

‘Operation–approximant’ and how
they change identities: The
acoustics and perception of Spanish
labial and velar approximants

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The variants

▶ Velarization of /b/. E.g.

◦ /b/ > /g/

<u>



/g/urro ~ /g/urrito

<ue>



el a/g/uelo

<ui>



/g/uitre

Diachronic evidence

- ▶ Labial and velar obstruents changed to /w/ in Indo–European (Poultney 1963), Solomon Islands Melanesian (Ivens 1928, 1931)
- ▶ /w/ is realized as [v] or [β] before front vowels in: Chinese (Dow 1972), Hawaiian (Pukui 1965), Old Irish (Cowgill 1967), Kaiwa (Guarani) (Bridgeman 1961), etc
- ▶ The role of the acoustic similarity of back labials and velars in sound change has been discussed by Durand (1956) and Herbert (1975) and others

Purpose

- ▶ To investigate
 - The acoustic and perceptual motivations of the velarization of /b/
 - The social factors that influence the variation

Common phenomenon

- ▶ Diachronic evidence
- ▶ Present in first language acquisition
- ▶ Found in most Spanish dialects


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Unstable sounds

- ▶ Not all sounds are similarly prone to change in a given language. Some sounds such as /b/ tend to be more susceptible to change than others under certain conditions.
 - An important question to address is *why* some sounds are more unstable than others. And, in the case of /b/, why it turns into /g/ and not say /d/.
- ▶ This study contributes to the understanding of speech perception and natural speech development
- ▶ Provides further evidence of language variation.

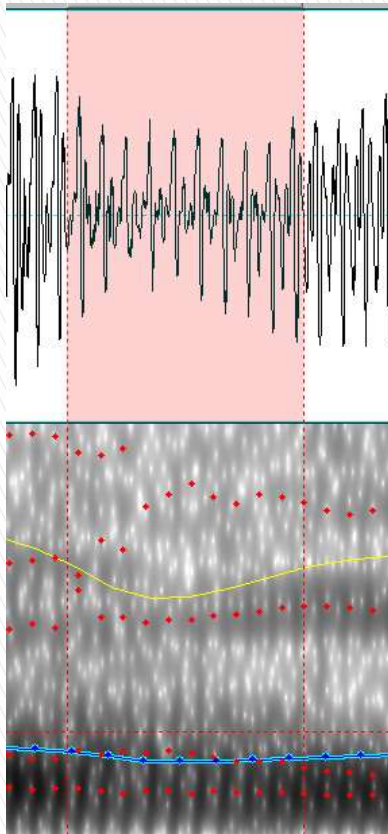
Evolutionary Phonology

- ▶ Common sound patterns typically result from common phonetically motivated sound changes (Blevins 2004:23)
 - ▶ They have principled diachronic explanations
 - ▶ Diachronic developments are the result of the interaction of articulatory and perceptual processes of speech
 - ▶ Attempts to explain the majority of the world's recurrent sound patterns
 - ▶ Phonetic precondition of change: misperception
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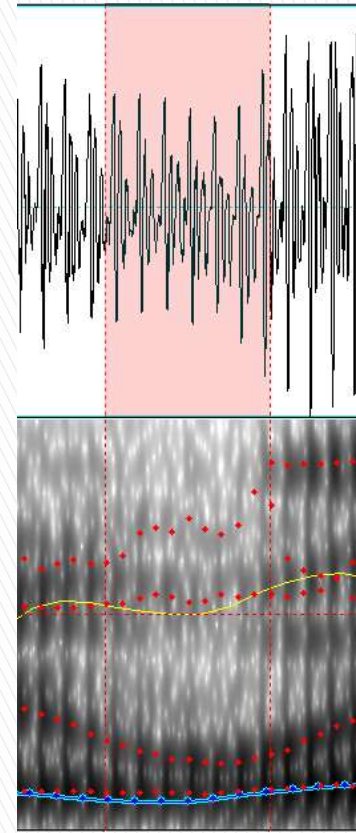
Ohala's theory of sound change (1989, 1993)

- ▶ Variability can lead to misperception of the speech signal
- ▶ Misperception of the target sound is a changed pronunciation and a good candidate for sound change
 - Similar sounds like /b/ ~ /g/ tend to be misperceived

