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FACTOR STRUCTURE ON DERMATOGLYPHIC PATTERNS OF NATIONAL LEVEL MEN CYCLISTS

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ABSTRACT

The purpose of the study was to find out the prominent contributing dermatoglyphic factors among national level men Cyclists. The subjects were 80 cyclists, who have participated in the National Cycling Championship held at New Delhi in March 1993 and in the III National Games held at Pune in January 1994. Forty dermatoglyphic variables were selected for this study. They included (1) Types of finger pattern, (2) Ridge counts (3) Pattern intensity (4) Ridge count per square Cms (5) Attained angles, and (6) Matric analysis of the palm. Factor Analysis (Principal Component Analysis) was done to find out the prominent dermatoglyphic factors comprising of any one or all of the selected dermatoglyphic variables among male cyclists. The unloaded factors obtained were then rotated by Varimax method to find out the final solution. Item with loading greater than or equal to ±0.40 of Varimax solution were selected for discussing each factor. Four prominent factors extracted after factor analysis were Ridge Count Factor, Horizontal Inter Triradial Distance Factor, Angular Factor & Shortest Inter Triradial Distance Factor.
Keywords:*Dermatoglyphic patterns, cyclists.*

1. INTRODUCTION

Normally an individual starts to take part in a sport without proper guidance. It is thus a sheer chance that one's choice of the sport may be suitable to one's own inherent capabilities. The sporting arena has become so much competitive, that the talents in different games and sports need to be identified at a very early age, so as to give them much specialised coaching from a much younger age (Singh & Kumar, 2013).

Dermatoglyphics are the component of human traits which remain unaltered after birth either by age or by environmental influences. In fact, these patterns are

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formed during the eighth week of conception and are governed by the same biological laws, which determine inheritance of other psychological factors also, hence, it is a well known fact, that the genetic properties of a person in relation to certain qualities do reflect in dermatoglyphic patterns.

deGaray, Levine and Carter (1974) in their book on genetics and anthropological studies of Olympic athletes have mentioned that dermatoglyphics was included as an important variable while carrying the genetic and anthropological studies on the athletes. Sharma and Shukla's (1981) attempt to find out if the athletes in track and field differed from non-athletes in palmar dermatoglyphics revealed significant difference between athletes and non athletes in almost all the selected dermatoglyphic traits.Verma and Kumar (1986) conducted a comparative study of dermatoglyphics in sportsmen and non-sportsmen. The findings revealed the dominance of loop finger patterns and significantly greater inter triradial distances in sportsmen. Bharadwaj (1986) studied on dermatoglyphic patterns of athletes and non-athletes found significant differences among throwers, jumpers, runners and non-athletes in males as well as in females in a number of selected dermatoglyphic variables. Verma and Saxena (1988a) studied the factor structure of dermatoglyphic variables of national level men basketball players. The inter triradial distance variables, the pattern intensity, and specific ridge count were found to be significant and prominent factors of men basketball players. Verma and Sexena (1988b) in the other study investigated the factor structure of dermatoglyphic variables on national level men gymnasts. Different studies with the variable of dermatoglyphic were conducted on different games by the contemporary researchers, but none of the researcher tried to work with cyclist, hence this study is undertaken.

2. METHODS AND MATERIALS

2.1 Subjects

The subjects of the study were 80 cyclists, who have participated in the National Cycling Championship held at New Delhi in March 1993 and in the III National Games held at Pune in January 1994. Prior to data collection an inform consent was taken from the all subjects as they were ready to participate in the study.

2.2Variables

Forty dermatoglyphic variables were selected for this study. They included as:

2.2.1 Types of Finger Pattern: Loops, Arches and Whorls are the different patterns found on fingers. The total of each patterns from all the fingers were counted and added separately. Thus an individual's total of all patterns will range from one to ten, which may or may not consist of arches, loops and whorls.

