The contribution of alignment, duration and scaling to the perception of contrastive focus in Catalan, Italian and Spanish

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\textit{Tone and Intonation in Europe (TIE4)}
Road Map

- Introduction
- Goals
- Methodology and results in production
  - Alignment
  - Duration
  - Tonal scaling
- Methodology and results in perception
  - Gating
  - Identification
- Conclusions
There seems to be a crosslinguistic tendency to express narrow contrastive focus (CF) through the use of retracted and higher pitch peaks (Estebas-Vilaplana 2000 for Central Catalan; Beckman et al. 2002 for Spanish; Smiljanic 2004 for Serbian and Croatian; Manolescu et al. 2009 for Romanian).
Effort Code’s prediction (Gussenhoven 2002):

- “Increases in the effort expended on speech production will lead to greater articulatory precision, but also a wider excursion of the pitch movement. [...] A frequent interpretation is that the speaker is being forceful because he believes the contents of his message are important, an informational meaning”.
- “Peak delay can therefore be used as an enhancement of, or even a substitute for, pitch raising”.

![Graph of pitch vs. time with peak delay and raised pitch highlighted]
In Catalan (Prieto et al. 2005) and in Castilian Spanish (De-la-Mota 1995; Nibert 2000; Face 2001; Hualde 2002, 2003), broad focus (BF) accents have late peaks (L+H*) while narrow contrastive focus (CF) accents have earlier f0 peaks (L+H*).
According to De-la-Mota (1995, 1997) and Face and Prieto (2007), a post-focal pitch reduction or a higher f0 peak height can be found in CF utterances.
A similar contrast is found in the varieties of Italian spoken in Pisa (Gili-Fivela, 2002, 2005, 2006, 2008) and Lecce (Stella and Gili-Fivela, 2009): as for Lecce Italian, pitch accents found in BF sentence initial position, both prenuclear and nuclear, have late peaks (L+H*), while accents found in CF have earlier f0 peaks (H*+L).
Moreover, in Pisa Italian the nuclear BF accent is higher in f0 (against the prediction of the Effort Code) and duration is greater for syllables bearing the CF accent (Gili-Fivela 2005, 2006).
Goals

○ Since Romance languages show variation in their use of pitch alignment, pitch range increase, and longer vowel duration in distinguishing between BF and CF (Face 2002 and De-la-Mota 1995 and 1997 for Spanish; Frota 2010 for European Portuguese; Manolescu et al. 2009 for Romanian; Marotta 1985 among others for Italian):

  ● **Goal 1**, to find out the specific contribution of tonal alignment, duration and tonal scaling to the expression of CF in CAT, IT and SP.
    - How can the Effort Code (informational interpretation) be inferred?
  ● **Goal 2**, to contribute to the understanding of the principles and variation of Romance intonation.
Methodology: production

- **Goal**: to compare the production of BF and CF in CAT, IT and SP.

- **Participants**: 5 native speakers of Majorcan Catalan, 5 for Leccese Italian and 5 for Madrid Spanish.

- **Context**: visually presented and elicited by means of question-answer pairs.

- **Targets**: 5 sentences x 2 focus types x 2 stress positions x 3 repetitions x 5 speakers = 300 sentences per language.
## Methodology: production (material)

<table>
<thead>
<tr>
<th></th>
<th>BF</th>
<th>CF</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT</td>
<td>Què t’han dit? <em>Que na Marina vendrà demà.</em></td>
<td>Na Tina? No, na MARINA vendrà demà.</td>
</tr>
<tr>
<td>IT</td>
<td>Cosa ti hanno detto? <em>Che la Melania verrà domani.</em></td>
<td>La Tina verrá domani? No, la MELANIA verrà domani.</td>
</tr>
<tr>
<td>SP</td>
<td>Qué te han dicho? Que Marina vendrá mañana.</td>
<td>Tina? No, MARINA vendrá mañana.</td>
</tr>
</tbody>
</table>
Methodology: production (measurements)

- H distance to the end of the accented syllable
- H height
- Duration of accented syllable
Results: production (H distance to the end acc. syll.)

Effect of focus type on H distance to the end acc. syll:

- CAT: p < .001
- IT: p < .01
- SP: p < .01

(General Linear Model, univariate)
Results: production (duration)

Effect of focus type on duration of the acc. syll:

- CAT: p > .05
- IT: p < .01
- SP: p > .05

(General Linear Model, univariate)
Results: production (H height)

Effect of focus type on H height:
p > .05  p < .05  p > .05
(General Linear Model, univariate)
Results: production (summary)

- **H distance to the end acc. syll.**: statistically significant in the 3 languages (more retracted peaks in CF).

- **Duration of the acc. syll.**: statistically significant only for IT (longer syllables in CF). There is a tendency in CAT and SP to express CF by means of longer syllables.

- **H height**: constant only for IT (lower H in CF), variability between speakers in CAT and SP (tendency to higher H).
  - IT goes against the prediction of the Effort Code confirming previous findings for Pisa Italian (Gili-Fivela 2005, 2006)\(\Rightarrow\)rising-falling accent is perceptually salient.
    - The complexity of the tonal movement prevents any increase in the height of the peak.
Methodology: perception

- **Goals:**
  - To find out the *specific contribution* of each parameter in perception,
  - To test whether there is a *direct correlation* between production and perception.

