Somatotypical, dermatoglyphic and physiological profiles of triathletes

ABSTRACT: Study aimed at investigating the anthropometric, dermatoglyphic and physiological profiles of high performance triathlon athlete. Ten high performance triathletes of (n=10) of Rio de Janeiro participated in it. Techniques of descriptive statistics were employed to characterize the sample universe, in which it was observed some homogeneity in 35 out of 36 evaluated items, corresponding to a homogeneity index of 96%. For the identification of dermatoglyphic profiles, it was made use of the protocol of Cummins & Midlo (1942) in order to obtain: a) the types of fingerprint patterns (A=0.6 ± 1.9; L=6.5 ± 2.9 and W=2.9 ±3.03); b) the number of lines of each finger (SQTL=118.6 ± 44.92); c) index delta (D10=12.3 ± 4.08); and d) the digital formulas (ALW=10%, 10L=20%, L>W=40%; W>L=30%). The anthropometric measures were obtained by evaluating: a) age (28.13 ± 5.50 years); b) weight (68.31 ± 6.05 kg); c) height (176 ± 3.41 cm); d) amount of body fat mass by means of the protocol of Pollock & Jackson (1993), (4.86 ± 1.45%); e) amount of body fat mass by means of the protocol of Faulkner (1964), (9.51 ± 0.74%); and f) somatotype, obtained by the method of Health and Carter (1990): endomorphy (1.55 ± 0.66); mesomorphy (4.22 ± 0.47); and ectomorphy (2.99 ± 0.59), featuring as meso-ectomorphy. The physiological profile was obtained by measuring the maximum consumption of oxygen (VO₂max=69.9 ± 5.09 mLkg⁻¹.min⁻¹). The results reflect the profile of high performance Olympic triathletes, in which the values observed represent models to be attained by younger athletes. With it, they can reach the highest degree of anthropomorphic development in the sports activity.

Keywords: Profile; Dermatoglyphics; Anthropometry; Somatotype; Triathlon; Triathletes.
Triathlon has been considered one of the most exhausting challenged ever created by man for testing not only the limits of human being’s physical capacity, but also the extremes of his/her mental capacity. Triathlon was created in the late 1970s, and debuted in the 2000 Olympic Games, in Sydney, Australia, with more than 300,000 spectators, more than in all soccer matches in the 1996 Olympic Games, in Atlanta, Georgia, United States. This sport is composed of three sporting modalities: swimming (1.5km), cycling (40km) and race (10km), which are staged simultaneously (International Triathlon Union, 2006).

The sport appeared in Brazil, in 1982. The foundation of the International Triathlon Union (ITU) and the evolutions of sports rules made the coaches and athletes be more and more demanding than before (Domingues Filho, 1995). In this manner, it began to have greater concern with the scientific and methodological aspects which are involved in the training and reception of new talents. According to Sleivert & Rowlands (2000:4), “the physiological demand of three sports modality is unique” imposes the development of distinct anthropometric and physiological features which are more relevant to the athletes which practice only one of these modalities.

High performance triathletes should have some physical features for these modalities because the distances are exhausting as for the Olympic Games. These distances are completed in a period of about one hour and half.

According to Dantas (1995; 1999), the making of a training program should be specific to the sports modality, and also paying attention to the athlete’s biological individuality. So, this makes it impossible for the making of high performance training programs for those who do not have anthropometric, physiological and genetic capacities for a given modality. The physiological stimuli which act out in the individual’s organism may do serious harm to one’s life.

The use of principles for sports training facilitates the making of training programs for swimmers, cyclists and runners. However, when it is made a training program for an athlete who takes part in the three modalities, some questions are raised: what are the recovery period of time between each stimulus? Will the principle of overtraining suit the training in it? Will this enable the athlete’s organism a better adaptation to the applied stimuli? Yet, how to set better training sessions for each modalities, without causing overtraining? (De Vito:1995; O’Tolle:1995).