“what looks similar to the eye in these displays will sound similar to the ear and thus be subject to confusion” (Ohala 1989:183)




a β u elo



ver γ ü enza


Research questions

1. Why /b/ becomes /g/? What are the acoustic and perceptual motivations of this change?
 2. How is this velarization transmitted in the community. What social (social class or education) and linguistic factors (phonetic environment, stress, position in the word) influence this variation?
 3. Does the performance in production mirror the performance in perception experiments?
 4. Does the performance in experiments match the performance in sociolinguistic interviews?
 5. What is the influence of literacy on the mental representation of sounds?
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Hypotheses

- ▶ The motivations of this variation
 - Acoustic similarity between labial and velar approximants
 - Confusion that arises in the context of round vowels such [u] is due to co-articulation.
- ▶ The velarization of /b/ is more frequent in the lower stratum of the population due to low level of education. Orthography helps to clarify ambiguous speech signals


Data collection

- ▶ Sociolinguistic interviews
 - ▶ Production experiments
 - ▶ Perception experiments
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Internal factors

- ▶ Internal
 - Following vowel
 - Preceding vowel
 - Stress
 - Stressed
 - unstressed
 - Position
 - Initial
 - Medial

External factors

- ▶ Age
 - 16–33 young
 - 34–65 adult
 - 66– older
 - ▶ Education
 - High: secondary and beyond
 - Low: primary complete or incomplete
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Participants

- ▶ 4 young male speakers of Caa Cati – Argentina
- ▶ Education
 - 2 literate
 - 2 illiterate

Production test

- ▶ Picture naming task to elicit target words
 - What's happening here?



Acoustic measurements for /b/ and /g/

- ▶ Formants in the middle of the consonant
- ▶ Formants in the beginning and middle of the following vowel
- ▶ Relative intensity
- ▶ Normalized duration





measured with Praat / exported to Excel

Perception test

▶ A X Discrimination task

Are they the same or different?

- = if they are the same
- ≠ if they are different

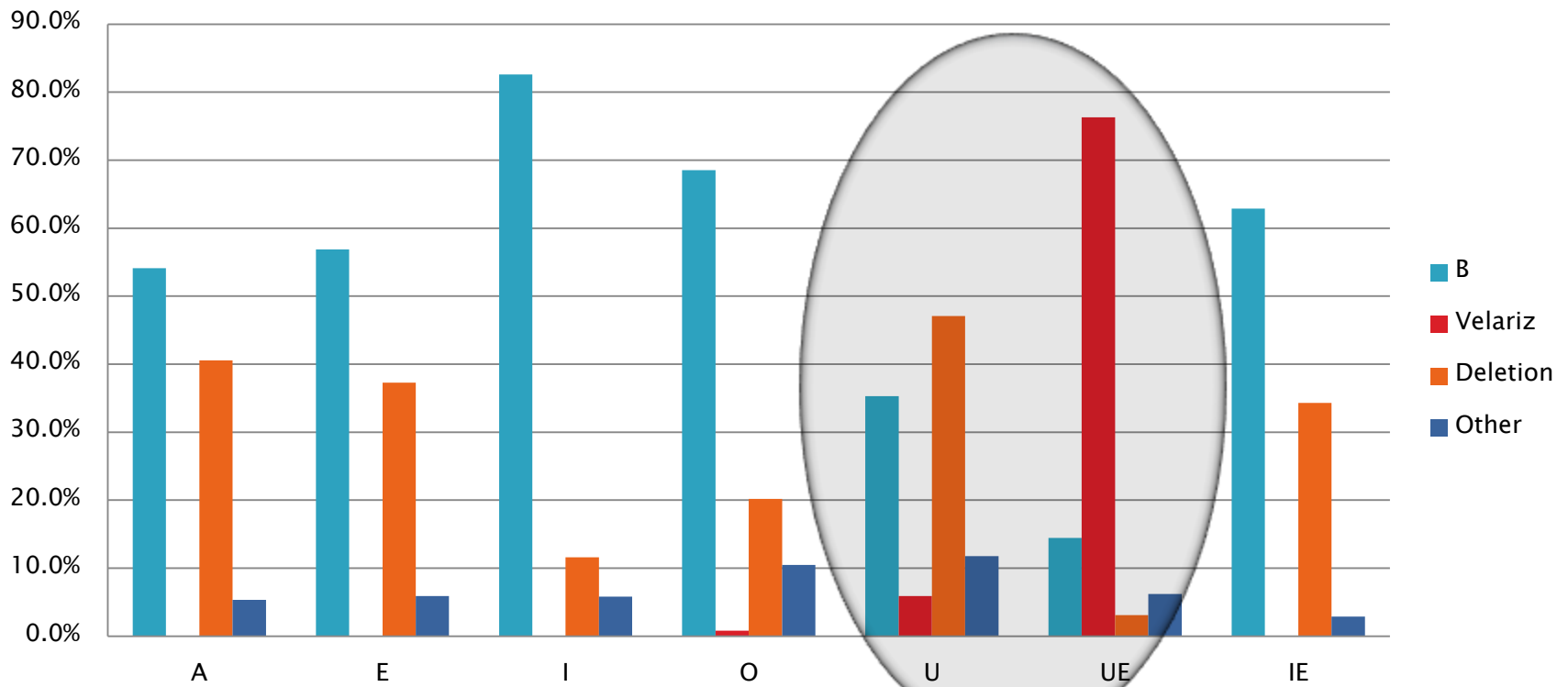
	=	≠
1. 		
2. 		
3. 		
4. 		

