Identification of the genetic, somatotypical and psychological profile of the highest-qualified brazilian athletes into female olympic gymnastics

Andréa João
Programa de Pós-graduação Stricto Sensu em Ciência da Motricidade Humana da Universidade Castelo Branco/RJ
andrea@domain.com.br

José Fernandes Filho
Programa de Pós-graduação Stricto Sensu em Ciência da Motricidade Humana da Universidade Castelo Branco/RJ
jff@ism.com.br

ABSTRACT: This study’s object was to describe the genetic, somatotypical profile, as well as psychological profile aspects of Brazilian gymnasts exhibiting high sports qualification, of Olympic Gymnastics level. To identify genetic characteristics, the selected approach was the digital dermatoglyphia protocol for identification of fingerprints, palms and soles, a protocol used by Cummins and Midlo (1942) to obtain the following dermatoglyphic indexes: a) type of design; b) number of lines in each finger and in all ten fingers (SQTL); c) the complexity of design (D 10); and d) types of digital formulae. Measurements of somatotype were obtained through the Laboratory Measurement of Somatotype called the Heath-Carter Method (1990). Regarding psychological characteristics, four questionnaires were applied in order to identify: the kind of personality; the level of emotional stability; of social anxiety; and the level of affirmativity. Techniques of descriptive statistics were employed, for the final characterization of a sample universe representing 25 gymnasts with highest sports qualification, per national standards.

Keywords: dermatoglyphia, somatotype, sports psychology

Correspondence to:

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INTRODUCTION

Gymnastics is one of the oldest and famous sports in the Olympic program. It's a sport that differs from the others for its plenty of hard moves, performed under special conditions: in the equipment, where it is evaluated the gymnast’s level by a group of judges, according to the program’s difficulty criterion, the composition and the quality of the performance (SMOLEVSKIY, 1996).

Six male trials (Solo Gymnasts, Horse, Rings, Jumping, Parallel bars, Bars) and four female (Jump, parallels bars, parallels and Bars) are involved in the official competitions.

Many gymnasts dream about winning a gold medal in Olympics, but there are also some athletes who are interested in the entertainment and social aspects of this sporting area. There are those who develop their physical capacities that may be used in other sporting areas or life situations. So, gymnastics may be practiced from entertainment to competition levels. (FEENEY, 1993)

So that the athlete can work in the competition area, he must possess the demanding physical and psychological characteristics to be considered a “sporting talent”. The high level athletes aim the search for the maximum performance to reach the high level competitions, and for that, they must train hard, spending a great part of their lives trying to achieve these goals.

One of the required conditions to achieve success in the high level area is the inborn talent or the athletes’ ability. According to Harre (1982), mentioned in Talent Opportunity Program Manual 1998 (TOP) of the American Gymnastics Federation, the young athlete’s development may be improved if his training is directed to the sporting area he is talented to. WEINECK (1999) defines the talented athlete as the one who embodies readiness and strength to perform under any conditions, presenting a high qualified performance in the respective age (proved in competitions). The “talented athlete” is found in the smallest part of the population. In Russia, the talent selection may last from children’s beginning in sports, about five years old, to their taking part in competitions. In sporting schools, the child is directed to the sporting area in which they have a greater chance to be successful. Then, the selection is taken based on the medical exams, pedagogical tests, genetic and psychological characteristic results. Due to the last World and Olympic Champions’ information, and the experience provided by the training methodology, to achieve the latest technical pattern, following the sport’s evolution. (SOMEVSKIY, 1996 P. 241)

New great idols, as the gymnast Daniele Hipólito, lead young people to the practice of gymnastics, although not all of them will achieve success.

Gymnastics has improved a lot technically, and it became extremely hard to reach the highest level, demanding special characteristics from those athletes who intend to achieve the best results. For this reason, choosing young talents is a crucial factor to succeed in the sporting career.

Many writers, as FILLIN (1998) and BOHME (1994), have recommended the creation of a model, scientifically based, which may supply basis for a trustful prognostic to select and detect the sporting talent. This model must be based on the genetic, functional, somatotypical and psychological profiles of those athletes with high results, following the information and index of the people their talent belong to.

