



A Comparative Analysis Of Footprint Dimensions Between Professional Classical Dancers And Non-Dancers Of Kerala: Implications For Suspect Identification In Forensic Investigations

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Abstract: Today's society is going through a situation where crimes are increasing day by day. It is the responsibility and duty of every law enforcement agency to understand the root cause of crimes and find the real culprits, bring them to justice, and give justice to the victims. A thorough forensic examination of the physical evidence plays a crucial role in the identification process in the criminal investigation. The uniqueness of the forensic evidence gives a leading path to the identification process. A footprint is evidence that can be seen in most crimes except cybercrime, and it has its own uniqueness. This research was conducted in the aim of determining the differences in the footprint dimensions between Professional Classical Dancers and Non-dancers. For this empirical study researcher has collected the footprints of both the right and left foot from 100 participants using the inking method. Heel to each toe length, breadth of the footprint, central axis, and heel angle were measured and standard deviation and mean of the measurements were taken along with the calculation of the Plantar Arch Index and Chippaux-Smirak Index. Also, Carl Pearson's correlation for the central axis and length difference and central axis and heel angle were calculated. The study results show that the measurements will not help to identify the profession of the individual but the correlation between the central axis and length difference of heel to 2nd toe and heel to 5th toe may help to find out the profession i.e., dancers or non-dancers.

Index Terms - Footprint examination, Classical dancers, Non-dancers, Chippaux-Smirak Index, Central axis, Plantar Arch Index.

I. INTRODUCTION

Suspect identification is very crucial in every crime investigation. Wrongful identification of the suspect may lead to losing trust in the criminal justice system (CJS). The day-to-day advancements in technologies are contributing to the increase in crime and making it difficult to detect criminals. Physical evidence is the most relevant and contributory factor to a successful crime investigation. According to Locard's principle of exchange, any two objects come in contact with each other and leave their traces one on the other (Mummery, 2021).

When a criminal is involved in a crime, he gets some beneficiary from it and will leave some traces of him at the crime scene. There is a high possibility for bare footprints or footwear impressions found at the crime scene, compared to any other physical evidence (Singh, 2021). Human footprint has unique characteristics similar to fingerprints where the ridges are unmatched by any other human being. So, the footprints can be used for personal identification (Nagwanshi and Dubey, 2018). Footprint has three basic scientific features

for personal identification i.e. Individuality, Continuity, and immutability. The footprints of the identical twins are also not similar and the friction ridges remain unchanged throughout a person's life (Singh, 2021).

Section 2(a) of the Prisoners Act of 1920 directs to take fingerprints and footprints of an arrested person (India, 1920). The available footprints can help to identify the repeated offenders. This study focuses on whether there is any difference in the footprint measurements of professional dancers and non-dancers. Continuous application of extra pressure on the foot of dancers there is a high chance of change in the overall footprint appearance of dancers. The study was done in Kerala by collecting the footprint of professional dancers from various classical dance academies of Kerala and non-dancers from the Kerala population. Identification of differences in the footprints will help in the identification of the profession of an individual.

LITERATURE REVIEW

'A Study on Footprint Dimensions between Sports and Non-Sports Category in Mangalore Students Population' by Pooja V Menon, Bhavya Shree Rai, and Sanjay R (2018). The study's objective was to determine whether there is any difference between the footprint dimensions among Sports and non-Sports persons. The sample size taken for the study was 100 (50 sports and 50 non-sports) from the age group 18-25 years. The sampling method used was random sampling. Footprint was taken voluntarily by issuing consent. The methodology which is used for the collection of data was the coloring technique. The comparison is done by taking parameters such as Foot length, breadth, and angle. They first grouped the height and foot length of sportsmen, non-sports men, sportswomen, and non-sports women separately. The same was done for height and foot angle. In the male left footprint between sports and non-sports, 0.7 cm of difference was found in the length and the foot angle difference was 0.5° . In the male right footprint, there was a 1.1 cm length difference in foot length, 0.4 cm breadth differences, and 0.3° difference in angle found between sports and non-sports persons. In female left foot there was 0.2 c.ms of length difference, 0.4 c.ms of breadth difference and 0.8° of foot angle difference was found. In the female-right 0.4 c.ms of difference in length, 3.8 c.ms of breadth difference, and 2° of foot angle difference were found. A minute difference was found in footprints between Sports and non-Sports persons.

