

Vol III Issue IX March 2014

Impact Factor : 2.2052(UIF)

ISSN No :2231-5063

International Multidisciplinary Research Journal

Golden Research Thoughts

Chief Editor
Dr.Tukaram Narayan Shinde

Publisher
Mrs.Laxmi Ashok Yakkaldevi

Associate Editor
Dr.Rajani Dalvi

Honorary
Mr.Ashok Yakkaldevi

IMPACT FACTOR : 2.2052(UIF)

Welcome to GRT

RNI MAHMUL/2011/38595

ISSN No.2231-5063

Golden Research Thoughts Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial board. Readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

International Advisory Board

Flávio de São Pedro Filho Federal University of Rondonia, Brazil	Mohammad Hailat Dept. of Mathematical Sciences, University of South Carolina Aiken	Hasan Baktir English Language and Literature Department, Kayseri
Kamani Perera Regional Center For Strategic Studies, Sri Lanka	Abdullah Sabbagh Engineering Studies, Sydney	Ghayoor Abbas Chotana Dept of Chemistry, Lahore University of Management Sciences[PK]
Janaki Sinnasamy Librarian, University of Malaya	Catalina Neculai University of Coventry, UK	Anna Maria Constantinovici AL. I. Cuza University, Romania
Romona Mihaila Spiru Haret University, Romania	Ecaterina Patrascu Spiru Haret University, Bucharest	Horia Patrascu Spiru Haret University, Bucharest,Romania
Delia Serbescu Spiru Haret University, Bucharest, Romania	Loredana Bosca Spiru Haret University, Romania	Ilie Pinteau, Spiru Haret University, Romania
Anurag Misra DBS College, Kanpur	Fabricio Moraes de Almeida Federal University of Rondonia, Brazil	Xiaohua Yang PhD, USA
Titus PopPhD, Partium Christian University, Oradea,Romania	George - Calin SERITAN Faculty of Philosophy and Socio-Political Sciences AL. I. Cuza University, IasiMore

Editorial Board

Pratap Vyamktrao Naikwade ASP College Devrukh,Ratnagiri,MS India	Iresh Swami Ex - VC. Solapur University, Solapur	Rajendra Shendge Director, B.C.U.D. Solapur University, Solapur
R. R. Patil Head Geology Department Solapur University,Solapur	N.S. Dhaygude Ex. Prin. Dayanand College, Solapur	R. R. Yaliker Director Managment Institute, Solapur
Rama Bhosale Prin. and Jt. Director Higher Education, Panvel	Narendra Kadu Jt. Director Higher Education, Pune	Umesh Rajderkar Head Humanities & Social Science YCMOU,Nashik
Salve R. N. Department of Sociology, Shivaji University,Kolhapur	K. M. Bhandarkar Praful Patel College of Education, Gondia	S. R. Pandya Head Education Dept. Mumbai University, Mumbai
Govind P. Shinde Bharati Vidyapeeth School of Distance Education Center, Navi Mumbai	Sonal Singh Vikram University, Ujjain	Alka Darshan Shrivastava Shaskiya Snatkottar Mahavidyalaya, Dhar
Chakane Sanjay Dnyaneshwar Arts, Science & Commerce College, Indapur, Pune	G. P. Patankar S. D. M. Degree College, Honavar, Karnataka	Rahul Shriram Sudke Devi Ahilya Vishwavidyalaya, Indore
Awadhesh Kumar Shirotriya Secretary,Play India Play,Meerut(U.P.)	Maj. S. Bakhtiar Choudhary Director,Hyderabad AP India.	S.KANNAN Annamalai University,TN
	S.Parvathi Devi Ph.D.-University of Allahabad	Satish Kumar Kalhotra Maulana Azad National Urdu University
	Sonal Singh, Vikram University, Ujjain	

**Address:-Ashok Yakkaldevi 258/34, Raviwar Peth, Solapur - 413 005 Maharashtra, India
Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.aygrt.isrj.net**



AN EMPIRICAL STUDY OF FINGERPRINTS ON TWINS

Santosh. Pujar M. A.

Ph.D Research Scholar , Karnatak University, Dharwad.

Abstract: Individuals are identified and discriminated on numerous bases by science as well as behavioral sciences. These peculiar traits which make a person stand out from the rest of the population are of exceptional significance in the arena of law and criminal justice. Identifying any person by his/her physical feature is very easy and the characteristics are observable to any human eye. But there may be cases where looks could be deceptive and physical traits could be fallible, as in case of twins. Twins have been studied ardently for decades now to introspect the role of nature and nurture in humans varied number of times in behavioral sciences. Twins, specifically Monozygotic Twins have been believed to share closely similar DNA and this makes a ground for an interesting piece of work as the genetic make is expected to be more or less the same.

The present study aims to understand if the principle of similarity observable in twin characteristic extends even to one of the most unique identification feature in humans, the fingerprints. The samples chosen here were 20 pairs of Twins (10 of each identical and fraternal twins). The study area was restricted to Dharwad District of Karnataka. The observations made were that monozygotic twins had 84% of the times similar basic pattern (arch, whorl, loop, composite) on the same finger as opposed to fraternal twins who had a recurrence rate of 53% of the times, Although the intricate ridge patterns (ridge endings, bifurcations etc) differed even in cases where the basic patterns were the same. The tools and techniques used for collection and studying the prints were traditional manual methods and no biometric tools were made use of.