Then, we may consider as this work’s main purpose, the identification by a group of characteristics, somatotypical and psychological aspects, and mainly, genetic characteristics, based on dermatoglyphy, to set a model for the well-qualified Brazilian female athletes who compete in gymnastics.
The creation of the best Brazilian athletes’ model is a crucial point to guide their talent to the high level, providing the talented children’s best result, encouraging them to search for the best performance on gymnastics or leading them to another sporting area where they may have more chance to reach success.

FERNANDES FILHO (1999) and DANTAS (1999) believe that setting the model of a group one intends to develop, may be the difference between success and failure in the development of sport’s training strategy.

FERNANDES FILHO (1997) also claims that the creation importance of this model isn’t focused only on finding new talents, adding that it indicates the quality and longevity of the athletes’ career: it holds, then, a great meaning under the polemic point health-performance.

The importance of a deeper study on the subject is evident both for the Brazilian lack of material about it and for the position gymnastics has acquired through the last international results. Knowing about the Brazilian athletes’ somatic constitution, including somatotypical, genetic and psychological characteristics of the group under this study will provide the comparison, using information from other people.

Furthermore, the Brazilian athletes’ information files, scientifically based, will create an unprecedented national file, and will also provide a support to the studious, allowing them, new scientific studies based on the new findings in this investigation field.

CARTER, SLEET and CLIMIE (1982) strongly expressed the importance of somatotype, one the anthropomatic program, developed during the Montreal Olympic Games (1976). Somatotypology focus on what pattern certain sports tend to.

FERNANDES FILHO (1997) considers that the fingerprints model avails, suitably, the sporting improvement in order to achieve the highest result, being an excellent way to set the functions in the game. What shows, not only efficacy, but also effort, time and money saving.

ABRAMOVA (1995), showing the importance of the genetic characteristics’ identification in talent finding and selection, claims: the connection among “fingerprints – sporting area – function in the game” indicates the ordinary biological natural law of the mutual linkings of the genetic prints together with the functional facts inborn talent, free from the importance of those people. Then, fingerprints can be used as a pattern for early sporting direction and selection under Brazilian or any conditions.

The use of previous knowledge of the abilities and genetic indicators, added to the phenotypical contribution, would be of great help on talent discovering and it’s development.

Regarding to fingerprints’ importance (ID) on human identification, NIKITIUK (1988), claims that fetus’ fingerprints take form from the third to the sixth month together with the blastogenic layer in the ectoderm system, and they don’t change along the life time, “ID includes shape kind, amount of lines on fingers, intricacy of shapes and the full line number”.

Since the 19th Century, IDs have been used to identify human beings, for their unpredictable and unique characteristics on each person, due to their use as precise indicators in criminal investigation.

FERNANDES FILHO (1997) refers to the last 20 years when scientific researches on Anthropologic Morphology and Sporting Genetic laboratory from VNIIFK (Moscow), demonstrating that IDs can be used directly in the sporting selection, in connection with physical kind.

Considering psychological characteristics Rioux (1980), mentioned by BARRETO (1983) in “Determinants Psychologiques de la Performance”, states that the high level athletes must have basically four essential demands.

1. A healthy and stable personality
2. A complete energetic potential on itself confirmed
3. An exceptional resistance to multiform disappointments
4. A great emotional stability, which is able to adapt to situation modulations, when it is necessary.According to LADER and WING’s theory, BARRETO (1983) says that people are born with a genetic propensity to emotions – one reacts more than another in stressing situations. So, a sensitive gymnast will find it more difficult to adjust herself to training and competition. Overanxiety may decrease one’s attention, concentration and movements’ organization. Stressing situations for a gymnast may be: the competition itself, to be losing the rooters’ hooting, the opponent’s presence, the coach or press critics, the family and friends’ presence, etc. The writer suggests, by an