A study on **'Assessment of flat foot by plantar arch index using footprint in aged population'** was conducted by P. Rithanya, K. Yuvaraj Babu, and Karthik Ganesh Mohanraj (2018). For this purpose, the researcher collected the samples from 50 subjects from Saveetha Dental College and Hospitals aged between 50 and 70 years. The samples were collected using a simple inking technique by standing foot morphology. The presence of a flat foot was analyzed by the equation Plantar Arch Index (PAI) = A/B , where A is the width of the mid-foot and B is the width of the heel. $PAI > 1.15$ is considered a flat foot. From this study, the result obtained was PAI ranged from 0.38 to 1.17, and the researcher concluded that the simple ink method is cost-effective and simple way to diagnose flat feet deformity using the Plantar Arch Index.

A study was conducted by Richa Mukhra, Kewal Krishnan, and Tanuj Kanchan on the topic **'Bare footprint metric analysis methods for comparison and identification in forensic examinations: A review of literature'**. This is the study in which the researcher reviewed research articles for the purpose of finding the best method for footprint analysis of two-dimensional prints. The paper explains different approaches by different researchers. One of the approaches was finding the Chippaux-Smirak Index which is given by Chippaux and Smirak. He also explains Gunn's method, overlay method, Robbin's method, Reel's method, etc., and the most widely used method found as Reel's method for the comparison of footprint evidence.

II. OBJECTIVES:

1. To identify the difference in footprint between dancers and non-dancers.
2. To compare the measurements of the footprint between dancers and non-dancers.
3. To ascertain the peculiar characteristics of the footprint based on the measurement to differentiate between the Dancers and non-dancers.

III. NEED FOR THE STUDY

Footprints are one of the pieces of evidence that can be present in each crime scene excluding the digital crime. The footprints can be ignored by the criminal during committing the crime because of a lack of knowledge about the individuality of the footprint. As the footprints are individual; the identification of the footprint helps to the identification of the individual. The continual use of feet by the dancers may develop different characteristics in the foot pattern which can help in the identification of the profession of a person. Hence this study is done to compare the footprint between dancers and non-dancers. Identification of the profession will help in the inclusion and exclusion of suspects and identification of the culprits.

IV. METHODOLOGY

For this empirical study data was randomly collected from the primary source of the universe of the study. The study population consisted of 50 professional classical dancers with 8 to 25 years of dance experience and 50 non-dancers belongs to Kerala. The age group of the participants ranges from 18 to 35 years. All the participants are from the female population and the participants with foot deformities were excluded. The method used for taking footprint was inking method.

Materials Required

- Plastic slab
- A4 sheets
- Acetone
- Cloth and cotton
- Scale
- Black ink
- Roller
- Protractor
- Writing materials

Procedure:

The researcher explained the purpose and objectives of the research and gave instructions to the subjects before recording the impression. The researcher then took the consent of the participants assuring that the footprints will only be used for the research purpose and will not be misused. The researcher told the subjects to wash their legs and wipe it off. Then the ink was spread over the slab using a roller. The subject was then asked to press their legs in the ink followed by pressing the leg properly on the A4 sheet. The subjects were then asked to clean their legs on a piece of cloth provided.

The parameters considered for the study are:

- *Foot length*: The foot lengths are taken from heel to each toe.
- *Foot width*: the width of the footprint at three regions such as ball width of the foot, the width of the mid-foot, and width of the heel.
- *Central Axis*: A line drawn from the second toe at 90° and another line drawn from the tip of the second toe to the tip of the fifth toe, the angle between those two lines is known as the Central axis.
- *Difference in length*: Difference in length between heel to second toe and heel to fifth toe.
- *Heel angle*: It is the *heel angle* between the *second* toe and *fifth* toe.
- *Plantar Arch Index (PI)*: This is calculated by dividing the mid-foot width by heel width.
- *Chippaux-Smirak Index (CSI)*: This is calculated by dividing the mid-foot width by ball width, which is multiplied by 100.

Limitation:

- Only the female participants are involved in this study.
- Only the footprint measurements are taken as parameters.
- The recording and analysis of the footprints were done manually hence there are chances of occurrence of manual errors such as missing of exact dimension.

V. DATA ANALYSIS:

For analysis, the researcher categorized the samples into right foot and left foot for both dancers and non-dancers in the different tabular columns and different measurements were inserted and the mean, standard deviation, plantar arch index, and Chippaux-smirk index were calculated accordingly.

