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CENTRE CANADIEN DE RECHERCHES POLICIÈRES

TM-08-96

BAREFOOT COMPARISON AND IDENTIFICATION RESEARCH

By: Sergeant Robert B. Kennedy

TECHNICAL MEMORANDUM

Submitted by
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Research and Review Section

April, 1996

NOTE: Further information
about this report can be
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Executive Summary

The objective of this research is to establish a database of barefoot impressions that can be used with other information gathered throughout the study to show the uniqueness of bare feet thereby enabling the forensic expert to compare crime scene impressions found inside footwear with the bare footprint of a suspect to establish identity.

This is a multi-year project which will address a number of phases one of which includes studying footwear and footprint impression results from a control group.

Last year Technical Memorandum TM-12-95 was issued, and is available upon request by faxing this Centre.

Sommaire

Cette recherche vise à établir une base de données sur les empreintes de pieds nus qui pourront être utilisées avec d'autres renseignements recueillis au cours de l'étude afin de démontrer le caractère unique des pieds nus et permettre ainsi à l'expert judiciaire de comparer les empreintes décelées à l'intérieur de chaussures et prélevées sur les lieux de crimes, aux empreintes plantaires d'un suspect afin d'établir l'identité de celui-ci.

Il s'agit d'un projet pluriannuel comprenant plusieurs étapes dont l'étude des résultats de la collecte de données effectuée par un groupe témoin sur les traces de chaussures et les empreintes de pieds.

Le document technique TM-12-95 a été distribué l'an dernier et l'on peut en obtenir un exemplaire. Il s'agit d'en faire la demande par télécopie au Centre.

1) INTRODUCTION.

The barefoot research described in this report has been conducted on a full time basis from April 1994 to March 1996. It entails the gathering, comparison and physical matching of barefoot impressions inside shoes/footwear, or in any other substance at a crime scene, eg., blood, mud, when ridge detail is not present.

2) SUMMARY. See TM-12-95

The purpose behind this research remains the same and that is to establish a database of barefoot impressions that can be used with other information gathered throughout this study to show the uniqueness of bare feet, enabling the forensic expert to compare scene of crime impressions found inside footwear, in mud, blood or some other medium with the bare footprint of a suspect to establish identity. Not only would this be useful for crime scene impressions, but it could prove very useful at times of mass disasters where identity is difficult to establish through other means.

This year, I enlisted the services of a computer programmer, JD. Schneider, to reformat our footwear data base. Auto Cad was used as the format with all the measurements being entered using a digitizing tablet rather than entering them manually, as was the case with the Q&A program(Fig.1). Each foot can now be digitally traced and stored. This new system allows us to search the impression and even do a quick comparison with the digitized image that we can print from our database(Fig. 2). It was decided to re-enter all the data from the Q&A file along with all the new incoming prints and re-search the entire collection with this new system. We have contracted Mr. Peter Peterson to add the approximately 3800 sets of impressions to the new database.

I am also making arrangements to have two or three troops in Depot Division, Regina assist us in this research, by wearing running shoes that we can look at over a period of approximately 1 year, recording the impressions inside the running shoe, noting any changes in the impression and recording the reason for these changes, if any.

Arrangements have been made with Dr. Marks, University of Tennessee, who runs the only human decomposition facility in the world, to photograph the bottoms of the feet of several recently deceased individuals, over a period of approximately 10 weeks, as they decompose. This project will show all the changes that take place to the human foot as the body decomposes and may prove useful when trying to identify the victims of crimes, or disasters.

To date, this study has shown that feet, as with everything in nature, are unique. Excellent progress has been made in the development of a computer program to compare the inked impressions of bare feet collected from volunteers in order to show the individuality of bare feet.

3) CONCEPT. See TM-12-95

Throughout this study, inked impressions from individuals continue to be collected. I am receiving assistance in collecting bare foot impressions from Dr. Sara Jones, Australia; Dr. Wesley Vernon, England; Dr. Norman Gunn, Canada; and Dr. John Dimagio, Arizona.

I am still collecting pairs of shoes from individuals interested in this study in order to see any correlation between inked impressions and impressions found in these shoes. It was very important over the past year to visit many locations obtaining inked impressions of bare feet, along with shoes from as many volunteers as possible. It was also instructive to collect a second inked impression from individuals who had previously given their impressions in order to see if any changes had taken place over a period of time. If changes had taken place, it was necessary to determine why. Sometimes it was an injury to the leg, foot, hip or back of an individual causing him to walk differently. As previously reported, while some impressions look similar at first glance, the differences became apparent upon closer observation.

