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DERMATOGLYPHICS AND ITS RELATIONSHIP WITH THE SPEED MOTOR CAPACITY IN CHILDREN AND ADOLESCENTS

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ABSTRACT

The purpose of this study was to investigate the presence of a dermatoglyphic mark characteristic of speed motor capacity in children and adolescents. A total of 1,238 female children and adolescents aged between 8 and 17 years old were surveyed. The sample was compared according to the classification parameters presented in the 20-meter-race test. The protocol for the analysis of the fingerprints was the Dermatoglyphic proposed by Cummins and Midlo, via Dermatoglyphic Fingerprint Reader®. The statistical analyzes were processed in the Statistical Package for Social Science (SPSS), version 20.0, being established the significance level p≤0,05. The comparison of the categorical variables showed a significant difference with a higher frequency of Radial Loop (LR) on the fingers MET1 (p=0,000), MET5 (0,000), MDT1 (0,000), MDT3 (0,040), and MDT5 (0,012), in the group classified as excellent and Radial Loop (LR) on the finger MDT3 (0,040), in the group classified as weak. It is concluded that there is a significant relationship between Radial Loop (LR) and the best performances in the speed test, which indicates the presence of dermatoglyphic mark that characterizes the predisposition of fetal development for different levels of speed in children and adolescents.

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INTRODUCTION

From the prenatal period to death the human being goes through processes of quantitative and qualitative order, called growth and human development, which although conceptually differ, are inseparable and demonstrate correspondence with each other, because the first one refers to the biological maturation, related to the chronological factor, while the second one is characterized by the improvement in systems of the human organism, in what concerns the accomplishment of its complex functions, such as motor development that is related to age, however, it does not depend exclusively on it (GUEDES, 2011). The identification and evaluation of the physical qualities necessary to a certain sport practice or to improve performance, become essential for the physical preparation and improvement of the individual's sporting performance (TUBINO; MOREIRA, 2003). The application of physical tests specific of the physical qualities such as motor coordination, agility, strength, power and speed, are considered basic, in the initial identification and analysis of the results, verifying that the stages of these valences are of fundamental importance for the formulation of objectives to be achieved throughout a training program (MACEDO, 2016).

When talking about physical qualities, speed, defined as the ability to move quickly, is recognized as essential in sports and its measurement is indispensable in physical ability tests. The speed is subdivided into: speed of acceleration, maximum speed, speed resistance and it depends on genetics, because it is linked to a greater number of fast twitch fibers, although this is not a determining factor (BOMPA, 2005). The genetic load associated with everything that is added to an individual after birth is able to form people totally different from each other, thus, the combination of these two factors gives rise to a sum of specificities that characterize each person, from their body composition to their sporting abilities (DANTAS, 2003). A possible method for analyzing the potential of fetal development is dermatoglyphics, since the fingerprints are understood as dermal representations of these characteristics (CUMMINS; MIDLO, 1961). The dermatoglyphic analysis,

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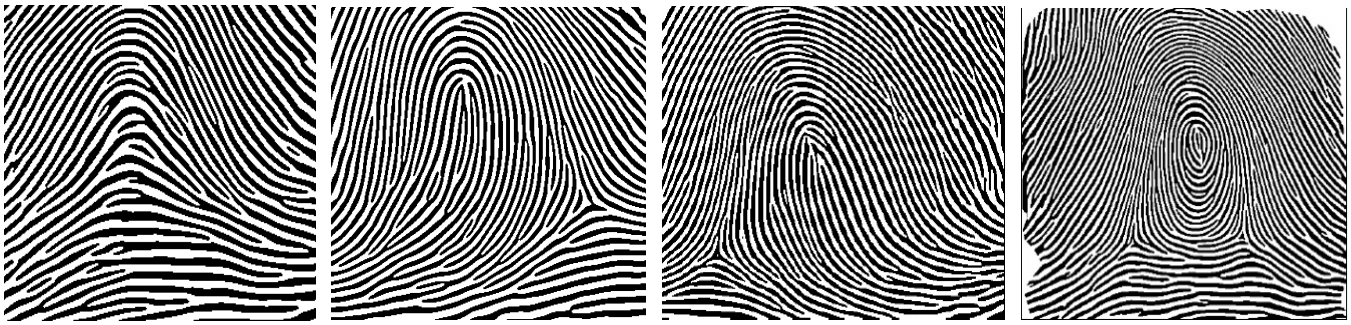
considering the fingerprints, includes the type of drawing, arch (A), loop (L), radial (LR) and whorl (W), and constitute a qualitative characteristic and the number of lines on the fingers (the number of ridges within the drawing), the summary complexity of the drawings and the total number of lines (ABRAMOVA; NIKITINA; OZOLIN, 2013). For Nodari Júnior and Fin (2016), "All drawings have multiple variations in their presentation form, either by the arrangement of core and deltas, or by the forms of the drawings and by the number of lines and minutiae", as a consequence the mathematical combinations presented by the fingerprints transcribe direct information of intrauterine neuro-motor development of individuals in aspects related to physical and anthropometric capacities, which allow the evaluation from the analysis of the fingerprints. Based on the above, the purpose of this study was to investigate the presence of dermatoglyphic mark characteristic of speed motor capacity in children and adolescents.