Table 1: Footprint Measurements of dancer's right foot

Sl. No.	Distance b/w heel and each toe					Width of the footprint			(PAI) =M/H	(CSI)=(M/B)*100	Central axis	2 nd – 5 th	Heel angle
	1	2	3	4	5	B	M	H					
Mean	21.874	21.581	20.804	19.742	18.252	8.416	2.382	4.458	0.53563	28.17169	42.94	3.329	13.96
SD	1.1069	1.1656	1.1008	1.060	0.8892	0.496	1.182	0.2928	0.27118	13.78416	6.2185	0.5297	1.1945

***1. Length measurement from heel to tip of each toe:** 1-heel to 1st toe, 2-heel to 2nd toe, 3-heel to 3rd toe, 4-heel to 4th toe, and 5-heel to 5th toe.
2. Width of the foot: B- ball, M- mid-foot, H-heel. **3. PAI- Plantar Arch Index.** **4. CSI- Chippaux-Smirak Index**
5. Length difference between 2nd and 5th.
6. Heel angle between 2nd and 5th toe

The given table explains the measurements of the dancer's right leg. The measurements are mainly divided into foot length measurements which consist heel to each toe measurements. From the 50 footprints, the highest value obtained in the heel to 1st toe measurement is 24.5 cm and the minimum value is 19.2 cm. The mean value obtained is 21.87 cm. The length from the heel to the second toe the highest measurement was obtained as 24.3 cm the minimum was 18.5 cm and the mean value obtained was 21.58 cm. The measurement of the heel to 3rd toe the largest length obtained was 23.4 cm, the minimum was 17.9 cm, and the mean value obtained was 20.8 cm. The length from heel to 4th toe the highest measurement obtained is 22.2 cm and the minimum is 17 cm. The average length is 19.7 cm. In the final measurement, i.e., length from heel to small toe, the highest measurement obtained is 19.9 cm and the minimum is 15.5 cm and 18.25 cm is the average obtained. The standard deviation of all the length measurements obtained is 1.1069, 1.1656, 1.100, 1.060, and 0.8892 respectively. Next is the measurement of the width of the footprint. It is explained in 3 different measurements, i.e., the width of the ball, the width of the mid-foot, and the width of the heel. The highest measurement of ball width is 9.7 cm and the minimum is 7.4 cm. The width of the mid-foot maximum is 6.5 cm and the minimum obtained is zero. The width of the heel obtained maximum is 5.2 cm and the minimum is 3.7 cm. The average width is 8.41 cm, 2.38 cm & standard deviation is 4.45 cm and 0.496, 1.182 & 0.292 respectively.

The maximum value of the plantar arch index obtained is 1.47 and the minimum obtained is zero and the average and standard deviation obtained are 0.5356 and 0.2711 respectively. For the Chippaux-smirk Index maximum value obtained is 64.77 and the minimum is zero with an average value of 28.17 and a standard deviation of 13.784. The maximum central axis measurement obtained is 55° with a minimum measurement is 28°. The average value of the central axis measurement obtained is 42.94° with a standard deviation of 6.218. This is followed by the difference in length of the heel to 2nd toe and heel to 5th toe. The maximum value obtained is 4.5 cm with a minimum value of 2.1 cm and the average value obtained is 3.32 cm with a standard deviation of 0.529. The final measurement is the heel angle between the 2nd and 5th toes. The maximum angle obtained is 16° with a minimum angle of 11°. The average angle obtained is 13.96° with a standard deviation of 1.194.

Table 2: Measurements of Dancers Left foot

Sl. No	Distance b/w heel and each toe					Width of the footprint			(PAI) =M/H	(CSI)=(M/B)*100	Central axis	2 nd -5 th	Heal angle
	1	2	3	4	5	B	M	H					
Mean	21.83	21.634	20.856	19.794	18.314	8.466	2.558	4.466	0.57350	30.09090	39.72	3.32	14.48
SD	0.960	1.1236	1.0708	1.0391	0.8724	0.4825	1.1634	0.2987	0.25640	13.25420	5.3377	0.56061	1.05443

1. Length measurement from heel to tip of each toe: 1-heel to 1st toe, 20-heel to 2nd toe, 3-heel to 3rd toe, 4 heel to 4th toe, and 5-heel to 5th toe.

