L2 Status affects L3 learning from the onset of acquisition:
A developmental study of L1 English, L2 Spanish, and L3 Catalan

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University of Southern California

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University of Michigan

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L3 ACQUISITION

- What factors characterize L3 phonetic and phonological acquisition?
- How do they mediate the patterns of influence observed from previously acquired languages?

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<td>→ Relative Proficiency Levels</td>
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L3 acquisition

• What factors characterize L3 phonetic and phonological acquisition?
• How do they mediate the patterns of influence observed from previously acquired languages?

Possible Patterns

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→ **Primary L2 Influence**
→ Combined Cross-Linguistic Influence

Possible Factors

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→ Structural Similarity
→ Relative Proficiency Levels
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Possible Patterns

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- Primary L2 Influence
- Combined Cross-Linguistic Influence

Possible Factors

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- Structural Similarity
- Relative Proficiency Levels
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<tr>
<td></td>
<td>→ <strong>L2 Status Factor</strong></td>
</tr>
</tbody>
</table>

L2 STATUS FACTOR

• Learners activate L2 and suppress L1 during L3 production (Williams & Hammarberg, 1998/2009; De Angelis, 2007; Falk & Bardel, 2007).
  o Result of desire to suppress L1 as being ‘non-foreign’, and of cognitive similarity between non-native languages.

• L2 status shown to have stronger influence than genetic typological similarity on cross-linguistic influence in L3 production (Llama, Cardoso & Collins, 2010).
  o L1 English/L2 French and L1 French/L2 English, all learning L3 Spanish

• Previous work suggests that L2 status also takes precedence over structural similarity in determining sources of cross-linguistic influence (Harper, 2016).
  o L1 English / L2 Spanish / L3 Brazilian Portuguese

Does L2 Status Factor override structural similarity at the Initial State?
RESEARCH QUESTIONS AND HYPOTHESES
1) How influential is the L2 Status Factor at the very initial stages of L3 phonological acquisition?

2) What is the role of structural typology on cross-linguistic influence at the earliest stages of L3 acquisition?

<table>
<thead>
<tr>
<th>LANGUAGES:</th>
<th>ALLOPHONIC PATTERNS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• L1 English</td>
<td>• Intervocalic Voiced Stop Spirantization</td>
</tr>
<tr>
<td>• L2 Spanish</td>
<td>• /l/ Velarization</td>
</tr>
<tr>
<td>• L3 Catalan</td>
<td></td>
</tr>
</tbody>
</table>
SPIRANTIZATION AND VELARIZATION IN ENGLISH, SPANISH AND CATALAN

• Allophonic voiced stop spirantization process systematically observed in native Spanish and Catalan speakers
  o \( /b \ d \ g/ \rightarrow [\beta \ ど \ y] \) in various environments (Cole, Hualde & Iskarous, 1999; Ortega-Llebaria, 2004; Kingston, 2008; Colantoni & Marinescu, 2010)
  o Difficult for L2 learners (L1 English) to reproduce (e.g., Zampini, 1997)
    • Pattern is transferred into typological similar L3 by L1 English/L2 Spanish learners (Harper, 2016)

• English and Catalan share similar allophonic \(/l/\) velarization patterns, with ‘dark’ \(/l/\) observed in syllable coda
  o Spanish lacks this pattern – ‘light’ \(/l/\) is found in all positions
  o L2 Spanish learners approximate, but do not completely reach, L1 norms, with more advanced learners producing more native-like ‘light’ \(/l/\) (Bean, 2013)
### Cross-Language Comparison: Intervocalic Voiced Stop Production

<table>
<thead>
<tr>
<th></th>
<th>L1 English</th>
<th>L2 Spanish</th>
<th>L3 Catalan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>More</strong></td>
<td>/b/ → [b]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Less</strong></td>
<td>/b/ → [β]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Constricted</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CROSS-LANGUAGE COMPARISON: /l/ PRODUCTION