Over the past year I have been working on a better system to photograph the weight bearing areas of a bare foot. This was accomplished by using a sheet of 1" thick plexi-glass and piping light through the edge of the glass. The individual stands on the glass and the weight bearing areas become quite visible, enabling us to photograph them from below(Fig. 3).

I am also trying to develop a means of enhancing the sweat impressions inside footwear. At present, with the help of Dr. Della Wilkinson, we are trying a PH indicator called bromo cresol blue, which is sprayed onto the insole. This pale yellow solution turns blue when it comes in contact with the sweat on the insole and hopefully turn it darker than the surrounding area. This looks promising, but more testing must be done.

4) NATIONAL AND INTERNATIONAL COLLABORATION.

This is still a priority in order to continue this research to lend credibility to the study. Over the last year I have made numerous contacts and discussed this research with several experts, some of whom were involved with the comparison of bare feet while some were experts in other disciplines.

I am still participating in the Swedish National Police project whose main purpose is to determine if everyone involved with the comparison of bare feet are using the same methodologies and scientific approaches and whether each would come to the same conclusions.

I am a member of the Footwear Tire Track Committee for the International Association for Identification (IAI) and am a member of a sub committee drawing up standards for the certification of tire track and footwear technicians.

I have met with Dr. David Sweet, who is involved with Forensic Odontology, in order to discuss this study and ensure that the same methodologies and scientific approaches are being used from one discipline to the other.

I also met with Dr. Tal Simmons, a forensic anthropologist and professor at Western Michigan University. She is involved with the evaluation of bare feet and was very interested with this study and offered any assistance I might require. A meeting has been planned to meet with Dr. Simmons in order for me to view her work and evaluate her results as they would apply to this research.

I met with Dr. Murray Marks, an anthropologist at the University of Tennessee. Dr. Marks runs a decomposition research facility at the university, where human bodies are left in fields, shallow graves, in vehicles, under and over trees, in order to study the effects that insects and other environmental factors would have on the decomposing bodies. He was also very interested in this study and we discussed setting up a project at this facility on the effects decomposition would have on the weight bearing areas of the bare foot.

I will be giving a presentation on my research at the IAI meetings in North Carolina in July. A paper has been accepted for publication in the journal, Forensic Science International. I am also in the process of preparing a paper for the Canadian Society of Forensic Science Journal.

Information on this research has been requested from as far away as Dr. Ahmad Okhovat, (Iran), Lennart Jonasson, (Forensic Engineer from the National Laboratory of Forensic Science, Sweden) and from Dr. Sally Brodrick, (Podiatrist , Winnipeg Manitoba), all requesting information on this research.

I have also received letters from Dr. Owen Facey, (Metropolitan Police Service, London, England), Michael Moes (Belgium Forensic Department), Malcolm Russell, (Future Products Ltd., England), Dr. Liu Shuquan (Technological Research Centre, China), and Dr. Dennis Rosen, (Dept. Of Physics University College, London, England), who have all expressed a desire to discuss this research with me.

5) PRACTICAL USES FOR POLICE. See TM-12-95

As shown in last year's annual report, the usual cases are still coming in for evaluation, and regular court cases are ongoing. I have also consulted on several cases for other experts both within and outside of Canada, eg. Dr. Norman Gunn has sent me a file he was working on for court in Florida. Tony Gummer, (Institute of Environmental Science & Research Ltd., Auckland, New Zealand) and from the San Diego PD, California have also forwarded files to consult on.

I have also consulted with two professors from Carleton University, Ottawa; Irwin Pressman, (Program Co-Ordinator, Operations , Research), and Sanping Chen, (Special Consultant/Manager Stats Consulting Centre). They have both agreed to the value of this research and are interested in lending support by evaluating statistically the data we are collecting. Dr. Pressman is also interested in getting industry to collaborate in this project.

While this research aids in the identity of criminals at crime scenes, it remains equally valuable in eliminating a person from having made the impressions at a crime scene. It can also be used to identify the victims of mass disasters or missing persons where other means of identification have been exhausted.

6) COMMUNICATION OF INFORMATION ARISING FROM RESEARCH TO POLICE.

