Lexical encoding of new phonological categories

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Phonetic decoding

Underlying phonological form

Phonological Decoding

Phonetic form

Japanese [ɾa]  Spanish [ε]  Catalan [e, ɛ]

Consonants & vowels

Phonetic Decoding

Assimilate to the phonetically closest segment
- acquired early & bottom up
- non-plastic in L2

Acoustic/Phonetic code

<table>
<thead>
<tr>
<th>la, ɾa</th>
<th>e, ɛ</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>e, ɛ</td>
</tr>
</tbody>
</table>
Lexical encoding for L2 words

Underlying phonological form

Phonological Decoding

Phonetic form

Phonetic Decoding

Acoustic/Phonetic code

phonotactics

stress

Consonants & vowels

Japanese /ra/ [ɾa] Assimilate to the phonetically closest segment - acquired early & bottom up - non plastic in L2

Spanish /ɛ/ [ɛ]

Catalan /ɛ, ə/ [e, ə]

/la, ɾa| /e, ɛ|
In another case, however...

Underlying phonological form

Phonological Decoding

Phonetic form

Phonetic Decoding

Consonants & vowels

stress

phonotactics

Phonetic form

Phonetic Decoding

Acoustic/Phonetic code

Dutch: [ɛ]

Spanish: [e]

Catalan: [e, ɛ]

same architecture in L2?
## Four combinations

<table>
<thead>
<tr>
<th>+ targetlike Category</th>
<th>– targetlike Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Lexical Contrast</td>
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</table>

<table>
<thead>
<tr>
<th>Native speakers</th>
<th>Weber &amp; Cutler 2004</th>
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<tbody>
<tr>
<td></td>
<td>Hayes-Harb &amp; Masuda 2008</td>
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<table>
<thead>
<tr>
<th>+ targetlike Category</th>
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<tr>
<td>– Lexical Contrast</td>
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<table>
<thead>
<tr>
<th>L1 acquisition</th>
<th>Pallier et al. 2001</th>
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<tbody>
<tr>
<td>Training studies</td>
<td>Ota et al. 2009</td>
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</table>
Is there a dissociation between both levels in L2?

- Closer look at the link between category learning and lexical encoding in a second language
- 2 groups of learners of French
- 2 experiments:
  - Examine categorization performance
  - Look at the form of lexical representations
<table>
<thead>
<tr>
<th>Methods and participants</th>
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<tbody>
<tr>
<td><strong>ABX</strong></td>
</tr>
<tr>
<td>– 19 advanced</td>
</tr>
<tr>
<td>– 19 beginners</td>
</tr>
<tr>
<td>– 8 native speakers</td>
</tr>
<tr>
<td><strong>Lexical Decision</strong></td>
</tr>
<tr>
<td>– 19 advanced</td>
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<table>
<thead>
<tr>
<th>late learners of French</th>
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<tbody>
<tr>
<td>advanced learners</td>
</tr>
<tr>
<td>Residence in France (6 mo. ~ 3+ years)</td>
</tr>
<tr>
<td>min. 8 semesters of French</td>
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</table>

<table>
<thead>
<tr>
<th>beginners</th>
</tr>
</thead>
<tbody>
<tr>
<td>no long exposure in France/French speaking country;</td>
</tr>
<tr>
<td>max. 4 semesters of French</td>
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</tbody>
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<table>
<thead>
<tr>
<th>native speakers (control)</th>
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<tbody>
<tr>
<td>French</td>
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</table>
Stimuli:
FRONT ROUNDED VOWELS

[i] [ε] [y] [oe] [u] [o]
Our Stimuli in ABX and Lexical Decision

\[ 9 = [\text{ø}] \]
\[ o = [\text{ɔ}] \]
Category acquisition

• High phonetic variability for [u] in English (across contexts), which overlaps the [y]-[u] distribution in French, makes acquisition of the contrast difficult
  – generally no confusion of [i] with [y]

• Similar pattern is predicted for [o]-[ø]
  – Mid-vowels could be harder to discriminate due to the narrower vowel space
  – However, categorization might be easy if [ø] is associated with a rhotic sound [ɹ] in English (Kingston 2003), while [o] is mapped onto AE [ɔ]
Exp 1: ABX on [u]-[y] and [ɔ]-[œ]

