Combinative markedness in three-consonant clusters

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Properties of word-initial sibilant-obstruent (SC) clusters have given rise to proposals that the sibilant is external to an onset beginning with C and possibly the syllable that contains it (Goad 2011). An "external sibilant" is not expected to directly interact with syllable-internal structure. In this light, we examine restrictions in SC-liquid sequences, bringing to bear new data on phonotactic patterns in Moenat Ladin. SCr clusters are well attested in Moenat, but SCl clusters are not. For closely related Italian, phonological and phonetic evidence has been adduced in support of an external sibilant structure (Chierchia 1986, Davis 1990, Hermes et al. 2013); however, this raises the question of how the sibilant influences the potential for a post-C lateral. We propose an account where the C in an SCl cluster stands in two basic marked relations with each of its adjacent consonants. The C forms a shared locus of violation for a cumulative markedness effect, producing an indirect interaction between the sibilant and post-C lateral.

Data. Ladin is a threatened minority Romance language; Moenat is dialect of Ladin spoken in the Fassa Valley (Trentino, Italy). Moenat allows word-initial obstruent-liquid sequences (C-Liq), as illustrated in (1a) with clusters where C is a labial. (Data are from the authors' fieldwork.) A sibilant /ʂ, ʐ/ can combine with a following C or C-Liq. Examples of SC-Liq are given in (1b). Note that sibilants show voicing agreement with a following consonant. Two noteworthy properties emerge in clusters containing an obstruent. **First**, Cl is marked compared to Cr. Words with Cr onsets are about twice as frequent as those with Cl, based on a type frequency survey using the *Dizionario Italiano Ladino Fassano* (DILF) (2a). Note that clusters with a dental C are excluded because /tl/ and /dl/ are not possible. **Second**, in SCl clusters the effect is magnified: SCr clusters account for over 90% of all SC-Liq clusters in word-initial position (2b).

(1) Moenat word-initial clusters with a labial obstruent

a.	***word***	***transcription***	***gloss***	*b.*	***word***	***transcription***	***gloss***
	prà	[pra]	'meadow'		*sprigolar*	[ʂprigo'lar]	'to frighten'
	brac	[bratɕ]	'arm'		*sbrion*	[ʐbri'on]	'scratch'
	plota	['plɔta]	'plate'		*splendor*	[ʂplen'dor]	'splendor'
	bloch	[blɔk]	'block'		*sbl…*	not attested	
	freit	[freit]	'cold'		*sfrear*	[ʂfre'ar]	'to rub'
	flinch	[flink]	'sparrow'		*sflagel*	[ʂfla'dʒɛl]	'a large quantity'

(2) Type frequency in DILF: Word-initial C-Liq and SC-Liq

	Cluster with /r/	***Count***	***Cluster with /l/***	***Count***	***% Cr***
a.	Labial-/r/ (pr, br, fr)	566	Labial-/l/ (pl bl, fl)	261	68%
	Velar-/r/ (kr, gr)	70	Velar-/l/ (kl, gl)	35	67%
b.	Sibilant-Labial-/r/	85	Sibilant-Labial-/l/	4	96%
	Sibilant-Velar-/r/	45	Sibilant-Velar-/l/	8	85%

These patterns raise questions about the computation of markedness in SC-liq clusters such that a plausibly external sibilant affects the potential for a post-C lateral.

Analysis. Our claim is that the avoidance of SCl clusters arises as a cumulative markedness effect deriving from the interaction of markedness constraints over two-consonant sequences with independent motivation. The constraints in question are in (3). The obstruent "C" is common to both, bridging the influence of an external sibilant on the lateral in an SCl cluster.

(3) a. *Cl: Assign a violation to a tautosyllabic obstruent-lateral sequence.
b. *SC: Assign a violation to a sibilant-obstruent sequence.

