J23   Cognitive Theoretical Perspectives in Studies of Forensic Document Examination

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After attending this presentation, attendees will understand some of the principles of cognitive psychology, and the use of eye-tracking technology to study attention and feature-matching processes as they relate to decision-making processes in forensic document examination.

This presentation will impact the forensic science community by demonstrating the importance of engaging in theoretically-based, multidisciplinary research to an understanding of the nature of the methodology and expertise in forensic document examination (FDE).

A substantial portion of FDE training is devoted to signature comparisons, handwriting, and hand printing. FDEs seek those features and characteristics which may be characterized as the document's identifying attributes or characteristics. Examiners first determine the presence or absence of features, and then qualitatively assign these features some degree of evidentiary weight in order to reach their decisions. Examiners are trained to look not only for substantial similarities or differences among writing samples, but also for repeated small characteristics which may be sufficient to establish clearly that writings are the work of two individuals even though they may contain a considerable number of general similarities. The number and quality of these features allow FDEs to make assertions about the authorship of the specimen 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. This paper discusses the application of cognitive theory to understanding the nature of attention, feature extraction and weighting, and decision-making in forensic document examination. Data from a national study of forensic document examiners will be used to illustrate the ways in which cognitive psychology can contribute to an understanding of the decision-making processes of experts in the field compared to lay those of lay people.

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, by inhibiting attention to irrelevant features, or by directing attention to how stimuli differ. Relational models place the target in relation 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. 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.[3] This feature-matching process, along with the deployment of attentional resources, is a core process of forensic document examination.

References:
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Feature Matching, Attention, Handwriting