IMPROVING FORENSIC DECISION MAKING: A HUMAN-COGNITIVE PERSPECTIVE

Itiel Dror
University College London

www.cci-hq.com
i.dror@ucl.ac.uk
IMPROVING FORENSIC DECISION MAKING: A HUMAN-COGNITIVE PERSPECTIVE

Itiel Dror
University College London

www.cci-hq.com
i.dror@ucl.ac.uk

• A huge topic!
• Much to cover, today just scratching the surface
• Happy to answer questions
• Applies to all expert decision making
• Some of it is ‘controversial’ (especially in the adversarial legal systems)
What is the *most consistent* finding in forensic science?

… the most consistent finding (in my view), is…: inconsistency!

“Inconsistency is the most *consistent* finding in forensic science”

**A problem…:**

1. Science
2. Justice
3. Forensic
Noise vs. Bias
A Hierarchy of Expert Performance

Itiel E. Dror
Noise vs. Bias

Biasability

Reliability

Dror HEP Hierarchy of Expert Performance
NOISE VS. BIAS

5. Reliability within
6. Reliability between
7. Biasability within
8. Biasability between

Dror HEP Hierarchy of Expert Performance
NOISE VS. BIAS

Dror HEP Hierarchy of Expert Performance
Let’s see the data!

“Inconsistency is the most consistent finding in forensic science”

**NOISE VS. BIAS**

Dror HEP Hierarchy of Expert Performance
Let’s see the data! From forensic science

“Inconsistency is the most consistent finding in forensic science”

NOISE VS. BIAS

All forensic domains!
Fingerprinting

• Even in bias studies, i.e., irrelevant context X vs. Y:
• If we look only within one condition, (context X alone, or context Y alone), there are inconsistencies.
• And, in the control group too (when no irrelevant context is given)
### Fingerprinting

- Even in bias studies, i.e., irrelevant context X vs. Y:
  - If we look only within one condition, (context X alone, or context Y alone), there are inconsistencies.
  - And, in the control group too (when no irrelevant context is given)

#### Table: Same Examiners – ‘Within’

<table>
<thead>
<tr>
<th>Past Decision</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Difficulty</td>
<td>difficult</td>
<td>difficult</td>
<td>not difficult</td>
<td>not difficult</td>
<td>difficult</td>
<td>difficult</td>
<td>not difficult</td>
<td>not difficult</td>
</tr>
<tr>
<td>Contextual Information</td>
<td>none</td>
<td>suggest exclusion</td>
<td>none</td>
<td>suggest exclusion</td>
<td>none</td>
<td>suggest individualization</td>
<td>none</td>
<td>suggest individualization</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expert A</th>
<th>consistent</th>
<th>consistent</th>
<th>consistent</th>
<th>consistent</th>
<th>consistent</th>
<th>consistent</th>
<th>consistent</th>
<th>consistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert B</td>
<td>change to exclusion</td>
<td>consistent</td>
<td>consistent</td>
<td>consistent</td>
<td>consistent</td>
<td>consistent</td>
<td>consistent</td>
<td>consistent</td>
</tr>
<tr>
<td>Expert C</td>
<td>consistent</td>
<td>change to exclusion</td>
<td>consistent</td>
<td>consistent</td>
<td>consistent</td>
<td>consistent</td>
<td>consistent</td>
<td>consistent</td>
</tr>
<tr>
<td>Expert D</td>
<td>consistent</td>
<td>change to exclusion</td>
<td>consistent</td>
<td>change to exclusion</td>
<td>change to individualization</td>
<td>consistent</td>
<td>consistent</td>
<td>consistent</td>
</tr>
</tbody>
</table>
Noise vs. Bias

6. Reliability between
5. Reliability within

Dror HEP Hierarchy of Expert Performance
Repeatability and Reproducibility of Decisions by Latent Fingerprint Examiners

Bradford T. Ulery¹, R. Austin Hicklin¹, JoAnn Buscaglia²*, Maria Antonia Roberts³
AND, EXPANDED TO THE ‘OBSERVATION’ LEVEL:

**NOISE VS. BIAS**
Fingerprinting

This 2006 finding, has been replicated... and, expanded to the ‘observation’ level:

Cognitive issues in fingerprint analysis: Inter- and intra-expert consistency and the effect of a ‘target’ comparison

Itiel E. Dror, Christophe Champod, Glenn Langenburg, David Charlton, Heloise Hunt, Robert Rosenthal

Contents lists available at ScienceDirect

Forensic Science International

journal homepage: www.elsevier.com/locate/forsciint
Fingerprinting

Table 4
The differences in number of minutiae observed by the same examiner at different times. The bottom row is the mean difference per latent mark (A–J), and the right most column is the mean difference per examiner (1–10).

