Experience and the processing of forms in alternating paradigms

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Overview of study

- **Review of literature**
  - Lexical processing of phonological variants
    - Lenition
    - Assimilation
    - Morphonological alternations
  - Role of experience
    - Effects of exposure to variants
- **Present Study**
  - Processing of a phonological alternation of Catalan
    - stress-induced vowel reduction
    - leading to positional neutralization
  - Role of experience across Catalan dialects
    - dialect with alternation
    - dialect without alternation

Lenition

- **Lenition or weakening leads to phonological variation**
  - English nasal flapping: *gentle* [dʒɛntl̩] ∼ [dʒɛr̃l]
  - English final-/t/ glottalization: *cat* [kæt] ∼ [kæʔ]
- **Are all variants efficient at contacting lexical entries?**
  - [1] Nasal flapping
    - full [nt]-variant triggers robust priming
    - nasal flap does not
  - [2] Final-/t/ glottalization
    - both forms trigger short-term priming
    - only full [t]-variant triggers long-term priming
  - ([3] Studies on deletion of French schwa lead to similar findings)

[1] Ranbom & Connine (2007)
[2] Sumner & Samuel (2005)
[3] Burki, Ernestus & Frauenfelder (2010)

Assimilation

- **Assimilation leads to phonological variation**
  - English nasal place: *green* [griːn deɪ] ∼ [griːm pɑrk]
  - English stop place: *wicked* [wɪkɪd deɪ] ∼ [wɪkɪb præŋk]
- **Are all variants efficient at contacting lexical entries?**
  - [4] viable contexts
    - assimilated form as effective as non-assimilated form
  - unviable contexts
    - assimilated forms hinder lexical processing
  - ([5] assimilated forms help in recognition of following word)

[4] Gaskell & Marslen-Wilson (1996)
[5] Gow (2001)

Morphonological alternations

- **Predictable variants in *different* forms of paradigm**
  - Some morphemes alternate and others do not (unpredictable)
  - Example: Spanish [e] ∼ [i̯e] is induced by stress

Infinitive	1st Sing.	1st Plur.	alternation?
cenar	c**e**no	c**e**namos	[e]
pesar	p**e**so	p**e**samos	[e]
segar	s**ie**go	s**e**gamos	[e] ∼ [i̯e]
pensar	p**ie**nso	p**e**nsamos	[e] ∼ [i̯e]

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Infinitive	1st Sing.	1st Plur.	alternation?
cenar	ceno	cenamos	[e]
pesar	peso	pesamos	[e]
segar	siego	segamos	[e] ∼ [i̯e]
pensar	pienso	pensamos	[e] ∼ [i̯e]

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pensar	pienso	pensamos	[e] ∼ [ie]

Are forms in alternating paradigms processed as efficiently as those in non-alternating paradigms?

r-lessness in NYC

- [6]**Sumner & Samuel (2009) on *r-lessness* in NYC**
  - NYC

r-less	r-full	alternation?
bake[ø]	bake[r]y	ø ∼ [r]
potte[ø]	potte[r]y	ø ∼ [r]

  - GA

r-full	r-full	alternation?
bake[r]	bake[r]y	[r]
potte[r]	potte[r]y	[r]

[6]Sumner, M., & Samuel, A. G. (2009). The effect of experience on the perception and representation of dialect variants. Journal of Memory and Language, 60(4), 487-501.

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r-lessness in NYC

- **3 dialect groups**
  - Native NYC: r-less
  - Non-native NYC: r-full but exposed to r-less
  - Not NYC: r-full
- **2 experimental tasks**
  - short-term priming
  - long-term repetition priming
- **Focus**
  - r-final words: baker, potter
  - surface forms "removed" from "underlying" form

r-lessness in NYC

- **Results**

Experiment	NYC	non-native NYC	GA
short-term	✓	✓	
long-term	✓		

- **Conclusions**
  - Alternating forms contact lexical entries
  - Experience facilitates short-term lexical recognition
  - Exposure is not enough for long-lasting storing

The present study

The present study

- Examines a morphonological alternation of Majorcan Catalan
  - stress-induced vowel reduction in the back vowels
- Assesses lexical processing in two Majorcan Catalan dialects
  - Sóller: [o] ∼ [u] alternation
  - Palma: no alternation
- How does experience affect lexical processing?
  - cross-dialect lexical recognition

