

Systematic Methodological Approach in Dermatoglyphics at Level 2

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Abstract: Dermatoglyphics is the branch of science concerned with the study of prints on the fingers, palm, soles, and feet. This branch of science is an offshoot of anatomical sciences. Dermatoglyphics as an aspect of science has been studied widely by lots of ardent researchers and have been used to solve lots of problems relating to peoples' identity and ancestry. Although, dermatoglyphics can be studied at three levels (1, 2, and 3) only level 1 (arches, loops, and whorls) have been explored. 99.9% of the works on dermatoglyphics is at level 1 but very few Nigerian indigenous works have been done at level 2 (bifurcations, trifurcations, bridges, ridge ending, enclosures, dots, opposed bifurcations, double bifurcations, island etc). This raises the question, what about level 2 and 3 study? *Aim & Objectives:* It is possible for one to think that the reason researchers have not dealt extensively on level 2 dermatoglyphics is lack of procedural knowledge and the understanding of the concept. Hence this study was done to explicitly showcase the procedures dermatoglyphics at level 2. *Materials and Methods:* Data Capture: The use of digital print scanner with very high resolution not less than 9000x4800 dpi (Hp G3110 Scanjet Scanner) which ensures the images are clear and visible. 2) Transfer of Prints: The captured prints are then transferred to a laptop system (computer) via a set of USB cords for examination. 3) Examination of Prints: The prints are assembled into the various categories following the objectives, each print intended to be studied will be zoomed and magnified using the magnification tool in the laptop (computer) for clarity and visibility. I) Make a straight horizontal and vertical line across the print on each finger or toe which divides it into quadrants. II) Examine each quadrant for digital patterns present. Taking note of the morphology of the patterns known. III) Identify and group the patterns seen for each finger or toe. IV) Summation- sum up the patterns for the left and right hands or foot, V) Compute into a statistical tool for analysis. **Conclusion:** There was marked difference between the males and females in the distribution of the patterns with the females having consistently higher values. Though the females had higher value of the Paul's Index.

Keywords: Level 2, Bifurcations, Dot, Trifurcation, Bridge, Ridge Ending.

INTRODUCTION

Dermatoglyphics is the branch of science concerned with the study of prints on the fingers, palm, soles, and feet. This branch of science is an offshoot of anatomical sciences. The study of prints of the hand (fingerprint) has vastly been exploited and lots of knowledge gained ranging from crime detection, human identification, to having a database for a nation that serves as their security system.

Dermatoglyphics as an aspect of science has been studied widely by lots of ardent researchers and have been used to solve lots of problems relating to peoples' identity and ancestry. Although, dermatoglyphics can be studied at three levels (1, 2, and 3) only level 1 (arches, loops, and whorls) have been explored. 99.9% of the works on dermatoglyphics is at level 1. This raises the question, what about level 2 and 3 study? Are there works done at level 2 or 3?

There are certain details that would not be seen at level 1 which can only be seen at level 2 and 3. A good example is sexual dimorphism and gender variation which have been mentioned by several authors to be absent in populations at level 1 study, have been seen to exist at level 2. Certain digital patterns at level 2 have been known to be associated with some races vis-a-vis bifurcation (a level 2 digital pattern) a common pattern widely distributed amongst the black race.

Some indigenous authors have done studies on dermatoglyphics at level 1 [1-11] to mention few but there are no indigenous works on level 2 yet except for three works by Paul and Paul [12].

There exist a large vacuum at level 2 dermatoglyphics which should be filled by researchers especially indigenous authors which will help create database for level 2 details in Nigerian population. This

to large extent could be used to solve problems relating to ancestral origin which has become an issue in most African populations especially Nigeria. This review

serves to help provide a step by step procedure to doing a study on dermatoglyphics at level 2 in Nigerian indigenous populations and Africa at large.

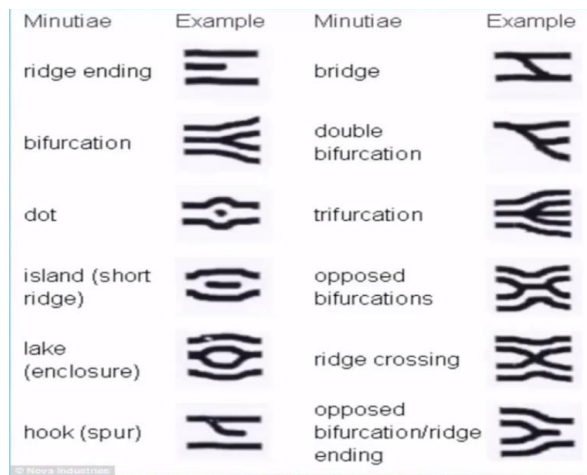


Fig-1: Digital Patterns at Level 2 Dermatoglyphics

MATERIALS AND METHODS

Conventionally, the population intended to be studied has to be known which is called *Study Population*, from which the sample size for the work is determined which is also called *Research Sample Size* after which, a design for the study is made which is always a non-experimental structure or design. Shortly after that, data for the intended study will be collected, analyzed and results presented. The problem will always be in the procedure for capturing and examining the data for this type of work. The steps are listed below:

Data Capture

There numerous ways data could be captured for dermatoglyphics which have been used in the past like ink method which is no longer in use now, use of digital camera as have been used in some works and use of digital print scanner with very high resolution not less than 9000x4800 dpi (Hp G3110 Scanjet Scanner) which ensures the images are clear and visible.

Transfer of Prints

The captured prints are then transferred to a laptop system (computer) via a set of USB cords for examination.

