Implicit and explicit learning and memory

BCS153 Week 11.2
3/28/19
Roadmap

• Implicit vs. Explicit learning
  ➢ The role of attention in implicit and explicit learning
  ➢ Music perception and sequence learning
• Implicit vs. Explicit memory
  ➢ ERP evidence
• Exam review
The role of attention in implicit vs. explicit learning

- Unattentational vs. Attentional (Curran & Keele 1993)
  - Learning of sequences
- Implicit learning with distraction?

Curran & Keele (1993)

- Single vs. Dual task performance in implicit vs. explicit learning
- Two groups: implicit (no description of the seq.) vs. intentional/explicit (instruction about the seq.)
- Two types of sequences: structured (S) vs. random (R)
- Distraction task in the dual task: high-tone counting (ignoring low-tones)
The role of attention in Implicit vs. Explicit learning (Curran & Keele 1993)

- Results
  - Implicit group: More aware vs. Less aware of the structures (from post-experiment self report)
Other types of motor skill learning – music instrument

- Music reading ~ syntax in natural language
  - Minati et al. (2008)
- Musicians vs. Non-musicians
- Listening to melodies vs. unstructured notes
What does implicit motor skill learning have anything to do with language?

• Brain functional overlap between implicit motor skill learning and language processing

• Articulation speech sound sequences
  ➢ Can be language-specific

• Articulation of word sequences
  ➢ Also can be language-specific
Summary

• Implicit and explicit learning can occur in parallel.

→ Doesn’t mean the neural circuits are the same

• Implicit learning not only found in motor learning, but also in other domains (e.g., language)

• Implicit motor-skill learning can be observed even with distraction.
Implicit vs. Explicit memory

• Long-term memory

➢ Unconscious vs. Conscious encoding of info

• Implicit learning = implicit memory?? What’s encoded in the implicit memory?

• Explicit learning = explicit memory?? What’s encoded in the explicit memory?
Implicit memory

• Data driven
  ➢ Unconscious encoding of events/stimuli
  ➢ Exemplars/Instances of input (not consciously processed)

• Repetition priming

• Masked priming
Implicit vs. Explicit memory (Rugg et al. 1999)

• Neural correlates of implicit and explicit memory

• Dissociation of implicit and explicit memory

• ERPs elicited from recognition memory task
Implicit vs. Explicit memory (Rugg et al. 1999)

Design

• Word studying phase

  ➢ Study word lists either *shallowly or deeply*

  ➢ Depth of processing: shallow/low-level (non-lexical) vs. deep/high-level (lexical, semantic and syntactic)

  ➢ Shallow task: Alphabetic order judgment (of the 1st and last letter) (e.g., *dog, toad*)

    ➜ *Supposedly harder to recall*

  ➢ Deep task: embed words in sentences (The *dog* is barking.)

    ➜ *Supposedly easier to recall*
Implicit vs. Explicit memory (Rugg et al. 1999)

Design
• Testing phase (recognition memory)
  ➢ Decide if the word was new or learned
  ➢ Key comparison

  Recognized old words (deeply or shallowly learned) vs. Unrecognized old words (esp. shallowly studied words judged as a new item) vs. New words
Implicit vs. Explicit memory (Rugg et al. 1999)

ERP results: Mean ERP Amplitude in three different conditions (shown as 3 different bars) minus Mean ERP amplitude (new words)

300-500ms

Implicit memory effect found at parietal sites

Old/learned words
Implicit vs. Explicit memory (Rugg et al. 1999)

ERP results: Mean ERP Amplitude in three different conditions (shown as 3 different bars) minus Mean ERP amplitude (new words)

500-800ms

Effect of depth of processing on recall (explicit)
Implicit vs. Explicit memory (Rugg et al. 1999)

Implications from the ERP results
• Distinct ERP patterns for implicit (Slide 13) vs. explicit memory (Slide 14)

• Unrecognized words (shallowing studied) show same effect as recognized words at P sites (red circle in Slide 13)
  → implicit learning/memory

• Depth of processing (affecting conscious recall; explicit memory) (Slide 14; Fig. 3b) separable from implicit memory effect (Slide 13)
Exam review

• Computation and cognition
  ➢ Similarities between a computer and human mind
  ➢ Functional descriptions
  ➢ Functional architecture

• Box-and-Arrow Models vs. Connectionist Models

• Why connectionism?

• How to interpret a connectionist model? The basics.
Exam review

• Strong AI vs. Weak AI

• Turing Machine

• Turing Test

• Chinese Room Experiment
  ➢ Semantics and syntax of symbols
Exam review

- One example algorithm: Test-Operate-Test-Exit (TOTE)
- Examples?
Exam review

• Language and cognition

How to interpret Boroditsky’s findings (Example below from Exp. 1)
Exam review

• Linguistic Category Model by Semin

→ How does it differ from previous research on language and cognition?

• Adjectives vs. Action Verbs
  ➢ Global (on subject’s characteristics; context-independent) vs. Focal attention (on the specific event the subject is involved; context-dependent; event-related)
Experimental evidence for Linguistic Category Model by Stapel and Semin?

FABRICATED DATA!!!
Experimental evidence for Linguistic Category Model by Stapel and Semin?

• Not yet! 
  FARBICATED DATA BY STAPEL!!!

(The original LCM proposer, Semin, was also a victim of the fraud.)

Experimental evidence for Linguistic Category Model by Stapel and Semin?

• Multiple replication done by Ijerman et al. (2015)
  ➢ Same paradigm and procedure used in Stapel and Semin (2007)
  ➢ No priming effect found!
  ➢ Null effect is also a type of scientific finding!!
  ➢ Validity of LCM to be tested further
  ➢ LCM → hypothesis (can be true)