Keywords: Fingerprints, Monozygotic Twins, Dizygotic Twins, Ridge patterns.

INTRODUCTION:

Fingerprints have been a subject of curiosity since its introduction as a character of distinction. It establishes a person's individuality and separates them from the others. It has appealed to the inquisitiveness of a lot many researchers and has become a subject of their study due its strong relevance in almost every area, criminal justice not being an exception.

Fingerprinting is the science of taking imprints of a person's fingers for the purpose of establishing personal identification. Forensic science has proven that the likelihood of two human beings having the same fingerprints is infinitesimal, and it has been concluded that the process of fingerprinting as a means of establishing personal identification is infallible.

Basically Finger Prints are the general ridge patterns present on the corrugate skin of the Human beings, which is on palms and foot part. They form on the palm area of baby during the 3th month when the fetus is in the womb of mother. Finger Prints remain unchanged during individual life span.

Finger Prints have general ridge patterns, which permit them to be systematically classified. Fingerprints are fully formed at the age of 7 months of fetus development.

Fingerprint ridge configurations do not change throughout the life except due to accidents such as bruises and cuts on the finger tips.

General Characteristics of Finger Prints:

1. Uniqueness.
2. Permanency.
3. Universality.

4. Simplicity of Recording.
5. Simplicity of Classification.

Historic Development of Fingerprints

Finger Prints started in 1955 -1913 BC, the Hammurabi's in ancient Babylon used finger seals on contracts. In 1787 – 1869 Johannes Perkenjee divided them in 9 categories. In 1870 Sir: Francis Galton (Father of Finger Prints) wrote the first book on Finger Prints. And also was the first person to classify Finger Prints systematically.

Over a hundred years, several attempts have been made to quantitatively establish the degree of individuality of fingerprints. Measurements have been made using models based on grids, ridges, fixed probabilities, relative measurements and generative distributions.

Twin Studies

The study of twins has been important in various physiological and behavioral settings. Genetic and environmental similarities of twins allow studies such as the effectiveness of drugs, presence of psychological traits, and so forth. Particularly traits are influenced by genes or the environment.

Because of the lack of sufficient twin data, few twin studies have been carried out in forensics and biometrics. Such studies are important because any modality needs to be evaluated in conditions under which the possibility of error is maximum, that is, the worst-case scenario. Satisfactory performance with twins strengthens the reliability of the method. It also establishes the degree of individuality of the particular trait. Such an individuality measure is relevant from the viewpoint of Daubert challenges in forensic testimony.

A significant number of twin pairs (206) have been studied for handwriting. These samples were processed with features extracted and conclusions drawn by comparing verification performances with twins and non-twins. In that study, the conclusion was that twins are discriminable but less so than an arbitrary pair of individuals.

Study on influence of Heredity and Environment on fingerprint

The modern history of the twin study derives from Sir Francis Galton's pioneering use of twins to study the role of genes and environment on human development and behavior. Galton, however, was unaware of the critical genetic difference between MZ and DZ twins. Sir Francis Galton [1876] was the first author to suggest the examination of twins as a method for determining the contributions of heredity and upbringing. He was initially unaware of the distinction between MZ and DZ twins made by Dareste in 1874 [Vogel & Motulsky 1986], and believed opposite sex pairs could arise from a single ovum [Rende et al 1990]. By 1883 however, he would state that opposite-sex twins "[are] never due to the development of two germinal spots in the same ovum", and that the MZ/DZ dichotomy explained "...a curious discontinuity in my results...Extreme similarity and extreme dissimilarity between twins of the same sex are nearly as common as moderate resemblance". His main analyses were to examine changes in twin similarity over time in two groups: those who were similar when young - where he looked for divergence with increasing age; and those who were dissimilar when young, in both cases arguing that if such environmental factors were of importance, similar parental treatment would lead to increasing similarity with age until the twins moved apart, whereupon similarity would decrease.