<table>
<thead>
<tr>
<th>Dermatoglyphic profile</th>
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<tbody>
<tr>
<td>MDT1 (Fingerprint drawing type)=1.36 ± 0.57;</td>
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<tr>
<td>MDT2 (Fingerprint drawing type)=1.12 ± 0.73;</td>
</tr>
<tr>
<td>MDT3 (Fingerprint drawing type)=1.08 ± 0.49;</td>
</tr>
<tr>
<td>MDT4 (Fingerprint drawing type)=1.44 ± 0.51;</td>
</tr>
<tr>
<td>MDT5 (Fingerprint drawing type)=1.24 ± 0.44;</td>
</tr>
<tr>
<td>MESQL1 (amount of lines on the finger)=10 ± 5.90;</td>
</tr>
<tr>
<td>MESQL2 (amount of lines on the finger)=7.56 ± 5.12;</td>
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<tr>
<td>MESQL3 (amount of lines on the finger)=8.72 ± 5.23;</td>
</tr>
<tr>
<td>MESQL4 (amount of lines on the finger)=11.52 ± 4.62;</td>
</tr>
<tr>
<td>MESQL5 (amount of lines on the finger)=10.16 ± 3.97;</td>
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<tr>
<td>MDSQSL1 (amount of lines on the finger)=11.48 ± 4.99;</td>
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<tr>
<td>MDSQSL2 (amount of lines on the finger)=8.16 ± 5.28;</td>
</tr>
<tr>
<td>MDSQSL3 (amount of lines on the finger)=8.72 ± 4.84;</td>
</tr>
<tr>
<td>MDSQSL4 (amount of lines on the finger)=11.36 ± 3.99;</td>
</tr>
<tr>
<td>MDSQSL5 (amount of lines on the finger)=10.08 ± 3.38;</td>
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Picture 1 - Fingerprint’s Drawings

Arc (A)  Loop (L)  Whorl (W)
experienced view, that a high level gymnast should have the following Psychological profile: high resistance to pain and anxiety levels following the usual patterns.

For an ordinary experienced gymnast, the psychological properties which allows to fight successfully against what changes his mood, is usual.

The work on harder exercises, subjectively dangerous, as its accomplishment during training and competition leads frequently to a notable emotional fatigue, so its quite important to know how to deal with psychological energy and spend it with reasonable concern – gymnastics’ training and competition success is impossible without the right inherent motivation. These characteristics’ group forms what we call “psychological profile” of a certain sport. (SMOLEYSIY, 1996 p, 274)

According to FILIN (1998), a high level athlete may be a model to those who practice this kind of sport. The high level athlete model must determine not only the main characteristics, but also the possible deflection from the “ideal pattern”, as to establish what changes must be made in the beginning of the sporting talent development.

This study was developed following a descriptive research.

The main part of this study, claimed by FLEGNER and DIAS (1995 p. 60), “its used to show several characteristic’s patterns . Mainly it is intended to place the person in a test scale of characteristic numbers and create one’s profile.

This sample was restricted to twenty-five Brazilian gymnasts in the pre-infantil, infantil, juvenile and adult categories, which had been classified until the 5th place in the Brazilian Female Gymnasts Championship – 2001, or had been called to the Brazilian Gymnastics federation (CBG) to join the Brazilian’s Juvenile and adult teams in 2002, emphasizing that all called gymnasts agreed to take part on this research.

It was chosen n=25 because nowadays, high qualified Brazilian Female Gymnasts don’t far overpass these numbers, then if we raise the numbers, we may compromise the results. The procedures used with the first five classified gymnasts in each category were established due to a notable difference on the final results after the 6th position, what would also endanger the quality of this sample.

The elimination procedures were:

a. Gymnasts who lived abroad
b. weren’t found during the research.

The chosen protocol to determine genetic characteristics was the fingerprints’ dermatoglyphy, by CUMMINS and MIDLO (1942), that FERNANDES FILHO (1997) mentioned.

The fingerprints’ analysis and acquisition is part of this research. After their acquisition, comes their previous reading analysis, whose pattern method is:

The kind of drawing on finger’s phalanx:

Arc “A” – It’s main characteristic is the delta absence; and its basically compounded by curved lines crossing the phalanx.

Loop “L” – It has only one delta . It is like a curve made by lines curving right round and crossing themselves.

Whorl “W” – It has two deltas. A pattern by curved lines that form a rough circle with its nucleus inside the bigger circles.