MATERIALS AND METHODS

This is a descriptive research with a quantitative approach. The design of the study is the correlational type, the design was characterized in collecting data on the variables of the same subjects and determine their respective relationships (THOMAS; NELSON; SILVERMAN, 2009). We investigated female children and adolescents aged between 8 and 17 years old, in public and private schools from the city of Joaçaba, Santa Catarina, Brazil. The sample was carried out by convenience and composed of 1,238 individuals, belonging to the database of the Laboratory of Exercise Physiology and Evaluation Measures, from the University of the West of Santa Catarina - Unoesc campus Joaçaba. The study included all the subjects who had the anthropometric data (weight and height), dermatoglyphics and speed test collected and stored in a database. The subjects who did not perform the speed test, nor the collection of anthropometric data and those who had the fingerprints illegible or anomalous were excluded. The protocol chosen to analyze fetal development through the collection of fingerprints was the Dermatoglyphic, proposed by Cummins and Midlo (1961), through the Dermatoglyphic Fingerprint Reader®, validated by Nodari Júnior (2014). For the capture, processing and analysis of fingerprints by Dermatoglyphic Method, a computerized process was used for dermatoglyphic reading, specifically, a reader consisting of an optical scanner equipped with a roller, which collects, interprets the image and creates, in binary code, a drawing, which is captured by specific software for the treatment and reconstruction of real and binarized black and white images. From the fingerprint collection the evaluator's interference occurs in the marking of the core and delta points, when, then, the software makes the qualitative image identification and quantitative of lines, generating the computerized worksheet resulting from the processed data. The drawings analyzed in dermatoglyphics are presented in order of formation, divided into arch, ulnar loop, radial loop and whorl, according to the drawings of Figure 1. For the 20-meter-race test (GAYA; GAYA, 2016), it was used a stopwatch and a track of 20 meters demarcated with three parallel lines on the ground as follows: the first (starting line); the second, 20m away from the first (timing line) and the third line, marked one meter from the second (finish line). The third line serves as the arrival reference for the student in an attempt to prevent him from initiating deceleration before crossing the timing line. Two cones were used for signaling the first and third lines. The individual starts from the standing position, with an advanced foot forward immediately behind the first line (starting line) and they are informed that they must cross the third line (finish line) as soon as possible. The evaluator shall trigger the timer at the time when the evaluated, in taking the first step, touches the ground for the first time with one foot beyond the starting line. The timer is locked when the student crossing the second line (timing line) touches the ground for the first time. The time of the course is marked in seconds and hundredths of seconds, two houses after the comma (GAYA, GAYA, 2016). The statistical analyzes were processed in the Statistical Package for Social Science (SPSS), version 20.0, being established the significance level $p \leq 0,05$. In the comparison between the groups and their quantitative variables, Kolmogorov-Smirnov test was used to observe the distribution of normality. As inference, it was used the non-parametric test called Kruskal Wallis (K independent samples in the case of speed test - Weak, Reasonable, Good, Very Good, Excellent) in comparisons between continuous variables: left hand, sum of the number of lines on finger 1 – thumb (MESQL1); left hand, sum of the number of lines on finger 2 – index (MESQL2); left hand, sum of the number of lines on finger 3 – middle finger (MESQL3); left hand, sum of the number of lines on finger 4 – ring finger (MESQL4) and left hand, sum of the number of lines on finger 5 – little finger (MESQL5); sum of the total number of lines on the left hand (SQTLE); right hand, sum of the number of lines on finger 1 – thumb (MDSQL1), right hand, sum of the number of lines on finger 2 – index, (MDSQL2); right hand, sum of the number of lines on finger 3 – middle finger (MDSQL3); right hand, sum of the number of lines on finger 4 – ring finger (MDSQL4) and right hand, sum of the number of lines on finger 5 – little finger (MDSQL5); sum of the total number of lines on the right hand (SQTLD); sum of the total number of lines – both hands (SQTL), and number of deltas (D10). For the comparison of categorical variables: arch (A), radial loop (LR), ulnar loop (LU), whorl (W), drawing of the left hand, finger 1 (MET1), finger 2 (MET2), finger 3 (MET3), finger 4 (MET4) and finger 5 (MET5) and, of the right hand, finger 1 (MDT1), finger 2 (MDT2), finger 3 (MDT3), finger 4 (MDT4) and finger 5 (MDT5), the chi-square test was used. Observed the significant difference between the figures manifested by the groups from the Chi-square, we opted for the recommendation made by Pereira (2001) to carry out the Analysis of Adjusted Residues. In this case, the data were compared to each other observing the standard value of 1,96 that is, all results found higher than the standard show the presence of significant difference between the groups and which of the figures on fingerprints is more frequent. The study was approved under protocol number 449.924, by the Ethics Committee on Research in Human Beings of Unoesc / Hust, in accordance with the ethical standards of norms and directives regulating research involving human beings and in accordance with Resolution 466/2012 of the National Health Council (BRAZIL, 2012) and with the Declaration of Helsinki (WMA, 2013).