2. Width of the foot: B- ball, M- mid-foot, H-heel. **3. PAI-** Plantar Arch Index. **4. CSI-** Chippaux-Smirak Index.

5. Length difference between 2nd and 5th.

6. Heal angle between 2nd and 5th toe.

The above table depicts the measurements of Dancers' left footprint. The maximum value length from heel to 1st toe is 24.2 cm and the minimum value is 19.1 cm. The average measurement for 50 footprints is 21.83 cm. The maximum value length from heel to 2nd toe is 24.4 cm and the minimum value is 18.3 cm with an average value of 21.63 cm. The maximum value of heel to 3rd toe measurement is 23.3 cm and the minimum value is 17.9 cm, which has an average value of 50 footprints is 20.85 cm. Heel to 4th toe measurement has the highest value of 22c.ms and a minimum value of 17.4 cm with an average value of 19.79 cm for 50 samples. The length measurement of the heel to the 5th toe has a maximum value of 19.7 cm and a minimum value of 16.2 cm. The mean value for 50 footprints is 18.31 cm. All the 5-length measurement has a standard deviation of 0.960, 1.123, 1.070, 1.039, and 0.872 respectively. The width of the ball of the foot has the highest value of 10 cm and a minimum value of 7.5 cm with a mean value of 8.46 cm for 50 footprints. The mid-foot width has the highest value of 6.6c.ms and a minimum value of 0.6c.ms with an average value of 2.55 cm. The maximum heel width is 5.2 cm and the minimum is 3.9 cm, with a mean value of 4.46 cm. Each width has its standard deviation value of 0.482, 1.163, and 0.298 respectively. The plantar arch index measurement has a maximum value of 1.431 and a minimum value of 0.12. It has a mean value for 50 footprints of 0.573 and a standard deviation of 0.256. The highest value got for the Chippaux-Smirak Index is 71.59 and the minimum value is 7.228, which has an average value of 30.09, and the standard deviation value is 13.254.

The central axis and heel angle between the 2nd and 5th toe have the maximum value of 56° and 17° respectively and the minimum angle of 27° and 12° respectively. The average value of central axis and heel angle for 50 footprints is 39.72° and 14.48° respectively. The standard deviation value for the central axis is 5.337 and the heel angle is 1.054. The length difference between heel to 2nd toe and heel to 5th toe has the highest value of 4.6.ms and minimum value of 2 cm. The average value for the length difference is 3.32 cm and a standard deviation of 1.054.

Table 3: Measurement of Non-Dancer Right foot

Sl. No	Distance b/w heel and each toe					Width of the footprint			(PAI)=M/H	(CSI)=(M/B)*100	Central axis	2 nd – 5 th	Heel angle
	1	2	3	4	5	B	M	H					
Mean	22.02	21.79	21.01	19.86	18.452	8.124	2.204	4.436	0.4983	27.010	44.24	3.345	13.32
SD	0.9918	0.9487	0.9179	0.8879	0.8217	0.4876	1.042	0.4144	0.2532	12.494	4.701	0.3947	1.316

***1. Length measurement from heel to tip of each toe:** 1-heel to 1st toe, 2-heel to 2nd toe, 3-heel to 3rd toe, 4-heel to 4th toe, and 5-heel to 5th toe

. 2. Width of the foot: B-ball, M- mid-foot, H-heel. **3. PAI-** Plantar Arch Index. **4. CSI-** Chippaux-Smirak Index.

5. Length difference between 2nd and 5th.

6. Heel angle between the 2nd and 5th toe.

The table No. 3 represents the different measurements of the Non-dancer's Right footprint. Each toe is represented as 1 to 5 numbers. The numbering is done according to their positions. 1 represents the big toe which is considered as 1st toe. The measurement of length from the heel to the tip of the first toe has the highest value of 23.9 cm among 50 samples and has the lowest value of 20.2 cm. The average value for 50 samples is 22.02 cm and the standard deviation is 0.991. The maximum length from the heel to the tip of the second toe is 23.9 cm and the minimum length is 20 cm, with the average value among 50 samples being 21.79 cm and the standard deviation is 0.948. The uppermost value for the measurement from the heel to the 3rd toe is 23.1 cm and the lowermost is 19.2 cm. It has the average value for all the samples is 21.01 cm and the standard deviation is 0.917. The measurement of the heel to the tip of the 4th toe starts from the value of 18.2 cm and ends at the value of 22.05 cm. All the samples have an average measurement of 19.86 cm and the standard deviation is 0.887. The length of the heel to 5th toe is ranging between 17.1 cm and 20.2 cm with a mean value of 18.45 cm and a standard deviation of 0.821. The second group of measurement is the width of the footprint in 3 positions, i.e., the width of the ball of the foot, mid-foot, and heel. The maximum width of the ball, mid-foot, and heel is 9 cm, 5.6 cm, and 5.3 cm respectively and the minimum value is 7 cm, 0 cm, and 3.2 cm respectively. The mean value of ball width is 8.12 cm with a standard deviation of 0.487, the mean of mid-foot width is 2.20 cm with a standard deviation of 1.042 and the average for heel width is 4.43 cm with a standard deviation of 0.414. The difference in the length of the heel to 2nd toe and heel to 5th toe has the highest difference value of 4 cm and minimum value of 2.3 cm. The average difference is 3.34 cm and the standard deviation is 0.394.