MORE VELARIZED
/l/ → [ʈ]

LESS VELARIZED
/l/ → [l]

L1 ENGLISH
L2 SPANISH
L3 CATALAN
L1 $\rightarrow$ L3 Influence

Spirantization

- More Constricted
  - English
- Less Constricted
  - Spanish
  - Catalan

Velarization

- More Velarized
  - English
- Less Velarized
  - Spanish
  - Catalan
HYPOTHESIS 1: SENSITIVITY TO SIMILARITY

INTERVOCALIC SPIRANTIZATION

<table>
<thead>
<tr>
<th>More Constricted</th>
<th>Less Constricted</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 English</td>
<td>L3 Catalan</td>
</tr>
<tr>
<td>L2 Spanish</td>
<td></td>
</tr>
</tbody>
</table>

VELARIZATION

<table>
<thead>
<tr>
<th>More Velarized</th>
<th>Less Velarized</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 English</td>
<td>L3 Catalan</td>
</tr>
<tr>
<td>L2 Spanish</td>
<td></td>
</tr>
</tbody>
</table>

L1 English
L2 Spanish
L3 Catalan
HYPOTHESIS 2: L2 → L3 INFLUENCE

INTERVOCALIC SPIRANTIZATION

MORE CONstricted

LESS CONstricted

L1 ENGLISH

L2 SPANISH

L3 CATALAN

VELARIZATION

MORE VELARIZED

LESS VELARIZED

L1 ENGLISH

L2 SPANISH

L3 CATALAN
EXPERIMENT DESIGN AND ANALYSIS
 EXPERIMENT DESIGN

• 20 speakers participated in this study
  • All participants were L1 English/L2 Spanish speakers
  • University students enrolled in upper-level Spanish courses
    • Intermediate L2 Spanish proficiency
  • Average Age: 20.9 years

• Speakers divided into two experimental groups:
  • **L2/L3 Group** = 11 L2 Spanish/L3 Catalan learners
    • All were enrolled in their first semester of Catalan study
    • Instructed in Eastern Catalan dialect (Recasens, 2013)
    • 4 men, 7 women
  • **L2 Control Group** = 9 L2 Spanish learners
    • No exposure to an L3
    • 9 women
Experiment Design

• Speakers recorded twice over the course of the semester
  • Recording 1: near the beginning of the semester (weeks 4-5)
  • Recording 2: during the last week of classes (week 15)

• All participants recorded reading carrier sentences in their L1, L2 and (when applicable) L3

• Presentation of stimuli was blocked by language
  • Active response videos presented to participants before each language block to get them into appropriate language mode

• Stimuli randomized within each block

Example stimulus sentences:

English: I say above promptly
Spanish: Digo abajo para ti
Catalan: Em dic abans per a ti
EXPERIMENT DESIGN

• Speakers recorded twice over the course of the semester
  • Time 1: near the beginning of the semester (weeks 4-5)
  • Time 2: during the last week of classes (week 15)

• Protocol for each recording session:
  1) Speakers participated in active response videos before each language block to get them into appropriate language mode (cf. Grosjean, 1982; Antoniou et al., 2011)
     o Presentation of videos and stimuli was grouped by language
  2) Speakers read aloud a series of carrier sentences:
     o **English**: I say **above** promptly
     o **Spanish**: Digo **abajo** para ti
     o **Catalan**: Em dic **abans** per a ti
Which country's telephone system did Tesla help develop?
**Experiment Design**

- 48 spirantization target words and 48 velarization target words included in stimuli.
  - Same stimuli used for both recording sessions.
  - All target words controlled for the vocalic context surrounding the target consonant and for the word’s cognate status in each language.