Therefore, for the process of identification of model features of a given sport it is necessary that for process of physical assessment is used specific protocols for the sports at issue. According to Fernandes Filho, “In the process of physical assessment […] the obtained results, by means of a battery of tests […] are important in order to able develop a good program of physical work. […] The more there are initial data […] the better the prescription of training.”
And thus, the formal and theoretical object of this study is focused on the Brazilian high performance triathlete, resident of the State of Rio de Janeiro. Its intentionality is based upon the results obtained by means of tests which portrays direct and indirect influence over the phenomenological and axiological comprehension of motive aspects of the athlete in several categories.

All the process of determination of the athlete’s profile is related a method based on ergomoticry. This method created some changes and evaluations based on other method of assessment already suggested, producing simultaneously changes and variation in the paradigms which provoke some interference in the order set.

In this study it was examined the anthropometric and genetic characteristic based upon dermatoglyphics and genetic characteristics, for these are intervening in the performance of these athletes. The aim of it was to try to quantify the analytical data obtained from the user, to qualify the young beginner in the modality in order to promote the development of more specific and precise training programs.

**Objective**

This study aims at identifying anthropometric, dermatoglyphic and physiological characteristics of high performance triathletes.

**Variables**

The dermatoglyphic characteristics are the following: digital formulae, types of patterns – A, L, and W (qualitative); SQTL, D10; and the number of lines in each finger (quantitative).

The anthropometric characteristics are the following: stature, weight, body fat mass and somatotype – endomorphy, mesomorphy and ectomorphy (quantitative).

The physiological characteristics are the following: maximum \( \text{O}_2 \) consumption – \( \text{VO}_2\max \).

**Delimitation of the study**

Oriented by the descriptive typology, the samples were selected intentionally, in which the study was limited to n=10 high performance triathletes in an Olympic competition between one hour and 45 minutes and 2 hours and 12 minutes.

**LITERATURE REVIEW**

**The history of triathlon**

Triathlon consists of three sports modality: swimming, cycling and running, which are performed back-to-back in immediate sequence. For many this is a definite test of human physical endurance.

It arouse as a sport in the midst of conversation in a table bar, in a mild night in Honolulu, capital of Hawaii, in a small brewery, Prima Brewery. In it there were sportsmen telling their deeds in the three traditional competitions of the city: Waikiki Rough, Water Swim, swimming competition with 2.4 miles; Around Oahu Rike Race, a cycling race whose circuit goes around the island of Oahu; and the marathon of Honolulu. The sportspeople would not reach to an agreement about which competition demanded more physical endurance. Then, the naval commander John Collins issued a challenge that combined the Wakiki Rough Water Swim (local race), a bike race around the entire island of Oahu, and the Honolulu Marathon. He was so inspired by this, jumped up on the stage during a break in this awards ceremony, grabbed the microphone and announced this new competition to everyone there. He then said that the winner would be declared the “Ironman.” The cabdriver, Gordon Haller, was the winner of the challenge with 11 hours and 46 minutes (Carvalho: 1995; ITU: 2001).

Officially, the triathlon was not created in this glorious day, but invented in early 70s by San Diego Track Club as an alternative training for severe racetracks. The first event of it consisted of a 10km race, an 8km cycling and 500m swimming. In 1989 the ITU was founded in Avignon, in France, and organized the first official worldwide competitions.

**Triathlon characteristics**

It provides its users with physical and physiological characteristics which are distinct from the pertinent ones to users of each modality individually (Sleivert; Rowlands: 2000). The back-to-back immediate sequence in the three modalities establishes the duration of time from 50 minutes up to 24 hours; the olympic triathlon is performed at about 1 hour and 50 minutes (Bentley:2002). As a consequence, the percentual of participation of energetic system in the competitions varies.

There are several specific aspects which create different physiological demands of individual sports practices such as swimming, cycling and running. The factor which provide these influences differ the age group from the elite category, mainly for the differences of rules of ITU. The specific physiological demands provided by the Olympic triathlon may result in different responses, when compared to the counter clock competitions (Bentley, 2002).

According to O’toole and Douglas (1995:251), “the first determinant of the success in triathlon is the capacity to endure the high percentual of energetic expense for a prolonged period of time,” characterizing the sports as endurance.

The morphofunctional characteristics of sports are related to hereditary capacities of several physical qualities of the individuals (Filin, 1996). Therefore, for a prognosis of them in young athletes it is necessary that one knows not only the characteristics of each sport, the level of physical and psychic demand, but also the model (profile) of the athletes, and the level of physical development in several age groups.