The central axis and heel angle between the 2nd and 5th toe have the largest angles at 54° and 17° respectively with minimum angles at 34° and 11°. The mean value for the central axis is 44.24° and for the heel, the angle is 13.32°. The standard deviation for the central axis is 4.701 and the heel angle is 1.316.

Table 4: The Measurement of Non-dancer's Left Foot.

Sl. No	Distance b/w heel and each toe					Width of the footprint			(PAI)= M/H	(CSI)=(M/B)*100	Central axis	2 nd – 5 th	Heel angle
	1	2	3	4	5	B	M	H					
Mean	22.05	21.86	21.06	19.90	18.48	8.17	2.12	4.368	0.4884	25.7341	40.46	3.379	13.58
SD	1.000	0.9919	1.002	0.9209	0.8541	0.5630	1.004	0.363	0.2465	11.8964	5.459	0.4261	1.3715

***1. Length measurement from the heel to the tip of each toe:** 1-heel to 1st toe, 2-heel to 2nd toe, 3-heel to 3rd toe, 4-heel to 4th toe, and 5-heel to 5th toe.
2. Width of the foot: B- ball, M- mid-foot, H-heel. **3. PAI- Plantar Arch Index.** **4. CSI- Chippaux-Smirak Index.**
5. Length difference between 2nd and 5th.
6. Heel angle between 2nd and 5th toe.

The above table explains the different measurements of non-dancers' footprints. The length from heel to 1st toe ranges from 19.9c.ms to 24.1c.ms, heel to 2nd toe ranges from 19.7c.ms to 23.8c.ms, heel to 3rd toe ranges from 19.1c.ms to 20.9c.ms, heel to 4th toe ranges from 18.2c.ms to 21.5c.ms and heel to 5th toe is ranging from 16.9c.ms to 20.6c.ms. The mean values for five-length measurements are 22.05 cm, 21.86 cm, 21.06 cm, 19.9 cm, and 18.48 cm respectively and the standard deviation values are 1.00, 0.991, 1.002, 0.920, and 0.854 respectively. The ball width has the lowest measurement 7c.ms and maximum measurement 9.1c.ms, which has an average value of 8.17 cm and a standard deviation of 0.563. The mid-foot width has the maximum value of 5.6c.ms and a minimum 0c.m and heel width have the maximum value 5.3c.ms and minimum value 3.4c.ms. The mid-foot and heel width of 50 footprints have an average value of 2.12 cm and 4.36 cm respectively and the standard deviation values are 1.004 and 0.363 respectively. Both the Plantar Arch Index and Chippaux-Smirak index have a minimum value of zero but the maximum value is 1.47 and 65.88 respectively. The mean value for Plantar Arch Index is 0.488 with a standard deviation of 0.246 and for the Chippaux-Smirak Index the average value is 25.734 and the standard deviation is 11.896.

The central axis has a maximum angle of 52° and a minimum angle of 28°. For the 50 samples, the average angle is 40.46, and the standard deviation of 5.459. The length difference between heel to second toe and heel to 5th toe has a maximum value of 4.3 cm and a minimum of 2.3 cm, which has an average value of 3.37 cm and a standard deviation of 0.426. The angle of the heel between the 2nd and 3rd toe has 11° as the minimum value and 18° as the maximum value. The average angle for 50 footprints is 13.58° and the standard deviation is 1.371.

Table 5: Correlation and P-value

Profession	Foot	Parameters	Correlation value	P-value
Dancers	right foot	heel angle and central axis	-0.39320	0.00*
	left foot		-0.26208	0.00*
	right foot	Central axis and length difference b/w heel to 2nd & heel to 5th toe	0.84835	0.00*
	left foot		0.54819	0.00*
Non-Dancers	right foot	heel angle and central axis	-0.44471	0.00*
	left foot		-0.62233	0.00*
	right foot	Central axis and length difference b/w heel to 2nd & heel to 5th toe	0.59607	0.00*
	left foot		0.64496	0.00*

Note: * refers to $p\text{-value} < 0.05$, which means statistically significant.

