Context-dependent perception of geminates

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Summary

Geminates in different contexts (defined in terms of word position and adjacent segments) are not evenly distributed cross-linguistically. Intervocalic geminates are the most common and non-vowel-adjacent geminates are the most rare. I provide experimental evidence that this typological pattern has some basis in perception: the geminate-singleton contrast is easiest to perceive in the intervocalic context and hardest in the non-vowel-adjacent environment.

Background

Geminates:
- long consonants
- 1.5-3 times as long as singletons

Many languages use consonant length contrastively:
- [bella] vs. [bela] ‘beautiful’/‘I bleat’ (Italian)
- [tsaka] vs. [taka] ‘fireplace’/’back’ (Finnish)

Geminates & context:
- intervocalic
- single-vowel-adjacent
- non-vowel-adjacent

Context & typology:
- Cross-linguistically
- Implicational universal

Proposal

Perceptually-based contextual markedness hierarchy of geminates:
- non-vowel-adjacent > single vowel-adjacent > intervocalic

Experiment 1 - Acoustics

Purpose: Investigation of the acoustic properties of geminates in different contexts

Recordings:
- 4 conditions
- Position in a word
- Following segment: V or C

Experiment 2 - Perception

Hypothesis: If the markedness hierarchy of geminates has some basis in perception, the geminate-singleton contrast should be the easiest to hear in the intervocalic context and the hardest to hear in the non-vowel-adjacent context.

Method:
- AX discrimination task: Measuring sensitivity to the geminate-singleton contrast in 4 conditions: medial+V, medial+C, initial+V, initial+C.
- Participants listened to ‘same’ (e.g., [assa]~[assa]) and ‘different’ (e.g., [asssa]~[asa]) word pairs.

Stimuli:
- Built using tokens recorded in experiment 1. For each condition, tokens were selected as follows:
  - 10 tokens where the duration of fricatives approximated mean duration
  - 10 tokens where the duration of vowels approximated mean duration
- In order to ensure that participants paid attention to the fricatives and not to the vowels, all the vowels were spliced. Different combinations of spliced vowels and fricatives were created in the following way:
  - Splicing the vowels out: [asss] [asas]
  - Creating test pairs with different vowel-fricative combinations: [asss] ~ [ssas]
- In order to control for random variation between tokens, 40 different vowel-fricative combinations were created. Each participant heard 4 of them.

Participants:
- 80 undergraduate students with no previous exposure to a geminate-singleton contrast (native English speakers)

Results:
- A-prime score calculated for each subject and each condition
- A significant main effect of context [F(3,237)=28.3; p<.001]
- No effect of spliced vowels [F<1]

Subjects’ sensitivity to the geminate-singleton contrast increased along the markedness scale:
- initial+C > medial+C, initial+V > medial+V
- This result supports the hypothesis that the geminate markedness scale is based in perception.
- Increased duration of marked geminates might be an attempt to compensate for their lesser perceptibility, but it is not enough to overcome the difference in perceptibility between the contexts.

Conclusion

The results of the present study provide support for the perceptual basis of the contextual markedness hierarchy of geminates:
- non-vowel-adjacent > single vowel-adjacent > intervocalic

Non-intervocalic geminates are marked because they are perceptually less salient.
Factors that diminish the perceptibility of geminates:
- non-medial word position
- adjacency to consonants