**ANTHROPOMETRIC CHARACTERISTICS OF TRIATHLETES**

Studies have shown that elite and amateur male triathlete have a mean stature of 179cm (Bonsignore, 1998; Denadai, 1995; Devito, 1995; Hauswirth, 1999; Hue, 1999; O’toole, 19995; Schabot, 2000), while the professional cyclists have 179.75cm (Fernandes-Garcia, 2000; Gnehm, 1997; Lied, 1999; Padilla, 2000.) It is concluded that both types of athletes show similar statures.

The 10km runners show a mean stature of 177.68cm (Rocker, 1998), they are the shortest of the triathletes. According to Slei-
 vert and Rowlands (2000), the bottom swimmers present a mean stature 185cm higher than professional cyclists and triathletes. The anthropometric data are of great importance for triathletes, because higher athletes may have some advantage over the athletes with lower body length because of the greater length of levers, promoting better ability for displacement by amplitude of higher movements, with a lower frequency of movements (TOWNSEND, 1995).

According to Toussaint, (1990), swimmers presented greater distance by arms movement and lower frequency than the triathletes (1.23 m x 0.92 m), providing greater movement speed (1.17 ms-1 x 0. 95 ms-1). Toussaint found that triathletes spend more energy to produce movement (45 W) than swimmers (32 W), and the triathletes spend more time training to develop their physical qualities, and little time for the technical part of the crawl swimming. However, in their studies were not observed the influences of body lengths in the levers.

MILLET, CHOLLET, CHALIÈS and CHATARD (2002) found that the lowest speed of the triathletes of elite category, in relation to swimmers of the elite category, is associated with shorter length of arms (1.70 m x 2.15 m) at the speed of \( V_{\text{O}_2\text{max}} \) reducing propulsion. The percentage of body fat differently influences the performance of endurance sports. The percentage of body fat of triathletes range from 6 to 11% (M = 9.85 ± 1.88) and is similar to those of cyclists, ranging from 6 to 11% (M = 8.03 ± 1.93). The difference in mean of the found values seems to have been influenced by the sample number from each study (HUE; LE-GALLAIS; BOUSSANA; CHOLLET; PREFAUT, 2000).

According to Lavoie and Montpetit (1989), the fat percentage of swimmers range from 6 to 10% and is similar to triathletes and cyclists. MCARDLE, KATCH and KATCH (1992) presented data from Pollock (1977), with values for the long run racers ranging to 11% (M = 9.85 ± 1.88) and is similar to those of cyclists, less than swimmers (70.1 kg) and greater than the runners.

**BODY COMPOSITION**

**Body Weight**
The triathletes have mean body weight of 68.58 kilograms (BONDIGNONE, 1998; DENADAI, 1995; DeVITA, 1995; HAUSSWIRT, 1999, HUE, 1999; O’TOOLE, 1995; SCHABORT 2000). The lesser weight than the cyclists (70.1 kg) and greater than the weight (67.2 kg) of competitors of 10 km races. However, data from triathletes of the Olympic Games (2000) indicate that the elite triathletes have mean weight of 71.98 kilograms, proving to be slightly heavier than the cyclists, and heavier than the runners.

**Percentage (%) of body fat**
Body composition can influence the performance of endurance sports. The percentage of body fat of triathletes range from 6 to 11% (M = 9.85 ± 1.88) and is similar to those of cyclists, ranging from 6 to 11% (M = 8.03 ± 1.93). The difference in mean of the found values seems to have been influenced by the sample number from each study (HUE; LE-GALLAIS; BOUSSANA; CHOLLET; PREFAUT, 2000).

According to Lavoie and Montpetit (1989), the fat percentage of swimmers range from 6 to 10% and is similar to triathletes and cyclists. MCARDLE, KATCH and KATCH (1992) presented data from Pollock (1977), with values for the long run racers ranging from 4.3 to 5% of body fat.

