Language and cognition
Explicit and Implicit learning

BCS153 Week 11.1
3/26/19
Roadmap

• Linguistic Category Model
• Empirical evidence
  ➢ Framed-line test
• Implicit vs. Explicit learning
  ➢ Language
  ➢ Motor-skill
  ➢ Music
Linguistic Category Model (Semin et al.)

• Evidence from Stapel and Semin (2007)
• Does exposure to action verbs vs. adjectives influence performance on a non-linguistic task?
• A different type of priming paradigm
  → Task 1 primes performance on Task 2
• Priming task: reorganize words into sentences
  • Adjectives
  • Action verbs
• Main task: Framed-Line Test (FLT) (Kitayama et al. 2003)
Linguistic Category Model (Semin et al.)

Evidence from Stapel and Semin (2007)

• Main task: Framed-Line Test (FLT) (Kitayama et al. 2003);
  ➢ Only the absolute task → Why? (Difference between this and Kitayama’s experiment?)
  ➢ Dutch participants only

• Predictions
  ➢ Adj. (less situational) → less deviation from the original line
  ➢ Action verbs (more situational) → more deviation from the original line
Linguistic Category Model (Semin et al.)

Evidence from Stapel and Semin (2007)

• Priming result

<table>
<thead>
<tr>
<th>Measure</th>
<th>Supraliminal priming</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjectives</td>
</tr>
<tr>
<td></td>
<td>$M$</td>
</tr>
<tr>
<td>Frame-line test</td>
<td>4.40</td>
</tr>
</tbody>
</table>

Mean error in millimeters
Implications of Stapel and Semin’s study

• The linguistic categories defined in English also work in Dutch
  ➢ still not clear how generalizable they can be

• Proof for situatedness of adjectives and action verbs

• Influence of language on a “non-linguistic” task
Summary

• LCM accounts for language and thought by looking at the cognitive implications (attention-driven) in language use.

➢ Broader domain

• Each predicate category has its functions in terms of both communication and attention-attraction.
  ➢ Abstract, less situational and global attention ➔ adjectives
  ➢ Concrete and focal attention ➔ action verbs
Language and cognition – what becomes implicit?
Language learning

• What?
  ➢ Referent
  ➢ Sound patterns (phonology)
  ➢ Sound properties (phonetics)
  ➢ Lexicon
  ➢ Syntax

• How?
  ➢ Implicit
  ➢ Explicit
Implicit learning

• Learning unconsciously??
• Baars and Gage (2010)
  ➢ Conscious input
  ➢ Implicit inferences about the input
• Berry and Dienes (1993)
  ➢ Learning complex structures of stimuli but not necessarily intending to do so
  ➢ Implicit knowledge less accessible to consciousness
Explicit learning

- Learning consciously??
- Dornyei (2009): learner's conscious and deliberate attempt to master some material or solve a problem
- Reber (1973)
  - Mnemonics
  - Heuristics
  - Other strategies
  - *Aid in the formation of representations*
Implicit vs. Explicit learning

- In parallel?
  - First language acquisition
    - Immersion
    - Adult’s feedback
  - Second language acquisition
    - Explicit instructions – metalinguistic knowledge
    - Immersion
Implicit $\leftrightarrow$ Explicit knowledge

- When explicit becomes implicit
  - Automatic processing through repetitive practice (e.g., playing instruments, sports)
  - Rule learning first $\rightarrow$ familiarization $\rightarrow$ Implicit knowledge

- When implicit becomes explicit
  - Unaware of the rules first $\rightarrow$ Aware of the structure (metacognition)
  - Teaching what you learned implicitly to someone (e.g., language)
Implicit vs. Explicit learning

• Implicit sequential learning
  ➢ Motor-skill learning (e.g., walk, run, throw, riding a bike etc.)
  ➢ First-language sound sequences
    o Statistical learning (Aslin, Newport, Tanenhaus and colleagues)
  ➢ First-language word sequences
Explicit vs. Implicit training

- Implicit sequential learning (Willingham & Goedert-Eschmann 1999)

- **Paradigm: Serial Reaction Time task**
  - 12-unit long sequence
  - Learning effect: reduction of RT over time
  - Training
    - Transfer of training – both random and repeating sequences

- **Confidence rating**

- **Sequence recall task**
Serial reaction time task (SRT): Implicit
Serial reaction time task (SRT): Implicit
Serial reaction time task (SRT): Explicit

2
Serial reaction time task (SRT): Implicit

Only one number shown after the first block
Explicit vs. Implicit training

• Results for training blocks
  ➢ Explicit group much slower at the beginning. Why?
  ➢ Implicit group overall faster than explicit group. Why?

Fig. 1. Response times during training, shown separately for the implicit- and explicit-learning groups. Error bars are standard errors.
Explicit vs. Implicit training

• Results for transfer block
• Learning score = RT (Random) – RT (Structured)

• Implicit learning occurs in parallel with explicit
Explicit vs. Implicit learning

Free recall task: Mean positions correctly recalled

Explicit

Implicit
The role of attention in implicit vs. explicit learning

• Unattentional 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: intentional/implicit (no description of the seq.) vs. 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

- Intentional/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
Take-home messages

• Implicit and explicit learning can occur in parallel.

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

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