Stress-induced vowel alternation in Majorcan Catalan

Palma Catalan

Phon.	$[+stress]$	$[-stress]$
o	c[o]ssa	c[o]sseta
u	c[u]ssa	c[u]sseta

$[+stress]$	o	u
$[-stress]$	o	u

Sóller Catalan

Phon.	$[+stress]$	$[-stress]$
o	c[o]ssa	c[u]sseta
u	c[u]ssa	c[u]sseta

$[+stress]$	o	u
$[-stress]$	u	

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Orthographic mapping of vowel alternation

Palma Catalan	phonology	orthography	phonetics
Stressed	o	*o*	o
Unstressed		*o*	o
Stressed	u	*u*	u
Unstressed		*u*	u

Sóller Catalan	phonology	orthography	phonetics
Stressed	o	*o*	o
Unstressed		*o*	u
Stressed	u	*u*	u
Unstressed		*u*	u

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Stressed	u	*u*	u
Unstressed		*u*	u

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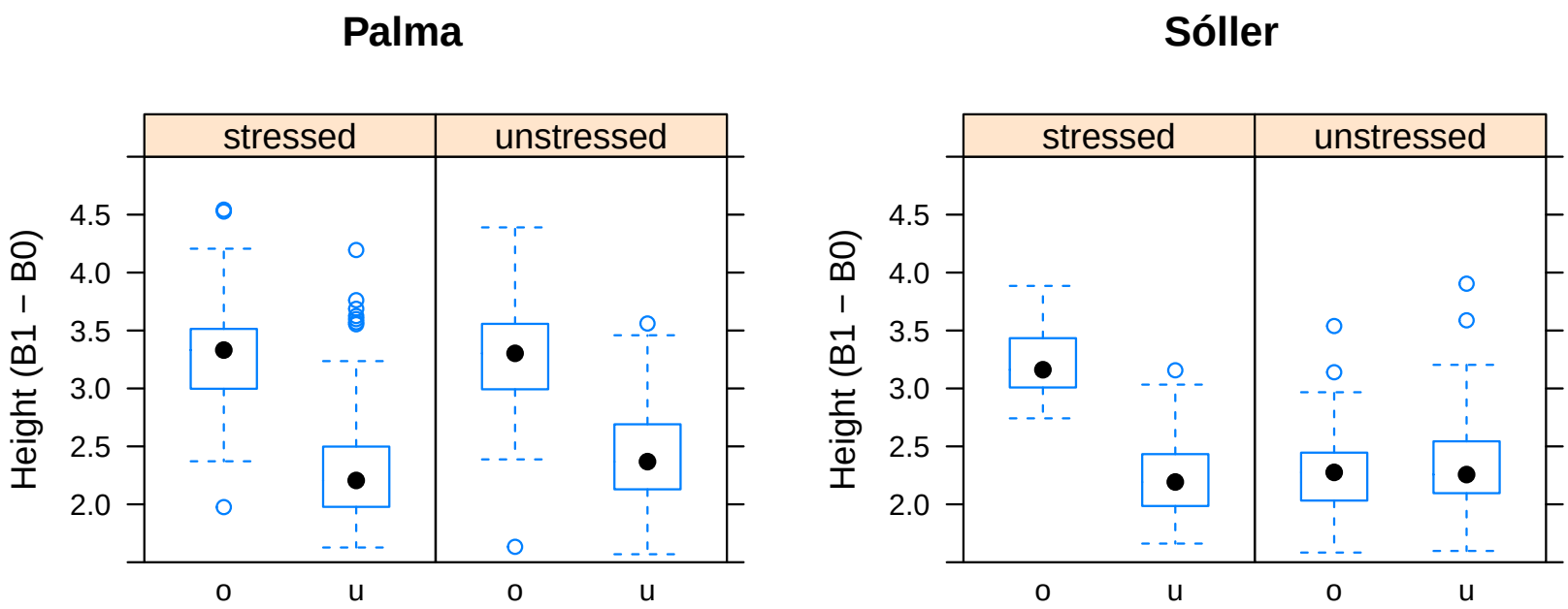
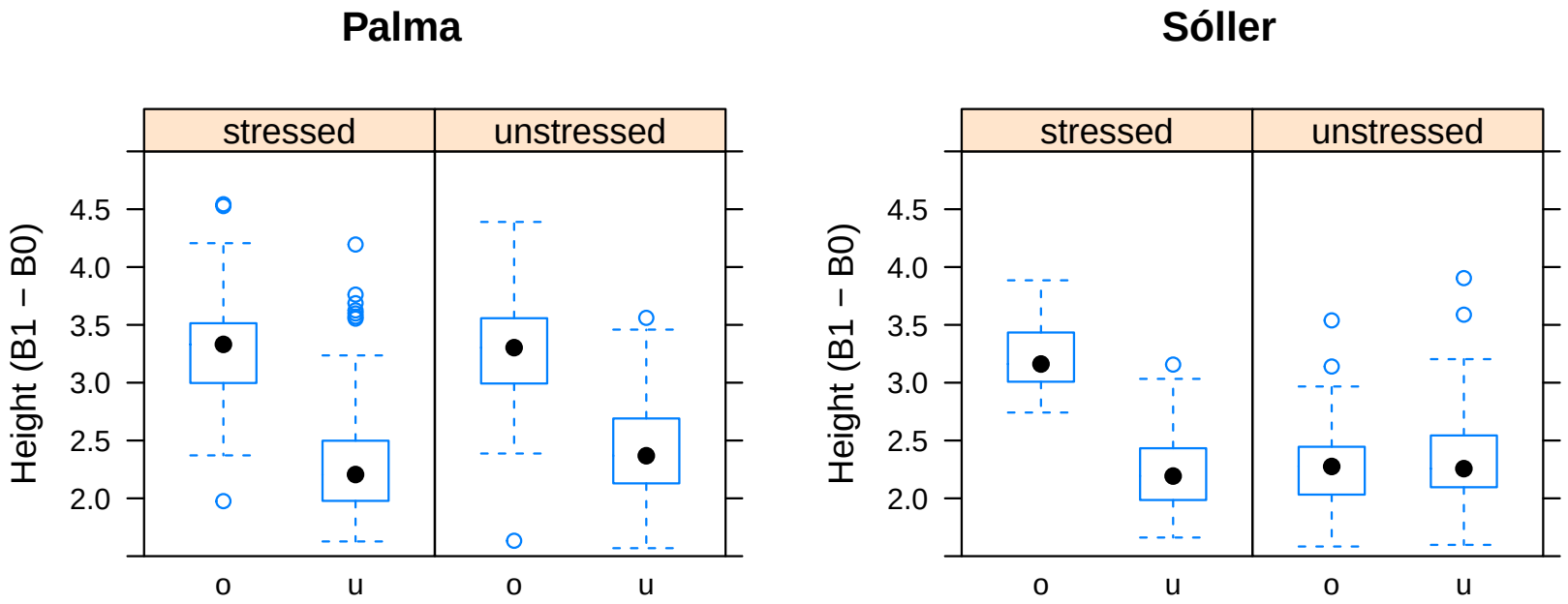
Preliminary production experiment

