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ESTIMATION OF STATURE USING FOOT AND SHOEPRINT LENGTH OF INDIAN POPULATION.

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ABSTRACT
In Forensic Anthropology, estimation of stature from feet dimensions plays an important role in establishing individual's identity. Stature is one describing characteristic that is used. In the mid-1800s, Topinard developed a mathematical formula for estimating a person's height from a foot print (foot length: stature ratio) and determined this ratio to be 15%.Foot length displays a biological correlation with height that suggests the latter might be estimated from foot- or shoeprints when such evidence provides an investigator the best or only opportunity to gauge that aspect of a suspect's physical description. Estimation of height using foot and shoeprint length can be very useful information in the process of identification of individual in forensic cases based on shoeprint evidence. It can help to narrow down suspects and ease the police investigation. Besides, stature is important parameters in determining the partial identify of unidentified and mutilated bodies.It can help the problem encountered in cases of mass disaster, massacre, explosions and assault cases. This is because it is very hard to identify parts of bodies in these cases where people are dismembered and become unrecognizable. Anthropometry refers to the study and measurement of body dimensions.The measurements can be made using osteometric board and the shoeprints can be recorded using an oil-based ink.A portable stadiometer can also be used for recording the stature . Foot length measurement was measured from behind the heel to the longest part of the foot; usually either the first toe or the second toe. Parallel measurement was made for the foot length measurement and osteometric board was used for the foot length measurement. Shoeprints that was printed using oil-based ink were measured using parallel measurement for its length.

KEYWORDS: anthropology, foot print, shoeprint, stadiometer, stature.

INTRODUCTION
Forensic anthropology is the application of the study of humans to situations of modern legal or public concern. This typically takes the form of collecting and analyzing human skeletal remains to help identify victims and reconstruct the events surrounding their deaths [1].Many parts of human body have been studied by forensic anthropologists in the progression to formulate biological profile [2]. Foot and shoe prints' relationship to the stature provides invaluable tool in forensic investigation [3-5]. It can be used as an aid in criminal investigation in order to develop biological profile to find suspects or to associate with witness' statement. In order to estimate stature, regression formulae are being devised for this purpose using foot and shoeprint length as the known parameter. Parameter is a fundamental aspect of science and is evident as emerging approach in the area of footprints and stature estimation because foot length displays a biological correlation with stature that suggests the latter might be estimated from foot or shoe prints. Morphology of human feet is greatly influenced by combined effects of heredity and living style of man that determines the size and shape of feet and footprints. Therefore, careful examination of foot impressions in forensic examination can provide useful clues to establish personal identity whenever complete or partial foot prints are recovered at the crime sceneand it can help in including and excluding possible presence of individuals at the crime scene. Footprints can be collected from almost all types of crime scenes but the possibility of their recovery at the scenes of sexual offences and homicides is relatively more. Examination of barefoot impressions is Important especially in developing countries like India wheremajority of the rural population like to walk barefooted becauseof socio-economic and climatic reasons.[6-7] The partial or complete footprints can be found on rain covered surfaces, newly waxed floors, freshly cemented surfaces, moistened surfaces, in dust, mud, sand, oil, paint and can be left in blood at the murder scenes. Gayer was probably the first person to

conduct a detailed study of footprints while working in the United Province of India and published his results in the form of a book [8].