Examination of Prints

The prints are assembled into the various categories following the objectives, each print intended to be studied will be zoomed and magnified using the magnification tool in the laptop (computer) for clarity and visibility.

- Make a straight horizontal and vertical line across the print on each finger or toe which divides it into quadrants.
- Examine each quadrant for digital patterns present. Taking note of the morphology of the patterns known.
- Identify and group the patterns seen for each finger or toe.
- Summation- sum up the patterns for the left and right hands or foot,
- Compute into a statistical tool for analysis.

RESULT PRESENTATION

Most commonly, the results are presented in tables though graphs are also used. Below are models of tables that could be used to present the results neatly.

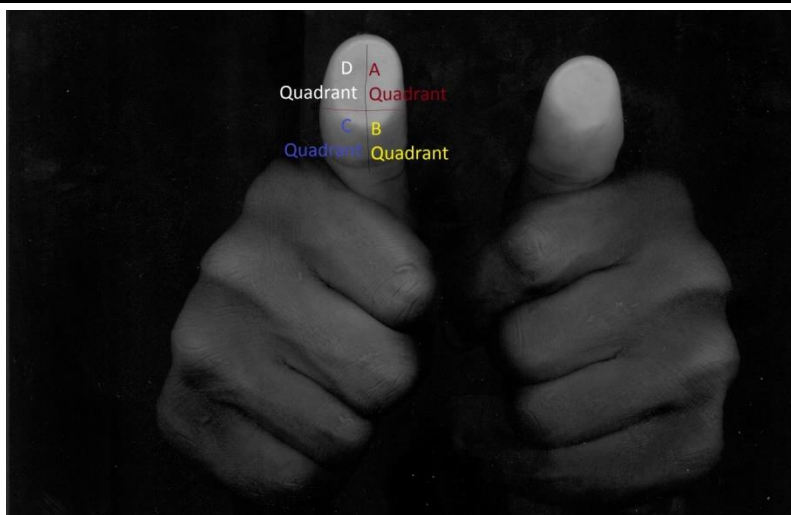


Fig-1: Thumb print with horizontal and vertical lines dividing into four quadrants (A, B, C & D).

Table-1: Total Level 2 Digital Patterns of Male And Female Subjects (%)

Fingers	Sex	BF	TF	Bridge	Dot	Lake	DBF	OBF	RE	Enclosure
Thumb	M	27	2	3	5	3	5	2	15	3
	F	30	5	3	4	4	3	3	17	4
Index	M	20	6	6	6	6	6	6	6	6
	F	25	7	6	5	5	7	4	12	4
Middle	M	18	7	7	7	7	7	7	7	7
	F	19	9	8	9	5	4	8	9	3
Ring	M	17	7	7	8	8	6	6	6	6
	F	19	6	5	7	7	6	7	7	6
Little	M	20	4	7	8	8	6	5	5	5
	F	22	3	5	6	7	6	8	5	4

BF-Bifurcation, TF- Trifurcation, DBF-Double Bifurcation, OBF-Opposed Bifurcation, RE- Ridge Ending.

Table 2:

S/N	PATTERNS	MALES		FEMALES	
		RIGHT	LEFT	RIGHT	LEFT
1	Ridge ending	14	9	16	17
2	Opposed bifurcation	2	4	5	4
3	Bridge	3	2	2	5
4	Lake (enclosure)	5	5	7	5
5	Bifurcation	17	10	19	11
6	Double bifurcation	2	4	5	4
7	Dot	3	2	2	5
8	Trifurcation	5	5	7	5
9	Island	2	4	5	4
10	Ridge crossing	3	2	2	5
TOTAL					

CALCULATION OF THE PAUL’S INDEX

$$\frac{\text{Bifurcation}}{\text{Ridge Ending}} \times 100$$

Males: $\frac{27}{23} \times 100 = 117.4$

Females: $\frac{30}{33} \times 100 = 90.9$

DISCUSSION

The result of this study indicates that bifurcation and ridge ending had the highest values which is consistent with previous reports on the patterns. This is unique to Africans and could be attributed to the genetic make-up of Africans as compared to the Caucasians.

The females have relatively higher values than the males which suggest sexual dimorphism and a result of hormonal difference in both sexes.

This indicates that the males had a greater value of Paul’s Index than the females. This difference in the result could a result depicts sexual dimorphism

and may have resulted from hormonal difference in the males and females.

Table-3: Comparison of Level 2 Digital Patterns of Male And Female Subjects

RIGHT	BF	TF	Bridge	Dot	Lake	DBF	OBF	RE	RC
Males	17	5	3	3	5	2	2	14	3
Females	19	7	2	7	7	5	5	16	5
Z score	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
P-Value	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Inference	Sign	Sign	Sign	Sign	Sign	Sign	Sign	Sign	Sign
LEFT									
Males	10	5	2	2	5	5	5	9	2
Females	11	5	5	5	5	4	4	17	4
Z score	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
P-Value	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Inference	Sign	Sign	Sign	Sign	Sign	Sign	Sign	Sign	Sign

P<0.05, BF-Bifurcation, TF- Trifurcation, DBF-Double Bifurcation, OBF-Opposed Bifurcation, RE- Ridge Ending, RC- Ridge crossing.

CONCLUSION

There was marked difference between the males and females in the distribution of the patterns with the females having consistently higher values. Though the females had higher value of the Paul’s Index. We wish to conclude by stating that works on dermatoglyphics generally could be simple and straight forward following these steps especially for beginners who have interest in dermatoglyphics.

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