Number of lines (NL) – The number of ridges on the skin forming the drawing is counted following the one that connects the delta and the drawing center, without considering the first and the last lines, according to Vucetich’s method. Then, it will be calculated fingerprint’s fundamental pattern index.

<table>
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<tr>
<th>Somatotypical profile</th>
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<tr>
<td>Endomorphy=2.34 ± 0.66;</td>
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<tr>
<td>Mesomorphy=4.63 ± 0.83;</td>
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<tr>
<td>Ectomorphy=6.35 ± 1.07;</td>
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<tr>
<td>Result=Ecto-mesomorphic</td>
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<tr>
<th>Psychological caracteristics’ profile</th>
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<tr>
<td>EI=26.88 ± 5.56;</td>
</tr>
<tr>
<td>LS=12.44 ± 4.12;</td>
</tr>
<tr>
<td>NEU=23.56 ± 7.57;</td>
</tr>
<tr>
<td>N=44.72 ± 17.78;</td>
</tr>
<tr>
<td>MM=20.12 ± 9.67;</td>
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<tr>
<td>UP=14.04 ± 8.48;</td>
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<tr>
<td>B=6.8 ± 5.82;</td>
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<tr>
<td>M=4.2 ± 5.60;</td>
</tr>
<tr>
<td>AD=20.96 ± 7.62;</td>
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<tr>
<td>SE=17.96 ± 7.55;</td>
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<tr>
<td>AF=45.76 ± 10.97;</td>
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The somatotypical measurement was obtained by the somatotypical HEALTH & CARTER method, which allows a refined study
about the ideal physical model on each kind of sport; this method is an excellent tool in talent finding and also allows an unceasing body observation, along the competition period, (ISAK, 2000). According to CARTER & HEALTH (1990, p. 371), the method is an excellent and safe evaluation method ($R = 0.98$).

**First compound determination – Endomorphy**

Number of tricipital, subescapular and supraliac skin ridges.

**Second compound determination – Mesomorphy**

This second compound will be found through the height in cm, the humerus and femur diameters record, and also arm and leg circumference record, being those circumferences connected through the subtraction of numbers, taken from the pricipital skin and calf wrinkles.

**Third compound determination – Ectomorphy**

This compound’s determination is extremely simple: for this, it will be recorded the person’s full body weight and height.

After the record, it is calculated each compound index. The chosen protocols for evaluation of the psychological characteristics were:

**Eysenck Personality Inventory (MPI – Maudsley Personality Inventory).** This inventory tries to measure three kind of evaluation: extroversion-introversion (EI), neuroticism (NEU) lie scales (LS) (BARRETO, 2002).

**Fear Inventory** – Its about situations that may cause anxiety and fear, classified in five levels: none (N), a little (up), more or less (MM), a lot (B) and too much (M). An athlete who gets high scores in this inventory is unable to reach any goal, in any area. He would be emotionally blocked by anxiety and generalized fears. In general, the great athlete presents a very low result in this test.

**Willoughby questionnaire**

This questionnaire intends to measure anxiety level of social people. High scores indicate this person is very shy on social situations. An athlete who gets high scores here may have problems in his sporting development, due to his emotional misadjustment on social relations (BARRETO, 2002). It is consisted of 25 questions to be answered according to a 5-point scale (0-4). Half of the questions consists of ordinary neurotic reactions, especially interpersonal, misadapting anxiety (AD); the other half indicates general emotional sensibility degrees (SE). This questionnaire is a neurocism high significant indicator (Wolpe, 1958, p.110). A score decrease is related to the patient’s improvement.

**Bernreuter scale**

Mentioned by BARRETO (2002) and WOLPE (1970) tries to measure people’s self-affirmativity (AF). The results indicate people are self-sufficient, determined, headstrong, aggressive, free, stable, consistent, independent or dependent, shy, weak, defenseless, etc. It is a very important test for a high level athlete. A high score on this test indicates the athlete has a great psychological support to reach sporting fineness (BARRETO, 2002). It is consisted of 60 questions. A normal score is between 24 and 42. A score under 20, generally suggests that he will find substantial problems (WOLPE, 1970).

