Dermatoglyphic, somatotype, and explosive strength profiles of women’s volleyball of the Brazilian team

ABSTRACT: Introduction: The position of prominence of the Brazilian volleyball in the international scenery requests investments, work and research. The determination of the profile of athletes of high qualification is important for the process of the athletes of youth selections during the training of long period of the modality. The objective of the study was to identify the dermatoglyphical, somatotypical and of the explosive force profiles of athletes’ inferior members of the Brazilian feminine volleyball selection. It is a descriptive study, with post facto former typology. Materials and Methods: The sample was composed of 28 athletes. The used protocols were: Dermatoglyphics (ID) of Cummins & Midllo (1961); the somatotype of Heath & Carter (1967); the adapted Sargent Jump Test (1921) (IVP); and the Test of Vertical Impulse with 3 meters Displacement (IVD). Results: of the (ID) were: D10=11.8±3.6; SQTL=117.1±46.0; A=11%; L=60%; W=29%; the somatotypical profile was characterized as “central”; and in the evaluation of the explosive strength was observed (IVP) = 47.0±7.6cm; (IVD) = 54.1±8.9cm. Discussion: The athletes’ high genetic predisposition was verified for explosive strength, speed resistance and agility, besides morphologic indexes and of the jump capacity suitable for athletes of high international qualification.

Keywords: volleyball, dermatoglyphia, somatotype, explosive strength.
INTRODUÇÃO

A posição de destaque do voleibol brasileiro no cenário internacional requer investimentos, trabalho e pesquisa. A determinação do perfil de atletas de alta qualificação é importante para o processo de seleção dos jovens atletas durante o treinamento de longo prazo da modalidade. O objetivo do estudo foi identificar o perfil dermatoglífico, somatotípico e da força explosiva de membros inferiores de atletas de voleibol feminino da seleção brasileira. Trata-se de um estudo descritivo, com tipologia ex post facto.

Materiais e Métodos: A amostra foi composta de 28 atletas. Os protocolos utilizados foram: a Dermatoglífica (ID) de Cummins & Midollo (1961); o somatório de Heath & Carter (1967); o Sargent Jump Test adaptado (1921) (IVP); e o Teste de Impulsação Vertical com Deslocamento de 3 metros (IVD).

Resultados: da (ID) foram: D10=11,8±3,6; SQTL=117,1±46,0; A=11%; L=60%; W=29%; o perfil somatotípico foi caracterizado como “central”; e na avaliação da força explosiva observou-se (IVP)=47,0±7,6cm; (IVD)=54,1±8,9cm.

Discussão: Foi verificada elevada predisposição genética das atletas para força explosiva, resistência de velocidade e agilidade, além de índices morfológicos e da capacidade de salto condizentes com atletas de alta qualificação internacional.

PALAVRAS-CHAVE: voleibol, dermatoglífica, somatotipo, força explosiva.

INTRODUCTION

The formulation of applied scientific methodology to the process of selection in sports is intimately linked to the study of the “model characteristics” of the most outstanding athletes in the modality. The high performance athlete may serve as a standard to be followed by sports users. In this way, Fernandes Filho et al. suggest that the identification of the high performance athlete’s profile may be carried out by means of evaluation of the basic physical qualities of the modality, the somatotype, genetic characteristics, among others.

In Brazil, several studies have been carried out to identify the pattern referring to the Brazilian high performance athletes in several modalities. However, few studies have been carried out aiming to identify the profile of volleyball players in Brazil. The identification of the women’s volleyball profile in Brazil is an important measure to keep up the lead worldwide, which is unarguably considered to be the best of the world.

Outlining a profile based on physical qualities or somatotype characteristics is a common practice and extensively used, the inclusion of the Dermatoglyphy in the methodological practice represents an advantage for this study.

The dermatoglyphic method consists of an evaluation of the fingerprints found in all the fingers. It is a procedure able to identify some genetic characteristics such as the predisposition as regards the prevailing physical qualities inherent to the athletes.

