Mapping the Transition from Unconscious to Conscious Knowledge

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Proposal: Unconscious knowledge may arise when the underlying representation is insufficiently strong to support awareness but of sufficient strength to have behavioural consequences (Cleeremans & Destrebecqz, 2003).

Experimental support: In a Serial Reaction-time Task (SRT) the presence of unconscious knowledge occurred after short but not extended training (Fu, Fu, & Dienes, 2008).
Artificial Grammar Learning (AGL)

Training for Group A
- XMXXMXM
- VTTVVM
- XMXRVM
- VVTRTVVM
- ...

Training for Group B
- XMTRRM
- VVRMTM
- XMTRRM
- VTRRRRM
- ...

Testing for Group A and B
- VTVTM
- VTRRM
- XXRVM
- XXRRM
- ...

Diagram illustrating the grammar structures for Group A and B.
The guessing criterion of unconscious knowledge

- We adopt HOT (Higher Order Thought) theory (Rosenthal, 2002) and use subjective measures of consciousness.
- HOT theories account for consciousness in terms of higher-order representations – for a state to be conscious there must be a representation of oneself as being in that state.
- HOT theory is implicit in the use of the guessing criterion of unconscious knowledge.
The guessing criterion establishes only the status of *judgment knowledge*. This ignores a range of other mental states such as knowing why a string is ungrammatical e.g. knowing T cannot follow X - *structural knowledge*. Subjective reports can be used to assess the status of both types of knowledge and have revealed behavioural dissociations (Dienes & Scott, 2005).

<table>
<thead>
<tr>
<th>Accurate Guess</th>
<th>Accurate Intuition</th>
<th>Accurate Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconscious Judgment Knowledge</td>
<td>Conscious Judgment Knowledge</td>
<td>Conscious Judgment Knowledge</td>
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<tr>
<td>Unconscious Structural Knowledge</td>
<td>Unconscious Structural Knowledge</td>
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60 participants trained under the guise of a memory test.
Participants classified each test string twice in two consecutive passes.
In each pass participants reported:
- Whether each string was grammatical (yes or no)
- The basis for each grammaticality judgment:

**Random** **Intuition** **Familiarity** **Rules** **Recollection**
(no confidence) (confidence with conscious or unconscious structural knowledge)
• The percentage correct is significantly greater than chance (50%) for all attribution categories.

• The percentage correct does not differ significantly between passes.
Experiment 1: Transition between attribution categories

- Change in reported basis for grammaticality judgments for the same test strings classified in the first versus second pass.
- All significant positive associations are shown (mean Phi coefficients).

\[ \begin{align*}
\text{Random Selection} & \rightarrow \text{Intuition} \quad 0.20^{**} \\
\text{Intuition} & \rightarrow \text{Familiarity} \quad 0.34^{**} \\
\text{Familiarity} & \rightarrow \text{Rules} \quad 0.25^{**} \\
\text{Rules} & \rightarrow \text{Recollection} \quad 0.19^{**} \\
\text{Recollection} & \rightarrow \text{Intuition} \quad 0.16^{**} \\
\end{align*} \]

\[ * p < .05 \quad ** p < .01 \quad N = 60 \quad \text{df range from 20 - 56} \]
The Calibrated Familiarity Model

- The difference in familiarity from the mean guides grammaticality judgments.
- Initially small differences predict grammaticality without supporting confidence.
- Conscious judgment knowledge emerges through calibration, as knowledge of the distribution of familiarity (and its assessed reliability) increases (cf. Lau 2008)
Evidence for the role of familiarity

- Evaluated by having participants provide subjective familiarity ratings for each test string (Scott & Dienes, in press)

**Correlations**

- Structural Similarity – Familiarity \( R = 0.40 \)
- Familiarity – Grammatical Status \( r = 0.26 \)
- Familiarity – Grammaticality Judgment \( r = 0.64 \)
  (Random Attributions) \( r = 0.34 \)
- Mean relative Familiarity – Confidence \( r = 0.46 \)

Experiment 2: Evaluating the calibration process

• 160 participants.
• Trained on an artificial grammar in the usual manner.
• At test they were required to report:
  - Grammaticality judgments (yes or no)
  - Subjective familiarity ratings (0 – 100)
  - Confidence ratings (50 – 100)
  - Basis for their judgment (Guess, Intuition, Rules, or Recollection)
• The key manipulation:
  - Confidence encouragement – 50% of participants received feedback intended to encourage them to be more confident.

“Your responses so far have been under confident. Please try to report all your confidence”
Experiment 2: Manipulating confidence

- No significant difference in overall accuracy for encouragement (61%) versus no encouragement (60%).
- The number and accuracy of guess responses significantly reduced by confidence encouragement.

![Percentage of Responses graph](image)

![Percentage Correct graph](image)
• Confidence threshold reduces with
  - Exposure to more strings
  - And confidence encouragement

Experiment 2: The calibration process

Confidence Threshold by Trial (with SE)

Confidence Threshold by Trial (with SE)

Calibration Process

Increasing confidence

Mean Familiarity

Increasing confidence

Highly Unfamiliar

Highly Familiar

Reduced confidence threshold

Absolute z-familiarity for guesses

Trial

No Encouragement

Encouragement
Summary

• Familiarity can initially influence responding without awareness.
• Confidence emerges as knowledge of the distribution of familiarity increases.
• This calibration process can be conceptualised as the transition from objective to subjective probability.

I know this string is well formed

HOT Box

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