2.2.2. Ridge Counts From Triradial Point to the Point of Core in Fingers: L1, L2, L3, L4, L5, R1, R2, R3, R4 and R5 are the Ridge Counts lying between the triradial point and the point of core on the thumb, index finger, middle finger, ring finger and the little finger of the Left palm and right palm respectively and were measured in numbers.

2.2.3 Pattern Intensity: LTPI and RTPI are the total number of pattern intensities lying in all the five fingers and are obtained by adding all the triradial points of the left and right palm respectively.

2.2.4 Ridge Count per Square Cms: LR/Sq. Cms. and RR/ Sq.Cms are the ridge counts lying in one square centimetre on the radial side of the left and right palm respectively and were measured in numbers.

2.2.5 Attained Angles: Latd and Ratd are the Attained angles formed from the tri-radial points "a", "t" and "d" of the left and right palm respectively and were measured in degrees.

2.2.6 Matric Analysis of the Palm: The Inter Triradial Distances are measured from the five triradial points of the right and left palm separately. The distance between the inter triradial "a" and "b" of the left and right were measured as Lab and Rab respectively by using a scale. All the other inter triradial distance variables were also measured in the same manner.

2.3Procedure adopted to take Finger Print

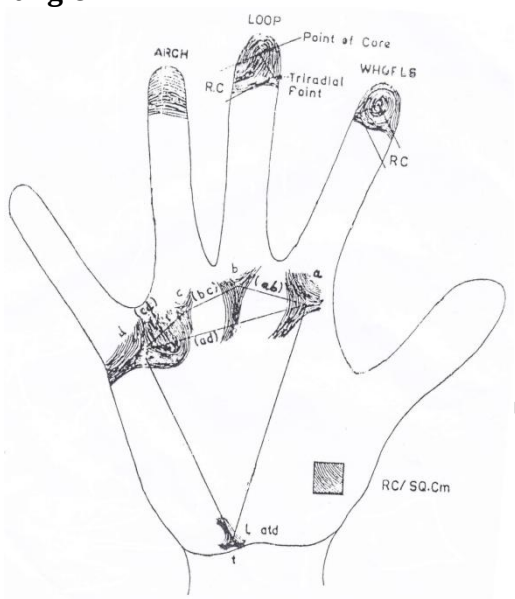
Firstly, the palm of the entire subject were cleaned and dried before taking the print. Then a small damp of printer ink was placed on a glass plate and spread with a roller into a thin layer. Then the stretched palm of the subject was placed at once in such a manner, so that it was not moved. Special care was taken on finger tips, mounts and butts of the palm. After assuring that the ink has been uniformly spread, the palm was then asked to place on plain sheet of paper with a uniform pressure applied by the investigator. The print was then left to dry for further investigations of the study. For the purpose of identifying the finger nomenclature was given as, Digit I-Thumb, Digit II-Index Finger, Digit III- Middle finger, Digit IV-Ring finger and Digit V-Little Finger (Figure 1).

2.4Statistical Analysis

Various descriptive statistics like the lowest and highest scores, kurtosis, skewness, mean, standard deviation, standard error and coefficient of variation were calculated. This has given an idea about the form of distribution of the variables. Factor analysis was applied to investigate the dominant factors of

dermatoglyphic variables of Indian national level men cyclists, for doing so the Principal Component Analysis method has been used and the final solution was obtained by varimax Rotation method.

Figure 1: **Showing the ridge patterns, point of core, tri radial point, ridge count/sq.cm. andatd angle**



RC= Ridge count between triradial point to point of core

3. RESULTS

The various descriptive profiles calculated on the dermatoglyphic variables of all the 80 national level men cyclists are shown in Table 1.

Table 1: Factor one of cyclists after rotated factor loadings (varimax solution).