Heath & Carter’s somatotype (1967) is defined as a valid method for the description of the athlete’s anthropometric characteristics. In the women’s volleyball, some studies were carried out for the checking of the athlete’s somatotype profile, as well as for the identification of diseases as regards the level of qualifications of them.
of commitment assumed with the researcher and not agree to take part of it freely and voluntarily.

The protocol for the determination of genetic characteristics of athletes was the dermatoglyphy of Cummins & Midllo (1961). This method includes the processing and later obtaining of fingerprints for the preliminary processing of reading, checking:

a) The type of patterns on the distal phalanges of the fingers: Arch “A”, pattern without deltas; Loop “L”, pattern of one delta; Whorl “W”, pattern of two deltas;

b) The quantity of lines in every finger of the right hand (MDSQL) and of the left hand (MESQL), and total ridge count (SQTL) which is equivalent to the sum of quantity of lines on the ten fingers;

c) The quantity of patterns, of different types, for all fingers of the right hand (MDT) and of the left hand (MET);

d) The delta index, \(D10 = \sum L + 2 \times W\); and

e) The types of digital formulas that indicate the representation in individuals of different combinations of types of patterns in the 10 fingers.

The measures of somatotype were obtained by Heath & Carter’s method which provides with a more accurate study on the ideal physical type of each sport modality\(^{23,38}\). For making of the indexes of endomorphy (relative adiposity), mesomorphy (musculoskeletal magnitude) and ectomorphy (relative linearity), it was used the protocols of measures of body mass, stature, perimeter of the right arm being contracted and corrected, perimeter of the left leg being corrected, subscapular, tricipital, supraspinatus and medial calf skinfolds) and osseous of diameters femoral and umeral biepicondilian\(^{39}\).

The Sargent Jump Test (1921) was conducted as reported by Johnson & Nelson (1979) for the evaluation of explosive strength of the lower limbs\(^{39}\). For greater specificity of the moves during a match, it was also used the test of vertical jump with displacement of 3m.

For the making of fingerprints, it was used a suitable form and Impress® collector (2005); the anthropometric measures were taken using a Filizola scale (2005), stadiometer, skinfold compass, anthropometric tape-measure and Sanxy caliper rule (2005); and, for the checking of explosive strength, a Cardiomed (2005) tape with precision of 0.1cm and a box of chalk were used.

It was made use of the descriptive statistic, structured in mean values and its derivatives, for the variables of continuous nature, and of the frequency distributions, for the variable of discrete nature. It was used the Fernandes Filho Radar\(^9\), which defines the truth interval of the mean (95%), the calculated mean for normalized values for all variables which were evaluated, illustrating the complete profile of the evaluated group.

**RESULTS**

The results of the dermatoglyphic profile of women’s volleyball are shown in the Table 1, 2, 3 and 4.

**DISCUSSION**

In the Table 1, the values showed great presence of (L), followed by (W), smaller occurrence of (A), and intermediate values D10 and SQTL. In dermatoglyphic scores of high performance, there is a tendency to the disappearance of (A), an increase of the pieces of (W), D10 and SQTL, indicative of the increase of the predisposition to motor coordination\(^ {9,18,19,21,22}\).

The characteristics of the types of prevailing fingerprints in this group of athletes showed the combination which presents the predisposition to explosive strength and to velocity resistance\(^1,19,26\). It may be considered that high levels of these physical qualities are necessary so that the volleyball athletes achieve high level of performance in the modality.

The results showed some dermatoglyphic parameters D10 and SQTL lower than those found in the national team of high qualified men’s\(^3\) volleyball, basketball and futsal, whose worldwide fame is remarkable. However, these were higher that those found in

<table>
<thead>
<tr>
<th>Table 1 - Descriptive data of the type of pattern, SQTL, D10 of Brazilian women’s volleyball</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Brazil</td>
</tr>
</tbody>
</table>
| D10: Delta index; SQTL: Total Ridge Count of the fingers; n: population; x: mean; sd: standard deviation; med: median; A: Arch; L: loop; W: Whorl.

