



E69 Reliability, Validity, Accuracy, and Bias in Forensic Document Examination: An Interdisciplinary Approach to Understanding Forensic Decision-Making Processes and Outcomes

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After attending this presentation, attendees will understand the application of some principles of psychology, the use of eye-tracking technology to study decision-making processes in Forensic Document Examination (FDE), and the potential for this research paradigm to inform other forensic fields.

This presentation will impact the forensic science community by demonstrating the importance of engaging in theoretically based, multidisciplinary research to achieve an understanding of the nature of the methodology and expertise in forensic examinations.

A substantial portion of FDE training is devoted to handwriting and hand printing comparisons. During these comparisons, examiners seek to identify features and characteristics which may be characterized as identifying attributes. The identification — comparison — decision process is common across many forensic areas; examiners first determine the presence or absence of features, then qualitatively assign these features some degree of evidentiary weight to reach their decisions. Examiners are trained to look for both substantial similarities and differences among specimens. The number and quality of these features allow examiners to make assertions about the source of the specimens and the extent of their confidence in their decisions.¹

A substantial body of research addresses the cognitive mechanisms involved in attention and visual search. Many current theories of attention propose that attention is based on the relationship between a bottom-up, saliency-based attentional system and a top-down, feature-specific selection mechanism. Attention is guided by relational information about the target or information about how the irrelevant information of a non-target differs from the features of the target. Relational models of visual search demonstrate that visual attention can be guided by: attending to specific feature values such as color, size, or intensity; inhibiting attention to irrelevant features; or directing attention to how stimuli differ. Relational models place the target in relationship to its context, offering more specific (e.g., directional) information about differences. This relational aspect of attention may be influenced by the presentation formats of stimuli.²

Tversky pointed out that most stimuli seem to be effectively described by the presence or absence of qualitative features.³ He and others argued that an object is represented by a set of features or attributes, and that judgments of similarity are achieved through a process of feature matching. Tversky's "Contrast Model" systematizes this "feature" approach and proposes that similarity depends on the proportion of features common to the two objects and also on their unique features. Feature matching occurs by establishing differences in quality or quantity, such as differences in color or size, or the presence or absence of the features upon which the judgment is based, usually in terms of binary variables. This feature-matching process, along with the deployment of attentional resources, is a core process of forensic document examination.

This presentation discusses the application of psychological theories and methods to understanding the nature of attention, feature extraction and weighting, and decision-making in forensic document examination, and discusses the application of this research paradigm to other forensic areas.

Data from a national study of forensic document examiners (supported by Award No. 2010-DN-BX-K271, awarded by the National Institute of Justice, Office of Justice Programs, U.S. Department of Justice) will be used to illustrate the ways in which cognitive psychology contributed to an understanding of the decision-making processes of experts in the field compared to those of lay people.



General Section - 2015

References:

1. Lindblom, B.S. (2006). A forensic document examiner's training. In J.S. Kelly and B.S. Lindblom (Eds.) *Scientific Examination of Questioned Documents* (2ed.). (Ch. 3, pp. 15-17).
 2. Becker, S. I. (2008a). Can intertrial effects of features and dimensions be explained by a single theory? *Journal of Experimental Psychology: Human Perception and Performance*, 34, 1417–1440.
 3. Tversky, A. (1977). Features of similarity. *Psychological Review*, 84, 327-352.
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