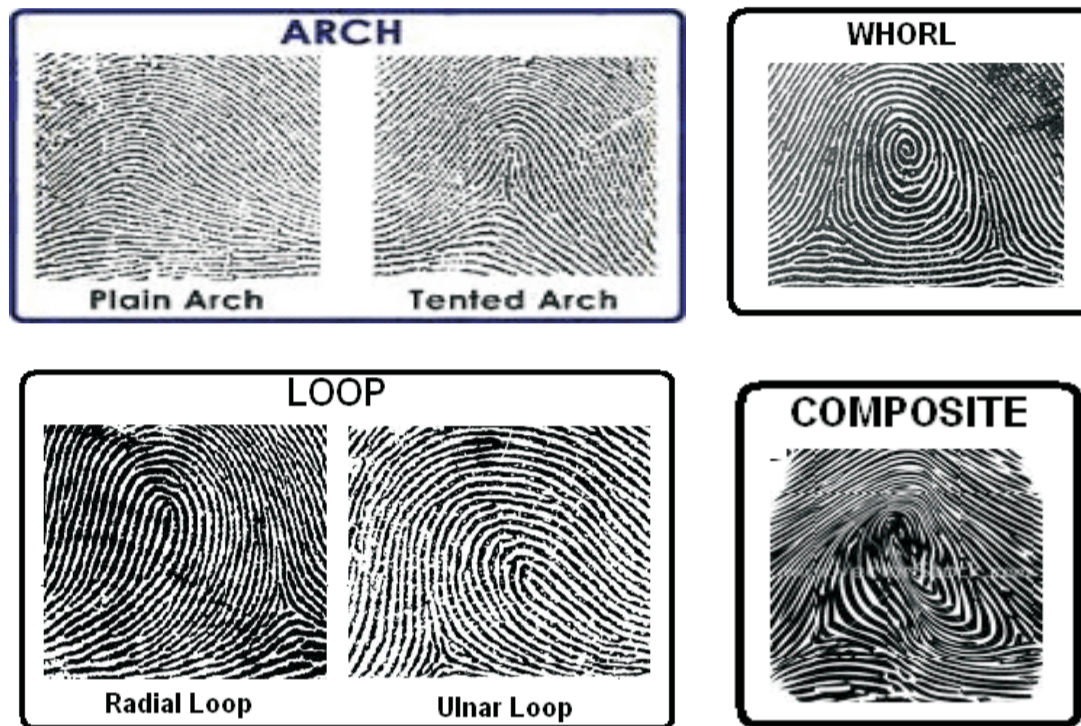
Methodology

The samples in the current research were processed with fingerprint features extracted and conclusions drawn by comparing basic and intricate patterns of fingerprints in both MZ (MONOZYGOTIC TWINS) twins, who may also be called as Identical Twins and DZ (DIZYGOTIC TWINS) twins or the Fraternal Twins.

The differentiation in MZ twins and DZ twins is, the MZ twins are consequence of division of a single fertilized egg into two embryos. Thus they have exactly identical DNA extract for the general micro mutation that begins as soon as the cell starts dividing. Fingerprints of Monozygotic twins start their development from the same DNA, so they are be expected to show considerable similarity in the present work as opposed to Dizygotic twins, who are divided or located in two different fertilized eggs with its separate embryo, thus there is huge difference in the DNA provided for the development. The observation to be made here is whether there exists a higher degree of similarity between the fingerprint patterns of Monozygotic twins as compared to Dizygotic twins.

The comparison is done on 2 levels-

Level 1: Feature corresponding to visually observable basic characteristics commonly used in fingerprint classification, namely



Level 2: The study of minute discrimination in same fingerprint pattern based on ridge characteristics like ridge bifurcations, ridge endings etc.;

Area of study

This particular study was held in the area of 181.66 km². The present population is around 7.86 Lacks.

OBJECTIVES OF THE STUDY

The main objective of the study is comparison of the fingerprints in Monozygotic & Di zygotic twins.
To study whether Monozygotic twins share more similarities in the basic patterns as compared to Dizygotic twins.
To study the ridge difference in the similar patterns of Monozygotic Twins.

Hypothesis

1. Identical (MZ) twins are having more similar basic patterns in the finger prints, comparatively Fraternal (DZ) twins are having less similarities.
2. There will be difference of characteristics even if the basic pattern is same.

Scope of study

Biometric study based on human characteristics for personal identification has attracted undivided attention of numerous researchers and has been the issue of interest in their study. This highly depends on the distinctive information in the biometrics. Identical twins having the closest genetics-based relationship are expected to have maximum similarity in their biometrics. Classifying identical twins is a challenging problem in case of manual anthropometric as well as some automatic biometric systems. The present research works towards identifying if one of the highly differentiating features in human the finger print could be applied to figure the distinctiveness in twins as well. The study works towards strengthening the basis to the known universal fact that “No two individuals have same or even similar fingerprints.”

Limitations of the study

- 1. A very small sample size was used for the above study, as a comparatively larger sample size could be more helpful in establishing a stronger base to support the hypothesis.
- 2. The use of modern Automated Biometric System could have helped rectify the errors if any made during the manual process of studying the fingerprint minutiae.

Fingerprints of Twins in Dharwad

Monozygotic and Dizygotic twins from the district of Dharwad in Karnataka were chosen as appropriate samples. MZ twins are identical twins that share 100% of the same DNA. DZ twins share only 50% of their DNA (fraternal twins). MZ twins are always the same gender, whereas DZ twins can be the same gender or one male and one female. DZM would be the male pairing of DZ twins. In the present study the researcher gathered about 20 pairs over all, in which 10 are identical twins (MZ) and the other 10 pairs are fraternal twins (DZ).

The traditional method was used to procure the fingerprints from the twins. The obtained Roll Prints were then scanned and the similarities and differences were manually identified. No Automated Biometric Systems were used for the study.

