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# CERTAIN CORRELATION MATRICES BETWEEN VARIOUS LONGITUDINAL AND TRANSVERSE TRENDS

Pons (1956:130) has emphasized on the importance of correlations that exists between some dermatoglyphic areas, majority of which behave in an independent manner and increases the interest in their use for human genetics. Thus, the need for calculating correlations and associations between various traits is too obvious to be detailed.

A total of 57 values of Pearson's linear coefficient of correlation (r) as based on 57 binary combinations of metric traits have been calculated for each of the two sexes separately. Most of those show a low order or independent relationship (r-values ranging between 0.000 to ± 0.500) but a few show a high order relationship also (r-values being more than ± 0.500). In other words, the traits in question are not independent of each other and are of some interest in quantitative palmar dermatoglyphics (Taneja 1968: 188—200; Sapra 232—257).

## MATERIAL AND METHODS

Bilateral inked impressions of non-Jat Sikh males (n = 200) and females (n = 200) taken in 'unextended' / 'adducted' category (Sharma and Taneja 1968: 257—266; Sharma and Sapra 1968: 11—16) of digital spreading form the size of the present sample. All the necessary care has been taken to keep away the affinals and to print only individuals older than 18 years, as the 'agefactor, if ignored, can become a serious source of error' (Sharma 1963: 222). Statistical constants pertaining to age of different individuals forming the present sample are:

| | |
|---|---|
| Mean ± S.E. | 30.23 ± 0.48 |
| S.D. ± S.E. | 9.71 ± 0.34 |
| C.V. ± S.E. | 32.12 ± 1.13 |
| Range | 18 — 66 years |

In the present study following six metric traits correlated in different pairs are considered:

1. Palmarprint Form Index (PFI) has been calculated *(see Fig. 1)* after Sharma (1963:1537—1541):

$$PFI = \frac{\text{Projective palmar 'breadth' (PB)}}{\text{Projective palmar 'length' (PL)}} \cdot 100$$

2. For assessing the proximo-distal (longitudinal) trends of digital triradii d, c, b, a, perpendicular distance (OM) from the base of each digit to its respective triradius *(see Fig. 2)* has been taken.

3. For assessing the radio-ulnar (transverse) trends of palmar digital triradii d, c, b, a. Positional Index has been calculated *(see Fig. 3)* after Sharma (1969: Pers. Conf.) by employing the following:

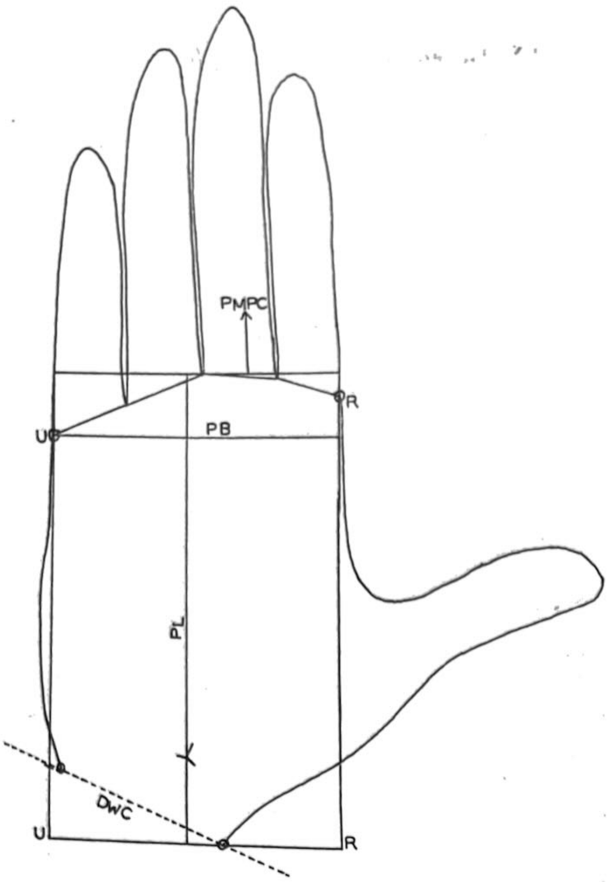
$$PI^d = \frac{R^V - p^d}{R^V - U^V} \cdot 100$$