Item No.	Name of the Variables	Factor Loadings
1	Left Thumb Ridge Counts (L1)	0.52
2.	Left Index finger Ridge Counts (L2)	0.77
3.	Left Middle Finger Ridge Counts (L3)	0.77
4.	Left Ring Finger Ridge Counts (L4)	0.68
5.	Left Little Finger Ridge Counts (L5)	0.48
6.	Left Palm Total Pattern Intensities (LTPI)	0.81
7.	Left Palm Total Ridge Counts (LTRC)	0.97
8.	Right Thumb Ridge Counts (R1)	0.56

9.	Right Index Finger Ridge Counts (R2)	0.77
10.	Right Middle Finger Ridge Counts (R3)	0.81
11.	Right Ring Finger Ridge Counts (R4)	0.71
12.	Right Little Finger Ridge Counts (R5)	0.71
13.	Right Palm Total Pattern Intensities(RTPI)	0.81
14.	Right Palm Total Ridge Counts (RTRC)	0.95
15.	Total Pattern Intensities (TTPI (L+R)	0.87
16.	Total Ridge Counts (TTRC (L+R)	0.99

Factor Analysis describes a procedure of identifying those linear combinations of variables (called as factors) which have large variances, ignoring the linear combinations which have small variances. In this study the Principal Component method was selected for the primary solution of Factor Analysis.

Scores of all the forty dermatoglyphic variables were subjected to correlational analysis. Later for factorization, the correlation matrix so obtained was used in the Principal Component Analysis. With the help of Principal Component Analysis, all the selected forty variables were divided into various factors by using the Kaisser's (1959) criteria suggested by Guttman (1954). Only those factors having latent roots greater than one were considered as common factors. Owing to this criterion four factors obtained were then rotated by varimax method to find the final solutions. Rotation of the factors is important in order to avoid the overlapping of variables in different factors. Later, each of these factors were interpreted and given names. Items with loadings greater than or equal to +0.40 on Varimax solutions were selected for discussing each factor. The resulted four factors of cyclists have accumulated to a total common variance of 65.83%.

Factor 1 (Table 1) is characterized by all the permanent variables of the selected 40 dermatoglyphic variables. Since the total ridge counts variables of both the Right (RTRC) and the Left palm (LTRC) and both combined (TTRC [L+R]) are the heavily loaded items. This factor could be called as the Total Counts Factor. This factor accounted for 36.91% of the total common factor accounted by all the four factors.

Table 2: Factor two of cyclists after rotated factor loadings (varimax solution)

Item No.	Name of the Variables	Factor Loadings
18	Left Palm Inter Triradial Distance (Lac)	0.78
19	Left Palm Inter Triradial Distance (Lad)	0.78

20	Left Palm Inter Triradial Distance (Lat)	0.58
21	Left Palm Inter Triradial Distance (Lbc)	0.48
22	Left Palm Inter Triradial Distance (Lbd)	0.64
23	Left Palm Inter Triradial Distance (Lbt)	0.61
24	Left Palm Inter Triradial Distance (Lcd)	0.43
25	Left Palm Inter Triradial Distance (Lct)	0.68
26	Left Palm Inter Triradial Distance (Ldt)	0.66
30	Right Palm Inter Triradial Distance (Rac)	0.72
31	Right Palm Inter Triradial Distance (Rad	0.73
33	Right Palm Inter Triradial Distance (Rbc	0.52
34	Right Palm Inter Triradial Distance (Rbd)	0.55
35	Right Palm Inter Triradial Distance (Rbt)	0.46
37	Right Palm Inter Triradial Distance (Rct)	0.64
38	Right Palm Inter Triradial Distance (Rdt)	0.57

The second factor (Table 2) obtained after varimax solution of cyclists were characterized by a mixture of 16 Inter Trirdial Distances of no specific denominations and hence could be called as the Mixed Factor. This factor was heavily loaded by the Inter Triradial Distance "ac" and "ad" of the Left Palm (Lac and Lad). This factor accounted for 25.82% of the total common factor variance put together by all the four factors.

