heath refers to a characteristic based in just lines of the phenotype3 influenced by
the hereditariness, nutrition, level of physical stress or the capacity of training of each individual is exposed.

Carter and Heath consider soma-type as a semi-quantitative description in the existent relative way and of the human corporal composition and that is expressed by three numeral values representative of the physical component exposed always in the same order (endomorph, mesomorph and ectomorph).

The endomorph is characterized by prevalence in the abdominal volume, muscular flabbiness and small relative dimensions of the extremities. The mesomorphism is characterized by an accentuated muscular and bone development, with the thoracic measures they prevail on the abdominal ones.

The ectomorph is predominant for a fragility aspect, muscular hypotonic, thinness with the measures of the length dominating on the diameters and circumferences. The main idea would be to analyze the individual’s corporal composition and to already compare with sportmen’s models organized and structured. The classifications of these models would be numeric expressions with values of 1 the 7. From 1 to 2.5 they are considered low; 3 to 5 moderate; 5.5 to 7 are high; already the above 7.5 are higher3, 4.

In Brazil the soma-typology emphasizes the characterization on specific profile of athletes in several sporting modalities classifying them as each function or position in the tactics inside of the sport team, as well as to facilitate the search and selection of sporting talents1, 2, 5, 6.

Para Carnaval1, the soma-typology is used to describe the athletes’ physical characteristics, but with limits, for instance, it should not be indicated to point separately who would reach the best performance. Corroborating, Skinner6 emphasize that is not possible to predict who will be a sport champion, because the degree of response to their characteristics (genotype / phenotype) depends on other variables as the physical training, technician and tactical. Like this in an Olympic final, all of the finalists have very similar profiles amongst themselves, but will have only a winner.

We noticed like this that the studies on the human soma-type, doesn’t guarantee the understanding the whole process of the human physical acting in the physical performance, but it seems to be a good beginning.

With the production of more data and meta-analyses can control the influences of the soma-type variables in the sport acting. When describing the world champions’ soma-type we can facilitate the selection work and guidance of new sporting talents.

In individual and collective sports we found studies which try to understand this relation, as the one of Araujo5 with swimmers, the one of João7 with athletes of Olympic gymnastics, the one of Nogueira9 in the handball, the one of Levandoski and Queiroga10 in the indoor football/futsal and the one of Lentini, Salas Ramírez, Viviani & Baldi, Silva and Gaya11, 12, 13, 14, 15 in the volleyball, both in female athletes.

Among the collective modalities the volleyball characterizes as one of the most popular sports in the world. This modality at first, appeared with initiative of William G. Morgan in Holyoke Massachusetts, USA in 1895 as recreational activity to reach people with advanced ages and overweight, as a substitution of the basketball that imposed a heavier rhythm.

In Brazil it was diffused by some authors in 1915 for the Colégio Marista de Pernambuco. Today this sport is considered as the most collective among handball, indoor football/futsal and basketball, because to win one point is necessary three of the six athletes that compose the team. The objective of the game is to do the ball cross the net and falls in the court of the opposing team16.

With the improvement of the technical level and physical preparation of the volleyball athletes became necessary to emphasize the motor experiences prioritizing the technical refinement in the formation period and the development of the physical capacities as reaction speed, strength, flexibility and resistance.

Now Pontagrossense’s sport is occupying intermediate positions in the state scenery of official competitions. We noticed the necessity to find out which factors could explain the low performance of the teams in recent years. In this context we look for to investigate the profile soma-type of the athletes Pontagrossense of youth volleyball team in the year of 2006 has soma-typical characteristics, corporal composition and motor performance are similar to other athletes of this modality in level national and international.

**METHODOLOGY**

The research is characterized as descriptive non-probabilistic. The select sample was composed by 11 athletes female with ages between 15 and 17 years old, who belong to municipal selection of the volleyball modality that disputed the 20th Games Youth’s From Paraná (Jojup’s) final stage in the city Pato Branco in the year of 2006, with the collection realized 40 days before the competitive period.

The subjects were submitted to anthropometric tests, physical fitness and motor performance. The anthropometric evaluation was accomplished through Heater-Carter’s soma-type (anthropometric method), due to the simplicity of the technique, low operational cost and for being a technique not aggressive1, 17.

For the evaluation of the physical fitness motor performance was applied some tests of the battery of the Projeto Esporte Brasil (PROESP-BR). Regarding the physical fitness they were used tests of flexibility (to sit and reach), strength and abdominal resistance and also the test of arm flexing with support of the hands and knees to the ground proposed by Carnival1. Regarding the motor performance were realized the test of explosive force of lower members (horizontal jump stopped) and agility tests of the square, Test of race for 12 minutes proposed by Cooper(1978).