The percentage of body fat differently influences the performance in triathlon. In swimming, an excess amount of body fat decreases the need of the body to expend energy to fluctuate and increase the thermal resistance to cold, due to the subcutaneous layer of fat. However, during the race the expenditure of energy is related to body weight by the need to raise and lower the gravity center of the body and accelerate and decelerate the legs moving the total body weight. In cycling, the athlete must move his body mass plus the weight of the bike to produce movement (GNEHM, 1997; KLEIN, 1997).

During the race, excess of body fat increases the thermal isolation of the body, increasing the internal temperature and consequently the peripheral circulation. This makes the body to divert blood of the muscle in activity to the skin, to allow the body to keep the thermal balance, thus affecting the aerobics resistance (ANGELO, 2000; MCARDLE, 1999; MOREIRA, 1996; POLLOCK, 1993).

The increase in body volume causes increase of the athlete’s body surface, as well as a very high stature, as in race and cycling. This increase generates increase of the forces resisting the displacement, being the resistance generated by the action of the traverse area to the displacement in the environment, thus suffering direct influence of the displacement speed (HAUSSWIRTH; LEHÉNAFF; DRÉANO; SAVONEN, 1999).

According to Angelo, Carvalho, Fernandes Filho and Dantas (2001) studying 11 triathletes in Rio de Janeiro, with a mean age of 29.9 years (SD ± 10.08), using the protocol of Faulkner (1968) found a mean percentage of body fat of 10.03% (SD ± 0.72%), corroborating to the studies of Sleivert and Rowlands (2000) and Lavoie and Montpetit (1989).

**Somatotype**
According to Mathews and Fox (1979, p. 247) “the somatotype is used to describe the physical type that is more susceptible to certain diseases, and as a mean to relate with success the body type in several sports.”

Since the creation of somatotyping by Sheldon, study that refers to the body type, which qualify the physical constitution of man according to the amount of body fat, muscle mass and bone tissue due to their proportionality and its improvement by Heath and Carter in 1975 (MATHEWS; FOX, 1979, p. 246), the somatotype has been used to describe the body type and in line with Sobral (1988), more susceptible to diseases and its relation with various sports modalities.

With the advancement of studies of somatotyping, the definitions of the components were altered (HEATH, CARTER, 1975):

- **ENDOMORPHIC** - refers to the relative and non-essential fat;
- **MESOMORPHIC** - refers to the musculoskeletal development relative to the stature;
- **ECTOMORPHIC** - represents the linearity of the individual relative to the physical.

According Marins and Giannich (1998), the study of somatotype allows to known the physical type of each sport mode and is an excellent method for detection of individuals with biometric profile regarding the sport modalities.

Degaray, Liveni and Carter (International Society for the Advancement of kinanthropometry - Isaka, 2000) refer to significant differences in size and in somatotype of practitioners of different sports. However, ethnicity can change the values of somatotype for a specific modality.

No study about somatotype of male triathletes was found. But Leake and Carter (1989) evaluated the somatotype of female
triathletes (n = 16) and compared it with that of Olympic runners and swimmers. The result showed that the mesomorphic component is balanced with the endomorphic (3.1-4.3-2.6) and the data were similar to those of the swimmers. The triathletes are generally heavier, with more lean mass, more mesomorphic and less ectomorphic that the elite runners. The authors reported that comparison with the cyclists was not possible because there is no information to corroborate the somatotype data.

**DERMATOGLYPHIC FEATURES**

**Scientific history**

The word DERMATOGLYPHICS originates from the Latin, dermo-skin, and from greek, glyphia-record. This term was proposed by Cummin and Midlo. Was introduced in the 41st Annual Session of the Anatomy Association, held in April 1926. Received classification as method, the branch of medical science, the study of skin topography. Juan Vucetich Kovacevich called it DACTILOSCOPY, from the greek daktilos-fingers and skpoiein-to examine. It was created in Argentina, existing today in all languages (POLICE PAPILOSCOPY ASSOCIATION OF RIO DE JANEIRO, 2002).

Currently, the dactilloscopy, as Fernandes Filho (1997), in line with Carlos Kenedy (CIA INSKAIVE, 2002) is divided into civil, criminal and clinical.