RESULTS

The results showed that the studied sample had anthropometric characteristics of height (m) (1.51 ± 0.12), body mass (kg) (46.66 ± 13.41) and age (years) (12.22 ± 2.31). For statistical analysis the sample was classified as weak, reasonable, good, very good and excellent. The results presented, according to the classifications, are shown in Table 1.



Drawing 1: Arch "A" **Drawing 2: Ulnar Loop "LU"** **Drawing 3: Radial Loop "LR"** **Drawing 4: Whorl "W"**

Source: Dermatoglyphic Fingerprint Reader, Nodari Júnior (2009).

Figure 1. Digitized images of Dermatoglyphic patterns

Table 1. Anthropometric characteristics of the female sample according to the speed test classification

Mean and Standard Deviation	Weak	Reasonable	Good	Very Good	Excellent	Total Sample
Age	12,25±2,28	11,85±2,16	12,64±2,43	12,16±2,57	9,60±1,14	12,22±2,31
Height (m)	1,51±0,12	1,51±0,12	1,52±0,10	1,50±0,11	1,45±0,10	1,51±0,12
Body mass (kg)	47,12±13,66	44,48±12,30	47,15±12,12	44,85±13,87	40,62±10,00	46,66±13,41
Sample	912	135	105	81	5	1238

Source: the authors (2018)

Table 2. Mean of the number of fingerprint lines of the left and right hand fingers, SQTLE, SQTLD, SQTL for females according to the classificationin the speed test