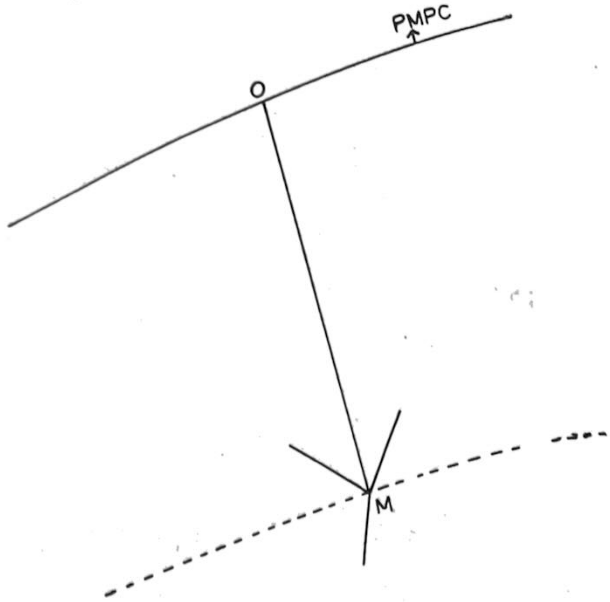
$$PI^c = \frac{R^{IV} - p^c}{R^{IV} - U^{IV}} \cdot 100$$

$$PI^b = \frac{R^{III} - p^b}{R^{III} - U^{III}} \cdot 100$$

$$PI^a = \frac{R^{II} - p^a}{R^{II} - U^{II}} \cdot 100$$

4. Modified Breadth-Height Index at Axial Triradius t ($BHI^t$) for proximodistal (longitudinal)




▲ FIG. 2. — *Diagrammatic representation of perpendicular deviation.*

◀ FIG. 1. — *Measurement of projective length (PL) and projective breadth (PB) for the calculation of palmarprint form index.*

trends of t has been calculated (see Fig. 4) after T a n e j a (1968: 131—132) using the following:

$$BHI^t = \frac{\text{Projective palmar 'breadth' (PB)}}{\text{Perpendicular upon PB (tQ) or Height}} \cdot 100$$

5. For radio-ulnar (transverse) trends of axial triradius t, Modified Positional Index has been calculated *(see Fig. 4)* using the following:

$$PI^t = \frac{\text{Radial shifting of t from the radial limit of the projective 'breadth' to the perpendicular projection of } t}{\text{Projective 'breadth' } (PB)} \cdot 100$$

6. t-Index has been calculated *(see Fig. 5)* after S h a r m a (1961:E 111; 1962; 42—49; 1963 a: 1529—1531; 1964: 167—171) using the following:

$$t\text{-Index} = \frac{\text{distance of axial triradius from A}}{\text{length } AB} \cdot 100$$

## DISCUSSION

A total of 57 values of Pearson's linear coefficient of correlation r has been calculated for the correlation matrices between various metric traits in binary combinations. All these values of r have been classified into the three convenient categories:

*Category A (r = 0.000 to ± 0.150):* An almost independent or no relationship exists in all such cases where values of Pearson's r are close to zero (but less than ± 0.150). Such a relationship exists between the following binary combinations of metric traits in both males and females (with a few exceptions) belonging to either of the two sexes:

1. *Intra-Transverse Directional Combinations:* $PI^c/PI^d$ (in males only), $PI^b/PI^d$, $PI^b/PI^c$, $PI^a/PI^c$
2. *Inter-Directional Combinations:* PFI/d-Perp., PFI/c-Perp., PFI/b-Perp., PFI/a-Perp., $PFI/PI^d$ (in males only), $PFI/PI^c$ (in males only), $PFI/PI^b$, $PFI/PI^a$, $PFI/PI^t$, PFI/t-Index (in females only), $PI^d$/c-Perp., $PI^d$/b-Perp. (in females only), $PI^d$/a-Perp., $PI^d$/d-Perp. (in males only), $PI^c$/c-Perp., $PI^c$/b-Perp., $PI^c$/a-Perp., $PI^b$/d-Perp., $PI^b$/c-Perp., $PI^b$/b-Perp., $PI^b$/a-Perp., $PI^a$/d-Perp. (in females only) $PI^a$/c-Perp. (in females only), $PI^a$/b-Perp. (in females only), $PI^a$/a-Perp., $PI^t$/d-Perp., $PI^t$/c-Perp., $PI^t$/b-Perp., $PI^t$/a-Perp., $PI^t/PI^d$, $PI^t/PI^c$, $PI^t/PI^b$, $PI^t/PI^a$, t-Index/d-Perp., t-Index/c-Perp., t-Index/b-Perp., t-Index/a-Perp., t-Index/$PI^d$ (in males only, t-Index/$PI^c$, t-Index/$PI^b$, t-Index/$PI^a$. All the parenthetical listings show that the r-value for the opposite sex actually belongs to the next Category B.

*Category B (r = ± 0.500):* A relationship of lower order/degree may be said to exist in all such cases where values of Pearson's r are close to 0.500 and departing sufficiently from zero value (between ± 1.500 to ± 0.500 but less than ± 0.500) so as not to be mistaken for values very close to zero (cf. Category A). Such values of r indicate a low or moderate order/degree of relationship between the following binary combinations of metric traits in

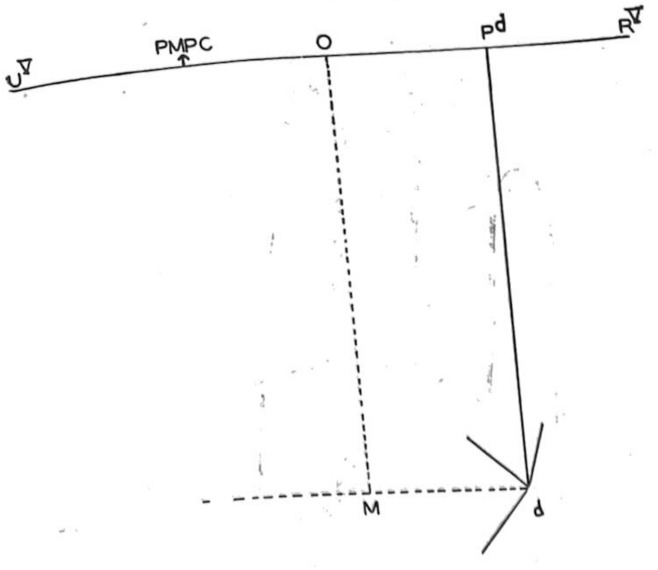



FIG. 3. — *Diagrammatic representation of modified positional index.*

both the sexes with a few exceptions that actually belong to Category A.

1. *Intra-Transverse Directional Combinations:* $PI^c/PI^d$ (in females only), $PI^a/PI^d$, $PI^a/PI^b$

2. *Intra-Longitudinal Directional Combinations:* c-Perp./d-Perp., b-Perp/d-Perp., a-Perp/d-Perp., a-Perp/c-Perp., a-Perp/b-Perp.,

3. *Inter-Directional Combinations:* PFI/$PI^d$ (in females only), PFI/$PI^c$ (in females only), PFI/t-Index (in males only), $PI^d$/d-Perp., $PI^d$/b-Perp. (in males only), $PI^c$/d-Perp. (in females only), $PI^a$/d-Perp. (in males only), $PI^a$/c-Perp., (in males only), $PI^a$/b-Perp. (in males only), $BHI^t/PI^t$, t-Index/$PI^d$ (in females only).