**Applicability in sports**

The studies of Moskatova (1998), Filin (1996), Sobral (1988), Zakharova, (1992) show that the preparation of an athlete should begin on the second childhood, with the guidance of the young for a group of procedures in which his physiological and psychological characteristics can be framed, avoiding the waste of genetic potential.

The processes of detection, selection and supervision of sporting talent made through physiological and neuromotor tests chosen to functional and neuromotor evaluations must possess high level of specificity and scientificity. This will enable a high correlation on results over time of biological maturation (ANJOS, 1998; FILIN, 1996; MOSKATOVA, 1998), but does not allows the knowledge about the genetic potential of an individual, only the level of development of his physical abilities.

A high-level athlete must meet all requirements of the sport modality with a minimum of deviation from its standard, thus in a minority population, as predisposition can not be created, but innate to individuals.

The fingerprints will become a determining factor for athletic success, allowing the identification of the individual, soon after his birth. According Fernandes Filho (1997), the fingerprints and dermal papillae are formed between the third and sixth month of intra-uterine life, and will exist until the cadaveric putrefaction, when occurs the detaching from the dermis.

According Fernandes Filho (1997), there are three main pattern types of digital pictures: arc (A), loop (L), and together the whorl and S - (W) draw, being the form of the patterns a qualitative characteristic. The number of lines (QL) is the sum of the total lines of all fingers (SQTL), and the number of skin ridges is the quantitative trait.

The evaluation of the intensity of the patterns makes it, initially in the presence of delta, and calculate the index of deltas (D10), which can be minimum "0" and maximum "20." The value of zero when the dermatoglyphic pattern appears presented in the form of the arc "A", where there are no deltas. The loop shows only one delta, while the S-draw present two deltas (FERNANDES FILHO, 1997).

When tabulating the data, it is used the following classification: the arc is "0", the loop is "1", and S-whorl and design are "2." And under the aspect of graphic formation, the mark of the arc is the simplest figure and S-whorl the most complex figure (FERNANDES FILHO, 1997).

According Fernandes and ROQUETI (1998), the objective of dermatoglyphic as pedagogical process for selection in sports, is to identify the genetic potential of an individual.

**Relation to sports practice**

According Fernandes Filho (1997), Guba and Tchernova report that the complexities of the patterns indicate the prognosis of physical constitution; Chuartz and Alekceev, report the relationship between the quantity of lines and female groups in VO2max, reflecting the correlation of the complexity of the shape of the pattern of fingerprints and physical resistance. In 1992, Abramova combines the principles of dermatoglyphia with the physical qualities: aerobic endurance, speed, coordination and strength in cyclical activities.

The classification of all the dermatoglyphic indexes and the somato-functional indexes in college rowers, highly skilled (n = 101), the low complexity of the designs (D10) and low sum of the total number of lines (SQTL) correlate with the high level of expression of strength and power. However, the high level of D10 and SQTL correlates with the high level of coordination and high aerobic endurance. The minimum values of D10 and SQTL characterize a need for development of motor coordination (ABRAMOVA; JDANOVA; Nikitin, 1990).

According Abramova, (1995), the high level of D10, the high percentage of loops and whorls, low percentage of presence of arcs and an average level of SQTL are common to the endurance sports like street cycling (presence of drawings - A-1, 4%, L-63, 5%, W-27, 7%) the skiing, and cycling at velodrome and the biathlon (presence of drawings - A-1, 2%, L-70, 9%, W-31, 2%). However, in ports such as volleyball there is an increase in the percentage of whorl (37.3%) and a decrease in the percentage of loops (62.7%) for longer modalities such as the street cycling.

**Physiological characteristics of the triathlete**

The physiological factors that influence the performance in the triathlon vary with the distances of the races, according to the percentage of energy participation in the duration range of the disputed race (LANDERS; BLANKSBY; ACKLAND; SMITH, 2000).

Studies have shown that training in triathlon promotes changes generated by the crossed transfer training (cross transfer) between the cycling/race modalities, but not between the swimming/cycling (MILLET, 2002). The physiological factors related to the cardiorespiratory systems required to help cycling performance in
the race (HUE, LE GALLAIS; PRÉFAUT, 2001). Swimming seems to be influenced by the high mechanical specificity of the modality (MILLET, 2002).