For analysis of the body composition were collected data regarding the mass, stature, systolic blood pressure, diastolic blood pressure, cardiac frequency in rest.

The necessary measures to the present study were obtained using the following instruments:

Following instruments: Balance with stadiometer of the Filizola brand, to determine the weight and height properly calibrated and measured a 100g precision and scale from 0 to 150Kg. A Skin-folds Compass of the Cescorf Scientific brand, manufactured
in Brazil and has 0.1mm precision to measure the thickness of the skin-folds.

A metal measuring tape flexible, with 2m of length and 0.1cm precision to assess the circumferences of the corporal segments. Pachymeter of Sanny brand, manufactured in Brazil with variation between 1 to 30cm and graduation of 1mm to evaluate the diameters of the corporal segments. Sphygomonometer of BD brand with metal bolt and stethoscope Rappaport Premium measuring in millimeter of mercury (mm/hg). Heart monitor of the Polar brand measuring in beat per minute (bpm).

The statistical analysis was accomplished through the software statistical SPSS version 13.0, using descriptive strategies to represent medium values; standard deviation, maximum and minimum.

### RESULTS

The results will be presented in three moments in agreement with the tables 1, 2 and 3, with the values of average, medium, deviate standard, minimum and maximum. In some variables we noticed a high standard deviation with the average values and medium moving away from normal curve. In spite of the distinction of these values the group presented homogeneous in most of the variables.

In the table 2, we find the variables related to tests of fitness and motor performance being evaluated as: flexibility (FLEX) in centimeters, flexed-arm (FBR) in repetitions per minute, abdominal resistance (ABD) in repetitions per minute, horizontal stopped jump(SHP) in meters, agility (AGL) in seconds and race for 12 minutes 12 min) in meters.

In the table 3 the values are presented regarding the characteristic soma-typical of the Pontagrossense’s team. The units of values of the endomorph, mesomorph and ectomorph don’t have specific measure.

### DISCUSSION

The discussion will also be presented in three moments, as mentioned previously.

In relation to the anthropometrics variables, the average of athletes’ body mass was 55.00kg with standard deviation oscillating between 7.72kg, and median of 52.0kg. Cambraia observed that for girls athletes of Brasilia with average age 14.88 years old a mass corresponding to 60.69 kg ± 9.34. Salas Ramirez for athletes of the selection Peruvian category minors (14 to 16 years) obtained average of 62.00kg ± 4.40Kg. Figueira Junior & Matsudo considered that the body weight influences in the fatigue of jumps, by that we noticed that the appraised athletes can show an advantage regarding staying in execution of these movements.

The athletes’ height with average of 1.71m ± 0.06 doesn’t differ in relation to the studies related: Cambraia, 18.21 ± 6.76; Salas Ramirez, 1.73 ± 0.04; Almeida & Soares, 1.74 ± 0.06. In the Montreal Olympics the Japanese athletes were champion of the competition with medium statures of 1.69m while the other competitors’ average was of 1.78m. Norton & Olds, showing that this variable didn’t influence significantly in the success of the team.

In relationship blood pressure systolic / diastolic and heart rate in rest were found medium values equal to 116 / 80 mm/hg and
92 bpm respectively. As Gaya\textsuperscript{26} the normal values for systolic blood pressure and diastolic are of 120/80 mm/hg, presenting a healthy blood pressure. FCR varies depending on each athlete’s physical condition. Hafen\textsuperscript{22} point a medium values from 60 to 100 bpm for normal adults. Levandoski\textsuperscript{23} propose that athletes should have the same FCR or inferior to 80 bpm due to the conditioning obtained with the physical training.

In relation to the capability and motor performance the flexibility obtained in the test of to sit and reach with support of the bench the average was equal to 0.18 ± 0.04 m. Gaya\textsuperscript{15}, with the five best teams of the Brazilian (final phase) Youth’s Brazilian Games (final stage) in the year of 1996, getting median values equal to 0.23 ± 0.06; showing that the group studied has similar performance.

A curiosity appears in the study of Lee\textsuperscript{24}, in athletes of the American adults selection, reports that one negative correlation exists between the vertical jump and hip flexibility (r = -0.54, p = 0.009). The result pointed that a better flexibility of the hip can induce negatively in the impulsion for the female athletes.

Regarding the strength of the superior members the average, median and standard deviation was of 22.3; 27.0; 8.6 repetitions. For Pollock & Wilmore\textsuperscript{25}, the average obtained in women between 15 - 19 years is 18 - 24 repetitions, and 25 - 32 for upper than the average. In this sample was observed that the average and median are in the established standard by the mentioned author. Already in the abdominal resistance initially was observed the values of Gaya\textsuperscript{15} still with the same group getting averages equal to 50.11 ± 8.40 repetitions per minute.

