Prosodic constituency and boundary scope in Italian: An articulatory and acoustic study

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INTRODUCTION

Prosodic phrasing & articulatory/acoustic variation:

- Gestures get larger, longer and further apart at phrase edges [1, 2, 3]
- The effect is incremental for larger/stronger boundaries.
- Much is known about phrase-initial gestural adjustments, less for phrase-final ones, especially for Romance languages.
- Temporal scope of acoustic right-boundary effect might go back to the rime of the stressed syllable [4]
- Articulatory. [5] found longer preboundary C closing and opening movement and longer time-to-peak velocities even when C is not immediately adjacent to the boundary because of intervening final vowel (“sod joking”)
- In Italian:
  - Closing/opening movements are larger and less stiff for stressed/accented than unstressed syllables [6]. What about preboundary effects? Is there an effect of vicinity to preceding stressed syllable?
  - Acoustic evidence on Neapolitan suggested the existence of three levels of phrasing. Intonation phrase (IP) > intermediate phrase (ip) > Accents phrase (AP) [7], in both questions and statements. Are these prosodic levels reflected in articulatory variation?

The π-gesture framework

Prosodic events (such as phrase boundaries) have a temporal interval of activation, similar to constriction gestures [3]. This predicts that:

- Strength of activation of π-gesture will be correlated with slowing down of constriction movements
- Stronger prosodic boundaries are associated to stronger π-gesture activation
- Boundary effects should be local (tied at the boundary, [7])

HYPOTHESES

1. Incremental effect of prosodic phrasing:
   - Labial constriction movement for preboundary C will have longer duration, greater amplitudes, longer peak-to-peak intervals and slower velocity when preceding a stronger boundary
   - Acoustic pre-boundary lengthening will cumulatively increases with prosodic boundary strength

2. Effects of prosodic phrasing on articulatory and acoustic variation are local and thus independent of pitch accent position

3. Similar prosodic phrasing effects in both question and statements

RESULTS

ACOUSTICS

- Preboundary vowels are longer in IP>ip>AP>syll
- Independent of stress position and sentence type

KINEMATICS

- Final onset consonants do not lengthen
- Stressed vowel is longer in IP>ip>AP, but only for penults

CORPUS

<table>
<thead>
<tr>
<th>Boundaries</th>
<th>Stress types</th>
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<tbody>
<tr>
<td>IP</td>
<td>Preboundary C closing</td>
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<td>AP</td>
<td>Final onsets</td>
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<td>Word-final syllable</td>
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<td>Penultimate</td>
<td>Antepenultimate</td>
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<tr>
<td>Penultimate</td>
<td>Antepenultimate</td>
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DISCUSSION

- The acoustic results show a clear preboundary lengthening for the word final vowel from the lowest levels (AP/syll) to the highest prosodic levels (IP and IP), but no difference between smallest levels (AP and syll). Onset consonants, on the other hand, do not show a comparable lengthening effect.
- Lengthening is strongest in the final syllable, though an incremental effect is also found on the stressed syllable (as for English, cf. [4]), though this is true only when the stressed syllable is very close to the boundary, i.e. one syllable away (i.e. in penultimate but not antepenultimate syllables).
- The kinematic temporal results show a lengthening pattern for the closing movement of the preboundary labial consonant, as well as for time-to-peak velocity and displacement of the same, independently of vicinity to the stressed syllable (i.e. equal effect for penult and antepenult syllables).
- On the other hand, the closing labial movement of stressed syllables (being further away from the boundary) does not vary according to boundary strength.
- Statistical analysis showed mixed evidence for 2 or 3 levels of phrasing, in both QS.

CONCLUSION

- As predicted by the π-gesture hypothesis, closing labial movements of preboundary consonant show temporal prosodic effects despite not being immediately adjacent to the juncture (one segment away).
- The temporal effects are incremental, being stronger for boundaries higher in the prosodic hierarchy. Similar but weaker evidence for spatial data.
- The effect does not extend to the closing movements of stressed syllable, neither for penultimate nor for antepenultimate stress.
- Need to extend data analysis to other speakers and segmental types.

REFERENCES