- **Participants:** 20 native speakers of Majorcan Catalan, 20 for Leccese Italian and 20 for Madrid Spanish.

- **Tasks:** gating and identification task (taking RT measurements) by means of E-prime (Psychology Software Tools Inc., 2009).

- **Tokens:**
  - Gating (2 sentences x 4 conditions x 6/7 gates x 5 blocks = 240/280 tokens).
  - Identification (7 steps x 4 conditions x 5 blocks = 140 tokens).
Methodology: perception (gating)

<table>
<thead>
<tr>
<th></th>
<th>CAT</th>
<th>Na Ma- (3/4)</th>
<th>Na Mari- (final)</th>
<th>Na Marina (1/2)</th>
<th>Na Marina (final)</th>
<th>Na Marina vendrà demà</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT</td>
<td>La Mela- (1/2)</td>
<td>La Mela- (3/4)</td>
<td>La Mela- (final)</td>
<td>La Melania (1/2)</td>
<td>La Melania (final)</td>
<td>La Melania verrá domani</td>
</tr>
<tr>
<td>SP</td>
<td>Ma (3/4)</td>
<td>Mari- (final)</td>
<td>Marina (1/2)</td>
<td>Marina (final)</td>
<td>Marina vendrá mañana</td>
<td></td>
</tr>
</tbody>
</table>

“Normal” or “correction” declarative?

BF }/ CF<br>alignment | duration | scaling
BF }/ CF<br>alignment | duration | scaling
BF }/ CF<br>alignment | duration | scaling

Praat (Boersma and Weenink 2010)
Results: gating (ALI and ALI+DUR)

(Effect of the manipulated parameter on the subject responses, General Lineal Model-univariant)
Results: gating (ALI+SCA and ALI+SCA+DUR)

(Effect of the manipulated parameter on the subject responses, General Linear Model-univariate)
Methodology: perception (identification)

<table>
<thead>
<tr>
<th>CF → BF</th>
<th>alignment</th>
<th>duration</th>
<th>scaling</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF → BF</td>
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</tbody>
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“Normal” or “correction” declarative?

Praat (Boersma and Weenink 2010)
Results: Identification and RT

<table>
<thead>
<tr>
<th>ALI</th>
<th>ALI+DUR</th>
<th>ALI+SCA</th>
<th>ALI+DUR+SCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>p&lt;.001</td>
<td>p&lt;.001</td>
<td>p&lt;.001</td>
<td>p&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(General Lineal Model, univariant)
## Results: Identification (slope values-logistic regression)

<table>
<thead>
<tr>
<th></th>
<th>CAT</th>
<th>IT</th>
<th>SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALI</td>
<td>0.445</td>
<td>0.4</td>
<td>0.570</td>
</tr>
<tr>
<td>ALI+DUR</td>
<td>0.320</td>
<td>0.364</td>
<td>0.394</td>
</tr>
<tr>
<td>ALI+SCA</td>
<td>0.237</td>
<td>0.557</td>
<td>0.439</td>
</tr>
<tr>
<td>ALI+DUR+SCA</td>
<td>0.208</td>
<td>0.460</td>
<td>0.373</td>
</tr>
</tbody>
</table>
## Results: Identification and RT (boundary values and RT peak)

<table>
<thead>
<tr>
<th></th>
<th>CAT</th>
<th>IT</th>
<th>SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALI</td>
<td>2,67 / 2</td>
<td>3,86 / 4</td>
<td>1,61 / 4</td>
</tr>
<tr>
<td>ALI+DUR</td>
<td>3,24 / 3-5</td>
<td>4,06 / 3-6*</td>
<td>3,51 / 3-6</td>
</tr>
<tr>
<td>ALI+ALT</td>
<td>3,86 / 3-5</td>
<td>4,18 / 3-7</td>
<td>3,47 / 3-7</td>
</tr>
<tr>
<td>ALI+DUR+ALT</td>
<td>4,20 / 4*</td>
<td>4,02 / 3-5</td>
<td>4,22 / 3-5</td>
</tr>
</tbody>
</table>
Results: perception (summary)

- **Gating**: no need for the post-focal region to distinguish the two focus types
  - Italian listeners can recognize the focus type earlier (1/2 way through the syllable) than Catalan and Spanish listeners
  - While alignment seems to be a robust cue in production, it is the integration of the three cues what allows listeners to recognize the focus type even at the second gate.

- **Identification**: it is only with the combination of the three prosodic features that we obtain clear S-shaped curves.
  - Preferences? CAT: ALI+DUR+SCA; IT: ALI+DUR; SP: ALI+DUR+SCA.

- The results of production are highly correlated in perception (importance of Italian CF).
Conclusions

- The three languages use alignment, duration and scaling to distinguish between CF and BF:
  - Retracted peaks and longer syllables for CF accents in the 3 languages,
  - Higher peaks for CAT and SP CF accents but complex rising-falling accents as a substitute for a “salience” marker in IT (Effort Code).

- For a full understanding of how CF works in different languages, it is necessary to determine the perceptual role of the different cues involved in production.
References

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