*Cl derives support from Ladin (see (2)) and cross-linguistically. A historic sound change in Italo-Romance caused lenition of /l/ to [j] following an obstruent (Maiden 1995, Krämer 2009). This process is evidenced in Ladin, e.g. *spienza* 'spleen' < *splēn* (Latin), although Cl

clusters are attested in the present-day language. In Campidanese, the lateral in Cl clusters underwent rhotacization, e.g. *prus* < *plus* (Latin) (Frigeni 2009). Baertsch & Davis (2009) cite this as support for interpreting /l/ as more marked than /r/ in the second position of an onset.

*SC is similar to a constraint proposed by Coetzee (2004), which prohibits a tautosyllabic s+stop sequence. While position-sensitive versions of this constraint may be possible, we employ a more general, context-free version, because (i) evidence suggests that word-initial sibilants in Italo-Romance are parsed external to the onset, and (ii) we lack evidence that intervocalic SC clusters pattern differently in terms of phonotactic markedness, even though S might be parsed as a coda. The markedness of SC clusters can be understood in terms of consonant cuing in the sequence (Steriade 1999, Wright 2004): Formant transitions are absent following the S and preceding the C. OCP restrictions interacting with SC sequences in English morphemes provide cross-linguistic support (Davis 1991, Lamontagne 1993, Coetzee 2004).

We propose that *Cl and *SC combine to have effect beyond two-consonant clusters: They prevent SCl sequences. For purposes of illustration here, we use OT constraint rankings, though weighted constraints could be employed to fit gradience in the lexicon (Hayes & Wilson 2008). In the categorical OT analysis, Cr and Cl clusters are permissible in Ladin, as are SC and SCr clusters, but SCl sequences are excluded. We derive this asymmetry using constraint conjunction (Smolensky 1993, 1997, Itô & Mester 2003): *Cl&*SC. An SCl sequence incurs a violation of the conjunction, because it incurs violations of *SC and *Cl with loci that intersect at C (Lubowicz 2005), but nonoverlapping SC and Cl will not violate the conjunction.

The core of the analysis is exhibited in (4), with schematic forms. Although there are many conceivable repairs for a hypothetical SCl input, we demonstrate a hypothetical mapping of /l/ to [j], based on the historical pattern of lenition; this violates IDENT-IO[consonantal].

(4)

Input	Output	*Cl&*SC	MAX-IO	IDENT[cons]	*Cl	*SC
i. /ʂple/	→ a. ʂpje			1		1
	b. ʂple	1W		L	1W	1
	c. ʂpe		1W	L		1
ii. /ple/	→ a. ple				1	
	b. pje			1W	L	
iii. /ʂpe/	→ a. ʂpe					1
	b. pe		1W			L

Further details of the analysis are elaborated to address place and voicing interactions with markedness and frequency of SC and Cl, and combinative effects in SCl clusters in the lexicon.

An alternative approach analyzes SC as a complex segment in the onset, with branching place/stricture (Selkirk 1982, Lamontagne 1993). This structure bypasses problems of sonority sequencing and predicts SC voicing identity. However, in Ladin, this approach encounters duplication problems. First, sibilants show voicing assimilation with any following consonant, including sonorants (e.g. [ʐl̩iŋk] 'to throw away', [ʐmaus] 'butter'). It is unwarranted to analyze sibilant-sonorant sequences as complex segments: their components potentially differ in any feature besides [voice] or [cons]. Therefore, voicing assimilation in sibilant-consonant clusters must be independently enforced. Second, treatment of SC as a complex segment misses that the set of SC's in Ladin is precisely what would arise from every combination of a sibilant fricative plus obstruent stop or non-sibilant fricative, as derived in a cluster treatment.

Implications. This study proposes that phonotactic restrictions in three-consonant clusters in Moenat Ladin surpass a markedness threshold by incurring simultaneous violations of elemental constraints. Moenat phonotactics support a cluster analysis of SC. The shared locus of the medial C in the component constraints enables an interaction between an external sibilant and non-adjacent lateral. Beyond Ladin, we discuss extensions to other patterns where restrictions on X emerge in SCX triconsonantal clusters, as in Greek and English (Goad 2011).