- Purpose: To confirm vowel alternation in Sóller
- **Participants:**
  - 6 speakers born, raised and residing in Sóller
  - 6 speakers born, raised and residing in Palma
- **Materials:**
  - 40 nouns: stress on stem vs. stress on derivational morpheme
    - 20 underlying /o/: *poma* ['pomə] - *pometa* [p[o/u]'mətə]
    - 20 underlying /u/: *lluna* ['ʎunə] - *lluneta* [ʎu'nətə]
  - Same carrier sentence for target word pair (medial-position)
  - 40 items $\times$ 2 dialects $\times$ 6 speakers $\times$ 2 iterations = 960 tokens
- **Analysis:** *Height Index* {F1 (Bark) $-$ F0 (Bark)}

Preliminary production experiment



Preliminary production experiment



Neutralization is complete. Alternation is categorical.

Method

Participants

- **Sóller:** 20 participants (ages 18-26)
  - Born, raised and residing in village
  - Secondary education or higher
  - Sóller only place of residence
- **Palma:** 20 participants (ages 19-29)
  - Born, raised and residing in city
  - Secondary education or higher
  - No personal connections with Sóller

Materials

Cross-modal priming in a lexical decision task

- Auditory primes
  - Real words: disyllabic fem. nouns + stress-bearing suffix *-eta*
  - Pseudowords: Trisyllabic nonce words ending in *-eta*.
- Visual targets
  - Real words: Orthographic representations
  - Pseudowords: Plausible orthographic representations

Materials: Conditions

- 2 experimental conditions (unstressed /o/ as first vowel):

[o]-prime

Prime	*Target*
p[o]méta	POMETA
(*Palma variant*)	

[u]-prime

Prime	*Target*
p[u]méta	POMETA
(*Sóller variant*)	

- Auditory primes by same Sóller Catalan speaker
  - Mean F1 for [o] stimuli = 467 Hz
  - Mean F1 for [u] stimuli = 344 Hz

