

84 - CORRELATION BETWEEN DERMATOGLIFIA AND ANAEROBIC CAPACITY IN DOWNHILL ATHLETES

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doi:10.16887/89.a1.84

Introduction

In high performance sports, every training strategy, evaluation method, technique teaching, seeks to be as efficient as possible, to improve the athlete's abilities. For better evaluation, Rizzi and Marcelino (2013) emphasize that dermatoglyphics is a method of observing fingerprints as a genetic marker and can be used to guide and detect sports talents.

Nogueira et al. (2005) add that dermatoglyphics can contribute to the orientation and sports selection of talents, and it helps significantly to a good physical preparation. Dermatoglyphics consists of interpreting dermatoglyphic patterns or patterns found on the ten fingers of the hands. From the Latin dermo, meaning "skin"; and from the Greek glypha, "to record" - is a term proposed by Cummins and Midlo (1942). It was introduced at the 42nd Annual Session of the American Anatomical Association, held in April 1926.

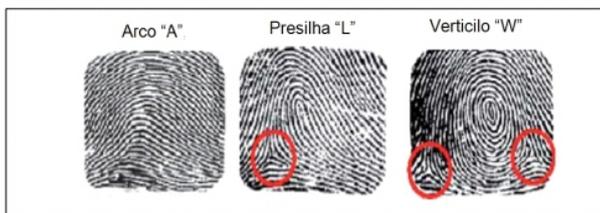
According to Medina (2000), the knowledge of the characteristics of a sport seems to propitiate the adequate application of the strategies that would influence in its better income. In this way, we see that the dermatoglyphic characteristics, as genetic marks, as well as the somatotype, are considered indicative to be used, both with respect to the athletic performance, as well as in the morphofunctional understanding of the athlete.

Dermatoglyphics brings the use of fingerprints as a discrete variable, thus characterizing itself as a broad-spectrum genetic marker for use in association with the basic physical qualities and fiber typology (DANTAS, ROQUETTI FERNANDES, CUNHA, RIBEIRO, BRÜCH, CARUZO and BATISTA, FERNANDES FILHO 2004).

In the study carried out by Pavel and Fernandes Filho (2004) they add that dermatoglyphics can help in the training strategies, of the various physical qualities involved in the sport, as an auxiliary measure to physical training, and especially technical as well, and consequently tactical.

According to Mettrau et al (2009) in the sport, the evaluation of this genetic pattern is obtained by analyzing the pattern of fingerprints with three types of fundamental designs: arch "A", clip "L" and whorl "W". The differentiation between these digital ones is related to the presence and absence of the deltas (tririads). The drawings are identified by the presence or not of delta. The arch (A) represents the drawing without deltas or triads, the simplest being identified by 0, the loop (L) is the design of a delta with value 1. The whorl (W) has two deltas, being identified by the value 2.

Figura 1 – Tipos de desenhos dermatoglíficos: Arco "A", Presilha "L", Verticilo "W".



Fonte: Barbosa, Fernandes e Fernandes Filho (2009).

With the number of deltas from all hands, we calculate the D10, which is the index of triads (VIEIRA, et al, 2012). In the digital drawings, there are two more important indices to be highlighted in the dermatoglyphic analysis: D10 and sum of the total number of lines (SQTL). D10 is the index representing the sum of all deltas of the ten fingers and the SQTL represents the sum of the number of lines in the ten fingers of the hands (METTRAU et al 2009). The dermatoglyphic classes are compared with the table below, showing their minimum and maximum physical values

Tabela 8. Classificação do conjunto dos índices dermatoglíficos e dos índices, somato-funcionais de jogadores no futsal (n=51).