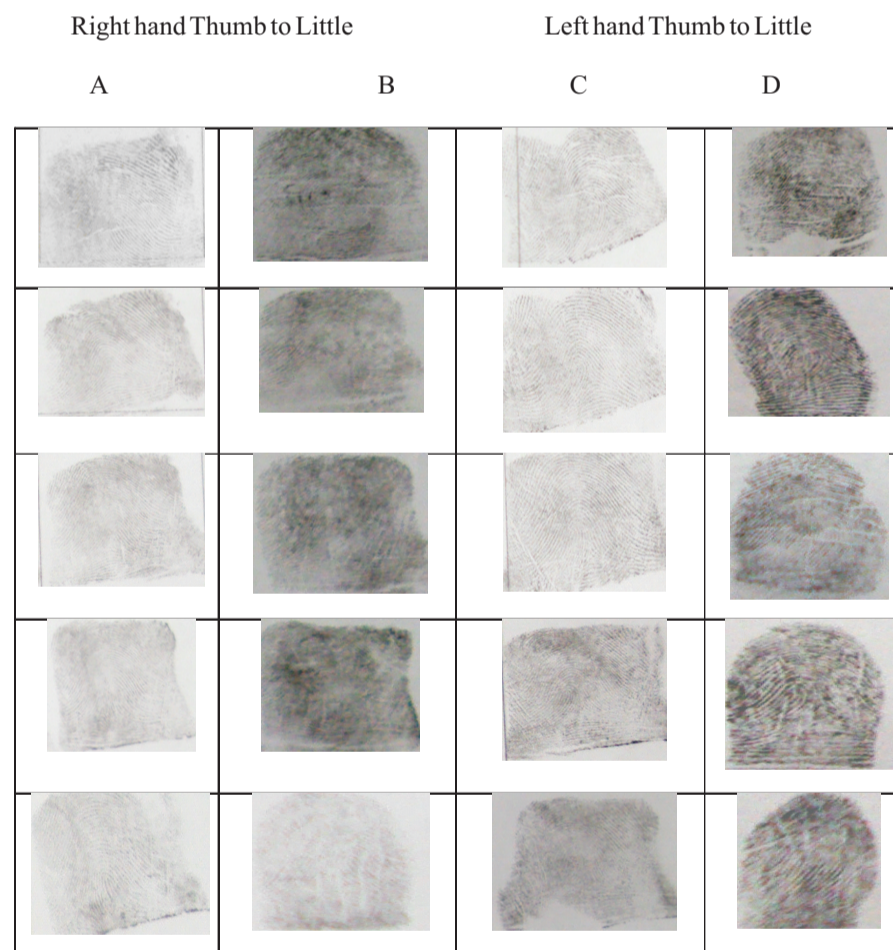
Results

Results Pertaining to Hypothesis 1

Monozygotic twins:

Below are 2 examples of the fingerprints of 2 pairs of identical twins who are represented as (TWIN 1=A) and (TWIN 2=B).

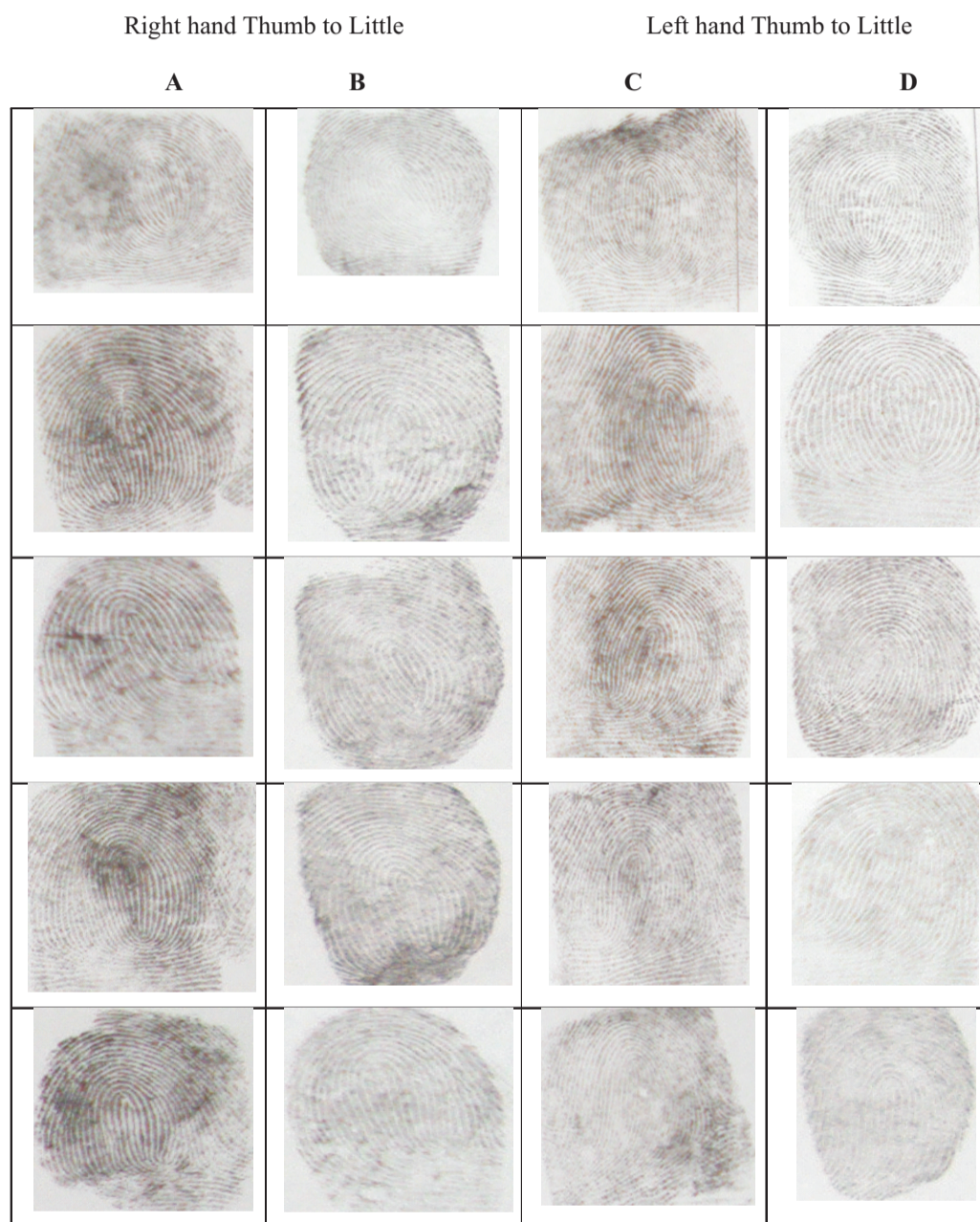
Observation 1:



An Empirical Study Of Fingerprints On Twins

Pictured above is an example of a pair of Monozygotic Twin Fingerprint wherein it is clearly identifiable that the basic patterns for all the 10 fingers of the twins are same.

Observation 2:

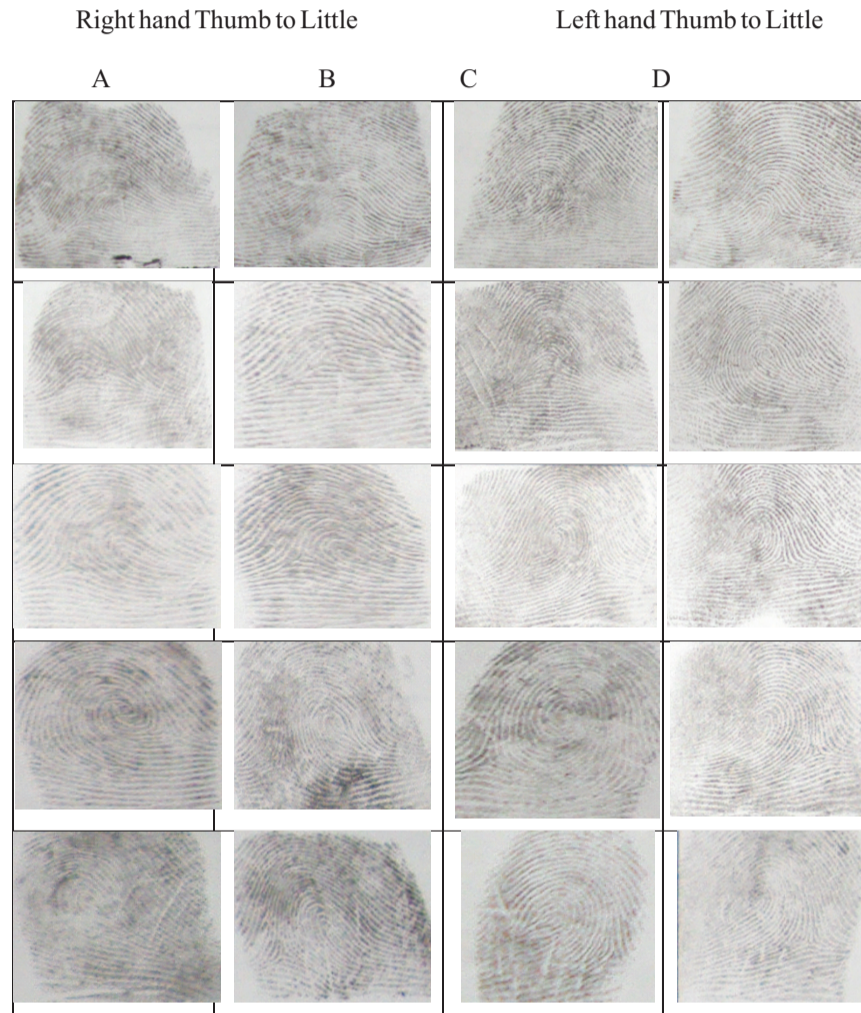


Here again in the case of the above observation it is clearly the striking resemblance between 9 of the 10 fingerprints can be pointed out between both Identical Twins.

Dizygotic Twins

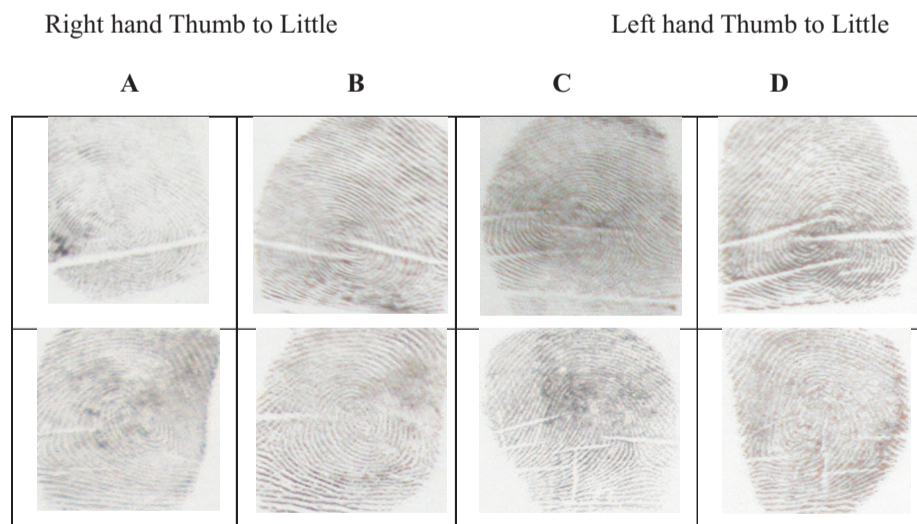
Below are 2 examples of the fingerprints of 2 pairs of Fraternal twins who are represented as (TWIN 1=A) and (TWIN 2=B).

