



Discrepancies in expert decision-making in forensic fingerprint examination



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ABSTRACT

The purpose of the present study was to analyse professional fingerprint examiners' investigative practices in the context of discrepancy decisions concerning challenging latents during fingerprint analysis and identification. The participants were fingerprint experts from the Forensic Laboratory of the Finnish National Bureau of Investigation. The data were from five audio-recorded "discrepancy meetings" where two examiners were discussing the rationale and justification for their differing interpretations of challenging and distorted fingerprint evidence. The meetings were chaired by the quality manager of the fingerprint group, who also in the first author of this article. The research questions addressed were as follows: What does the examiner see in the latent fingerprints? What does the examiner actively do with the latents? How were decisions made during the investigative process? In accordance with Goodwin's professional vision framework, the results revealed how the participants used partial and limited information in making judgments about the difficult and distorted latents. The examiners appeared to be involved in active, constructive efforts, mentally, to repair poor latents by supplementing with missing information. They also highlighted various aspects of latents by colour coding as well as manipulated fingerprint images in several ways so as to make the significant patterns easier to recognize. Because the methods and practices of characterizing latents were only vaguely specified, the examiners used locally developed ad hoc practices to facilitate their investigations, ending up with different interpretations. It is concluded in the article that the fingerprint community in Finland should make strong efforts to develop the methods of fingerprint investigation and determine clearer criteria for decision making and documentation practices. Furthermore, the interpretations made by fingerprint experts should be made more transparent to the customers.

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1. Introduction

The examination of fingerprint evidence consists of a complex stepwise process in matching two fingerprints, one found in the crime scene and the other from a fingerprint register. There is a high expectation set for the fingerprint examiners to produce accurate results during the examination process. The examiners are also expected to document this process and present their reports in court, if asked. In public, the forensic service provider's

results are often taken for granted as correct and considered to represent "the truth". Stakes are thus very high because even a single fingerprint may in fact be crucial evidence on the basis of which someone is sent to prison for a lifetime. A case of fingerprint identification or non-identification therefore carries a great deal of weight as evidence, and its factuality is seldom questioned in court. Due to several US Supreme Court rulings, however, fingerprint examination has been questioned and challenged and forensic service providers have been forced to consider whether the results of fingerprint examination can be assumed, in reality, to represent an infallible, error-free culture of investigation (see Ref. [1]). Also due to embarrassing fingerprint misidentifications, such as the Mayfield case in the USA and the PC Shirley McKie case in the UK, forensic service providers have confronted challenging situations requiring them to upgrade the level of their activities (e.g., Ref. [2,3]).

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Thus new transparency, productivity, and quality requirements are forcing the providers of forensic science services to find new ways of improving their efficiency without lowering the reliability of the investigation. Ethnographic laboratory studies (e.g., Ref. [4]) have revealed that actual laboratory work is much more messy, opportunistic, and contingent than the normative perspectives on forensic methods or retrospective accounts produced by examiners and other practitioners indicate. The actual link between variation in fingerprint feature selection and the examiner's ultimate decision-making strategies in fingerprint identification, especially in complex cases, is not well known or widely understood. Fingerprint examination often relies on ridgeology that was claimed to offer a more "holistic" and "scientific" basis for the identification of fingerprints than the "old" method of counting special minutiae [5,6]. Ridgeology with the ACE-V (Analysis, Comparison, Evaluation and Verification) process does not, however, give the fingerprint examiner the tools for producing arguments concerning decisions; it provides only a frame of reference for assessing critical aspects of the fingerprints being examined [7]. Moreover, a lack of validated and transparent thresholds is a recognized weakness of the ridgeology approach and the ACE-V protocol [8].

The present study focuses on analysing the fingerprint examination process in Finland, which involves making decisions on ambiguous and distorted fingerprints, where discrepant interpretations have been given by two independent examiners. The examiners are expected to state their conclusions according to Forensic Laboratory rules. They have to be confident regarding their final conclusions, because of which the rules for reporting discrepancies in fingerprint identification in Finland usually follow the more conservative (weaker) conclusion, such as "no value" (i.e., not identifiable) or "not identified". Examiners try to avoid false positives and minimize errors. Also the effect of the forensic culture makes these ethically followed, safeguarded rules [9,10].

