Stress Clash Resolution in the Light of French corpora

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Stress Clash in French

• In French, **Stress Clash** is traditionally defined as the occurrence of **two adjacent primary accents**

  – Il ne dort pas [Verluyten 1982: 123]
  – Un beau vase [Rossi 1979: 15]
  – La fille a pris des haricots verts [Dell 1984: 84]
  – Un soulier noir [Martin 1987: 927]
Stress Clash in French

- Since they violate the alternation between weak and strong syllables, **stress clashes** tend to be **avoided**, as in many other languages

## Stress Clash Resolution in French

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beat insertion</strong></td>
<td>Silent pause: je n’étais pas apte</td>
</tr>
<tr>
<td></td>
<td>Schwa: Marc @ Blanc</td>
</tr>
<tr>
<td><strong>Beat deletion</strong></td>
<td>Stress shift: une journée chaude</td>
</tr>
<tr>
<td></td>
<td>Deaccenting: une journée chaude</td>
</tr>
</tbody>
</table>

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Martin [1987], Hoskin [1994]
Stress Clash Resolution in French

• In the literature, it has been claimed that Stress Clash Resolution (SCR) takes place in a different extent depending on the unit of the prosodic hierarchy the stress clash site is located
Stress Clash Resolution in French
prosodic level, predictions and previous studies

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<thead>
<tr>
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<th>Prosodic Level</th>
<th>Example</th>
<th>Predictions</th>
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<tr>
<td>Type I</td>
<td>within a single Clitic Group</td>
<td><em>ira-t-il nous ne répondons pas</em></td>
<td>SCR obligatorily applies</td>
</tr>
<tr>
<td>Type II</td>
<td>within a single PP</td>
<td><em>une vieille dame les mêmes villes</em></td>
<td></td>
</tr>
<tr>
<td>Type III</td>
<td>between two restr. PPs</td>
<td><em>une journée chaude un restau sale</em></td>
<td>SCR is optional</td>
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prosodic level, predictions and previous studies

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<tr>
<td>Type I</td>
<td>within a single</td>
<td><em>ira-t-il nous ne répondons pas</em></td>
<td>SCR</td>
<td>Not tested</td>
</tr>
<tr>
<td></td>
<td><em>Clitic Group</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type II</td>
<td>within a single <em>PP</em></td>
<td><em>une vieille dame les mêmes villes</em></td>
<td>SCR obligatorily applies</td>
<td>100%</td>
</tr>
<tr>
<td>Type III</td>
<td>between two <em>restr. PPs</em></td>
<td><em>une journée chaude un restau sale</em></td>
<td>SCR is optional</td>
<td>60%</td>
</tr>
</tbody>
</table>
Research questions

1. Are the results obtained in previous works dealing with SCR application in French still valid for non-laboratory speech?
2. Is stress clash resolution sensitive to regional/stylistic variation?
Material
Data

- **7-hour database**
  - 8 varieties of French (locales)
  - 8 speakers per locale (4m/4f)
  - 2 speaking styles (read/conv.) per speaker

- **Age** is a controlled variable
  - Locale (F (7, 48) = 0.214, n.s.)
  - Gender (F (1, 48) = 0.002, n.s.)
  - Locale*Gender (F (7, 48) = 0.117, n.s.)

Durand et al. [2009]; Avanzi et al. [2012]
Annotations

1. Orthographic transcription

2. Phonemic and syllabic alignment

3. Word segmentation and PoS Tagging

4. Prominences and disfluencies annotation

5. AP and IP segmentation

6. Clash sites identification

Fleiss [1973]; Avanzi et al. [2010, 2011]; Goldman [2011]; Christodoulides et al. [2013]
## Stress clash in the corpus

<table>
<thead>
<tr>
<th>Condition</th>
<th>Prosodic Level</th>
<th>Example</th>
<th>Nb. of sites</th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Read speech</td>
<td>Conv. speech</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type I</td>
<td>within a single CG</td>
<td>[ira-t-il] nous ne répondons pas</td>
<td>185</td>
<td>34.07%</td>
<td>111</td>
<td>32.55%</td>
</tr>
<tr>
<td>Type II</td>
<td>within a single PP</td>
<td>une vieille dame les mêmes villes</td>
<td>126</td>
<td>23.20%</td>
<td>107</td>
<td>31.38%</td>
</tr>
<tr>
<td>Type III</td>
<td>between 2 restr. PPs</td>
<td>une journée chaude la moyenne d’âge</td>
<td>232</td>
<td>42.73%</td>
<td>123</td>
<td>36.07%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>543</td>
<td>61.43%</td>
<td>341</td>
<td>38.57%</td>
</tr>
</tbody>
</table>
Stress clash in the corpus
acoustic analysis

• The **identification** of stress clash sites was semi-automatically coded in a dedicated tier

• The response **respect/violation** for SCR was obtained on the basis of the identification of prominences performed by the annotators of the corpus

• To ensure the annotations were reliable, an **acoustic analysis** of the data was conducted

• Measurements regarding **duration** and **F0** were calculated and retrieved automatically for each site of clash of the corpus.
Stress clash in the corpus
acoustic analysis – duration measurement