Table 3: Factor three of cyclists after rotated factor loadings (varimax solution)

Item No.	Name of the Variables	Factor Loadings
20	Left Palm Inter Triradial Distance (Lat)	-0.53
22	Left Palm Inter Triradial Distance (Lbd)	0.45
23	Left Palm Inter Triradial Distance (Lbt)	-0.64
25	Left Palm Inter Triradial Distance (Lct)	-0.58
26	Left Palm Inter Triradial Distance (Ldt)	-0.58
27	Left Palm Attained Angle (Latd)	0.70
31	Right Palm Inter Triradial Distance (Rad)	0.47
32	Right Palm Inter Triradial Distance (Rat)	-0.58
33	Right Palm Inter Triradial Distance (Rbc)	0.45
34	Right Palm Inter Triradial Distance (Rbd)	0.63
35	Right Palm Inter Triradial Distance (Rbt)	-0.64
37	Right Palm Inter Triradial Distance (Rct)	-0.60
38	Right Palm Inter Triradial Distance (Rdt)	-0.67
39	Right Palm Attained Angle (Ratd)	0.84

Factor 3 (Table 3) for cyclists was heavily loaded by both the Attained angles of the right palm (Ratd) and the left palm (Latd) along with a mixture or both negatively and positively loaded Inter Triradial Distance Variables. Since the Atd angle variables very significantly dominate this factor, this factor could be named as the Attained Angle Factor. This factor accounted for 25.25% of the total common factor variance accounted by all the four selected factors among cyclists.

Table 4: Factor four of cyclists after rotated factor loadings (varimax solution)

Item No.	Name of the Variables	Factor Loadings
17	Left Palm Inter Triradial Distance (Lab)	-0.74
21	Left Palm Inter Triradial Distance (Lbc)	0.53
22	Left Palm Inter Triradial Distance (Lbd)	0.43
28	Left Palm Ridge Counts Per Sq. Cm (CR/S.C)	-0.41
29	Right Palm Inter Triradial Distance (Rab)	-0.70
39	Right Palm Ridge Counts Per Sq. Cm. (RR/S.C.)	-0.50

The fourth factor (Table 4) obtained after varimax rotation among cyclists need special mentioning, as it was the only factor, which was characterised by the Ridge Counts per square cms variables of both the right (RR/Cm2) and the left palm. This factor constituted 11.93% of the total common factor variance accounted for by all the four factors.

4. DISCUSSION

Genetic factor undoubtly contribute to the matrix or factors that bring about the emergence and success of an individual to the extent that he/she will eventually reach the status of cyclists of National or International caliber. There are interactive reasons and empirical evidence indicating that some individuals are highly endowed with respect to one or several biological properties associated with a given sports performance, while others are less endowed. Thus, it is the genes, that is solely responsible for exhibiting a particular character or special quality and hence the presence of a particular gene type or structure is directly responsible for superior performance.

Thus, genetic variation might have influenced performance in two ways, firstly because of a favourable genotype allowing him/her to be part of a small population of those who can reach the level of a superior performance. Secondly, the individual might have inherited a genotype that is associated with a high response to the training regimen, relevant to a specific sport. It is quite likely that

the National level cyclists of today are individuals who might be superior phenotypically and are highly sensitive to training genotypically.

5. CONCLUSIONS

Within the limitations of the present study, the following conclusions were drawn, applicable only to Indian male cyclists:

- Ridge Count Factor characterized by Total Ridge Count of the right palm (RTRC), Total Ridge Count of the left palm (LTRC) and both combined (TTRC) [L+R] was found as the most significant Principal Component factor among cyclists.
- Horizontal Inter Triradial Distance factor consisting of Lac, Lad, Rac and Rad was found to be the next most significant factor.
- Angular Factor characterised by left palm attained angle (Latd) and right palm attained angle (Ratd) was found as the third most significant Principal Component factor among Indian cyclists.
- Shortest Inter Triradial Distance Factor consisting of Lab and Rab was found to be the fourth significant factor.

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