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Materials: Conditions

- Control condition (unstressed /a/ as first vowel):

control

Prime	*Target*
r[ə]téta	POMETA
Unrelated prime	

- [7]Inter-Condition lexical frequency controlled

[7]Rafel i Fontanals, J. (1998). *Diccionari de frequències. Corpus textual informatitzat de la llengua catalana*. Barcelona, Spain: Institut d'Estudis Catalans

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Materials: Fillers

- 30 experimental pairs + **240 filler pairs**
- 120 word target pairs + 120 pseudoword target pairs

	word			**pseudoword**	
Condition	*Prime*	*Target*	*Condition*	*Prime*	*Target*
identity	*nineta*	NINETA	**identity**	*vameta*	VAMETA
unrelated	*festeta*	NINETA	**unrelated**	*balmeta*	VAMETA
pseudo	*balmeta*	NINETA	**word**	*festeta*	VAMETA

Procedure

Lexical decision task

- auditory prime $\rightarrow$ 1.1 s SOA $\rightarrow$ visual target
- reaction times measured from the onset of the visual target
- 270 trials = 30 experimental pairs + 240 filler pairs
- fully randomized order

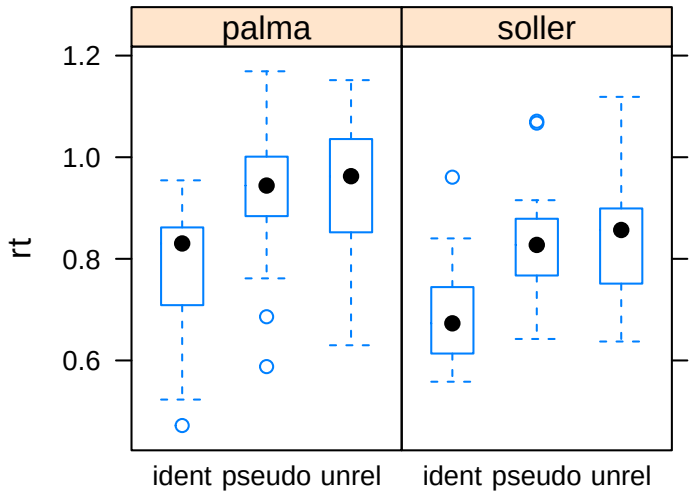
Data analysis

- Only correct responses were included in the analysis (94.67%)
- Data excluded
  - RT shorter than 300 ms (0.39%)
  - RT longer than 1500 ms (2.33%)
- RT were log-transformed
- **Statistical analysis:**
  - $\log(RT) \sim condition \times dialect + \varepsilon$ {by-subjects, by-items}

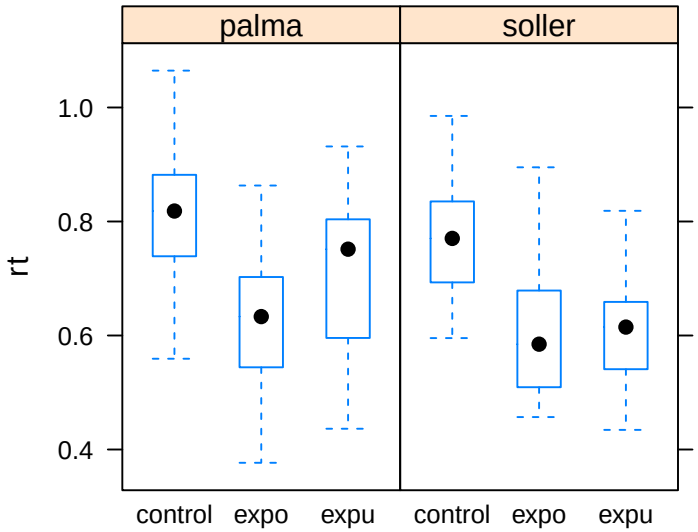
Results

Validity test

- Analyze **real word fillers** to test experimental paradigm
- Expectations:
  - Shorter RT for *identity prime* condition
  - Longer RT for *unrelated* and *pseudoword prime* conditions