- Ratio Duration \( \frac{\text{Fin}_{\text{syll}}_{w1}}{\text{syll}_{w2}} \)
  - Calculated in ms

- Example
  - Young female speakers from Tournai (top) and Martigny (bottom), read speech
    - \text{Autour des mêmes}_{w1} \text{villes}_{w2}
Stress clash in the corpus
acoustic analysis – F0 measurement

- **Diff_F0_Vowel_fin_syll\_w1**
  - Difference between the last and first points of the vowel, calculated in semitones

- **Example**
  - Young female speakers from Tournai (top) and Martigny (bottom), read speech
  - Autour des mêmes\_w1 villes\_w2
Stress clash in the corpus
acoustic analysis – duration results

N = 884

SCR applies
SCR doesn't apply

Ratio duration $\frac{\text{Fin}_w}{\text{Fin}_S_{w2}}$
Stress clash in the corpus
acoustic analysis – F0 results

Difference F0 final vowel (st)

SCR applies
SCR doesn't apply

N = 479
Results
acoustic validation – summary

• Acoustic analyses confirm the annotation is reliable. Sites where SCR apply different prosodic cues compared with the sites where it does not apply

  – The **duration** of the last syllable of the first word of the clash is longer when SCRR does not apply than when the rule applies

  – Difference of **pitch movement** on the last syllable of the first word (rising when SCRR does not apply, falling when it applies)
Research questions

1. Are the results obtained in previous works dealing with SCR application in French still **valid** for **non-laboratory speech**?

2. Is stress clash resolution **sensitive** to **regional/stylistic variation**?
Analysis
Statistics

• **Generalized Estimated Equations** with repeated measures were run with the **speaker** as a **random** variable, the **SCRR (yes/no)** as a **dependent** variable, and the following predictors as **independent** variables:

  – **Locale**
    (8 varieties)
  – **Speaking style**
    (read, conv. speech)
  – **Condition**
    (Type I, Type II, Type III)
  – **Local articulation rate**
    (mean duration of the syllables of the IP hosting the stress clash site)
Results
locale

- No effect of locale
  - Locale is not implicated in any interaction

N = 884
Results

speaking style

• No effect of speaking style
  – speaking style is not implicated in any interaction

N = 884
Results

Effect of condition

- Condition is not implicated in any interaction

\( p < 0.001 \)

N = 884
Type I illustration

Short Clitic Group

Le premier ministre [ira-t-il]\textsubscript{GC} à Beaulieu
Produced by a Parisian female speaker, read speech

Long Clitic Group

[nous ne répondons pas]\textsubscript{GC} de la réaction […]
Produced by a Parisian male speaker, read speech
Type II illustration

SCR applies (70%)  SCR does not apply (30%)

euh ensuite euh école supérieure de jeunes [Adjective] filles [Noun]
Produced by a Geneva speaker, conv. speech

et c'était une vieille [Adjective] dame [Noun], elle avait dans sa main
Produced by a Nyon speaker, conv. speech
Type III

**SCR applies (71%)**

SCR does not apply (29%)

préparent une *journée*\(_N\) *chaude*\(_{Adj}\) au premier ministre

Produced by a Lyon male speaker, read. speech
Results

• Effect of condition (p < 0.001)
  - Condition is not implicated in any interaction

N = 884
Results
local articulation rate

- Effect of articulation rate
  
  \( p < 0.001 \)

  - articulation rate is not implicated in any interaction

\[ N = 884 \]
### Summary

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Discussion and Conclusion
Research questions

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Prosodic domain(s)

- **Phonological Phrase** is **not** the domain for SCR application
  - **Clitic Group** appears to be a more robust unit to predict SCR application
    - See also recent work on **liaison**
  - A monosyllabic PPs directly following another PP is not forbidden in French, even such a phenomenon is not that frequent (30%)
  - One can wonder whether the **position of the adjective** (before or after the lexical head of the NP) really has an impact on SCR, since no significant differences between Type II and Type III were found

Elordieta et al. [2003]; Durand & Lyche [2008]; Avanzi et al. [2013]
Research questions

1. In which prosodic domain(s) stress clash resolution obligatory apply?

2. Is SCR sensitive to regional/stylistic variation?
Regional/Stylistic variation

- SCR does not vary as a function of regional origin of the speaker, neither as a function of speaking style.

- Nevertheless, SCR appears to be sensitive to tempo: the faster the speaker articulates, the greater the chance for SCR not to apply.

Fougeron & Jun [1995]; Post [2011]
Perspective

• Future work should take into account:
  
  – The position within the **host IP** (prenuclear vs nuclear)
  
  – The **shape of the tones** (are the tones similar/different?)
  
  – The **morphological nature** of the items involved in the clash
  
  – The **frequency of the words** and their **colocation**
Perspective

Type II

j'ai eu une belle vie
un jeune membre
de grandes formes
il joue de la flûte
douce
Marc Blanc
Les travaux de ville

Type III

[Waveform and phonetic analysis information]
Thanks for your attention!
Aknowledgments

• This study was conducted with the help of Alice Bardiaux, Pauline Dubosson and Jean-Philippe Goldman
• Thanks to Elisabeth Delais for precious comment
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