CLASSES	D10	SQTL	MÍNIMO	MÁXIMO
I	6,0	22,0	COORDENAÇÃO RESISTENCIA DE VELOCIDADE AGILIDADE E RESISTENCIA	FORÇA
II	9,1	86,2	COORDENAÇÃO RESISTENCIA DE VELOCIDADE E RESISTENCIA	VELOCIDADE E FORÇA
III	11,1	119,1	COORDENAÇÃO, RESISTENCIA	VELOCIDADE FORÇA EXPLOSIVA
IV	14,1	139,6	VELOCIDADE E FORÇA	COORDENAÇÃO RESISTENCIA DE VELOCIDADE AGILIDADE
V	16,1	150,1	FORÇA	COORDENAÇÃO RESISTENCIA DE VELOCIDADE AGILIDADE E RESISTENCIA

SILVA DANTAS, ROQUETTI FERNANDES E FERNANDES FILHO (2004)

When we change the focus of evaluation of genetic characteristics, to evaluate the athlete's current level of training, emphasizing the sports require anaerobic potential, it is detrimental with evaluation of the aerobic potential because it has parameters and means of assessment well defined and validated in literature.

The evaluation of the anaerobic potential does not have a widely accepted method for this purpose and allows the distinction between anaerobic alactic and lactic systems. Despite this, the Wingate Anaerobic Test (TAW) has been used for this purpose due to its ease of administration and a great variety of parameters for the analysis of the mechanical power yield that is supposed to reflect the anaerobic potential (KISS, 2003; INBAR, BAR-OR, SKINNER, 1996; SZMUCHROWSKI, 1998).

Wingate's anaerobic test was developed during the 1970s at the Wingate Institute in Israel. Since its inception, the Wingate anaerobic test has been used in several works with the most different types of subjects. The elaboration of this test arose from the need to obtain more information about the anaerobic performance, since in some daily activities, and especially in the sports modalities, it is necessary to perform movements with great power, instantaneously or in a few seconds (BAR-OR, 1987; INBAR et al., 1996).

Garrett Jr. (2003: 62) points out that "the objectives of the 30-second Wingate test are to determine anaerobic potency and anaerobic capacity". The Wingate anaerobic test lasts 30 seconds, during which the individual being evaluated tries to pedal as many times as possible against a fixed resistance, aiming to generate the highest possible power in that period.

The power generated during the 30 seconds is called average power, and probably reflects the localized resistance of the exercise group, using energy mainly from the anaerobic pathways.

The highest power generated 3 or 5 seconds is called peak power and provides information about the peak mechanical power that can be developed by the muscle group performing the test. Since peak power normally occurs within the first 5 seconds of the test, it is believed that the energy for such activity comes essentially from the ATP-CP system, with some contribution from glycolysis. The test also provides the fatigue index, which is calculated according to Equation:

$$\text{Fatigue Index (\%)} = \frac{(\text{Peak power} - \text{lower power during test})}{\text{Peak power}} \times 100$$

Once the total resistance was applied, the power was determined by the mean of rotations every 5 seconds. The peak power (PP) was considered as the highest power value measured in 5 seconds. The mean power (MW) was determined by the mean values presented every 5 seconds throughout the test (30s). The fatigue index (IF%) evaluated refers to the percentage of decay between the highest and the lowest value presented.

The fatigue index reports the performance drop during the test. The mean power and peak power can be expressed in relation to the body mass (W.kg-1), allowing the comparison between subjects of different body masses (BAR-OR, 1987; INBAR et al., 1996).

The elaboration of this test arose from the need to obtain more information about the anaerobic performance, since in some daily activities, and especially in the sports modalities, it is necessary to perform movements with great power, instantaneously or in a few seconds (BAR-OR, 1987; INBAR et al., 1996). Not being different with Downhill athletes (cycling mode whose goal is to end a downhill path in the shortest possible time), make dermatoglyphics data association, and Wingate test, featuring its power and anaerobic capacity.

#### Methodology

For the evaluation of the fatigue index (IF%), a Monark ergometer bicycle with mechanical braking was used to perform the Wingate test. To determine the body composition of the individuals was collected data such as height and body mass. The equipment used for data acquisition was: Cardiomed stadiometer fixed to the wall and medical scale Filizola. The dermatoglyphic method was used to identify the physical valences.

The protocol chosen to determine the genetic characteristics was the digital dermatoglyphics, from Cummins and Midlo (1942), to which Fernandes Filho (1997) refers. It was part of the method used in the present research the processing and subsequent obtaining of fingerprints.