<table>
<thead>
<tr>
<th>Examiner</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>3.1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>1</td>
<td>4.1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.8</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2.3</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>3</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3.2</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.2</td>
</tr>
<tr>
<td>Mean</td>
<td>3.5</td>
<td>2.4</td>
<td>3.6</td>
<td>1.7</td>
<td>3.4</td>
<td>2.6</td>
<td>2.9</td>
<td>3.7</td>
<td>0.7</td>
<td>1.3</td>
<td>2.58</td>
</tr>
</tbody>
</table>

Cognitive issues in fingerprint analysis: inter- and intra-exam consistency and the effect of a ‘target’ comparison

Itiel E. Dror a,b,*, Christophe Champod c, Glenn Langenburg c,d, David Charlton e,f, Heloise Hunt a, John C. Sibthorpe a.
THIS 2011 FINDING, HAS BEEN REPLICATED...

DNA

Subjectivity and bias in forensic DNA mixture interpretation

Itil E. Dror \textsuperscript{a,b,*}, Greg Hampikian \textsuperscript{c}

Again...

‘noise’, inconsistency, lack of reliability, reproducibility, repeatability, etc.
DNA

- In 2018 NIST published its MIX studies

"variations observed among laboratory results"
NIST interlaboratory studies involving DNA mixtures (MIX05 and MIX13): Variation observed and lessons learned

John M. Butlerab, Margaret C. Klineb, Michael D. Cobleb,1
THIS 2011 FINDING, HAS BEEN REPLICATED...

DNA

- In 2018 NIST published its MIX studies
- And more replications...

“LR values obtained show a wide range of variation”
Forensic Science International: Genetics

Research paper
GHEP-ISFG collaborative exercise on mixture profiles (GHEP-MIX06).
Reporting conclusions: Results and evaluation
## Footwear

<table>
<thead>
<tr>
<th>1996 Study Case No.</th>
<th>Identification</th>
<th>Very Probable</th>
<th>Probable</th>
<th>Possible</th>
<th>Inconclusive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>7</td>
<td>15</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>11</td>
<td>9</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>27</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>29</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Biasability and reliability of expert forensic document examiners

Itiel E. Dror\textsuperscript{a,*}, Kyle C. Scherr\textsuperscript{b}, Linton A. Mohammed\textsuperscript{c}, Carla. L. MacLean\textsuperscript{d}, Lloyd Cunningham\textsuperscript{e}
Table 2
Decisions 1–4 are judgments supporting identification (1= Identification; 2= Highly probable wrote; 3= Probably wrote; 4= Indications wrote), whereas decisions 6–9 are judgments supporting elimination (6= Indications did not write; 7= Probably did not write; 8= Highly probable did not write; 9= Elimination).

<table>
<thead>
<tr>
<th>Scale</th>
<th>Prosecution</th>
<th></th>
<th></th>
<th>Defense</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>1=Identification</td>
<td>0/13</td>
<td>0%</td>
<td></td>
<td>0/12</td>
<td>0%</td>
</tr>
<tr>
<td>2=Highly probable wrote</td>
<td>1/13</td>
<td>8%</td>
<td></td>
<td>1/12</td>
<td>8%</td>
</tr>
<tr>
<td>3=Probably wrote</td>
<td>2/13</td>
<td>15%</td>
<td></td>
<td>2/12</td>
<td>17%</td>
</tr>
<tr>
<td>4=Indications wrote</td>
<td>5/13</td>
<td>39%</td>
<td></td>
<td>4/12</td>
<td>33%</td>
</tr>
<tr>
<td>5=Inconclusive</td>
<td>0/13</td>
<td>0%</td>
<td></td>
<td>0/12</td>
<td>0%</td>
</tr>
<tr>
<td>6=Indications did not write</td>
<td>1/13</td>
<td>8%</td>
<td></td>
<td>1/12</td>
<td>8%</td>
</tr>
<tr>
<td>7=Probably did not write</td>
<td>3/13</td>
<td>23%</td>
<td></td>
<td>1/12</td>
<td>8%</td>
</tr>
<tr>
<td>8=Highly probable did not write</td>
<td>1/13</td>
<td>8%</td>
<td></td>
<td>3/12</td>
<td>25%</td>
</tr>
<tr>
<td>9=Elimination</td>
<td>0/13</td>
<td>0%</td>
<td></td>
<td>0/12</td>
<td>0%</td>
</tr>
</tbody>
</table>
Table 2
Decisions 1–4 are judgments supporting identification (1= Identification; 2= Highly probable wrote; 3= Probably wrote; 4= Indications wrote), whereas decisions 6–9 are judgments supporting elimination (6= Indications did not write; 7= Probably did not write; 8= Highly probable did not write; 9= Elimination).