*Category C ($r = \pm 0.500$ and above till $\pm 1.000$):* A high order/degree relationship may be said to exist in all such cases as have the values of Pearson's r more than $\pm$ 0.500 and in fact approaching the higher limits of r like $\pm$ 0.90 or are still approaching the value of r = $\pm$ 1.000. Values belonging to Category C alone are being listed with all the statistical details (Table 1).

All the values of r are highly significant as may be judged not only from the respective probable errors of r ($p < 0.001$) but also from the values of t obtained for the significance of r-values.

*Table 1* shows the values of Pearson's correlation r between c-Perp. and b-Perp. for the two sexes as strikingly high. This indicates that the triradii lying closer to each other are more closely related or show a high order relationship than the triradii lying apart from it since the spatial relationship between c & b is relatively closer to each other than digital triradii like c & d or b & a, not to speak of c & a, b & d or d & a. This means that the high order relationship existing between the anatomical localisation/ /positioning of different digital triradii is shown by only one combination and this happens to be adjacent to each other. It is very much unlike the case with localisation of plantar triradii where this objection holds good almost as a rule without single exception (I n d i r a 1970: 140—167). The proximity being a chance-factor, this high order relationship between c & b may also probably be attributed to the variable positioning of digital triradii as reported by V a l s i k (1933: 179—183) who reports that the position of 'triradii b are comparatively the least variable, those of d the most variable and a & c in that sense a median between two extremes'.

High order relationship is also shown between t-Index and $BHI^t$ in both sexes. This is in agreement with the already known fact (T a n e j a 1971 : 67—72; T a n e j a: 53—62; S a p r a 1970: 232—257) that t-Index and $BHI^t$ are both longitudinal measurements aligned in the proximo-distal direction (along an axis parallel to the longitudinal axis of the palmar surface) and an increase in the value of one is related with an increase in the value of the other, i.e. one might follow either of the two to indicate the proximo-distal positioning of axial triradius.

TABLE 1

*Values of Pearson's Correlation r in Category C*

| Binary Combinations of the Concerned Metric Variables | Values of *r* | |
|---|---|---|
| | Males | Females |
| 1. b-Perp. vs. c-Perp. | $+ 0.596 \pm 0.033$ (P.E. of r = 0.022) | $+ 0.537 \pm 0.036$ (P.E. of r = 0.024) |
| Values of t | 10.42 | 8.95 |
| 2. $BHI^t$ vs. t-Index | $+ 0.713 \pm 0.024$ (P.E. of r = 0.016) | $+ 0.794 \pm 0.002$ (P.E. of r = 0.001) |
| Values of t | 14.25 | 18.21 |
| Probability Level) | ($P < 0.001$) | ($P < 0.001$) |