Observation 1:

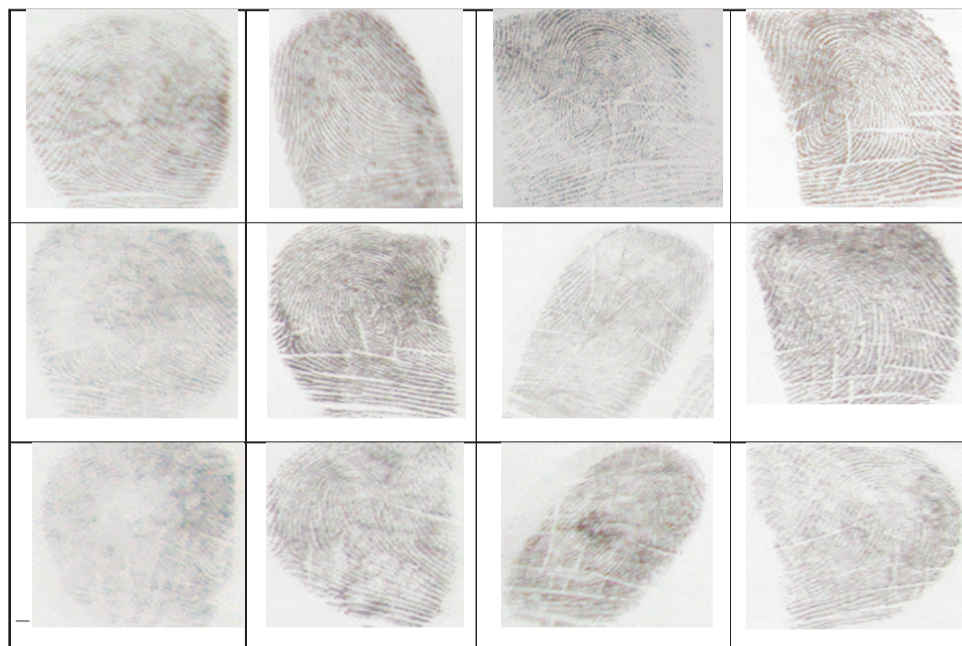


Here we can observe that 3 of the fingers are having same patters in both individuals, RT, RM, LM (Right Thumb finger)(Right middle finger)(Left middle finger) rest of the 7 fingers are having different patterns.

Observation 2:



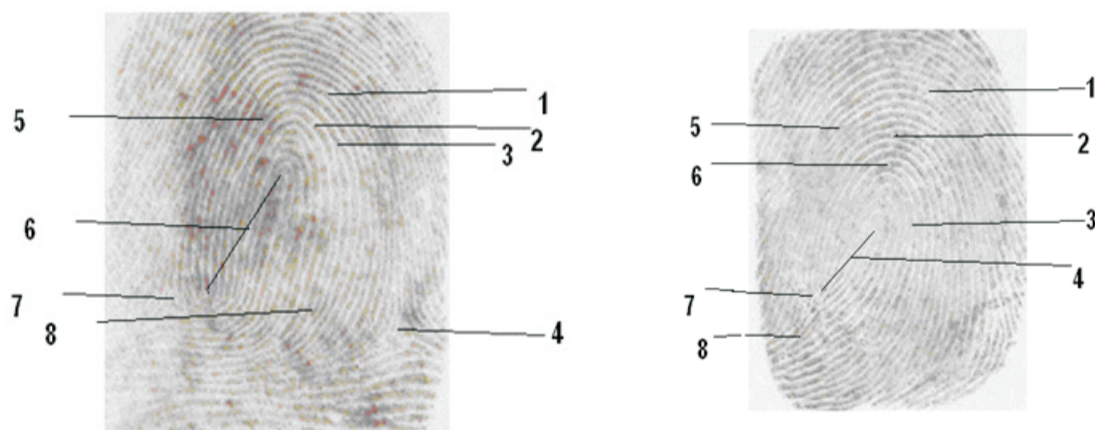
An Empirical Study Of Fingerprints On Twins



Here we can observe that 5 of the fingers are having same patters in both individuals, RI,RR,LI,LM,LR (Right Index finger),(Right ring finger),(Left index finger),(Left middle finger),(Let ring finger) rest of the 5 fingers are having different patterns.