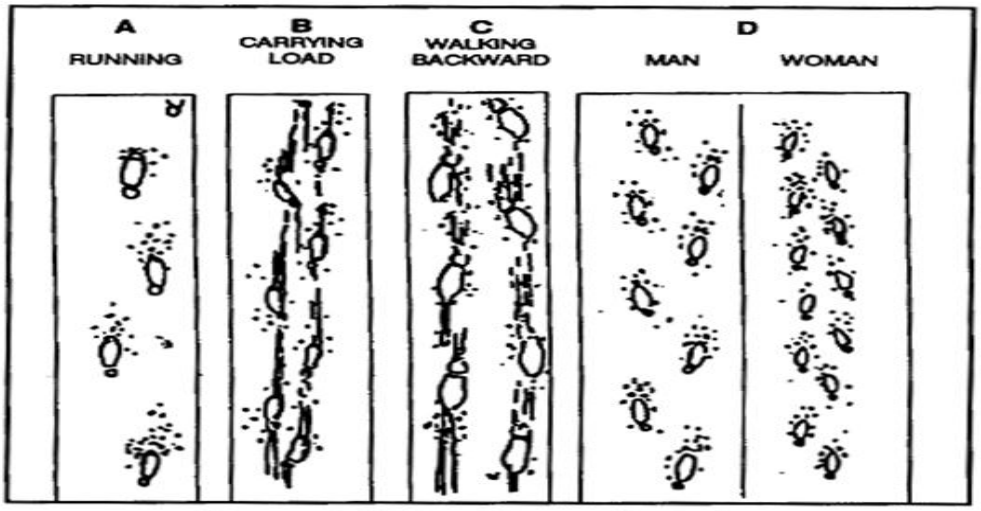

Figure-1 Different types of footprints.

Figure-2: Measurement of Foot Length.

DISCUSSION

Shoeprints are often found at crime scenes and provide valuable forensic evidences. It has been estimated that more than 30% of all burglaries provide shoeprints that can be recovered from the crime scene [9, 10]. Because of the pattern of repeated offences, rapid classification of such shoeprints would enable investigating officers not only to like different crimes, but to identify potential suspects while the crime is still 'hot' [11]. Since shoeprint length is highly correlated with shoe size and increases linearly, in principle shoe size should yield an estimation of height. There are two main difficulties one is variation in the style of sole and heel, which substantially increases the variability of the imprint left by shoes of the same shoe size [12-13]. Shoeprint lengths correlate with a person height is borne out by results reported in the anthropological literature for more than a century [14-16]. If present, foot prints, either of more commonly as shoeprints, provide an opportunity for estimating height as one characteristic helping to identify or eliminate a suspect. Evaluating and weighing all the factors involved in shoeprint examination may cause different experts to reach completely different conclusions based on the same facts this happens often because of the lack of common standards in shoeprint examination [17]. Several practical shoeprint classifications, such as device-dependent noise, distortions, and incompleteness [18]. An image related database classification system was developed for shoe sole pattern designs. Sole designs are stored with shoe information (brand name, size, style, material, etc). Pattern types and certain features existing on shoe soles and they are used as searching criteria [19]. A shoeprint collection could be developed by taking footwear impressions of known criminals and/or by visiting shoe stores. In a case, in which there are shoe impressions taken from suspects, crime scene impressions and shoe designs with their brand names in the same database, it is possible to link crime scenes by a single search as well as to get a suggestion of a possible suspect, and to find a brand name of the shoe [20]. Subjects with any apparent disease, orthopedic deformity, injury or disorder were excluded.

CONCLUSION

It has been concluded thatfootprints and foot outlines are of utmost importance in estimating the stature in forensic examinations. Footprint andfoot outline lengths are strongly correlated with stature and thusgive better prediction of stature than the other measurements. Even though trace evidences becoming more and more important in legal cases, only little is known about the influence of task and context factors on comparative judgments. From the forensic point of view, the proposed retrieval method is considered as a method to determine a linkage between suspects only. For forensic scientists,

it is often interesting to establish whether the investigated shoeprint has already been photographed and we can also estimate the stature of the individual by applying regression formula Y = a + bX ± SEE where, stature is denoted as 'Y', 'a' is a constant and 'b' is the regression coefficient of each independent variable while 'X' is the individual variable. The confirmation of validity of linear regression equations to reconstruct stature from walking shoeprint length on a fresh sample provides excellent norm grams for the population of this area. Although these norm grams would seem to be applicable in younger adults only, the application of correlation of correlation factors derived with similar characteristics could, however, enable us to use for older subjects, provided the rate of structural loss is known. Moreover the estimationof stature from walking shoeprint length is easy, economical and convenient. An important point to remember is that the people from different regions of India bear different morphological features depending upon their geographical distribution and primary racial characteristics hence a single formula cannot represent all parts of the country.

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