Results interviews

Interviews

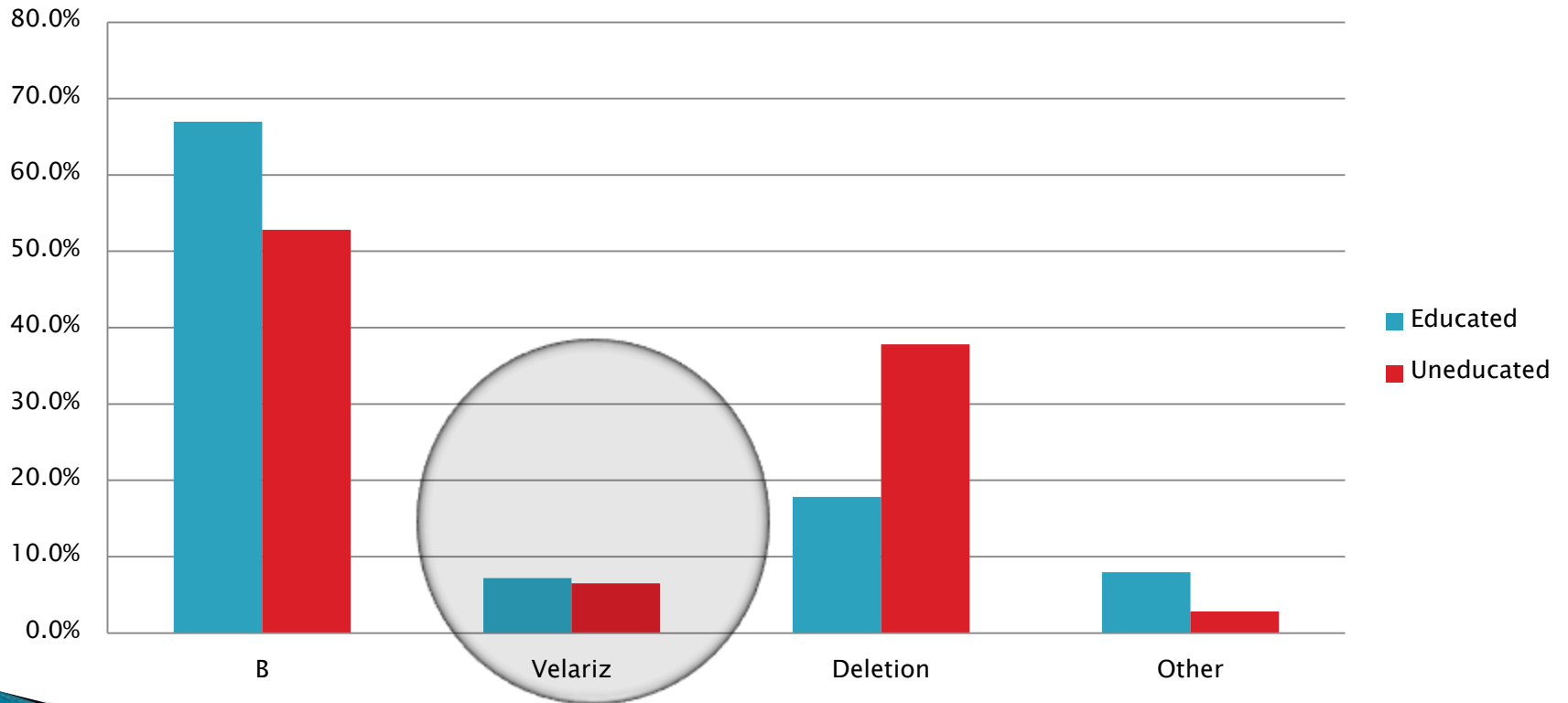
1099 tokens

Rate of /b/ velarization Following context



Influence of literacy

Rate of /b/ velarization Literacy

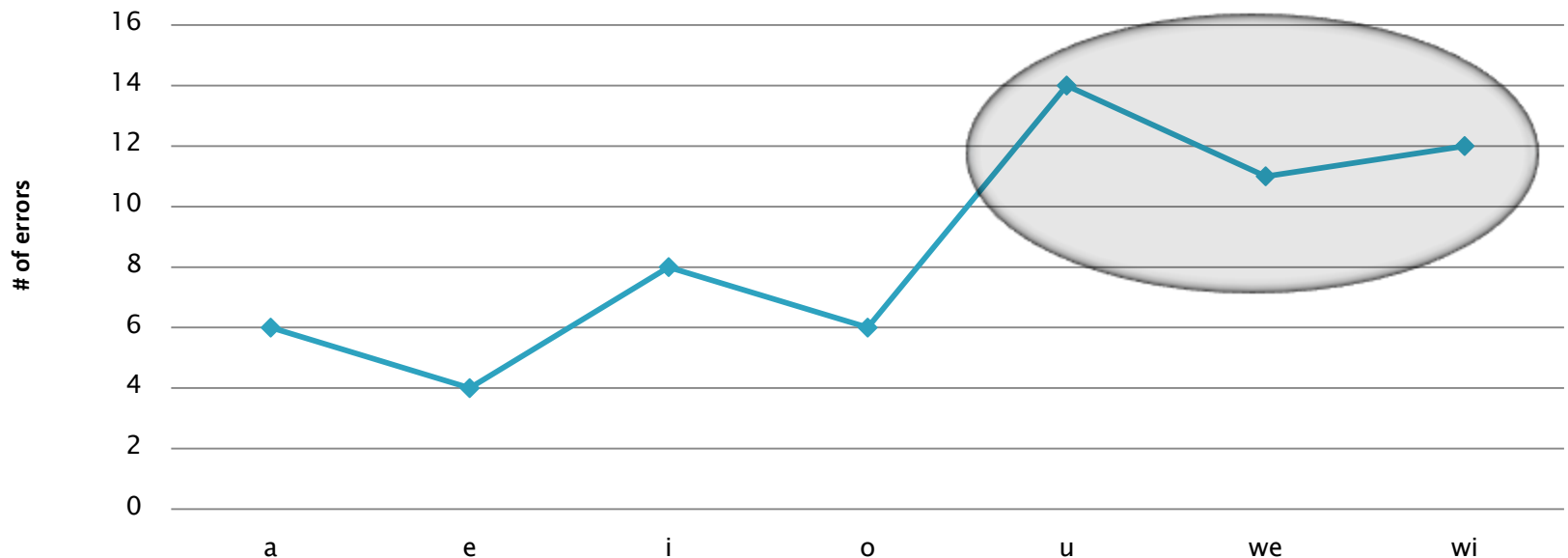


Results perception



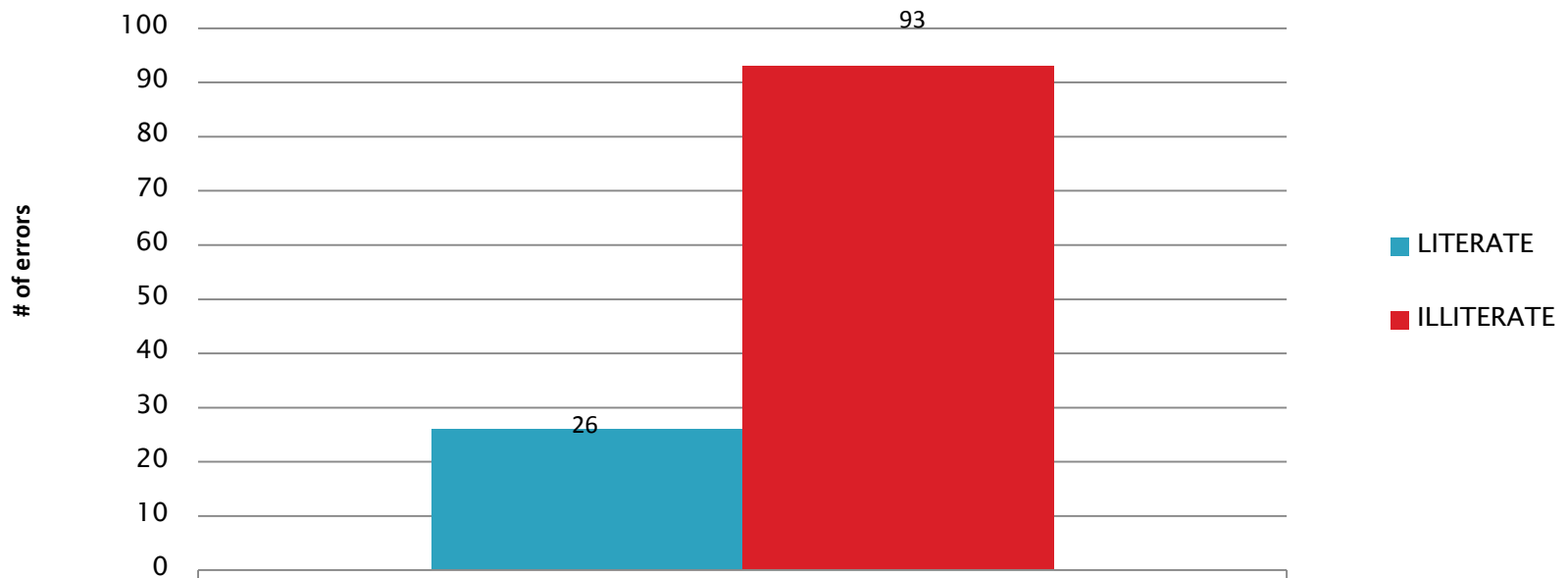
Discrimination of /b/ and /β/

Number of errors according to following vowel/diphthong



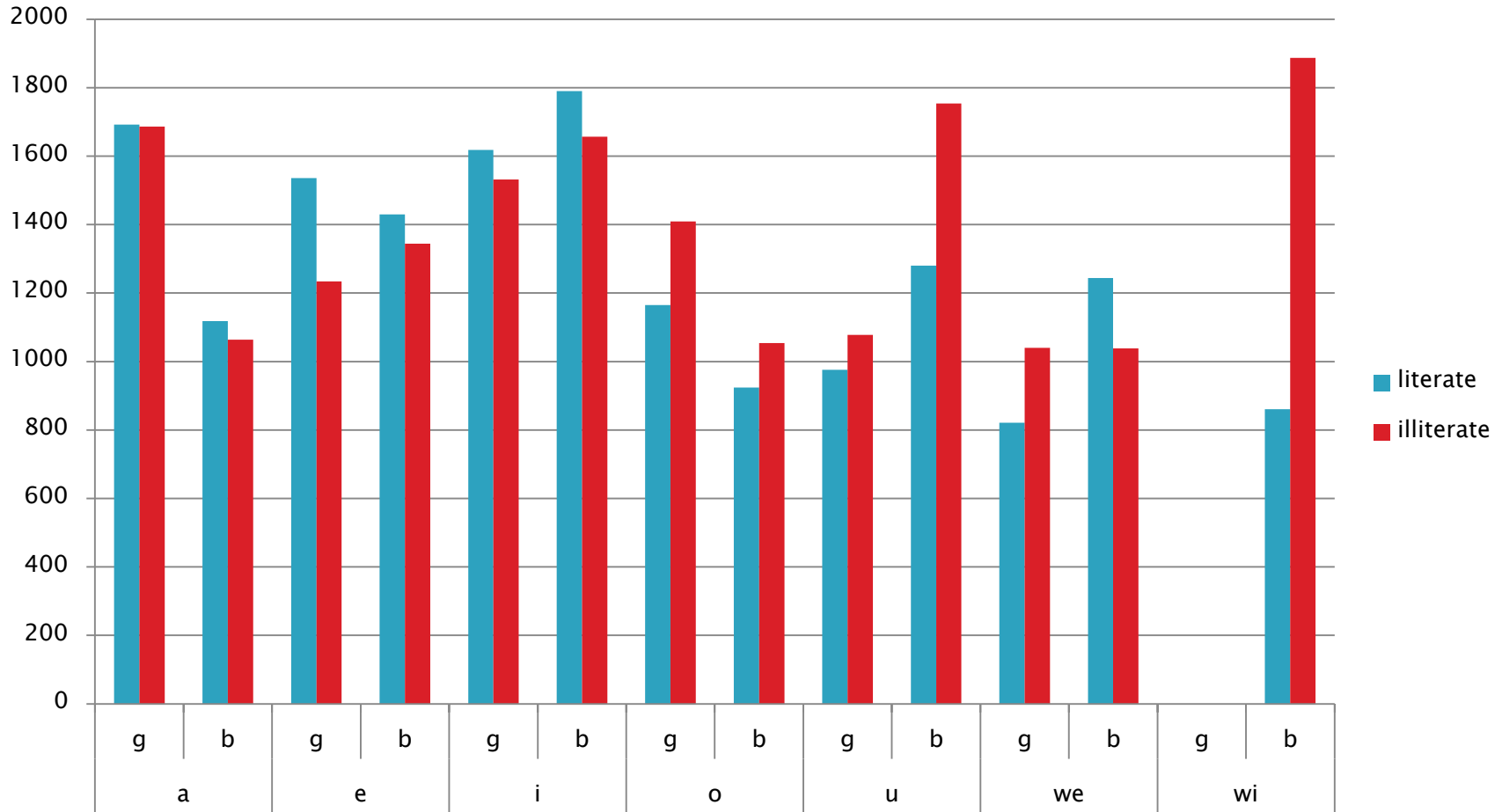
Group results: literate vs. illiterate

