

# Heredity and Environment in Finger and Palm Prints

## *Progress report*

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Recent years have witnessed a growing interest in dermatoglyphics: an increasing number of associations between dermatoglyphic alterations and different diseases (especially chromosomal aberrations) are actually being reported, which is of particular concern to human and medical geneticists, as well as to clinicians and pediatricians.

Having been shown to undergo practically complete genetic conditioning, fingerprints are also being applied, by different authors, to the diagnosis of zygosity in twins.

On the other hand, although, on account of available data, a large impact of heredity may be assumed in their determination, dermatoglyphics as a whole still fail to find a clear genetic definition.

Furthermore, with respect to clinical aspects and applications, a clear quantitative definition of dermatoglyphic alterations, and therefore of dermatoglyphic normality and its variability, is still needed.

Last, but not least, a wider and generalized application of dermatoglyphics to the diagnosis of zygosity in twins would require a clear, morphological and genetic, quantitative definition of each trait, as well as the introduction of simple and standardized statistical methods for calculating the probabilities of monozygosity and dizygosity.

A twin study of dermatoglyphics has therefore been carried out, with the twofold aim:

- 1) To help reaching a clearer genetic definition for a number of digital and palmar dermatoglyphic traits;
- 2) To contribute to a generalized and standardized application of dermatoglyphic traits to the diagnosis of zygosity in twins.

In such a study, twins represent both the means and the object of the research: in fact, while the application of the twin method may help separating the genetic and environmental components in a number of dermatoglyphic traits, once one or more such traits shown to undergo complete genetic conditioning, they may, in turn, be applied to the study of twins, by providing a simple and economic method for a reliable diagnosis of zygosity.

A sample of 250 twin pairs was drawn from the Mendel Institute's twin file, consisting of 50 twin pairs for each possible combination as to sex and zygosity, as shown in Tab. I. Zygosity was determined on account of the following data:

- 1) General examination and comparison, with special respect to specific anthropologic data, such as eye color, hair color and form, etc.;
- 2) Specific question as to whether the cotwins were ever mistaken one for the other, and by whom;
- 3) Obstetric information, i.e., the number of choria;
- 4) Specific biochemical data, such as blood groups.

The information obtained under (1), (2) and (3) was only used to support, or disprove, the diagnoses, which were always based on biochemical data.

For both partners of all 250 twin pairs, finger and palm prints of both hands were collected, through the *Faurot inkless technique*, and studied with respect to a number of traits, as shown in Tab. II.

Each trait has been examined both separately on the right and left hand, and on the two hands together.

The collected data, after being cross-checked and corrected, with respect to any possible bias, especially from operator's errors, are now being transferred onto magnetic tape and analyzed.

Tab. I. Material

Sex	Zygosity		Total
	MZ	DZ	
♂♂	50	50	100
♀♀	50	50	100
♂♀		50	50
Total	100	150	250

Tab. II. Dermatoglyphic traits studied

*On Fingers:*

Finger ridge count

Number of digital triradii

*On Palms:*

Main line index

D-line index

A-d ridge count

a-b ridge count

a-t-d-angle

a-b-d circumference (cf. Alciati, 1965)

 $\alpha$  angle (cf. Alciati, 1965)

While the analysis is being completed and its results will be published in a forthcoming note, it may be worth stressing the importance of the results already obtained in a preliminary study, based on the analysis of finger ridge counts in 50 MZ and 50 DZ, both ♂♂ and ♀♀ twin pairs (Parisi and Di Bacco, 1968).

The intraclass correlation coefficient has been shown to be of 0.985 in MZ and 0.533 in DZ twin pairs, with very limited confidence intervals ( $0.966 \leq \rho \leq 0.993$ ) in the former, thus showing complete genetic conditioning. No influence of sex and

handedness was noticed. Single finger ridge counts apparently behave as cumulative counts on the five or ten fingers, although with an obviously higher random variability.

Once applied to the diagnosis of zygosity, the total finger ridge count provides, by itself, a fairly high probability for a correct diagnosis, i.e., 0.86.

### References

- ALCIATI G. (1965). Nuova valutazione quantitativa dei dermatoglifi palmari. *Acta Genet. Med. Gemellol.*, **14**: 427-430.
- PARISI P., DI BACCO M. (1968). Fingerprints and the diagnosis of zygosity in twins. *Acta Genet. Med. Gemellol.*, **17**: 333-358.

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