	Mean Weak	Mean Reasonable	Mean Good	Mean Very Good	Mean Excellent	p
MESQL1	12,74±5,56	12,32±5,59	13,09±5,50	13,58±5,39	10,80±5,93	0,264
MESQL2	8,59±5,63	8,87±5,68	9,14±5,67	8,77±5,50	2,60±2,96	0,160
MESQL3	9,76±5,65	9,71±5,80	10,69±5,78	9,83±6,09	7,60±7,02	0,329
MESQL4	12,32±5,64	11,81±5,85	13,26±5,56	12,43±5,77	10,80±6,14	0,420
MESQL5	10,80±5,08	10,51±4,77	10,88±5,44	11,16±4,90	9,60±3,91	0,801
SQTLE	54,20±21,82	53,23±22,04	57,05±22,49	55,77±20,95	41,40±20,46	0,372
MDSQL1	14,59±5,70	14,46±5,07	15,364,96	15,17±5,06	12,20±4,86	0,507
MDSQL2	9,09±5,73	8,62±5,40	9,31±6,11	9,79±5,82	6,00±6,28	0,408
MDSQL3	10,13±5,11	9,81±4,89	10,85±4,88	10,20±5,30	8,80±6,38	0,581
MDSQL4	12,56±5,52	11,67±5,53	13,28±5,11	12,69±5,56	10,40±6,34	0,100
MDSQL5	10,82±5,17	10,40±4,77	11,58±5,31	10,85±5,42	10,40±3,97	0,495
SQTLD	57,19±21,24	54,96±19,73	60,38±19,90	58,70±20,59	47,80±22,08	0,210
SQTL	111,39±41,90	108,19±40,67	117,43±40,92	114,47±40,38	89,20±42,00	0,284
D10	12,00±3,43	12,23±3,53	12,32±3,49	12,58±3,68	9,60±3,43	0,313

Source: the authors.
p≤0,05 - Significance level.

Table 3. Significant difference between the figures of the right and left hand fingers found when compared to the classifications weak, reasonable, good, very good and excellent for the female sex

MET1	MET2	MET3	MET4	MET5	MDT1	MDT2	MDT3	MDT4	MDT5
0,000*	0,191	0,209	0,052	0,000*	0,000*	0,409	0,040*	0,097	0,012*

Source: the authors (2018)
*p≤0,05 - Significance level.

When observing the speed test, compared the groups weak, reasonable, good, very good and excellent, there was no statistically significant difference on average the sum of the number of fingerprint lines, according to Table 2. The comparison of the categorical variables (types of drawing) demonstrated a significant difference in MET1 (p=0,000), MET5 (p=0,000), MDT1 (0,000), MDT3 (p=0,040), and MDT5 (p=0,012), shown in Table 3. It was identified a higher frequency of Radial Loop (LR) on fingers MET1, MET5, MDT1, MDT3 and MDT5 in the group classified as excellent and Radial Loop (LR) on the finger MDT3 in the group classified as weak, according to Table 4.

DISCUSSION

Our study did not present a significant difference with regard to the quantitative variables in number of lines, however, in the types of figures there was positive relation between the Radial Loop (LR) in the classifications excellent and weak for females. In the literature, it is possible to find articles that refer to Dermatoglyphics and speed. Assef *et al*. (2009) noted that the sports modalities of speed and strength are inserted in the field of low values of D10 and SQTL. Linhares *et al*. (2009) conducted studies with 136 male students aged between 10 and 14 years old and the results in the tests of strength, aerobic power and speed improved with the advancement of puberty, in all stages, which establishes a positive relation between the progress in maturation and the improvement of the physical performance of the group studied. In dermatoglyphics, the same study did not find significant difference with respect to the types of figures, D10 and SQTL. However, this study sought to identify dermatoglyphic marks only on male students, different from the present research which was limited to research on female students, and this may generate

controversy because the dermatoglyphic patterns differ between the two sexes. Weineck (1999) considers the traverse speed as a key factor of the special conditional preparation of the sportsman/sportwoman. The dermatoglyphic method has been used by sports modalities in studies. According to Silva *et al*. (2008), professional male soccer players have high rates in the sum of the number of lines (SQTL = 181,2), and predominance of L > W, which characterizes a greater predisposition to resistance, speed and coordination. Differently from what was found by Silva *et al*. (2008), in handball the group of women athletes of the Brazilian National Team classified in center, point guard, goalkeeper and winger presented, in the whole group, high rate of arch (A), low sum of the total number of lines (SQTL).