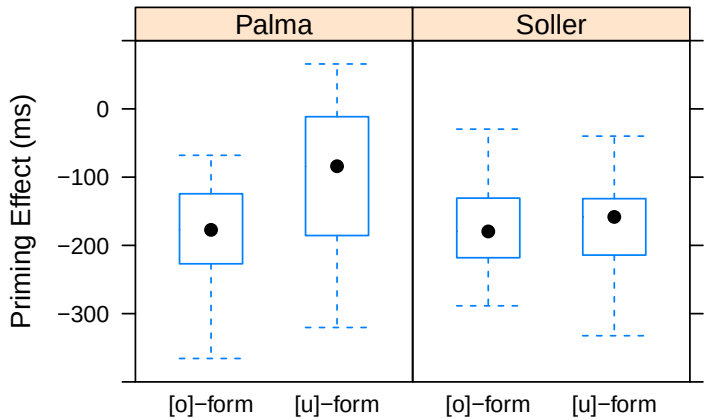


Experimental conditions: Raw log(RT)



Variant	Palma	Sóller
non-alternating	✓	✓
alternating		✓

Experimental conditions: Priming Effect (ms)



Priming Effect:
experimental (ms) − control (ms)

Variant	Palma	Sóller
non-alternating	✓	✓
alternating		✓

Discussion

Summary

Palma = Expected finding

- Robust priming only by the non-alternating [o] forms
- (Slightly primed by the alternating [u] forms)
  - [8] Phonological similarity triggers moderate priming
  - [9] Immediate processing highly resistant to phonetic mismatch
- Own variant triggers more robust priming

[8] Sumner & Samuel (2009)
[9] Marslen-Wilson, Moss & van Halen (1996)

Summary

Sóller

- Both [u]- and [o]-forms show comparably robust priming
  - Phonology-to-orthography mapping?
  - Alternating paradigms?
  - Dialect contact?

Discussion

Sóller: Phonology-to-orthography mapping?
Unexpected priming of [o]-forms due to simplex phonology-to-orthography mapping

	phonology	orthography	phonetics
Stressed	o	*o*	o
Unstressed		*o*	u

Sóller speakers not hindered by complex match in own dialect
Simplex forms are always facilitated, even if not in own dialect

Discussion

Sóller: Alternating paradigms?
Alternating paradigms are more costly unless in own dialect
Non-alternating paradigms are easier even if not in own dialect

- Sóller variant: alternating
- Palma variant: non-alternating

Sóller speakers not hindered by alternation in own dialect
Efficiently process alternating and non-alternating forms

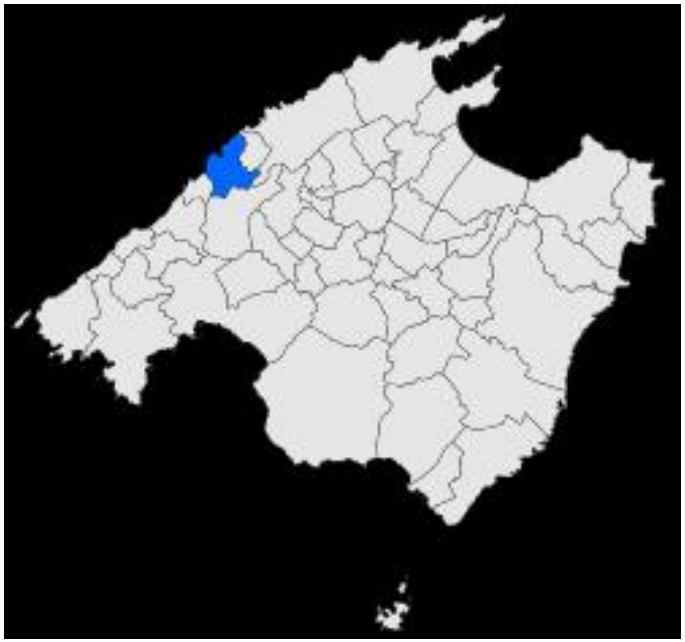
Discussion

Sóller: Dialect contact?
Unexpected priming of [o]-forms due to intensive contact

- Speakers from Sóller regularly commute to Palma
- only 14,000 inhabitants in village
- village recently open to intense contact

Sóller speakers store two forms in lexicon: own and foreign

Discussion



Sóller speakers store two forms in lexicon: own and foreign

Conclusion

Alternation processing strongly modulated by experience:

- The two groups effectively process their own dialectal form
- Sóller listeners also process the foreign form effectively. Why?
  - Advantage in accessing [o]-forms:
    - Phonology-to-orthography mapping (simplex)
    - Alternating paradigms (non-alternating)
    - **Experience with [u]-forms makes up for this advantage thus neutralizing the possible underlying difference**
  - Experience alone: Intensive dialect contact
    - No advantage for [o] forms
    - **Lexical access exclusively modulated by experience**