After the preliminary processing of its reading, where the protocol recommends: identify the types of drawing: arch (A), loop (L) or whorl (W); count the number of lines on each finger of the hand (QL); count the number of lines on all ten fingers (SQTL); determine delta 10 (D10) - summary intensity of the drawings; determine the types of digital formulas, identify the number of deltas in each finger of both hands, right hand (MDT) and left hand (MET).

During the Wingate test, subjects are instructed to remain seated and pedal as fast as possible for all 30 sec. of the test. It was given 2-3 sec. the subject to overcome the inertia of the wheel before all resistance was applied, and the stopwatch was triggered from this moment. Once the total resistance was applied, the power was determined by the mean of rotations every 5 sec. The peak power (PP) was considered as the highest power value measured in 5 sec. The mean power (MW) was determined by the mean of the values presented every 5 sec throughout the test (30 sec).

For the data collection and organization, a specific spreadsheet was created in Excel for windows 2007. The data are collected, in an environment appropriate for such activity, in the premises of the University of the Region of Joinville - UNIVILLE, Campus Joinville. The temperature is controlled between 22 ° C and 24 ° C, with relative humidity between 60% and 80%. The data after being arranged and tabulated in an Excel for Windows 2003 worksheet will be redirected to the statistical package SPSS 16.0 where they were analyzed by the descriptive statistics.

#### Results and Discussion

For the analysis and interpretation of the data, we used descriptive statistics with measures of central tendency (mean) and dispersion (standard deviation). The Shapiro Wilk test demonstrated normality among the investigated variables, thus opting for parametric tests. The comparative of the samples was given by Student's t-Test for independent samples, adopting significance level  $p < 0,05$ . The Pearson coefficient matrix was used to correlate the investigated variables and the coefficient of determination, adopting Anova One Way significance level  $p < 0,05$ .

Table 1- Characterization of the sample of amateur mountain bikers Downhill (n=19)

Variables	$\bar{X} \pm SD$
Age (years)	30,9 ± 9,8
Height (meters)	1,77 ± 0,1
Body mass (Kg)	79,1 ± 11,9

$\bar{X}$ = mean, SD= standard deviation

Table 1 shows the characterization of the participants, with the mean age of the athletes being 30.9 ± 9.8 years, height 1.77 ± 0.1m and the mean weight being 79.9 ± 11.9 kg. Morales, Brasilino and Dutra (2013) analyzed and characterized a group of mountain biking athletes (n = 15) more homogeneous, presenting a mean of 22.9 ± 5.4 years, as well as their average height of 176.2 ± 4.2 cm and their average body mass was 66.7 ± 6.8 kg.

Table 2 - Analysis of the absolute and relative frequency of amateur Downhill mountain bike athletes, according to the dermatoglyphic classes

Class	Frequency.	Frequency %
I	0	0
II	4	16
III	3	12
IV	1	4
V	11	44

Fonte: a propria pesquisa

A greater number of class V athletes were found, which according to the dermatoglyphic classification are athletes with predominantly aerobic valences, with speed, agility, coordination and resistance, with low strength index.

Table 3 - Relationship between the total number of lines (SQTL) and anaerobic power, anaerobic capacity and fatigue index (IF%) of mountain bike practitioners, Down Hill category, submitted to the Wingate test.

Class	n	Capacity		Power		IF%	
		r	r <sup>2</sup>	r	r <sup>2</sup>	r	r <sup>2</sup>
I	0	-	-	-	-	-	-
II	4	-0,54	29%	-0,69	48%	-0,89	79%
III	3	1,00	100%	1,00	100%	0,85	71%
IV	1	-	-	-	-	-	-
V	11	0,21	5%	0,38	15%	0,31	10%

r = Pearson's correlation coefficient, r<sup>2</sup>= determination of coefficient

Observing the data of table-3 to classes II and III, showing that they have greater anaerobic power, anaerobic capacity and fatigue index, evaluated with Wingate test. Class II ( $r = -0.54$ ) being a slight relation between the increase of the lines of the fingers of the fingers and the fall of anaerobic capacity.

Sport modalities of velocity and strength are included in the low values of D10 and SQTL; the modalities with complex proprioception, in the field of high values, and the groups of resistance sports occupy the intermediate position (FAZOLO et al., 2005).