**Maximum oxygen consumption**

The maximum oxygen consumption (VO$_{2\text{max}}$) is a determining factor in the performance of triathlon athletes, as well as in sports of endurance, it is necessary to sustain a high rate of energy production for a long period of time, depending on a high demand for oxygen of the body in activity (BASTOS, BONSIGNORE 1996, 1998; DEVITO, 1995; EVANS, 1997; HAUSSWIRTH, 1999; HUE 1999; MILLET, 2000; O‘TOOLE, 1995; SCHARBORT, 2000; SLEIVERT, 2000).

The VO$_{2\text{max}}$ depends on the lung capacity to absorb the oxygen, heart function (cardiac output), the system of transport of oxygen in arterial blood, the cell capillarization, the ability to use oxygen in the muscles in activity and genetic potential.

A high cardiorespiratory capacity (VO$_{2\text{max}}$) is common to triathlon athletes of high performance (BUNC, V., HELLER, J., HORCIC, and J. NOVOTNY, J. 1996), however, is less than the athletes of specific modalities (swimming, cycling, running). According to SLEIVERT, G. S. and HUE, O. et al. (2000) the values of VO$_{2\text{max}}$ in cycle ergometer and treadmill in the elite triathletes (75.9 ± 5.2 and 78.5 ± 3.6 ml.kg$^{-1}$.min$^{-1}$ respectively) have a difference of only 3.31%. For amateur athletes of average values corresponding to the ventilatory threshold (69.1 ± 7.2 e 70.2 ± 6.2 ml.kg$^{-1}$.min$^{-1}$) have no statistically significant difference. The difference found in the threshold of elite triathletes may have been influenced by the number of evaluated individuals (n = 6, elite) compared with the amateur triathletes (n = 23).

The study reported by HUE, O. et al. (2000) confirms the study of Schneider et al. (1990), showing no significant difference (p > 0.05) in the values found for VO$_{2\text{max}}$. And those values are similar to the athletes of specific sports.

The physiological responses of the sequence practice of triathlon, still seem to be an essential factor of study to increase the performance of athletes. A relatively high VO$_{2\text{max}}$ and of extremely importance for success in the triathlon, particularly in Olympic and short distances.

**METHODOLOGY**

We used the descriptive method (FLEGNER and DIAS 1995, p.56), which employs PROFILE typology (FLEGNER and DIAS, 1995, p. 60).

The sample consisted of - n = 10 - male triathlon athletes of high-performance, residents in the state of Rio de Janeiro, practicing the modality for over 2 years and have a performance time between 1 hour and 45 minutes to 2 hours and 12 minutes in the Olympic triathlon.

To obtain the data necessary for the present study, we used the following protocols: stature, skinfold, perimetry (Isaka, 2000), body fat percentage (%BFP) of Jackson and Pollock, seven skinfolds, Faulkner (% FBF); somatotype of Heath-Carter (1990); dermatoglyphic method (DI), dermatoglyphic protocol of Cummins & Midlo (1942), which Fernandes Filho (1997, p. 26) refers, maximum oxygen consumption - VO$_{2\text{max}}$ protocol presented by Hue et al. (1999, 2000 and 2001) for ergometric treadmill and is applied to test different days for each group of four and two athletes. The evaluated started the test at 5 km / h for one minute with 0% of inclination. The speed was increased by 1 km / h every minute until reaching 18 km / h. So the speed was maintained and the inclination was increased by 1% every minute until exhaustion.

**Statistical treatment**

We conducted a descriptive statistical treatment containing: mean (X), standard deviation (SD), maximum value, minimum value, and distribution of frequencies. As this study is of evaluation of profile, the statistical approach has become more inclusive, using the data normalization, according to techniques of calculating scores denoted in dimensionless indexes.