I have been, and am presently involved with lecturing throughout Canada, at law enforcement workshops and seminars, on the value of this type of physical evidence both criminally and otherwise. I have given presentations at the Canadian Identification Society (C.I.S.) Halifax, N.S., at the I.A.I conference in California, and at the European Meeting for Shoeprints/Toolmarks in Finland. I am scheduled to give a presentation at the IAI International Conference in North Carolina in July.

A course will be given in 1997 where one Forensic Identification Technician from each province will be trained in this technique, in order to do criminal comparisons and attend court as to his/her findings

7) FUTURE RESEARCH.

1. Future research still needs to **focus on improving** the recovery of the stained and indented impressions found inside of footwear for comparison with known impressions.
2. More work needs to be done gathering the inked barefoot impressions from volunteers in order to establish a larger scientific database from around the world.
3. All data gathered from the inked impressions must be added to and searched through, the computer program database.
4. More blind tests need to be done in order to establish the reliability of the database, as well as comparison techniques.
5. More collaboration with experts in this field must be done and a line of communication with these experts must be established so we can maintain the integrity of this field.
6. More shoe manufacturers must be contacted in order to obtain more footwear for comparison purposes.
7. A controlled subject group must be established so that changes, if any, in the foot may be noted over a period of time. This control group will come from the R.C.M. Police Training Academy, Regina, where several troops will be asked to have their running shoes examined over a 1 ½ year period in order to record the impressions left in the insole of the shoes, noting any changes that take place over this period.
8. Police agencies must be visited on a regular basis at their training seminars in order to update them on this new and developing technique.
9. The remaining prints and all incoming prints must be entered on the computer program in order to establish a reliable data base. This would require hiring another contract person to input the data on the system.
10. The occasional use of a computer programmer, in order to update the system that is now in place, may be required.

8) CONCLUSIONS.

While this research has shown barefoot comparison techniques to be a reliable and useful means for possible identification in both criminal cases as well as for other types of disasters, much research is left to be done in order to establish this as a useful and reliable piece of evidence in the scientific world as well as in courts of law. It is hoped that this research can be completed in the next two years in order that this technique can be extensively used in the field, with one person in each province being responsible for the comparison of, and presentation of this barefoot evidence in a court of law.

