COGNITIVE THEORETICAL PERSPECTIVES IN STUDIES OF FORENSIC DOCUMENT EXAMINATION

MEASUREMENT SCIENCE AND STANDARDS IN FORENSIC HANDWRITING ANALYSIS CONFERENCE, JUNE 2013

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The Comparison Process

- What FDEs do (decision process)
  - If Q is suitable for comparison, then
    - Evaluate
    - Compare
    - Determine significance
    - Evaluate quantity
    - Conclusion

- But HOW do they do it?
Answering the “HOW” Question

- **Attention**
  - Focus and filtering
  - **What do we attend to?**
    - Attentional and foveal focus
  - **Why do we attend to it?**
    - Stimulus-driven
    - Goal-directed
Examine these signatures...

What questions come to your mind?
Top-Down vs. Bottom-Up Processing

Top Down Processing

“Large chunk” processing
LARGER CONCEPT
FINER DETAILS

Bottom-Up Processing

“Small chunk” processing
FINER DETAILS
LARGER CONCEPT
You Make the Call

How much information does an examiner need to make an accurate call?

_Tachistoscope view of a signature:_

1. Look at the fixation cross.
2. After 3s the slide will automatically change to a signature.
3. **Don’t blink**—you’ll miss it!
Questioned

Lauren Marley
Would you say that this signature is genuine, or simulated?

On a scale of 1 (not at all confident) to 4 (extremely confident), how confident would you say you are in this decision?

- Not at all confident
- Somewhat confident
- Moderately confident
- Extremely confident
Questioned
Process Opinion

Would you say that this signature is genuine, or simulated?

On a scale of 1 (not at all confident) to 4 (extremely confident), how confident would you say you are in this decision?

- Not at all confident
- Somewhat confident
- Moderately confident
- Extremely confident
Interpreting Eye-Tracking Data

Identifying diagnostic information using extended view data

- Unfiltered (raw) data
- Filtered data
- Heat maps
- Areas of interest (AOI)
Signature 1 Raw Data

Fixations: FDE1=1,200; FDE2=683; FDE3=1,196

- Raw data without the fixation filter demonstrates all visual activity
Signature 2 Raw Data

Fixations: FDE1=7,361; FDE2= 3,632; FDE3=1,706

- Some activity is irrelevant, data must be refined
  - Velocity threshold = 50 pixels
  - Duration threshold = 100ms
Filtered Signature 1 Gaze Plots

- Total Fixations: FDE1 = 60; FDE2 = 22; FDE3 = 43
- Fixation Duration: FDE1 = 30.16s; FDE2 = 29.24s; FDE3 = 31.84s
Filtered Signature 2 Gaze Plots

- Total Fixations: FDE1 = 292; FDE2 = 70; FDE3 = 64
- Fixation Duration: FDE1 = 132s; FDE2 = 74s; FDE3 = 44s
Finding the Diagnostic Hot Spots

Unfiltered heat map  Areas of Interest (AOI)  Filtered heat map
Overall Call Accuracy

Overall accuracy $= \frac{1161}{1647} = 70\%$

- Accuracy slightly higher for RSU than USD
Call Accuracy by View Duration

- All Trials (N=1638 calls)
  - 1162 Accurate (70.9%); 476 Inaccurate (29.1%)
  - $\kappa = .416$ (moderate agreement)
Call Accuracy by View Duration

- **Tscope View (N=819)**
  - 555 Accurate (67.8%)
  - 264 Inaccurate (32.2%)
  - $\kappa = .352$ (fair agreement)

- **Extended View (N=818)**
  - 606 Accurate (74.1%)
  - 212 Inaccurate (25.9%)
  - $\kappa = .480$ (mod agreement)
Education and Training Implications

- **Practice, talent, and skill development**
  - Some talent + much training = expertise IF practice is deliberate
    - Deliberate practice
    - Motivated learner
    - Performance feedback
    - Performance monitoring
    - Elimination of incorrect response

- **Implications of knowledge about expertise for teaching**
  - Skill acquisition training
  - Importance of problem decomposition
    - Componential analyses
    - Mastery learning
Future Directions

- **Expertise**
  - Stages of development
  - Skill organization
  - Practice vs. talent
  - Education and training

- **The Comparison Process**
  - Characteristics
  - Attention, perception, the comparison process, decision making

- **Judgment**
  - Probability- vs. frequency-based judgment
  - Scale properties
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