E64 Expert Decision Making and Visual Analysis: An Empirical Approach to Understand and Advance Examination in the Human Identification Sciences

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After attending this presentation, attendees will better understand how experts approach forensic tasks and analyze evidence within the laboratory, and how this can be conceptualized and translated into decision-making maps. These findings draw important parallel processes between domains previously considered to be unconnected, with implications across the forensic domain.

This presentation will impact the forensic science community by illustrating that there are gaps in the understanding of the decision-making tasks required when drawing inferences, making it challenging to fully assess expert performance.

The goal of this presentation is to demonstrate to attendees the judgments, decisions, and visual processes within two key domains of the forensic identification sciences, and how procedural similarities between these can be exploited to drive empirical research, which seeks to improve these judgements and decisions through the use of state-of-the-art technology. In order to do so, this presentation presents the decision maps of experts undertaking analysis processes within the fields of forensic anthropology and fingerprint analysis. These maps have been developed by combining independent information concerning visual comparison tasks present in both fields and the potential for exchanging knowledge on decision strategies and challenges involved.

Human decision making is a key component of the forensic science process (e.g., the recognition, collection, analysis, and interpretation of evidence) and it has been shown that factors can influence those decisions, affecting the investigative process and subsequent legal outcomes, with the potential for significant societal impact at a global scale.[1,2] It is clear that the concerns raised over expert decision making, including the vulnerabilities of cognitive processes and inappropriate weight assigned to evidence, have not only been highlighted in recent key governmental reports, but created debate and heated controversy.[3,4] Specific criticism has been directed at comparison and human identification processes, as many of the forensic methods used within the identification fields (e.g., fingermark comparison, bitemark comparison, morphological hair analysis, and forensic anthropology) are based on visual comparison tasks. Within the human identification field, the challenge of combining and interpreting analyses of different characteristics of evidence, and achieving transparency in decision-making and evidence-based conclusions, needs to be tackled. This includes a better fundamental understanding of the decisions being made and the visual processes being undertaken within the forensic identification sciences. Therefore, this study takes an empirical approach to provide a comprehensive understanding of the decisions made by expert decision makers in the laboratory, allowing for further targeted empirical studies investigating visual attention within these key decision processes common to both forensic identification fields.

Two experimental studies were designed whereby experts within the fields of fingerprint analysis and forensic anthropology were observed during casework analysis in the laboratory. Forensic anthropologists were asked to assess skeletal remains and develop biological profiles, documenting their decisions throughout this process. Similarly, fingerprint experts were asked to conduct the analysis process of Analysis, Comparison, Evaluation-Verification (ACE-V) on fingermarks recovered from crime scenes. A hierarchical task analysis approach was utilized to collect and analyze data, and decision trees were produced for each process observed. The resulting decision trees from both experimental studies were then compared and contrasted at a process and decision level.

These results will be used to discuss how the method can be applied to other forensic identification sciences, and the importance and possibility of taking both a holistic and detailed approach to understanding the judgments and decisions made during the forensic identification processes, in order to address and overcome the criticisms facing forensic visual analysis and comparison tasks.

Reference(s):

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3. Government Chief Scientific Advisior. Forensic Science and Beyond: Authenticity, Provenance and Assurance, Evidence and Case Studies, 2015.
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Decision Making, Identification, Visual Analysis

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