**Conditions:**
- **control:** sun vub, tid ted
- **high:** mub myb, tud tyd
- **mid:** mɔb mœb, tod tœd

192 randomized trials:
- 16 control
- 8 i/e
- 8 cons.
- 16 high
- u/y
- 16 mid
- œ/œ

**Response:**
- A or B

*female voice 1 female voice 2*
- beg = adv
- Both are different from natives
- All groups have higher errors on the mid condition

Learners vs. Native speakers:

Beginners and Advanced are not different globally (no effect of group, no interaction with condition)
Summary: Phonological ABX

• Globally a small error rate for $[u\text{-}y]$ (12%)

• Performance overall worse for $[\text{o}\text{-}{\text{"}}{\text{\text{"}}}]$
  – Establishing this category seems most difficult for both learner groups

• Seemingly persistent errors:
  – Inexperienced and advanced learners are not different from each other, and both differ from the natives
Experiment 2: Lexical Decision

- **Method** (see Pallier et al. 2001)
  - Speeded auditory Lexical decision („real word?“)
  - Word pairs separated by 8 – 20 items in between
  - Facilitation (RT) on conditions „same“ vs. „minimal pair“

- **Stimuli (words + nonwords)**
  - 40 test words: 5 pairs for 4 different contrasts:
    - \[\text{i-y}, \text{u-y}, \text{o-œ}\] \[\text{E oe}\]
  - 40 nonwords (similar to the test words)
  - 180 fillers
  - Counterbalanced in 4 lists (aa – bb – ab – ba)
Exp 2: Repetition priming on minimal pairs

Mean reaction times for catalan-specific contrasts [e-ɛ] and [o-ɔ] by early bilinguals:

Catalan-dominant (a) vs.

Spanish-dominant (b) (Pallier, Colomé, and Sebastián-Gallés 2001)
Results for [i-y] (control)
Results for [u-y]

Reaction Time (ms)

- ** ns
- ***

Priming!!

Beginners

Advanced

Native Speakers

- Same 1
- Same 2
- Min Pair 1
- Min Pair 2
Results for [ɔ-œ]

O-œ

<table>
<thead>
<tr>
<th>Reaction Time (ms)</th>
<th>Beginners</th>
<th>Advanced</th>
<th>Native Speakers</th>
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<tr>
<td>Same 1</td>
<td>**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Same 2</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min Pair 1</td>
<td>**</td>
<td></td>
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** ns

Bar chart showing reaction times for [ɔ-œ] in different groups: beginners, advanced, and native speakers. The chart indicates significant differences marked with ** and non-significant differences marked with ns.
Summary

• Condition same elicits priming in all contrasts for all groups

• For the control contrast [i-y]
  – All three groups behave alike: no priming on minimal pair condition
    • => no sign of spurious homophony for this contrast

• For the test contrast [u-y]
  – Advanced = Native speakers: no priming
  – Beginners: significant priming on minimal pair condition

• For the test contrast [o-œ]
  – All three groups behave alike, and do not show priming on the minimal pair condition
General summary

• However, both learner groups are not different on the ABX task
  – Error rate is small, but significantly higher than the natives

• Advanced learners are like the native speakers in the lexical decision, even though they are like the beginners on ABX
  – They establish lexical contrasts « regardless » of their performance in ABX – without experiencing any benefit at the level of categories

• Beginners, despite rather good categorization of [u-y], experience lexical homophony
  – Conversely, they have lexical contrast for the categories which are most difficult to discriminate…… (o-oe)
Dissociated mechanisms

• For both learner groups, it seems that establishing a lexical contrast is possible
  – for both [u-y] and [o-oe] in case of the advanced
  – only for [o-oe] in case of the beginners
• ...even if category „robustness“ remains limited.... Indeed, both groups are not target like at the categorization level
Our results

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<td>Beginners [o-oe]</td>
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<td>(PRESENT DATA)</td>
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Training studies
L1 acquisition

Beginners [u-y]
(PRESENT DATA)
L2 phonological acquisition

• Proceeds differently from first language phonological acquisition
• Converging evidence towards dissociated mechanisms:
  – Category acquisition
  – Formation of contrastive lexical representations
• Lexical contrast does not always result in a benefit at the level of categories in L2 acquisition
• What are the mechanisms that allow development of lexical contrast in absence of robust sound categorization?
References


Maddieson 1984