<table>
<thead>
<tr>
<th>Table 2 - Descriptive data of the type of pattern of MET and MDT of Brazilian women’s volleyball</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>n</td>
</tr>
<tr>
<td>mean</td>
</tr>
<tr>
<td>median</td>
</tr>
<tr>
<td>sd</td>
</tr>
<tr>
<td>minimum</td>
</tr>
<tr>
<td>maximum</td>
</tr>
<tr>
<td>pattern</td>
</tr>
<tr>
<td>CV(%)</td>
</tr>
</tbody>
</table>

n: population; sd: standard deviation; CV: coefficient of variation; MET: type of pattern of each finger of the left hand (1st finger to 5th finger); MDT: type of pattern of each finger of right hand (1st finger to 5th finger).
According to the table of dermatoglyphic and somato-functional classification, this does not assure high sportive qualification when the greatest participation of athletes takes part of the Brazil team, for although the group of athletes takes part of the Brazil team, the predisposition to coordination, resistance, absolute strength and high stature. The studies with athletes of the female volleyball reinforce the data of the American Volleyball team (3,1-3,4-3,2), and those of the Italian athletes of the first division (2,9-3,1-3,0), and different results presented by the Greek Volleyball team athletes (4,2-2,2-2,2), those of the Argentenian team of the first division (4,5-2,8-2,9), of the Italian team of the second division (3,1-3,5-2,7) and amateur Italian athletes (4,7-3,9-2,3). These data convey differences in relation to the level of qualification in the somatotype of women’s volleyball, and the Brazilian athletes present morphological characteristics compatible with high performance.

For a better view of the group distribution in relation to the somatotype component, it can be observed that somatotype-compatible with high performance. The literature suggest that the major characteristics of high performance athletes’ somatotype are: higher levels of ectomorphy and mesomorphy and smaller values of endomorphy. However, the “central rating” (3,5-3,0-3,5) of the female Brazilian athletes reinforces the data of the American Volleyball team (3,1-3,4-3,2) and those of the Italian athletes of the first division (2,9-3,1-3,0), and different results presented by the Greek Volleyball team athletes (4,2-2,2-2,2), those of the Argentenian team of the first division (4,5-2,8-2,9), of the Italian team of the second division (3,1-3,5-2,7) and amateur Italian athletes (4,7-3,9-2,3). These data convey differences in relation to the level of qualification in the somatotype of women’s volleyball, and the Brazilian athletes present morphological characteristics compatible with high performance. The literature suggest that the major characteristics of high performance athletes’ somatotype are: higher levels of ectomorphy and mesomorphy and smaller values of endomorphy.
However, this can be due to the high number of juvenile athletes of the sample, which may be contributed for the reduction of the mean of the group. The results are upper than those the college American women’s volleyball (45.5±6.4cm)\textsuperscript{33}, young Australian athletes of the national team (45.7±1.6cm)\textsuperscript{34}, young American athletes (37.4±5.7cm)\textsuperscript{35}, including the setters’ scores (42.8±8.1cm) and opposite (42.0±5.1cm) the young English men’s volleyball team\textsuperscript{41}.

In the test of vertical impulsion with displacement (VID), also referred as impulsion of attack by the coaches, the value 54.1±8.9cm was found. This result was upper in relation to the values obtained by the national team (51.2±1.8cm), state level (45.3±1.0cm) and new players (38.7±1.5cm), all from the young Australian division\textsuperscript{34}. It was also observed the shortage of data in the specialized literature in relation to this variable, maybe by the specificity of this type of jump in relation to volleyball.

The scores showed that the explosive strength of lower limbs is made potential when performed after the performance of displacement, this type of jump is more used during volleyball games both in situations of attack and block\textsuperscript{30,31}.