The Information was collected where the gymnasts live or during a CBG championship or event realization in which they were present.

To create this people’s descriptive analysis, intending to build their profiles, it was followed statistics conceptions, observing the descriptive concepts, defined by the observation of the collected information of those compounds under this research protocol.

Descriptive statistics were used, aiming to establish researched sample’s content.

The frequency distribution as it is continuous, follows a well-defined standardized metric system, according to the basic statistics pattern, such as, the people’s number, mean, pattern deflection, maximum and minimum scores, dispersion and curtose analysis.

Dispersion analysis, combined with the curtose test, aims to number the studied people homogeneity degree.

It was also taken into consideration an adimensional and relative variable from the score classification, set between the maximum and minimum observed results, aiming to eliminate dimensional variances among the studied patterns, and then we can analyze, comparatively, their distribution and, easily, figure out the studied group profile’s peculiarities. These results are shown standardized. It was used a “Radar” graphic kind which shows the truth space in curves (95%) averaged calculated for the respective pattern.

Aiming the tests’ measurements, this study was established in harmony with the statistics treatment basic considerations, in order to keep the scientific research, it was taken into consideration a significant level as $p<0.05$, what means 95% probability of not making a kind I mistake, in the statements expressed during the research.

**RESULT’S PRESENTATION AND ANALYSIS**

The dermatoglyphy profile found a high qualified Brazilian Gymnasts retifies ABBRAMOVA & COLS (1990) statements, where low
intensity drawings (D10) and the low full number of lines (SQTL) are related with the high level strength and power demonstration.

The average numbers and their derivation of the somatotype are presented on chart 1. There, it can be observed the endomorphy 2.34 ± 0.66, mesomorphy 4.63 ± 0.83, ectomorphy 6.35 ± 1.07, classifying the gymnasts as ecto-mesomorphics.

It was found the following fingerprint formulas in the analyzed sample for a total of 15 (100%) out of 25 observed in percents (%):

\[
10L = 6.7\%; 
10W = 6.7\%; 
ALW = 13.3\%; 
L > W = 40.0\%; 
W > L = 33.3\%
\]

These results are additional characteristics of this observed group. In order to identify the sample’s profile and suggest a profile to the high qualified athlete, it will be used a radar graphic, with average standardized numbers, in each analyzed pattern, because they don’t follow the same value class, except the somatotype. Observing the particular characteristics of each experimental pattern, the following values were found:

\[
\text{score } < i > = \frac{\text{Obs Val } < i > - \text{Min Obs Val}}{\text{Max Obs Val } - \text{Min Val}}
\]

The homogeneity may be confirmed in: dermatoglyphic characteristics’ profile – nineteen homogenized items, twenty-five evaluated items (19/25), 76%, a high homogeneity degree. Somatotypical characteristic profiles - three homogenized items, three evaluated items (3/3), 100%, high homogeneity degree. Psychological characteristics profile – nine homogenized items, eleven evaluated items (9/11), 81.8%, high homogeneity degree.

It can be inferred from the research that the result fulfills the need to prove the presented problem – the Brazilian high qualified gymnasts profile knowledge, due to the demonstration of the dermatoglyphy connection as an extra possible evaluation protocol, specially for gymnastics.

The graphic 3 demonstrates all observed items through their standardized averages, in order to visualize the whole profile:

It is advisable to create a required physical abilities’ profile on female gymnastics. As these tests are directly influenced by phenotype, it is necessary to work apart, according to the age, shared in the pre-infantile, infantile, juvenile and adult categories. This study will help the presented profile on this research, providing a better view of the Brazilian high qualified gymnast. The connection between the dermatoglyphic, somatotypical and psychological patterns together with the physic abilities required by the sporting area great meaning.

The presented results are the pattern-values that must be used to find out the gymnast’s efficacy prognostic.

As soon as the genetic, somatotypical and psychological profiles are identified, there must be a comparison between the acquired values and the sample pattern values.

Values correlation indicates that the analyzed gymnast matches the sporting area profile. The non-correlation indicates a reduced efficacy in the sporting area, because the values are the best Brazilian gymnasts’ data on the sporting area.

REFERENCES