Table No. 5 depicts the Karl Pearson Correlation value and p-value of Dancers and Non-dancers. The Correlation of heel angle and central axis has a negative correlation for dancers and non-dancers in both footprints. The dancer's right foot has a correlation value of -0.3932 and the left foot has -0.2620. Non-dancers' right foot has a correlation value of -0.4447 and the left foot has -0.6223. All footprints have a p-value of less than 0.05, which means all are statistically significant. The next parameters correlated are the central axis and length difference between heel to 2nd toe and heel to 5th toe. The dancers' right footprint has a correlation value of 0.8483 and the left footprint has a value of 0.5481. Non-dancers' right footprint and left footprint have the correlation values 0.5960 and 0.6449 respectively. All footprints have a p-value of less than 0.05, which means statistically significant. Similarly, the graphs show the variation in the correlation.

VI. FINDINGS

- It was found that there is no significant difference in the length measurement and width measurement of footprints between Dancers and No-dancers. Hence the length measurement cannot be used for the identification of profession i.e., Dancers or Non-dancers from the footprint. The mean value obtained for the length measurement of the dancer's right foot is heel to 1st toe (21.874) heel to 2nd toe (21.581), heel to 3rd toe (20.804), heel to 4th toe (19.742) and heel to 5th toe (18.252) and the dancer's left foot is heel to 1st toe (21.83) heel to 2nd toe (21.634), heel to 3rd toe (20.856), heel to 4th toe (19.794) and heel to 5th toe (18.314). The mean value obtained for the length measurement of non-dancer's right foot is heel to 1st toe (22.022) heel to 2nd toe (21.797), heel to 3rd toe (21.01), heel to 4th toe (19.861) and heel to 5th toe (18.452) and the non-dancers left foot is heel to 1st toe (22.05) heel to 2nd toe (21.86), heel to 3rd toe (21.06), heel to 4th toe (19.90) and heel to 5th toe (18.48).
- It was found that there is no significant difference in the Plantar Arch Index, Chippaux-Smirak Index, and heel angle between the 2nd and 5th toe, central axis, and length difference between heel to 2nd toe and heel to

- 5th toe between Dancers and Non-dancers. These measurements will not help to identify the profession from the footprint.
- The correlation between the central axis and heel angle of the dancer's right footprint is (-0.393), the dancer's left footprint is (-0.262), the non-dancer's right footprint is (-0.444) and the non-dancer's left footprint is (-0.622). For both the dancers and non-dancers gives a negative correlation between central axis and heel angle and there is very minute difference in the correlation between dancers and non-dancers; hence the correlation of central axis and heel angle will not help to identify the profession from the footprint.
 - The Central axis and length difference b/w heel to 2nd & heel to 5th toe has a high correlation in the dancer's right foot (0.848) and in the non-dancer's right foot has less correlation (0.596) but in the case of the left foot of both dancers (0.548) and non-dancers (0.644) there is no significant difference in correlation. Hence the correlation of central axis and length difference b/w heel to 2nd & heel to 5th toe can be used for right foot comparison between Dancers and Non-dancers. Then it can be told as if the right footprint is available the correlation value comes to more than 0.6 then it can be assumed that of the Dancer's footprint if it is less than 0.6 then it can assume that of the non-dancer's footprint.

VII. SUGGESTIONS

The researcher can increase the sample size and also can include the male population for further research. For further research, the researcher can include different dance forms and can compare the footprints between them. Can correlate between height and foot length and also include the gate pattern as well. A detailed analysis of ridge characteristics will help in the conclusive identification of an individual. For further study, the scanning method can be used for the sample collection instead of manual collection.

VIII. CONCLUSION

The researcher found that there is no significant difference in the measurement of the footprint of dancers and non-dancers. However, there is a small difference in the correlation value of the heel angle and the central axis between dancers and non-dancers. The researcher also found a highly significant difference in the right footprint correlation value of the central axis and length difference between heel to 2nd toe and heel to 5th toe between dancers and non-dancers. The correlation value has a high positive correlation for the dancers' right footprint. Hence the researcher concluded that the measurements will not help to identify the profession of the individual but the correlation between the central axis and length difference of heel to 2nd toe and heel to 5th toe may help to find out the profession i.e., dancers or non-dancers. The implementation of footprints along with fingerprints in biometric identification systems such as Adhaar will help in the easy identification of individuals due to the unique features of the footprint.

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