**Table 1 - Anthropometric profile – mean values and its derivatives for age, weight, stature ,%BFP and %FBF**

<table>
<thead>
<tr>
<th></th>
<th>AGE</th>
<th>WEIGHT</th>
<th>STATURE</th>
<th>%BFP</th>
<th>%FBF</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Mean</td>
<td>28.13</td>
<td>68.31</td>
<td>176.10</td>
<td>4.86</td>
<td>9.51</td>
</tr>
<tr>
<td>S. D.</td>
<td>5.60</td>
<td>6.05</td>
<td>3.41</td>
<td>1.45</td>
<td>0.74</td>
</tr>
<tr>
<td>Standard Error</td>
<td>1.77</td>
<td>1.91</td>
<td>1.08</td>
<td>0.46</td>
<td>0.23</td>
</tr>
<tr>
<td>Minimum</td>
<td>20.00</td>
<td>61.50</td>
<td>171.00</td>
<td>2.87</td>
<td>8.57</td>
</tr>
<tr>
<td>Maximum</td>
<td>36.07</td>
<td>79.60</td>
<td>181.00</td>
<td>6.75</td>
<td>10.50</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>-0.98</td>
<td>-0.09</td>
<td>-1.35</td>
<td>-1.52</td>
<td>-1.90</td>
</tr>
<tr>
<td>Result. Kurtosis</td>
<td>Homo</td>
<td>Homo</td>
<td>Homo</td>
<td>Homo</td>
<td>Homo</td>
</tr>
<tr>
<td>Asymmetry</td>
<td>-0.05</td>
<td>0.71</td>
<td>0.21</td>
<td>0.05</td>
<td>0.09</td>
</tr>
<tr>
<td>Result. Asymmetry</td>
<td>Central</td>
<td>Central</td>
<td>Central</td>
<td>Central</td>
<td>Central</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interval %95 Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min_Mean</td>
</tr>
<tr>
<td>24.66</td>
</tr>
<tr>
<td>66.40</td>
</tr>
<tr>
<td>175.02</td>
</tr>
<tr>
<td>3.97</td>
</tr>
<tr>
<td>9.06</td>
</tr>
</tbody>
</table>
The kurtosis was used to assess the homogeneity degree of the sample, and the index of dispersion for the analysis of the symmetry of distribution, according to the Gaussian (normal curve).

The variable of dimensionless character, derived by classification score, between the maximum and minimum observed values, in order to eliminate the dimensional differences, among the several variables of the study. Thus, can be made a comparative analysis of the same distributions as well as better understanding about the peculiarities of the profile of the group. Graphically, it uses the radar method, presenting the curves, which define the true range of the mean (95%), the calculated mean for the variable.

The inferential statistical was based on post-hoc test of the kurtosis, which verified the uniformity of the calculated mean values.

**PRESENTATION OF RESULTS**

The collected data are presented according to the number of samples and mean values and their derivatives for the investigated variables, types of digital formulas and normalized variables. It is important to emphasize that the athletes here evaluated involved the Brazilian teams in many years of triathlon in Brazil.

The evaluated athletes presented:

<table>
<thead>
<tr>
<th>Table 2 - Mean values and their derivatives of somatotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=10</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>S. D.</td>
</tr>
<tr>
<td>Standard Error</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
<tr>
<td>Kurtosis</td>
</tr>
<tr>
<td>Result. Kurtosis</td>
</tr>
<tr>
<td>Asymmetry</td>
</tr>
<tr>
<td>Result. Asymmetry</td>
</tr>
</tbody>
</table>

**ANTHROPOMETRIC PROFILE** – the variables age, stature, weight, %BFP and %FBF showed homogeneous distributions (Table 1). The SOMATOTYPE (Table 2) showed homogeneity in endomorphic index of 1.55 ± 0.66, mesomorphic 4.22 ± 0.47, ectomorphic 3.00 ± 0.59. Eight homogeneous items, of eight assessed items (8 / 8) 100%, showing excellent degree of homogeneity. The triathletes are somatotypically characterized as meso-ectomorphics.

**PHYSIOLOGIC PROFILE** - maximum oxygen consumption was of 69.9 ± 5.09 ml.kg⁻¹.min⁻¹. The values found among the athletes were presented with a small homogeneous asymmetry (-1.11) and curve tends to the left (Table 3). These values are similar the data presented by Hue (2001), respectively 68.7 ± 2.6 ml.kg⁻¹.min⁻¹, and are close to the variation by Hue (2000).