To investigate the dermatoglyphic, somatotype and explosive strength measures altogether with the results obtained were turned into a single non-dimensional score and presented in Fernandes Filho’s Graph (Graph 2). This illustrates the profile which reflects

\begin{table}[h]
\centering
\caption{Descriptive data of the somatotype of Brazilian women’s volleyball}
\begin{tabular}{cccc}
\hline
 & Endomorphy & Mesomorphy & Ectomorphy \\
\hline
n & 28 & 28 & 28 \\
mean & 3.5 & 3.0 & 3.5 \\
sd & 1.0 & 1.3 & 1.1 \\
median & 3.4 & 3.0 & 3.5 \\
minimum & 2.0 & 0.6 & 0.2 \\
maximum & 6.5 & 5.9 & 5.4 \\
CV(%) & 28.5 & 43.3 & 31.4 \\
\hline
\end{tabular}
\end{table}

\begin{table}[h]
\centering
\caption{Descriptive data of the explosive strength of lower limbs of Brazilian women’s volleyball}
\begin{tabular}{cccc}
\hline
 & IVP & IVD \\
\hline
n & 28 & 28 \\
mean & 47.0 & 54.1 \\
sd & 7.6 & 8.9 \\
median & 46.0 & 52.0 \\
minimum & 33.0 & 34.0 \\
maximum & 63.50 & 71.50 \\
cv(%) & 16.1 & 16.4 \\
\hline
\end{tabular}
\end{table}

n: population; sd: standard deviation; CV: coefficient of variation.

This study can conclude that the evaluated group had the following characteristics in relation to dermatoglyphy: greater presence of (L), followed by (W), smaller occurrence (A), and intermediate values of D10 and SQTL; rating in the “class” III according to the Abramova Table; presence of symmetry of MET/MDT; predominance of digital formulas (ALW), (L>W) and (W>L). These data reveal high genetic predisposition for explosive strength, velocity resistance and agility, regarded as important physical qualities for volleyball.

The “central” somatotype showed some compatible characteristics with high qualified athletes in this modality\textsuperscript{23,26}. In volleyball, there is a major worry about the morphological aspects during the selection of athletes\textsuperscript{23,26,27,28}.

As regards the scores of explosive strength, it was observed a high potential for the performance of moves of jump, because the scores found were considered “very good,” besides meeting the international standard for the modality and sex.

\begin{figure}[h]
\centering
\caption{Types of dermatoglyphic patterns}
1.1 - Arch (THE); 1.2 - Loop (L); 1.3 - Whorl (W)
\end{figure}

\begin{figure}[h]
\centering
\caption{Somatocarta of Brazilian women’s volleyball}
\end{figure}

\begin{figure}[h]
\centering
\caption{Fernandes Filho Radar Descriptive data of Brazilian women’s volleyball}
\end{figure}
This way, the results of this study showed some dermatoglyphic, somatotype and lower limbs explosive strength parameter compatible with the characteristics of high qualified athletes for the modality.

It is recommended that further studies are carried out with the inclusion of other physical qualities, evaluation of technical and tactical capacity of athletes, psychological characteristics, setting of intermediate scores during the long-term training process in the base categories, or even by comparing the characteristics of each age group aiming to provide an overview of the evolution of the scores.

Setting a profile is not about the exclusion, but the need, because the high performance is a special condition: it is the summing of a genetic factor (genotype) and training (phenotype), whose sporting success depends on the dialectical complex unity (be it congenital, acquired; biological and social), in which the users’ real capacity will only be found out during the learning process and education. However, one must not overlook that paraphrasing the distinguished researcher Fernandes Filho¹, [...] “It is not the athlete who chooses the sports, but the sport who selects the athlete”.

Acknowledgments

Special thanks to Brazilian Volleyball Confederation (CBV), in Portuguese) and the member of the Brazilian Technical Committee for the young Brazilian Volleyball team.

REFERENCES