<table>
<thead>
<tr>
<th>Scale</th>
<th>Prosecution</th>
<th></th>
<th>Defense</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>1=Identification</td>
<td>0/13</td>
<td>0%</td>
<td>0/12</td>
<td>0%</td>
</tr>
<tr>
<td>2=Highly probable wrote</td>
<td>1/13</td>
<td>8%</td>
<td>1/12</td>
<td>8%</td>
</tr>
<tr>
<td>3=Probably wrote</td>
<td>2/13</td>
<td>15%</td>
<td>2/12</td>
<td>17%</td>
</tr>
<tr>
<td>4=Indications wrote</td>
<td>5/13</td>
<td>39%</td>
<td>4/12</td>
<td>33%</td>
</tr>
<tr>
<td>5=Inconclusive</td>
<td>0/13</td>
<td>0%</td>
<td>0/12</td>
<td>0%</td>
</tr>
<tr>
<td>6=Indications did not write</td>
<td>1/13</td>
<td>8%</td>
<td>1/12</td>
<td>8%</td>
</tr>
<tr>
<td>7= Probably did not write</td>
<td>3/13</td>
<td>23%</td>
<td>1/12</td>
<td>8%</td>
</tr>
<tr>
<td>8=Highly probable did not write</td>
<td>1/13</td>
<td>8%</td>
<td>3/12</td>
<td>25%</td>
</tr>
<tr>
<td>9=Elimination</td>
<td>0/13</td>
<td>0%</td>
<td>0/12</td>
<td>0%</td>
</tr>
</tbody>
</table>
“Results showed low reliability between DF examiners in observations, interpretations, and conclusions”

A hierarchy of expert performance (HEP) applied to digital forensics: Reliability and biasability in digital forensics decision making

Nina Sunde a, *, Itiel E. Dror b
A hierarchy of expert performance as applied to forensic anthropology

Stephanie Hartley MA¹,² | Allysha Powanda Winburn PhD¹
Firearms

“The results from this study showed that there are differences in examiner conclusions when examining the same evidence.”

Evaluating firearm examiner conclusion variability using cartridge case reproductions

Eric F. Law PhD  |  Keith B. Morris PhD
Bloodstain Pattern Analysis (BPA)

Forensic Science International
Volume 325, August 2021, 110856

"The results show limited reproducibility of conclusions"

Accuracy and reproducibility of conclusions by forensic bloodstain pattern analysts

R. Austin Hicklin a, Kevin R. Winer b, Paul E. Kish c, Connie L. Parks a, William Chapman a, Kensley Dunagan a, Nicole Richetelli a, Eric G. Epstein a, Madeline A. Ausdemore a, Thomas A. Busey d
Forensic Psychology

(In case you are thinking...: “These data is forensic ‘psychology’, not forensic ‘science’... “)

I have already presented data from fingerprinting, firearms, DNA...

A Hierarchy of Expert Performance Applied to Forensic Psychological Assessments

The data show:

- Competence assessment: Experts (3) reached different conclusions in 29% of the cases
- Legal sanity assessment: Experts (3) reached different conclusions in 45% of the cases
- Conditional release of a patient who had been hospitalized by reason of insanity (NGRI): Experts (3) reached different conclusions in 47% of the cases.
The effect of contextual information on decision-making in forensic toxicology

Hilary J. Hamnett a, *, Itiel E. Dror b
Cognitive bias in forensic pathology decisions

Itiel Dror PhD¹  |  Judy Melinek MD²  |  Jonathan L. Arden MD³  |  Jeff Kukucka PhD⁴  |  Sarah Hawkins JD⁵  |  Joye Carter MD, PhD⁶  |  Daniel S. Atherton MD⁷
“Inconsistency is the most consistent finding in forensic science”

Presented data (mine, and of others), about conclusions and observations:

- Fingerprinting
- DNA
- Footwear
- Handwriting
- Digital
- Anthropology
- Firearms
- Bloodstain Pattern Analysis (BPA)
- Forensic psychology
- Toxicology
- Pathology

Shall I go on...?
What is the *most consistent* finding in forensic science?

“Inconsistency is the most consistent finding in forensic science”

- This is true (as I have shown) whether you use categorical decisions, verbal scales, or statistics.
- Of course, these issues (‘noise’, inconsistency, lack of reliability, reproducibility, repeatability, etc.), arise in the more difficult/challenging cases.
- When they are easy, self-evident, then these issues are diminished, but no expertise is required either, as novices can do the task.

→ How to reduce these ‘noise’, inconsistency, lack of reliability, reproducibility, repeatability, etc.?
How to reduce these ‘noise’, inconsistency, lack of reliability, reproducibility, repeatability, etc.? 

First, how NOT to…:

• Flip a coin: ‘heads’ = match, ‘tails’ = exclusion! 😊
• Or, similarly, give them irrelevant biasing information, so they all arrive at the same conclusions…!
• WRONG way to deal with these issues, but… it has been done…:
How to reduce these ‘noise’, inconsistency, lack of reliability, reproducibility, repeatability, etc. ?