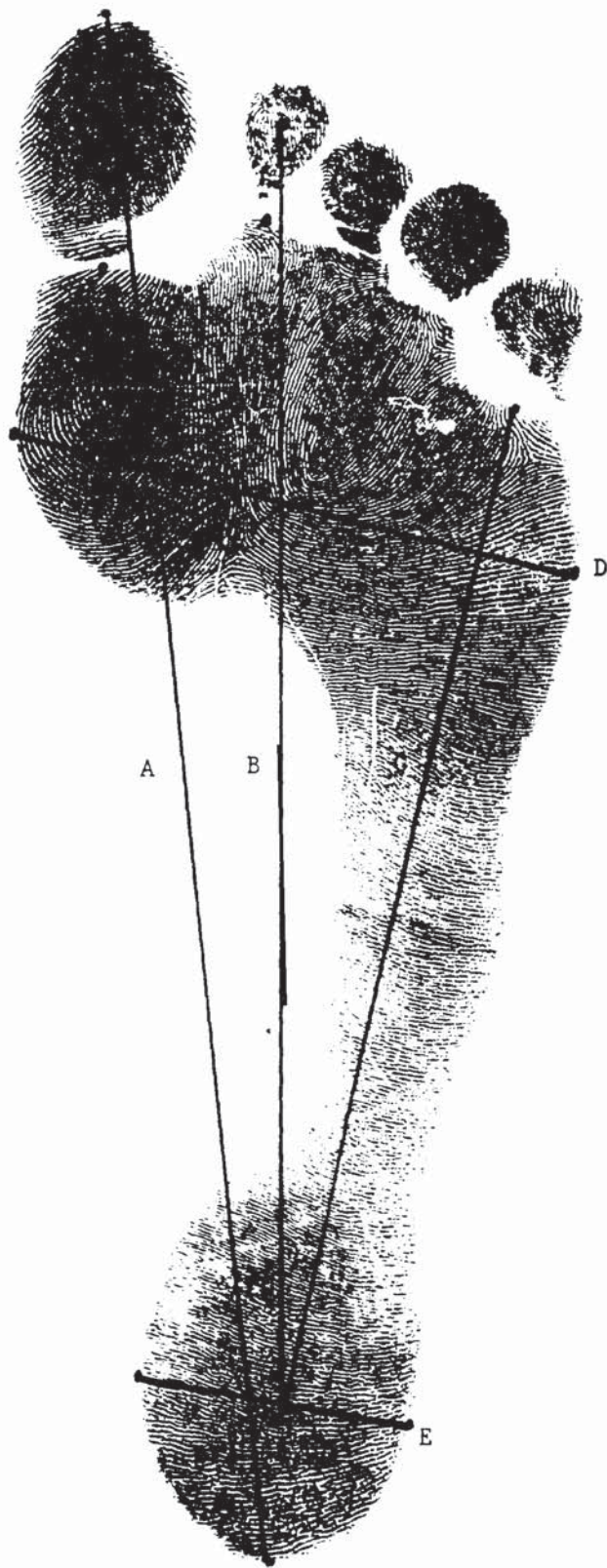
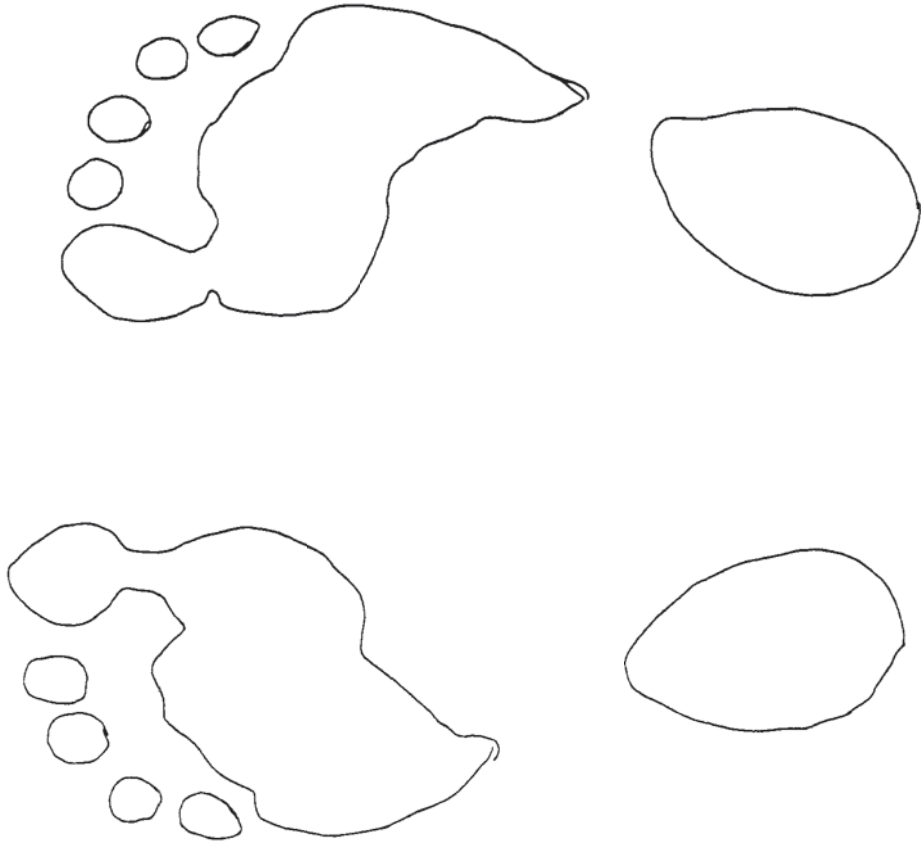


Fig. 1 Shows some of the measurements used for the database.
A edge of heel to tip of toes.
B optical center of heel to optical center of each toe.
C optical center of heel to metatarsal head area.
D width of ball of foot.
E width of heel.

MEASURE IN mm	L	R	REMARKS
LENGTH	251.0	237.8	
B. WIDTH	83.7	84.1	
H. WIDTH	52.9	51.0	
CENTRE HEEL TO	centre L	centre R	Border Heel to border L R
1st T	198.4	187.2	250.6 237.7
2nd T	201.1	194.7	245.4 235.5
3rd T	197.6	188.8	241.3 231.1
4th T	183.7	179.4	226.2 221.2
5th T	165.5	163.4	209.0 205.9
LMT	1 2 3	1 2 3	
BORDER	206.6	208.5	186.4 195.9 196.8 182.1
CENTRE	172.5	173.3	151.3 162.6 162.7 147.8

NAME	Jeff MacNeil		
RACE	cauc		
HT	5'9"	AGE	25
WT	180	ETHNIC ORIGIN	
SHOE SIZE	9	SEX	M





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