- Spirantization target words (/b/) evenly divided into two conditions: stressed and unstressed

- Velarization target words (/l/) divided into two conditions: syllable-initial and syllable-final
**DATA ANALYSIS: SPIRANTIZATION**

Plosive \([b]\) = Low acoustic energy during consonant

Spirantized \([\beta]\) = High acoustic energy during consonant

Higher C/V intensity ratio ➔ Greater spirantization
Unvelarized [i] = Higher F2, larger difference between F2 and F1

Velarized [ɬ] = Low F2, smaller difference between F2 and F1
RESULTS: SPIRANTIZATION
**Between-Groups Comparison: Spirantization by Time**

<table>
<thead>
<tr>
<th>L2/L3 Group</th>
<th>L2 Group</th>
</tr>
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<tbody>
<tr>
<td><strong>C/V Ratio</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Time 1</strong></td>
<td><strong>Time 2</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>English</strong></td>
<td><strong>Spanish</strong></td>
</tr>
<tr>
<td></td>
<td></td>
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- **L2/L3 Group**
  - English: C/V Ratio
  - Spanish: C/V Ratio

- **L2 Group**
  - English: C/V Ratio
  - Spanish: C/V Ratio

*** Significant difference between Time 1 and Time 2.
BEETWEEN-GROUPS COMPARISON: SPIRANTIZATION BY TIME

<table>
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</tr>
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<tbody>
<tr>
<td>English</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spanish</td>
<td></td>
<td></td>
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</tbody>
</table>

C/V Ratio

Time 1

Time 2

n.s.
L2/L3 Group: Language by Time

The diagram shows the C/V ratio for English, Spanish, and Catalan languages at two different times (Time 1 and Time 2). The box plots indicate the distribution of the C/V ratio, with Time 1 data in purple and Time 2 data in blue.
L2/L3 GROUP: LANGUAGE BY TIME

![Graph showing C/V ratio for English, Spanish, and Catalan languages at two different times.

- English: Time 1, Time 2
- Spanish: Time 1, Time 2
- Catalan: Time 1, Time 2

Statistical significance indicated by ***.
L2/L3 GROUP: LANGUAGE by TIME

C/V Ratio

English  Spanish  Catalaon

Time 1  Time 2

n.s.
L2/L3 GROUP: LANGUAGE BY TIME

C/V Ratio

English  |  Spanish  |  Catalan

n.s.  |  n.s.  |  n.s.

Time 1 | Time 2
L2/L3 GROUP: EFFECT OF STRESS

The diagram illustrates the comparison of C/V ratio for unstressed and stressed conditions across three languages: English, Spanish, and Catalan. The box plots show the median, interquartile range, and outliers for each condition within each language.
L2/L3 GROUP: EFFECT OF STRESS

**n.s.**
MODEL 2: EXPERIMENTAL GROUP (SPIRANTIZATION)
RESULTS: VELARIZATION
BETWEEN-GROUPS COMPARISON: VELARIZATION BY TIME

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F2-F1 (Hz)
**Between-Groups Comparison: Velarization by Time**

- **L2/L3 Group**
  - ***

- **L2 Group**
  - ***

Box plots showing F2-F1 (Hz) for English and Spanish in the L2/L3 Group and L2 Group at two time points (Time 1 and Time 2). The plots indicate a significant difference (** ***).
**Between-Groups Comparison: Velarization by Time**

- **L2/L3 Group**
- **L2 Group**

<table>
<thead>
<tr>
<th>Language</th>
<th>Time 1</th>
<th>Time 2</th>
<th>n.s.</th>
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<td>English</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Spanish</td>
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<td></td>
<td></td>
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**Notes:**
- n.s. indicates no significant difference.
L2/L3 GROUP: LANGUAGE BY TIME
L2/L3 GROUP: LANGUAGE BY TIME

n.s.
INDIVIDUAL EFFECTS: POSITION
INDIVIDUAL EFFECTS: TIME

<table>
<thead>
<tr>
<th>BF</th>
<th>CK</th>
<th>EA</th>
<th>MF</th>
<th>MH</th>
<th>MS</th>
<th>MT</th>
<th>SC</th>
<th>SD</th>
<th>TS</th>
</tr>
</thead>
</table>

Language: E S C

F2 F1 (Hz)
INDIVIDUAL EFFECTS: TIME

ALL L2/L3 LEARNERS
L2/L3 GROUP: POSITION

*** n.s.

n.s.