Number of discrimination errors according to literacy



Results production

Similarity between /b/ and /g/ – literate vs. illiterate



Similarity between /b/ and /g/ – literate vs. illiterate

▶ Illiterate

- /b/e – /g/e
- /b/i – /g/i
- /b/we – /g/we

- T-test: ba – ga

▶ Literate

- /b/e – /g/e
- /b/i – /g/i
- /b/u – /g/u

- T-Test: ba-ga
bu-gu

Problem: fewer tokens with /we/ /wi/

Discussion

Does the performance in the interviews mirror the performance in production and perception experiments?

▶ Interviews

- More velarization with /u/, /we/ and /wi/
- Literacy is **not** relevant
- Variation from below
- More deletion in illiterates


▶ Perception experiment

- More errors with following /u/ and /we/ /wi/
- Literacy **is** relevant


▶ Production experiment

- Differences in F2 of /b/ and /g/ in educated and uneducated groups in /u/ and /wi/


Conclusion

- ▶ Less discrimination errors in literate speakers
 - ▶ Literacy blocks the development of this natural sound change
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Drawback in analysis approximants

- ▶ Difficult to discriminate /b/ from /g/ in interviews (w/o visual cue)
 - ▶ Difficult to measure
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Future move ...

- ▶ Include analysis of /b/ & /g/ deletion
 - ▶ Separate stressed & unstressed (more tokens)
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