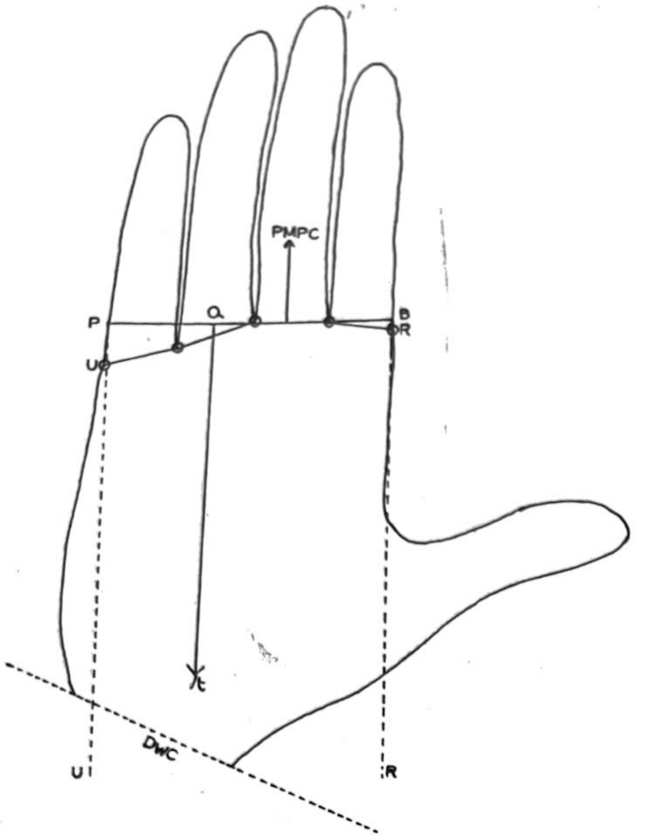



FIG. 4. — *Measurement t Q (height) and projective breadth (PB) for the calculation of modified breadth height index (BHI$^t$) and* $\frac{QB}{PB}$ *for the calculation of modified positional index at axial triradius (PI$^t$).*

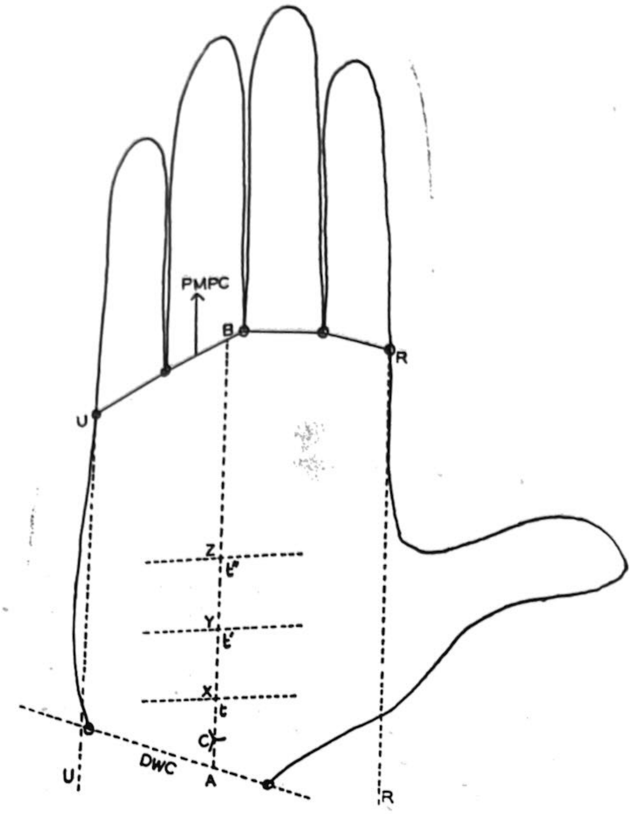



FIG. 5. — *Proximo-distal positioning of axial triradius as denoted by t-index.*

## SUMMARY AND CONCLUSION

The present material consists of bilateral inked impressions of 200 males and 200 females of non-Jat Sikh community, taken in 'unextended' (= 'adduction' of Valsik) category of digital spreading. Six metric traits considered are Palmarprint Form Index (PFI), Perpendicular Deviation, Positional Index at axial triradius t (PI$^t$), Modified Breadth-Height Index at axial triradius t (BHI$^t$) and t-Index.

The values of Pearson's linear correlation r between c-Perp. and b-Perp. for the two sexes are strikingly high indicating that the triradii lying closer to each other are more closely related than others lying with wider intervening spaces (morphologically speaking). Additionally, this may also be attributed to the variable positioning of digital triradii as found by Valsik who reported that the 'triradii b are comparatively the least variable, those of d the most variable and a & c in that sense a median between two extremes'.

High order relationship is also shown between t-Index and BHI$^t$ in females. In other words, increase in the value of one is related with an increase in the value of other, i.e. one might follow either of the two measures to asses the proximo-distal positioning of axial triradius t.

Lastly, t-Index and radio-ulnar trends of axial triradius show a high order relationship indicating that the longitudinal and transverse trends of localisation of axial triradius are highly associated with each other and not independent.

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