



### B170 Testing the Accuracy and Reliability of Palmar Friction Ridge Comparisons: A Black Box Study

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**Learning Overview:** After attending this presentation, attendees will be aware of the results of a recent large-scale black box study that measured the performance of expert friction ridge examiners to establish a discipline error rate estimate for the comparison of palmar impressions. This is the first study to specifically measure performance on the palmar comparison task.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by providing an error rate estimate that can be used by examiners in court when testifying to the results of palm comparisons. These results provide the first step in establishing the foundational validity of palmar comparisons, as defined by the recent President's Council of Advisors on Science and Technology (PCAST) Report.<sup>1</sup>

In 2011, a team of researchers from the Federal Bureau of Investigation (FBI) and Noblis published in the Proceedings of the National Academy of Sciences the first large-scale black box study measuring the accuracy of fingerprint examiners.<sup>2</sup> They reported a low rate of false positives (0.1%) and a rather high rate of false negatives (about 7.5%). The FBI/Noblis study dealt only with marks and prints originating from the distal phalanges of fingers (fingerprints). However, anecdotally it is estimated that approximately 30% of comparison cases involve palm impressions. It has been unknown up to now whether examiners are equally accurate at both tasks. This presentation provides the results of a recent large-scale black box study that measured examiners' accuracy when conducting exclusively palm comparisons.

This presentation reports on the results recorded both during the Analysis phase and the Comparison phase by a total of 226 fingerprint examiners who carried out a total of 12,279 determinations in Analysis and 9,460 decisions following Comparison. The pool of cases was composed of 526 cases (questioned and known palm impressions) of known ground truth (i.e., the source of the unknown impressions was known to the researchers before conducting the study). Both known mated pairs and known non-mated pairs were presented. Participants first performed a suitability analysis on unknown mark; thus, not all unknown marks proceeded to comparison (those deemed by the examiner to be unsuitable were not presented with a known exemplar to compare). Unknown marks and known exemplars varied in quantity and quality of features to reflect the complexity of casework.

Two online Shiny applications will also be presented for exploring the results of the study and the data's associated confidence and credible intervals. The implications of these results on the reporting of "error rates" associated with palm print examinations will be discussed along with the implications and incidence of "questionable" conclusions that may not be supported by a consensus panel.

#### Reference(s):

1. PCAST. *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*. Report to the President (2016), <https://obamawhitehouse.archives.gov/administration/eop/estp/pcast/docsreports/>.
2. Bradford Ulery, R. Austin Hicklin, JoAnn Buscaglia, and Maria Antonia Roberts. Accuracy and reliability of forensic latent fingerprint decisions. *PNAS* 108, no. 19 (May 2011): 7733-7738, <https://doi.org/10.1073/pnas.1018707108>.

#### Error Rate, Black Box, Fingerprints