Table 4. Adjusted residuals of types of female fingerprint figures when compared to the weak, reasonable, good, very good and excellent groups

		Fingerprint figures				
		A	LU	LR	W	p
MET1	Weak	1,0	-0,1	0,5	-0,5	0,000
	Reasonable	-10,	0,8	0,9	-0,2	
	Good	0,0	0,1	-0,7	0,0	
	Very Good	-0,3	-1,1	-0,6	1,3	
	Excellent	-0,6	-0,1	6,3	-0,8	
MET5	Weak	0,6	1,1	0,1	-1,6	0,000
	Reasonable	-0,7	-1,2	0,1	1,8	
	Good	0,4	-0,1	-0,9	0,1	
	Very Good	-0,4	-0,2	-0,8	0,6	
	Excellent	-0,4	-0,5	5,4	-0,7	
MDT1	Weak	1,4	1,0	-1,0	-1,4	0,000
	Reasonable	-0,2	-0,4	0,3	0,4	
	Good	-0,8	0,6	0,6	-0,4	
	Very Good	-1,1	-1,8	-0,7	2,3	
	Excellent	-0,4	-0,6	5,8	-0,1	
MDT3	Weak	-0,6	0,4	2,2	-0,9	0,040
	Reasonable	0,4	0,0	-1,6	0,3	
	Good	0,4	0,1	-1,4	0,2	
	Very Good	-0,3	-0,6	-1,2	1,3	
	Excellent	1,4	-1,0	3,3	-0,9	
MDT5	Weak	0,3	0,3	1,5	-1,1	0,012
	Reasonable	0,0	-0,9	-1,3	1,4	
	Good	0,5	0,5	-1,1	-0,5	
	Very Good	-1,0	0,1	-1,0	0,8	
	Excellent	-0,4	-0,4	4,2	-0,7	

It is worth mentioning that the present study found significant differences in the dermatoglyphic characteristics of fingerprints for females, corroborating with the findings of Díaz and Espinoza (2008), when carrying out a study of the relation of the digital characteristics and physical abilities with athletic athletes of both sexes (14 women and 15 men), aged between 12 and 17 years old, it was observed a higher correlation of the drawings Loop (L), Arch (A) and D10 with the strength of power in the group of women thrower. Research by Fonseca *et al*. (2008) performed with high-performance female volleyball athletes, to identify somatotypic, dermatoglyphic and explosive strength aspects of lower limbs, observed the predominance of digital formulas, combination of drawings which indicate the predisposition to explosive strength of lower limbs (ALW), speed resistance (L > W) and agility (W > L). In this perspective, researches point out that as men and women have different dermatoglyphic characteristics, what should be observed regarding the performance of the statistical analyzes (KRISHAN; KANCHAN; NGANGOM, 2013; NODARI JÚNIOR, *et al*., 2016). The results found in the present research, when analyzed from the perspective of dermatoglyphics as a tool for the identification and orientation of sports talents, are in accordance with the considerations of Del Vecchio and Gonçalves (2011), which highlight, the increase of the frequency of Loops. Researches by (KLEIN; FILHO, 2003; CUNHA JÚNIOR, PRETTO; DÍAZ; ESPINOZA, 2008; FONSECA *et al*. 2008; SILVA *et al*., 2008; LINHARES *et al*., 2009; KRISHAN; KANCHAN; NGANGOM, 2013) make no distinction between Radial Loop (LR) and Ulnar Loop (LU) and do not indicate in which fingers the predominance of the figures occurred. Another aspect observed in these studies is that the collections of the dermatoglyphic data occurred according to a traditional method proposed by Cummins and Midlo (1961), which uses ink and paper limiting studies to small samples by making the qualification and quantification process slow, while our study used the computerized method, that allows more practicality, greater precision, less margin of error in studies with larger samples.

Conclusion

The results of this study indicate a significant relationship between the Radial Loop (LR) and the best performances in the 20-meter-race test, on the fingers MET1, MET5, MDT1, MDT3 and MDT5 and the Radial Loop (LR) on MDT5 in the group classified as weak, indicating the presence of dermatoglyphic mark that characterizes the predisposition and the fetal development for different levels of speed in children and adolescents. Thus, it is found in dermatoglyphics a scientific method of investigation that makes it possible to predict neuro-motor abilities, pre-arranged in individuals. The data presented here make it possible to constitute scientific material that may aid in the prescription of exercises, and / or sports orientation based on the genetic potential of each individual. We also suggest that if performed in other countries, it is necessary to use reference tables according to their place of origin and the level of physical conditioning of the individual.

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