Table 4 - Relationship between fingertip designs and anaerobic power, anaerobic capacity and fatigue index (IF%) of mountain bike practitioners, Downhill category, submitted to the Wingate test.

Class	Capacity		Power		IF%	
	r	r <sup>2</sup>	r	r <sup>2</sup>	r	r <sup>2</sup>
A	-0,09	0,75%	-0,09179	0,8%	-0,02757	0%
L	0,05	0,26%	-0,15	2,1%	-0,33	11%
W	-0,08	0,71%	0,10	1,0%	0,30	9%

r = Pearson's correlation coefficient, r<sup>2</sup>= determination of coefficient

There was no strong correlation (above 0.5 or below -0.5) in any relation between fingertip designs and anaerobic power and capacity and fatigue index.

#### Conclusions

The literature shows the importance of the dermatoglyphic test for the detection of muscular valences, positive points and to improve on an individual basis. The Wingate test, according to the literature, is an important tool for individual analysis of anaerobic yield and fatigue index of the athlete.

The dermatoglyphic association with the power, anaerobic capacity and fatigue index of mountain bike athletes (downhill) who underwent the Wingate test proved to be a powerful tool for athletes' analysis. It was detected that in athletes Catarinenses with mean age of 30 years  $\pm$  9.8 years.

The mean height was 1.77 m  $\pm$  0.1 m with a mean weight of 79.9 kg  $\pm$  11.9 kg had a predominance of class V (44%), that is, they have predominantly aerobic valences, with speed resistance, agility, coordination and resistance, with low index of strength. Class II and III athletes have greater power and anaerobic capacity and fatigue index.

Class II and III according to the dermatoglyphic classification table have maximum valence in velocity and strength, that is, the test was compatible with the comparative table.

The relation between the digital drawings and the anaerobic power, anaerobic capacity and fatigue index was very weak, with no correlation.

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#### CORRELATION BETWEEN DERMATOGLIFIA AND ANAEROBIC CAPACITY IN DOWNHILL ATHLETES

**Abstract:** This work aims to associate dermatoglyphics with the power and anaerobic capacity of mountain bike athletes (downhill), submitted to the Wingate test. Thus, characterizing athletes through dermatoglyphics, evaluating power and anaerobic capacity with Wingate test, then doing data correlation. The population / sample to be surveyed participates in the Catarinense downhill championship, with stages of competition in several cities of Santa Catarina, being the show pilots from Joinville, Sao Bento do Sul, Schroeder and Jaragua do Sul. There were 19 individuals competing in the downhill Catarinense circuit, aged between 18 and 35 years, male. The data were collected, in an appropriate environment for this activity, in the dependencies of the University of the Region of Joinville - UNIVILLE, Campus Joinville. It was detected that athletes from Catarinense had a predominance of class V (44%), that is, they have predominantly aerobic valences, with resistance of speed, agility, coordination and resistance, with low strength index. Class II and III athletes have greater power and anaerobic capacity and fatigue index. The classes II and III, have maximum valence in speed and strength. The relation between the digital drawings and the anaerobic power, anaerobic capacity and fatigue index was very weak, with no correlation.

**Keywords:** Dermatoglyphics; Anaerobic Capacity; Mountain Bike Downhill.

#### CORRELATION ENTRE DERMATOGLIFIA ET CAPACITÉ ANAÉROBIE DANS LES ATHLÈTES EN DESCENTE

**Résumé:** Ce travail vise à associer des dermatoglyphes à la puissance et à la capacité anaérobie des athlètes de vélo de montagne (descente), soumis au test de Wingate. Caractérisant ainsi les athlètes à travers des dermatoglyphes, évaluant la puissance et la capacité anaérobie avec le test Wingate, puis effectuant une corrélation de données. La population / l'échantillon à interroger participe au championnat de descente Catarinense, avec des étapes de compétition dans plusieurs villes de Santa Catarina, à savoir les pilotes de spectacle de Joinville, de Sao Bento do Sul, de Schroeder et de Jaragua do Sul. Dans le circuit Downhill Catarinense, 19 hommes, âgés de 18 à 35 ans, étaient en compétition. Les données ont été collectées, dans un environnement approprié pour cette activité, dans les dépendances de l'Université de la région de Joinville - UNIVILLE, Campus Joinville. Il a été détecté que les athlètes de Catarinense avaient une prédominance de classe V (44%), c'est-à-dire qu'ils avaient des valences principalement aérobies, avec une résistance de vitesse, d'agilité, de coordination et de résistance, avec un indice de résistance faible. Les athlètes de classes II et III ont une plus grande puissance, une capacité anaérobie et un indice de fatigue plus élevés. Les classes II et III ont une valence maximale en vitesse et en force. La relation entre les dessins numériques et le pouvoir anaérobie, la capacité anaérobie et l'indice de fatigue était très faible, sans corrélation.

