B95 Why Do Latent Print Examiners Differ in Their Conclusions?

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Learning Overview: After attending this presentation, attendees will understand the factors associated with differences in conclusions made by professional latent print examiners.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by describing the underlying reasons for differences in forensic latent print examiners' conclusions.

Why do latent print examiners reach different conclusions? Previous studies reported reproducibility of conclusions was generally 80-90%, depending on the measure—high but certainly not unanimous—but when examiners described a comparison as "difficult," reproducibility was 50-55%.[1,2] This work focuses on explaining why latent print examiners do not always reproduce each other's conclusions, particularly focusing on understanding "missed IDs"; why some examiners are inconclusive or make erroneous exclusions on comparisons of mated images when other examiners make identification conclusions. Results are based on an experiment in which eye-tracking technology was used to measure eye-gaze behavior of 121 practicing latent print examiners as they performed over 2000 fingerprint comparisons, along with new analyses of the data from our earlier Black Box and White Box studies.[1-3]

This presentation describes a model of disagreements that quantifies the contributions of different types of disagreements to overall reproducibility and explains how factors such as image characteristics, subjective sufficiency thresholds, procedural errors, and examiner uncertainty contribute to specific decisions. This model offers some predictive utility for recognizing when these factors may affect reproducibility and may be used in addressing these issues in training.

Many differences in conclusions can be explained by individual examiners' tendencies toward specific conclusions, most notably in making decisions of Value vs No Value, Identification vs Inconclusive, and Exclusion vs Inconclusive. These tendencies can be understood as an implicit individual decision threshold that can vary notably among examiners. Most of the remaining differences in conclusions occur close to these implicit individual decision thresholds and are conclusions that are often not repeated by the examiners themselves. The time that examiners spend in analysis and comparison, and the level of difficulty they assess for a comparison, are associated with these implicit thresholds. When examiners are making comparisons close to their implicit individual decision thresholds, the comparisons are generally slow and more likely to be rated difficult.

Eye tracking was used to show how examiners' eye behavior can explain differences in conclusions. When examiners missed IDs (especially erroneous exclusions), they often did not extensively compare the prints under proper alignment. The results provide additional information on the prevalence and reproducibility of erroneous identification and exclusion conclusions (false positives and false negatives). The study shows notable differences among examiners, which has implications for staffing, assigning verifiers, and disagreements by experts in court; examiner-specific performance rates could be measured in rigorous proficiency testing like a black box test and used operationally.

Hypothesis statement: The differences in conclusions made by forensic examiners can be explained (at least in part) by eye gaze behavior and other factors.

Reference(s):

1. Ulery, Hicklin, Buscaglia, Roberts (2011). Accuracy and reliability of forensic latent fingerprint decisions. *Proceedings of the National Academy of Sciences*, 108(19): 7733-7738.
2. Ulery, Hicklin, Buscaglia, Roberts (2012). Repeatability and reproducibility of decisions by latent fingerprint examiners. *PloS ONE*, 7(3), e32800.
3. Ulery, Hicklin, Roberts, Buscaglia (2014). Measuring what latent fingerprint examiners consider sufficient information for individualization determinations. *PLoS ONE*, 9(11), e110179.

Latent Prints, Examiner Behavior, Eye Tracking