Temporal Coordination and Markedness in Moenat Ladin Consonant Clusters

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References & Poster

1. Overview

A study of Moenat Ladin word-initial consonant clusters:

- ***Question: Why are SCl- clusters in Moenat exceedingly rare despite SC-, Cl-, Cr-, and SCr- being well-formed?***

- **Key contributions:**

1) Experimental evidence that word-initial S before C is external to the syllable onset.
2) Analysis of exclusion of SCl- as a threshold effect in Harmonic Grammar (HG) from combined markedness of onset-external S and a Cl onset.

2. Background: Ladin Clusters

Ladin is a threatened minority Romance language.
Moenat is the variety spoken in Moena (Trentino, Italy).[1]

1) Moenat word-initial clusters include:

- **SC**, **Cl**, **Cr**, **SCr** (S = sibilant, C = stop, exx. with [p, b] below)
- **SCl** is exceedingly rare.

SC	[ʂpuˈdar]	'to spit'	[ˈʐbiɔfa]	'foam'
Cl	[ˈplɔta]	'plate'	[blɔk]	'block'
Cr	[pra]	'meadow'	[bratʂ]	'arm'
SCr	[ʂprigoˈlar]	'to frighten'	[ʐbriˈon]	'scratch'

2) Markedness in clusters:

- In closely-related Italian, S in a word-initial SC cluster is external to the syllable onset.[2], [3], [4] Onset-external S is plausibly marked.
- /l/ is more marked than /r/ in second position of an onset.[5]

3) Hypothesis: The combination of onset-external S with a Cl onset gives rise to a markedness threshold effect that SCl clusters exceed in contrast to SC, Cl, and SCr.

4) Prediction: SC clusters should show evidence of temporal coordination consistent with onset-external S.

3. Experiment

- Experiment using acoustic data to examine temporal coordination in Moenat clusters (following methodology of Durvasula et al.[6]).
- SC in syllable onset is expected to show a **C-centering effect** with respect to following V anchor (Fig. 1).
- Onset-external S is not expected to affect alignment of onset Cs, showing a **right edge effect** (Fig. 2).[4], [7], [8], [9]

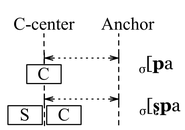

Figure 1

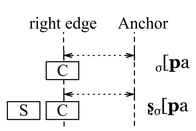

Figure 2

3.1. Design: Stimuli and Procedure

1) Stimuli

- Real and nonce words, 12 repetitions
  - 11 C ~ SC pairs: e.g. ˈpaka ~ˈʂpaka, ˈbamaˈ ~ ʐbama
  - 6 l ~ Cl pairs: e.g. ˈlaka ~ˈplaka, ˈlasa ~ˈglasa
  - 5 Cr ~ SCr pairs: e.g. ˈprita ~ˈʂprita, ˈbrama ~ˈʐbrama
- Frame: [dimo (ela) la ___ maria]
  - 'Say the _ Maria!'/ 'Say she _ Maria!'
- Recordings acquired and analyzed using Praat.

2) Participants: 4 native speakers of Moenat (3 M, 1 F)

3) Measurements

- **Acoustic landmarks**
  - midpoint of each consonant
  - an anchor (end of the following vowel)
- **Right edge**: midpoint of rightmost consonant
- **C-center**: average of midpoints of consonants in a cluster
- **Calculation** (see Fig. 3)**:**
  - Right-to-anchor duration (R-to-A)
  - Center-to-anchor duration (C-to-A)

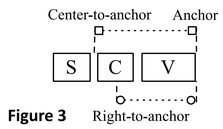

Figure 3

3.2. Analysis

- The **Relative Standard Deviation (RSD)** of C-to-A duration and R-to-A duration was compared for each target pair (e.g. [ˈpaka] ~ [ˈʂpaka])[9], [10].
- The **smallest RSD** determines which duration is the most stable for that pair.
- Target comparisons:

(i) **C ~ SC**; (ii) **Cr ~ SCr**; (iii) **l ~ Cl**

- For (ii) Cr ~ SCr, C-to-A duration for Cr (Fig. 4) was compared with two C-to-A durations for SCr:
  - from C-center of all consonants in $S_1C_2r_3$ (Fig. 5), the alignment expected for syllable-internal S.
  - from C-center of C_2r_3 in $S_1C_2r_3$ (Fig. 6), the alignment expected for syllable-external S.