**Mots-clés:** Dermatoglyphia; Capacité anaérobie; montagne vélo descente

#### CORRELACIÓN ENTRE DERMATOGLIFIA Y CAPACIDAD ANAERÓBIA EN ATLETAS DE DOWNHILL

**Resumen:** Este trabajo tiene por objetivo asociar la dermatoglia con la potencia y capacidad anaerobia de atletas de mountain bike (downhill), sometidos a la prueba de Wingate. Caracterizando así a los atletas por medio de la dermatoglia, evaluando potencia y capacidad anaerobia con prueba de Wingate, entonces así haciendo la correlación de datos. La población / muestra a ser investigada participa del campeonato Catarinense de downhill, con etapas de competición en diversas ciudades de Santa Catarina, siendo la muestra pilotos provenientes de Joinville, São Bento do Sul, Schroeder y Jaragua del Sur. Fueron 19 individuos competidores en el circuito Catarinense de downhill, con edades entre 18 y 35 años, del sexo masculino. Los datos fueron recolectados, en un ambiente apropiado para tal actividad, en las dependencias de la Universidad de la Región de Joinville - UNIVILLE, campus Joinville. Se detectó que atletas Catarinenses poseían predominancia de clase V (44%), o sea, poseen valencias predominantemente aeróbicas, con resistencia de velocidad, agilidad, coordinación y resistencia, con bajo índice de fuerza los atletas de clase II y III tienen mayor potencia y capacidad anaeróbica e índice de fatiga. Las clases II y III, tienen valencia máxima en velocidad y fuerza. La relación entre los dibujos de las digitales y la potencia anaeróbica, capacidad anaeróbica y índice de fatiga fue muy débil, no habiendo correlación

**Palabras clave:** Dermatoglia; Capacidad anaerobia; bicicleta de montaña cuesta abajo

#### CORRELAÇÃO ENTRE DERMATOGLIFIA E CAPACIDADE ANAERÓBIA EM ATLETAS DE DOWNHILL

**Resumo:** Este trabalho tem por objetivo associar a dermatoglia com a potência e capacidade anaeróbia de atletas de mountain bike (downhill), submetidos ao teste de Wingate. Caracterizando assim os atletas por meio da dermatoglia, avaliando potência e capacidade anaeróbia com teste de Wingate, então assim fazendo a correlação de dados. A população/amostra a ser pesquisada participa do campeonato Catarinense de downhill, com etapas de competição em diversas cidades de Santa Catarina, sendo a mostra pilotos provenientes de Joinville, São Bento do Sul, Schroeder e Jaragua do Sul. Foram 19 indivíduos competidores no circuito Catarinense de downhill, com idades entre 18 e 35 anos, do sexo masculino. Os dados foram coletados, em um ambiente apropriado para tal atividade, nas dependências da Universidade da Região de Joinville – UNIVILLE, campus Joinville. Foi detectado que atletas Catarinenses possuíram predominância de classe V (44%), ou seja, possuem valências predominantemente aeróbicas, com resistência de velocidade, agilidade, coordenação e resistência, com baixo índice de força. Os atletas de classe II e III possuem maior potência e capacidade anaeróbica e índice de fadiga. As classes II e III, possuem valência máxima em velocidade e força. Já a relação entre os desenhos das digitais e a potência anaeróbica, capacidade anaeróbica e índice de fadiga foi muito fraca, não havendo correlação.

**Palavras-chave:** Dermatoglia; Capacidade anaeróbia; mountain bike downhill