First, how NOT to…
So, what can/should be done?

Optimize/prioritize the order (sequence) of information

I will:
1. Show that order is important
2. Show how to optimize/prioritize the order (sequence)

It is NOT about depriving examiners of information they need, but presenting it in the ‘right’ sequence (& I need to show what ‘right’ is).
1. Show that order is important

- Long and well established research demonstrates that order impacts how/if we remember things, e.g., the primacy effect.
- Moreover, not only we remember it well, but it has far reaching implications on how further information is subsequently processed.
  - Generates ideas/hypothesis
  - Selective cognitive attention
  - Confirmation bias
  - Escalation of commitment
  - ...
  - ...
Illustration:
1. Show that order is important

- The impact of sequencing has been shown, time & again, in many domains, e.g.:
  - **Food tasting** (M.L. Dean, Presentation order effects in product taste tests. 1980, J. Psychol., 105,107-110).
  - **Countering conspiracy arguments** (such as anti-vaccine conspiracy theories (D. Jolley, K.M. Douglas, Prevention is better than cure: addressing anti-vaccine conspiracy theories 2017, J. Appl. Soc. Psychol. 47, 459-469).
How to reduce these ‘noise’, inconsistency, lack of reliability, reproducibility, repeatability, etc.?

First, how NOT to...

So, what can/should be done?

Optimize/prioritize the order (sequence) of information

I will:
1. Show that order is important
2. Show how to optimize/prioritize the order (sequence)

It is NOT about depriving examiners of information, but presenting it in the ‘right’ sequence (& I need to show what ‘right’ is).
2. Show how to optimize/prioritize the order (sequence)

• All have the same order…
• But what order?
• Not ‘random’ (artificial)
• Clear (suggested) criteria:
  1. Objectivity
  2. Relevance
  3. Biasability
Objectivity

• Some evidence is more objective than other…
• E.g., video footage vs. eyewitness
• E.g., a sober eyewitness vs. an intoxicated eyewitness
→ Obviously, start with the more objective…!
Relevance

• Some evidence is more relevant than other...
• E.g., an empty prescription drug box is more relevant than the neighbor saying the deceased looked depressed
→ Obviously, start with the more relevant…!
Biasability

- Some evidence is more biasing than other...
- E.g., knowing how the prints were lifted is less biasing than knowing the race of the person.
  → Obviously, start with the less biasing…!
2. Show how to optimize/prioritize the order (sequence)

- Clear (suggested) criteria:
  1. Objectivity
  2. Relevance
  3. Biasability

- These are each a continuum
- They interact with one another
- Always need to weigh ‘risk’ vs. ‘benefit’. E.g., George Floyd autopsy:
How to reduce these ‘noise’, inconsistency, lack of reliability, reproducibility, repeatability, etc.?

Optimize/prioritize the order (sequence) of information

Linear Sequential Unmasking–Expanded (LSU-E): A general approach for improving decision making as well as minimizing noise and bias
For practical details guidance on implementing LSU-E, see:
For practical details guidance on implementing LSU-E, see:

### LSU-E Worksheet

**Form completed by:** __________________________  **Role:** __________________________  **Location/Laboratory:** __________________________

<table>
<thead>
<tr>
<th>Information Type</th>
<th>Source of Information</th>
<th>Guiding Principles: Circle one number for each principle*</th>
<th>Explanation of any potential for bias</th>
<th>Steps taken to prevent, mitigate, or identify the effects of bias</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Biasing power:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Subjectivity:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Irrelevance:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Biasing power:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Subjectivity:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Irrelevance:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Biasing power:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Subjectivity:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Irrelevance:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Biasing power:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Subjectivity:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Irrelevance:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Biasing power:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Subjectivity:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Irrelevance:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Biasing power:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Subjectivity:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Irrelevance:</strong> none - 1 2 3 4 5 – a lot</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Let me summarize and finish with: another **illustration** of sequencing: and then, with a few final words.
“Inconsistency is the most consistent finding in forensic science”

- This is true whether you use categorical decisions, verbal scales, or statistics.
- But, we can reduce ‘noise’ (inconsistency, lack of reliability, reproducibility, repeatability), as well as bias, by using LSU-E
- This is just a step, one avenue, in considering the human element in forensic science
- Realizing the importance & pivotal role of cognitive & human factors in forensic science
- LSU-E is about considering and thinking about the order in which examiners are exposed to and consider information.
- And making it part of forensic labs SOPs.
Thank you very much!

IMPROVING FORENSIC DECISION MAKING:
A HUMAN-COGNITIVE PERSPECTIVE

Itiel Dror
University College London

www.cci-hq.com
i.dror@ucl.ac.uk