Thus, 'not identified' is not an error, it can be a pass or a false negative. In order to avoid passes or false positives, joint meetings which include the examiners in question are organized to discuss the discrepant analyses. Discrepant judgements need to be understood and explained in order to see what is causing the discordance. Fingerprint examination methods need to be improved. Before explaining the Finnish fingerprint examination system in detail, we will briefly review the international research on expertise in fingerprinting.

2. Expertise in fingerprint examination

Learning to do fingerprint analysis requires sophisticated expertise acquired through years of training and practical experience. Expertise may be defined as individual mastery of a well-organized body of usable knowledge that a person utilizes to focus selectively on the critical aspects of a complex problem, and, thereby, reaches an exceptionally high level of performance in his or her trained domain of activity [11]. Expert knowledge represents the cultural-historical evolution of the professional domain and is embodied in social practices of expert communities and networks [12,13]. Professional expertise is, to a large extent, based on tacit or implicit knowing; experts know more than they can tell and often cannot provide reliable verbal description of their reasoning process [14]. This is especially true in such visualization-rich domains of expertise as interpreting X-ray images or analysing fingerprints, where pattern recognition plays a crucial role. Goodwin's theory of professional vision assists in understanding and explaining experts' sophisticated visual competencies in recognizing complex patterns when comparing target fingerprints (latents found at the crime scene) with filed prints. Examiners' internalized professional knowledge provides psychological tools [15] for separating significant cues and signs from

non-significant background. Such visual capabilities allow experts to make well-justified inferences relying only on partial and limited information. Goodwin [16] categorized professionals' visual activity according to three practices; coding, highlighting, and producing and articulating material representations. Coding by marking minutiae in latents enables making AFIS database searches and comparisons with the suspect's fingerprints. By highlighting disturbances and colour coding ridge flows (i.e. details) or minutiae, the examiner makes his or her perceptions visible to other experts. Constructing external material representations involves manipulating fingerprint images in various ways by using AFIS and/or PhotoShop and also by producing written annotations which ground and justify one's interpretations.

The very same mechanisms that allow an expert to detect patterns relying on fragmented and limited information, may, however, lead to mistakes and error. Human reasoning is biased by so-called confirmation bias [17–19], i.e., a tendency to selectively attend to evidence that supports one's own expectations or hypotheses. Rather than a one-directional flow of information from outside to inside, visual perception is a constructive process driven by a participant's expectations [20]. Due to the tacit or implicit nature of expert knowing [21], the fingerprint examiner may not be aware of the impact of heuristics and biases on his or her reasoning and decision making. Earlier studies have indicated a wide variation of results and interpretations in fingerprint case work. Technical errors often involve erroneous exclusions, missed identifications, and inappropriate inconclusive or no value decisions [22–24]. Experience as a fingerprint examiner, the quality of the latent, and expectations regarding the case being investigated affect examination in challenging and ambiguous decision situations [25]. Fingerprint identification is more vulnerable to internal and external elements and biases when the difficulty of the task increases [23,26]. Consequently, there are frequent occasions in which fingerprint examiners disagree about the same latent.

3. Research setting: the Forensic Laboratory of the National Bureau of Investigation of Finland

The present study was carried out in the Forensic Laboratory of the Finnish National Bureau of Investigation (NBI), which operates under the Ministry of the Interior. The Forensic Laboratory is one of NBI's divisions and provides a wide variety of forensic services to the law enforcement officials in crime investigation, such as the analysis of fingerprints, drugs, secretion marks, DNA, textile fibres, hair, paint, glass, gunpowder, handwriting and chemicals. The laboratory is also responsible for developing the procedures, equipment, and quality of crime-scene investigation in Finland. The Forensic Laboratory follows the standard of general requirements for the competence of testing and calibration laboratories SFS-EN ISO/IEC 17025. In 2014, the Laboratory had 120 experts representing different specializations.

The present study is grounded on efforts to improve the quality of fingerprint investigation. Traditionally, a fingerprint examiner's work has been very individualistic in nature, the examiner choosing the case to be examined, analysing all latents found at a crime scene, and working alone with the case until a research report was produced. Because of the idiosyncratic and opaque nature of an examiner's local analytic and interpretative practices, it has been very hard to make this work more transparent and subject to quality assessment. The investigation process embodied a great deal of tacit knowledge and also, potentially, hidden confirmation biases [25]. The examiner's perceptions, interpretations, and rationales in making decisions were not systematically documented. Discrepancies in challenging latents in identification between examiners were not documented in any way.

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