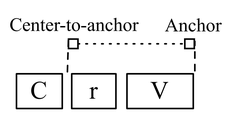

Figure 4

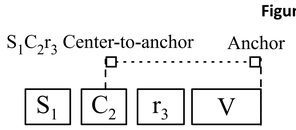

Figure 5

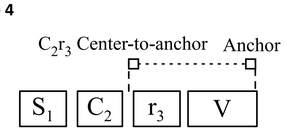

Figure 6

3.3. Results and Discussion

1) Results

- Pooled data across speakers:

- **a) C ~ SC: Right-edge effect**

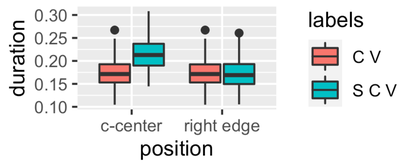

Figure 7. RSDs
R-to-A: 16.56
C-to-A: 18.54

- **b) Cr ~ SCr: Right-edge effect**

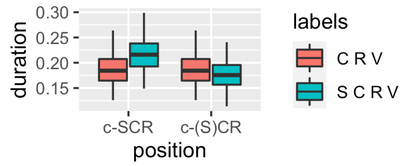

Figure 8. RSDs
SCr C-to-A: 16.54 (Fig. 5)
(S)Cr C-to-A: 15.65 (Fig. 6)

- **c) l ~ Cl: Mixed**
  - S5 + S6: **C-centering Effect**

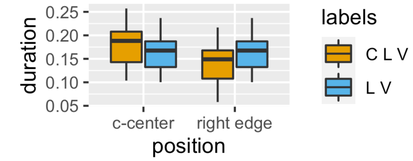

Figure 9. RSDs
R-to-A: 25.23
C-to-A: 22.12

  - S3 + S4: **Right-edge effect**

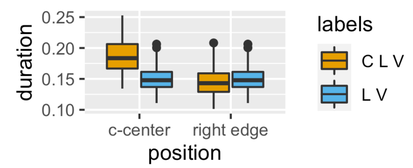

Figure 10. RSDs
R-to-A: 14.53
C-to-A: 18.09

2) Discussion

- The temporal alignment results suggest that:
  - **Word-initial S is external in SC and SCr clusters**.
    - ✓ Analyses across speakers show a clear right-edge effect for SC.
    - ✓ Most speakers show a right-edge effect for SCr compared with Cr (corresponding to Fig. 6).
  - Word-initial Cl can be syllabified as an onset by at least some speakers.
- **Cross-word syllabification effects?** The first consonant in a cluster could perhaps have formed a coda of [la].
  - Nevertheless, SC and Cl differ in potential for onset-hood.
  - Even with preceding [la], Cl showed alignment consistent with an onset for some speakers, but SC did not.
- **Proposal**: The lack of SCl- clusters arises through combined markedness of syllable-external S and an onset with /l/ in second position.

4. HG Analysis

1) Analysis of Phonotactics

- Word-initial clusters are subject to a **threshold effect**, implemented in HG.[11], [12], [13]

2) Constraints (AOV = assign one violation)

i. ***σ[SC:** AOV to tautosyllabic SC sequence.[14]
ii. ***σ[Cl:** AOV to a tautosyllabic Cl sequence.[5]
iii. **Parse:** AOV to a syllable-external segment.
iv. **MParse:** AOV to the null parse.[15]

Structure of analysis

- Parse and *σ[Cl each have a lesser weight than MParse, so that Sσ[CV and σ[ClV forms are permissible.
- But their ***combined*** weight exceeds the threshold of the weight of MParse, causing Sσ[ClV forms to be ruled out.

S in SC is onset-external:

w(*σ[SC), *w*(MParse) > *w*(Parse) (a ~ b/c)

	SCV	MParse	*σ[Cl	*σ[SC	Parse	
	w	*8*	*4*	*6*	*5*	***H***
☞ a.	**Sσ[CV**				1	*-5*
b.	σ[SCV			1		*-6*
c.	⊙	1				*-8*

- Same violation profile for SCr clusters, making onset-external S optimal: σS[CrV

Cl *can* form a complex onset (Fig. 9):

w(Parse), *w*(MParse) > *w*(*σ[Cl) (a ~ b/c)

	ClV	MParse	*σ[Cl	*σ[SC	Parse	
	w	*8*	*4*	*6*	*5*	***H***
☞ a.	**σ[ClV**		1			*-4*
b.	Cσ[lV				1	*-5*
c.	⊙	1				*-8*

SCl is not permitted:

w(*σ[Cl) + *w*(Parse) > *w*(MParse) (a ~ b)
w(*σ[Cl) + *w*(*σ[SC) > *w*(MParse) (a ~ c)
*2*w*(Parse) > *w*(MParse) (a ~ d)

	SClV	MParse	*σ[Cl	*σ[SC	Parse	
	w	*8*	*4*	*6*	*5*	***H***
☞ a.	⊙	1				*-8*
b.	Sσ[ClV		1		1	*-9*
c.	σ[SClV		1	1		*-10*
d.	SCσ[lV				2	*-10*

5. Conclusion

1) In this study,
   - we reported experimental evidence suggesting that word-initial S before C is external to the syllable onset in Moenat.
   - we provided an analysis of exclusion of SCl- as a threshold effect in HG.
2) The combined markedness account allows syllable-external S to interact with syllable-internal phonotactics.
3) Future work: Probe temporal alignment in Cl clusters by examining duration of the preceding vowel.