**PROFILE OF DERMATOGLYPHIC CHARACTERISTICS** - twenty-four homogeneous items, of twenty-five items assessed (24/25), showing 96% homogeneity, excellent grade, where only the MET1 finger showed heterogeneous. All triathletes had evaluated the same type of figure in MDT5 with mean MDSQL5 of 12.20 lines.

<table>
<thead>
<tr>
<th>Table 3 - Mean values and its derivatives for the characteristics of ( VO_{2\max} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

**Table 4 - Mean values and their derivatives for the types of design, SQTL and D10**

<table>
<thead>
<tr>
<th>A</th>
<th>L</th>
<th>W</th>
<th>D10</th>
<th>SQTL</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Mean</td>
<td>0.6</td>
<td>6.5</td>
<td>2.9</td>
<td>12.3</td>
</tr>
<tr>
<td>S.D.</td>
<td>1.90</td>
<td>2.99</td>
<td>3.03</td>
<td>4.08</td>
</tr>
<tr>
<td>Standard Error</td>
<td>1.18</td>
<td>1.85</td>
<td>1.88</td>
<td>2.53</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Maximum</td>
<td>6</td>
<td>10</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>10.00</td>
<td>-1.97</td>
<td>-1.55</td>
<td>0.58</td>
</tr>
<tr>
<td>Result Kurtosis</td>
<td>Homo</td>
<td>Homo</td>
<td>Homo</td>
<td>Homo</td>
</tr>
<tr>
<td>Asymmetry</td>
<td>3.16</td>
<td>-0.14</td>
<td>0.60</td>
<td>-0.59</td>
</tr>
<tr>
<td>Result Asymmetry</td>
<td>Right</td>
<td>Central</td>
<td>Central</td>
<td>Central</td>
</tr>
</tbody>
</table>

**Fit Perf J, Rio de Janeiro, 2, 1, 55, Jan/Feb 2003**
In the investigated sample were found the following types of formulas with their digital distribution as percentage:

\[ ALW=10\%, \; 10L=20\%, \; L>W=40\% \; \text{e} \; W>L=30\%. \]

These results are an important characteristics of the sample. Depending on the studied type, the results allow to identify the profile of the athlete in triathlon, suggesting a profile for high-performance athlete. The data were plotted in radar graph-type, with the standardized values of each investigated variable, because they do not follow the same class of securities, except for somatotype. Observing the characteristics of each experimental variable regulating the values that have examined its correspondent in scoring, dimensionless (without dimension), on the interval \((0 < x < 1)\) and is shown in Figure 1.

**CONCLUSION**

The results of the study respond to the need for verification of the presented problem - identification of the anthropometric, physiological and dermatoglyphic profiles of athletes of triathlon, of high performance, from the state of Rio de Janeiro - when shown the possibility to use dermatoglyphic, as one more protocol of assessment, particularly for the triathlon. Thus, the dermatoglyphic is inserted in the ergomotricity, or in motor behavior, considered as work, observed and controlled, from the standpoint of performance and efficiency.

The identification of the anthropometric, physiological and dermatoglyphic profiles of athletes of triathlon, of high performance, can be directly applied in the development of training programs of the several physical qualities involved in sports, helping the physical, technical and tactical trainings. This statement is based on the certainty that the results presented here reflect the profile of high-performance athlete in triathlon, and suggest a predisposition of a subject to the sport or similar modality, when the results of an evaluation show a similar profile as the exposed.

Other modalities that are similar can use these results in order to establish anthropometric, and physiological dermatoglyphic parameters.

**Figure 1 - Total standardized profile**


DE VITO, G. et al. Decrease of endurance performance during olympic triathlon. Interna-


FERNÁNDEZ-GARCÍA, B. et al. Intensity of exercise during road RACE pro-cycling com-


POWERS, S. K.; HOWLEY, E. T. Fisiologia do exercício: teoria e aplicação ao condiciona-


POWERS, S. K.; HOWLEY, E. T. Fisiologia do exercício: teoria e aplicação ao condiciona-

SOCIEDADE INTERNACIONAL PARA AVANÇO DA CINEANTROPOMETRIA. Apostila de


TOUSSAINT, H. M. Differences in propelling efficiency between competitive and triathlon