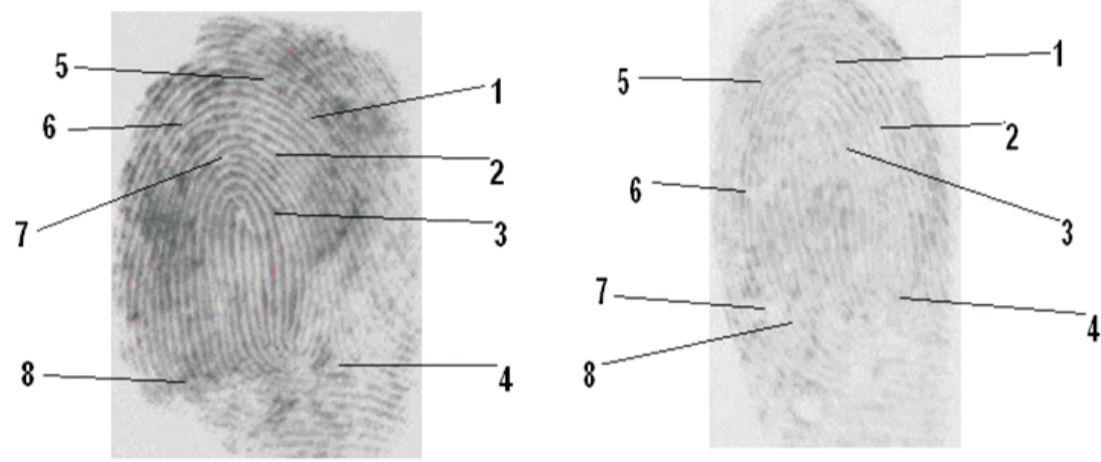
Differences in 2 prints having same basic pattern

Ridge difference 1: the following prints belong to the identical TWINS IN Observation 2 above



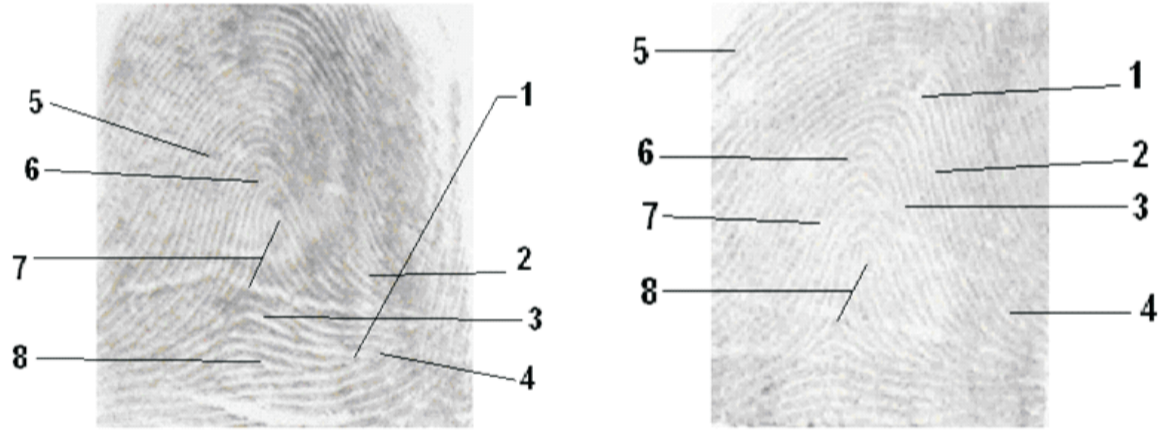
- 1,3,5,8- Bifurcation
- 7,4- Delta
- 6- Two cores 8 lines in between
- 2- Haitus

- 1,2,3,5,6,8- Bifurcation
- 7- Delta
- 4- Two cores 4lines between

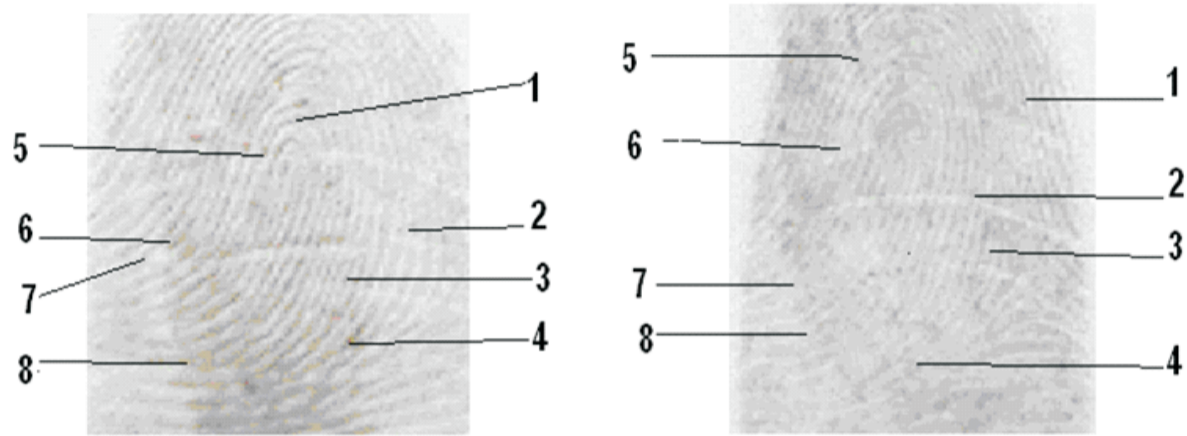


- | | | | |
|--------------|-----------------------|------------|-----------------------|
| 1,2,3,5,6,8- | Bifurcations | 1,3,5,7,8- | Bifurcations |
| 4- | Delta 5 lines to core | 2- | Ice land |
| 7- | Ridge end | 4- | Delta 3 lines to core |
| | | 6- | Haitus |

RIDGE DIFFERENCE 2: THE FOLLOWING PRINTS BELONG TO THE IDENTICAL TWINS IN Observation 1 above



- | | | | |
|--------|--------------------------------|--------|-----------------------------|
| 1,2,6- | Bifurcation | 1- | Haitus |
| 3- | Ice land | 2,3,6- | Bifurcation |
| 4,8- | Ridge end | 4- | Ridge end |
| 5- | Recurve | 5- | Ice land |
| 7- | 6 Ridge between delta and core | 8- | 5 Ridges between delta-core |



1,3 – Ice land
2,4,5,7,8-Bifurcation
6 - Ridge end

1,3 – Ice land
2,4,7,8 - Bifurcation
5,6 – Recurve

These were few of the examples where even if the basic pattern of same finger of two individuals is same, but there are many differences we can find in the charectaristics.

