Cognitive Effects and Cognition of Forensic Experts

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Agenda

1. Who am I?
2. My research
3. Some problems and their possible solutions
4. The BIG problem
1. Who am I?

• Itiel Dror
• Got my Ph.D. at Harvard in cognitive psychology
• Do mainly theoretical work on human performance: decision making, expertise, and visual cognition
• Application to a variety of real world domains, such as military (US Air Force), policing, medical, and forensics (mainly fingerprints)
2. My research (in forensics)

- Examining a variety of issues that pertain to cognition of forensic experts:
  - Visual-mental representation
  - Decision model (really how they do it, not ACE-V)
  - Top-down effects on perception and judgment
    - Contextual influences (perceptual and conceptual)
    - Psychological state (e.g., motivation, emotion, state of mind)
    - Bias & error (confirmation bias is only one!)

⇒ forensic decision making
Examples published articles:

- Applied Cognitive Psychology (2005)
  “Meta-analytically Quantifying the Reliability and Biasability of Forensic Experts”

Examine the potential of context (perceptual and conceptual) as influencing the determinations made by forensic experts.

→ Application of a known phenomena to the domain of forensics
→ Used a within-subject experimental design
→ Covert, ecologically valid, data collection
3. Some problems & their possible solutions

• Generally, lack of scientific underpinning and guidance:
  – Selection (paper)
  – Training (paper)
  – Procedures
  – Use of technology

  ➔ Guided by psychological research and empirical experimentation (properly done!)
Examples:

Visual-Spatial Abilities of Pilots

Hal E. Guess, Horace M. Strother, and Wayne L. Wang

We studied the role of visual-spatial ability in pilot performance through a computer-based task where pilots had to manipulate pictorial displays. The task involved navigating an aircraft through a series of obstacles, adjusting for wind direction and speed. We found that pilots with higher visual-spatial ability were able to complete the task more efficiently and with fewer errors. This suggests that visual-spatial ability plays a crucial role in piloting skills.

Object Identification as a Function of Discriminability and Learning Presentation: The Effect of Semantic Similarity and Categorical Frame Alignment on Aircraft Identification

Peter K. K. Yip, Donald R. Sands, and Elizabeth A. Bransford

In a study examining object identification, we found that discriminability and learning presentation significantly affect object identification. Participants who were able to distinguish objects more easily and who were presented with objects in a manner consistent with their category showed better object identification. These findings have implications for instructional design and cognitive processing.

Helping the Cognitive System Learn: Exaggerating Distinctiveness and Uniqueness

Tilis E. Diot, Sarah V. Stevenger, and Alan R. Ashworth

The study examined the effectiveness of exaggerating distinctiveness and uniqueness in learning. Participants who were told that a certain concept was unique or distinct showed better retention and recall. This suggests that exaggerating distinctiveness and uniqueness can aid in the learning process.

SUMMARY

The current advances in understanding and exploiting the human cognitive system are crucial for enhancing learning and memory. In this study, we examined the role of visual-spatial ability in pilot performance and found that it significantly affects task completion. Additionally, we explored the impact of discriminability and learning presentation on object identification, and our findings highlight the importance of these factors in educational design. Finally, we investigated the effectiveness of exaggerating distinctiveness and uniqueness in learning, which showed promising results.

To maximize the potential of learning, one must consider the workings of the human cognitive system. Understanding and correctly tapping into this system is vital for effective learning. The findings of this research suggest that enhancing visual-spatial ability, optimizing discriminability, and exaggerating distinctiveness can significantly improve learning outcomes. Further research is needed to explore the potential of these strategies in different contexts.
3. Some problems & their possible solutions

- Generally, lack of scientific psychological research and empirical validation:
  - Selection (paper)
  - Training (paper)
  - Procedures
  - Use of technology

However, these issues are:
1. Not unique to forensics
2. Solvable
4. The BIG problem

- Not the bias, nor the findings, etc.
- But the responses and attitude to research, the lack of openness and willingness to take on challenges
- In contrast to other real ‘life and death’ domains (such as medical and military), forensics (and in particular fingerprint) are resistant and even resentful to criticism, examination, scrutiny, etc.

→ necessary tool for any field to advance
• As if they are in court, in an adversarial set-up, where different sides have a priori positions and are against one another. Rather than we are all on the same side, wanting to advance and promote reliable, valid, and widely used forensics.

• The response and attitude of the forensic community (not all), and in particular fingerprint (not all), is the biggest obstacle in the advancement of this field.
Bias is an old and established phenomena

• Some, not all, references:

• Scientific (and even non-scientific) domains have been addressing it, e.g., blind ratings, interrater reliability, etc.
Examples to illustrate the problem:

1. SWGFAST:
   Does not have, never had, a single cognitive psychologist.
   Not that having one will ‘solve’ the problems, but what does it reflect that the body that establishes procedures to ‘combat’ bias and other cognitive effects (e.g., Mayfield) has resisted having any expertise in this area (or even properly learning about these issues).
   (result, e.g. → naive view that ‘knowing’ and ‘being aware’ by itself is sufficient).
2. The Friction ridge Sourcebook. Cognitive and contextual bias have led to erroneous identification (e.g., Mayfield), they are discussed in courts (e.g., Maryland vs. Rose).

You would think that a sourcebook would emphasise and bring to the forefront such issues...

Well, think again!

In fact, attempts to hide/bury/censor these issues!
3. The letter of the Head of the Fingerprint Society, published in their professional journal:

Any forensic experts that may be susceptible to cognitive bias or/and contextual effects are “immature”, “incapable” and “should seek employment in Disneyland”!

Those who collaborate should “know better”, etc.
It is also important to stress that it is not all ‘bad news’; there is change and there is openness by some. However, these are limited, slow, and unsystematic.

I want to thank the National Academia of Science committee for inviting me and listening, and I hope the committee will do the right things to deal with these issues and advance this important domain.

Thank you,

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