F2-F1 (Hz)

English

Spanish

Catalan

Language

Onset

Coda
SUMMARY & DISCUSSION
SUMMARY OF RESULTS

• No differences observed between the two speaker groups for either /b/ or /l/
  o L2/L3 group’s production of /b/ and /l/ was similar to L2 group’s production of /b/ and /l/ in L1 English and L2 Spanish
  o Suggests no effect of L3 Catalan exposure on either L1 or L2

• For the L2/L3 group, production of both /b/ and /l/ in L3 Catalan was on par with their L2 Spanish production
  o More spirantized [β] in L2 Spanish and L3 Catalan, but plosive [b] in L1 English
  o Less velarization of [l] in Spanish and Catalan, but velarized [ɬ] in L1 English

• Allophonic effects on production due to stress or position within the syllable observed in L1 English, but not in L2 Spanish or L3 Catalan
HYPOTHESIS 1: SENSITIVITY TO SIMILARITY

- L3 Catalan production patterns fit with “Sensitivity to Similarity” hypothesis for Spirantization, but not for Velarization

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<th>Velarization</th>
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HYPOTHESIS 2: L2 $\rightarrow$ L3 INFLUENCE

- Strong evidence for L2 $\rightarrow$ L3 transfer as the primary mechanism of cross-linguistic influence at the initial stage of L3 Catalan acquisition.
CONCLUSION

1) Strong evidence for L2 Status Factor from the very beginning of L3 acquisition.
   • Robust to the effect of time during early stages of acquisition

2) Patterns of cross-linguistic influence into the L3 do not seem to be affected by structural similarity between sound pairs across languages.
   • Effect of structural similarity overridden by L2 Status Factor

3) Models of adult phonological acquisition (e.g., Best & Tyler, 2007; Flege, 1995) may need to consider L2-L3 interaction effects of the type we have documented here.
THANK YOU
REFERENCES


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### APPENDIX A: QUESTIONNAIRE

<table>
<thead>
<tr>
<th>Question</th>
<th>1=very similar; 7=very different</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Overall, rate how similar you think the <strong>Catalan</strong> and <strong>English</strong> languages are.</td>
<td>5.22</td>
</tr>
<tr>
<td>2. Rate how similar you think <strong>Catalan</strong> and <strong>English</strong> are in terms of pronunciation.</td>
<td>5.5</td>
</tr>
<tr>
<td>3. Overall, rate how similar you think the <strong>Catalan</strong> and <strong>Spanish</strong> languages are.</td>
<td>2.94</td>
</tr>
<tr>
<td>4. Rate how similar you think <strong>Catalan</strong> and <strong>Spanish</strong> are in terms of pronunciation.</td>
<td>4.16</td>
</tr>
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## Appendix B: Questionnaire

<table>
<thead>
<tr>
<th>Question</th>
<th>1=similar; 3=different</th>
</tr>
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<tbody>
<tr>
<td>1. Rate how similar the pronunciation of ( l ) (not ( ll )) is in English &amp; Catalan</td>
<td>1.61</td>
</tr>
<tr>
<td>2. Rate how similar the pronunciation of ( b ) is in English &amp; Catalan</td>
<td>1.94</td>
</tr>
<tr>
<td>3. Rate how similar the pronunciation of ( l ) (not ( ll )) is in Spanish &amp; Catalan</td>
<td>1.17</td>
</tr>
<tr>
<td>4. Rate how similar the pronunciation of ( b ) is in Spanish &amp; Catalan</td>
<td>1.41</td>
</tr>
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