DISCUSSION

Only few of the taken samples are shown above as examples ,but the following table contains the results of the rest of the samples collected, it shows us that in 10 fingers how many fingers are having the same pattern which his/her siblings have in the same finger :

Table.1

Sl.no	Identicals (MZ)	Similar	Different
01	Observation 1	09	01
02	Observation 2	09	01
03	Observation 3	09	01
04	Observation 4	08	02
05	Observation 5	10	00
06	Observation 6	09	01
07	Observation 7	08	02
08	Observation 8	08	02
09	Observation 9	08	02
10	Observation 10	06	04
	TOTAL out of 100	84	16

Table.2

Sl.no	Fraternal (DZ)	Similar	Different
01	Observation 1	07	03
02	Observation 2	07	03
03	Observation 3	08	02
04	Observation 4	06	04
05	Observation 5	06	04
06	Observation 6	05	05
07	Observation 7	05	05
08	Observation 8	05	05
09	Observation 9	03	07
10	Observation 10	01	09
	TOTAL out of 100	53	47

The results were as follows: The percentage of times identical twins had the same prints for a given finger was 84%, considering only it against 53% of the times for fraternal twins. Identical twins are having 31% more comparing to the Fraternal twins.

Basic Fingerprint pattern (arch, loop, whorl, composite) features are used only as a coarse method of eliminating candidates from a large database (e.g., AFIS). However, they have little implication on the discriminability of twins because these features are not solely used in the individualization of fingerprints. The friction ridges are of utmost importance in identifying the discrepancies. Here it was clearly observable that the ridge characteristics differed significantly even in cases where the same fingers of identical twins had same basic prints.

CONCLUSION

A study of the individuality of the fingerprints of twins has been presented. Using a set of 20 samples, the similarities of the fingerprints of twins were studied. Live scans and younger ages of the subjects were identified and selected to ensure good-quality prints thereby allowing the focus to be on the inherent individuality of fingerprints and one that was not affected by image quality issues.

Two studies were conducted using fingerprint features 1st results, obtained by human visual comparison; show that identical twins' fingers have a higher probability of having the same classification (84%) than in the case of fraternal twins (53%), 2nd features were studied with minutiae identifying the differentiation in the ridge characteristics.

The observations made were:

1. The similarity of fingerprints of identical twins is the more as compared to the similarity between fingerprints of fraternal twins. This indicates that genetic influence on the formation of minutiae in identical twins is more than the influence among fraternal twins.
 2. The similarity of fingerprints of twins is different from the similarity between arbitrary fingers.
- The implications of the study are (1) there is a significant difference between the fingerprints of identical and fraternal twins, and (2) twins can be successfully discriminated using fingerprints. The net result of the findings is that the argument for the individuality of fingerprints is strengthened.

REFERENCES

1. Jaina, Anil K, Prabhakar Salil, Pankantic Sharath., "On the similarity of identical twin fingerprints.," The Journal of The Pattern Recognition Society 35, 2002, p 2653 – 2663.
2. Maltoni, D.; Maio, D.; Jain, A. K.; Prabhakar, S. Handbook of Fingerprint Recognition.
3. Springer: New York, 2003; p 176.
4. Srihari Sargur N, Srinivasan Harish, Fang Gang., "Discriminability of Fingerprints of Twins.," Journal of Forensic Identification, 2008/109, 58(1).
5. Srihari, S. N.; Srinivasan, C. H. On the Discriminability of the Handwriting of Twins. J. For. Sci. (Accepted for publication).
6. <http://earthsky.org/human-world/identical-twins-fingerprint>, 30/11/2012
7. http://www.nytimes.com/2009/10/06/science/06qna.html?_r=0



Santosh. Pujar M.A.

Ph.D Research Scholar , Karnatak University, Dharwad.

Publish Research Article International Level Multidisciplinary Research Journal For All Subjects

Dear Sir/Mam,

We invite unpublished Research Paper, Summary of Research Project, Theses, Books and Book Review for publication, you will be pleased to know that our journals are

Associated and Indexed, India

- * International Scientific Journal Consortium
- * OPEN J-GATE

Associated and Indexed, USA

- EBSCO
- Index Copernicus
- Publication Index
- Academic Journal Database
- Contemporary Research Index
- Academic Paper Database
- Digital Journals Database
- Current Index to Scholarly Journals
- Elite Scientific Journal Archive
- Directory Of Academic Resources
- Scholar Journal Index
- Recent Science Index
- Scientific Resources Database
- Directory Of Research Journal Indexing

Golden Research Thoughts
258/34 Raviwar Peth Solapur-413005, Maharashtra
Contact-9595359435
E-Mail-ayisrj@yahoo.in/ayisrj2011@gmail.com
Website : www.aygrt.isrj.net