In our study we observed very heterogeneous values, (average, median, standard deviation and the minimum and maximum values) they disagree with among them, showing a low level in this variable which can be responsible for a decreased performance expected in the competition. The results of the stopped horizontal jump obtained indexes of relevance.

The average and standard deviation obtained, they reached superior values in all of the ages as compared with the referential of the table of PROESP-BR\textsuperscript{26}. The square test also presented a low performance. The average was among 6.59 ± 0.37 seconds, the referential Gaya\textsuperscript{26} indicates inferior values to 6.00 seconds to obtain a very good performance.

As this test evaluates the reaction speed, defines the reaction speed as “the speed with which an individual is capable to respond to the emergence of a stimulus”\textsuperscript{27}, the athlete should dominate this capacity because the displacement speed in short spaces plays a fundamental part in this sporting modality, because the athlete needs to be prepared to coordinate and to execute movements in fast fractions of seconds, to look for the ball and not to let to fall it, mainly in the foundations of defense.

In relation to the race of 12 minutes, the athletes traveled average distances of 1840.6 ± 162.2 meters. The results of\textsuperscript{18} verified much high values, the average and standard deviation equal to the 2.228 ± 221.22. Cooper\textsuperscript{28} classify this test in 6 level according to the distance traveled for women between 13 and 19 years.

The sample is at the level 2 possessing the classification with weak performance. For the group to reach the highest level in the test, the athletes should be with the superior averages distances of 2430 meters traveled in 12 minutes, showing that this group has one more negative variable in the fitness and motor performance.

In relation to the profile soma-type the literature exposes a diversification as for the quantitative results, but it follows a pattern in the qualitative classification, involving athletes of categories of younger and adult in the volleyball modality.

Our study had averages of (4.74 - 3.30 - 4.57) classifying as endomorph-ectomorph. Gaya\textsuperscript{15} with the same group described previously got equal averages (4.36 - 2.68 - 3.44) getting the same classification of our study. Sources S. paula\textsuperscript{29} in athletes with 15 years of the state of Minas Gerais (4.87 - 2.37 - 2.88) balanced-endomorph differentiating slightly in relation with the second and third component, but maintaining the 1st component as dominant. Viviani & Baldini\textsuperscript{13} with Italian athletes minor than 18 year-old in the amateurs’ position obtained average results (4.9 - 3.8 - 2.6) and (4.7 – 3.9 – 2.3) for adult athletes, concluding there not to be significant difference among the both groups, classifying them as meso-endomorph. Salas Ramirez\textsuperscript{12} with athletes in the Peruvian selection up to 16 years (3.0 – 2.5 – 3.5) classified as balanced ectomorph. Esper\textsuperscript{30}, for Argentinean athletes of the first division obtained averages (4.5 – 2.8 – 2.9) classifying as endomorph-balanced in study with girls between 7 to 17 years pointed out that the endomorphic is the component that that possessed medium adult in all of the ages. Lentini\textsuperscript{11} accomplished a study with 32 sporting modalities in Argentina, and the volleyball obtained indexes (3.4 – 2.9 – 3.2), classifying as a measure of central tendency, where any component differs from each other in more by more than half unit, however the 1st component is shown with an advantage in the collective average, and also concluded that none of 32 modalities the third component (ectomorph) was superior predominance and 57% of the teams had predominance of the second component (mesomorph)

**CONCLUSIONS**

During the formulation of this article we suggested some hypotheses on the low competitive performance in state level of the Pontagrossense team.

Through the evaluation of the motor performance and phenotypic characteristics, we considered that the sample has a similar soma-type profile to other athletes of the modality of feminine volleyball in national and international level, what demonstrates that the evolution of this sport has being characterized by the construction of athletes with the same physical pattern, where the differential for the obtaining of the success in the performance will be in the groups who showed more capable during the competition.

Analyzing the other variables we noticed that the group could be in better pre-competitive conditions. The reason for high FCR was proven by the low performance in the aerobic test of 12 minutes, because a good cardiovascular condition besides strengthening the heart muscle provides a decrease of FCR.

On the motor performance the result of the components which indicated the performance of the flexibility, forces of the superior members, potency in the inferior members, were positive points, but the tests involving both muscular resistance located of abdo-
men and anaerobic resistance, as well as the agility are topics to be worked better by this technical committee.

It is suggested to the professionals of the area to analyze and to plan, basing their objectives of the training starting from the results of studies of this sort, because these probably will demonstrate positive characteristics and common negatives among athletes that can be correlated with a better performance.

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