



1. Overview

- New analysis of *Raddoppiamento fonosintattico* (1b) and *Gorgia Toscana* (1c) in Florentine in the framework of *Gradient Symbolic Representations*.
 - Unified explanation (strengthening ~ undershoot) for the different outcomes of a single underlying form: /k/ → [k], [k:], [x].
- (1) a. /in/ /'kasa/ 'in house' → [inj'ka:za]
 b. /a/ /'kasa/ 'at home' → [a'k:a:za]
 c. /la/ /'kasa/ 'the house' → [la'xa:za]
- One single analysis of these phenomena, considered as in competition (by any previous account).
 - Empirical adequacy: length of these derived segments (RF geminates ≠ lexical geminates).

3. The framework

- Gradient Symbolic Representations:** continuous, numerical weight ~ degree of activity or presence of a symbol in a linguistic representation (Smolensky & Goldrick 2016).
- Numerical gradient associated to input and output elements (Faust & Smolensky 2017, Zimmermann 2018).
- The constraints are weighted, not ranked.

4. The proposal

- The **phonological property of strength** is a correlate of the **phonetic length**.
- Strength is interpretable/visible on the segmental tier.
- The gradient activity of the **output** segments can be other than 1.
- Stress** brings into the representation some phonologically derived extra-activity that can be transferred from the suprasegmental tier to a segment.
- RF-geminates:** non-moraic consonants associated to a strength value greater than 1 ("more present" in the representation) → interpreted by the phonetics as long.
- Lenited allophones:** defective segments, weaker than default ("not canonically present" in the representation), due to undershoot → interpreted by the phonetics as non-occlusive and, consequently, as short.

$$(4) \quad /k/ \begin{cases} 1.5 \text{ — } [k:] & [\text{RF}] \\ 1 \text{ — } [k] & [\#-, C_-] \\ 0.7 \text{ — } [x, x, h] & [V_-] \end{cases}$$

6. Concluding remarks

- RF arises by associating extra strength to a segment; it is therefore related to the phonological representation of linguistic elements and its sole trigger is MAX(STR).
- Gorgia is a weakening process of postvocalic lenition that involves a decrease of strength, due to undershoot. Lenited allophones are phonologically defective segments.
- What is new: (i) the **competition** between these two phenomena and their complementary distribution, (ii) the representation of the derived segments based on the concept of **phonological strength** with a broader **empirical adequacy** than other approaches, (iii) a new contribution to the understanding of the division between **phonetics and phonology**.
- Possible further implementations: stressed vowel lengthening, the diachronic development of weak segments, synchronic variability of Gorgia, backward gemination, vowel deletion...

7. References

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2. The phenomena (Tuscan, Florentine)

Raddoppiamento fonosintattico (RF) (Chierchia 1983-86, Loporcaro 1997, Passino 2013)

Sandhi process, where the initial consonant of the word₂ in the string word₁-word₂ is lengthened if:

- (2) a. word₁ is an **oxytone**:
 /tʃi't:a/'kara/ 'dear town' → [tʃi't:a'k:ara] **Stress-driven RF**
- b. word₁ is an item of a **closed lexical class**, whose historically earlier form has a consonant in final position:
a, da, e, o, ma, né, tra, come, dove, qualche 'to, from, and, or, but, nor, between, how, where, some'
 /'kome/'va/ 'how are you?' → ['ko:me'v:a] **Lexical RF**

Gorgia ('Tuscan throat') (Kirchner 2000, Marotta 2006, 2008, Rammsammy 2017)

- Postvocalic consonant lenition:** gradient, continuous phenomenon, with areal and style-dependent variability.
- It targets primarily stops, but all consonants; word-internally and across word boundaries (intervocalic position or branching onset):

- (3) a. /la/ /'ko:sa/ [la'ko:sa] 'the thing' → [la'hɔ:sa]
 b. /la/ /'kre:ma/ [la'kre:ma] 'the cream' → [la'xre:ma]

*Asymmetry: word-internally, Gorgia is independent from stress; across word-boundary, it is only possible after non-stressed vowels. Why no lenition in (2a) *[tʃi't:a'xara]? ✓ Gorgia is in complementary distribution with RF.

The derived segments: evidence for strength

- RF-geminates are shorter than lexical geminates (47% vs 200% longer than the singletons) (Campos-Astorkiza 2014) and resemble singletons (Payne 2006) → **strengthening**
- Allophonic fricatives are: shorter than phonemic fricatives ([ɸ]= 51 ms vs [f]= 83 ms) (Soriano 2002) + shorter than non-lenited stops ([h]= 44 ms vs [k]= 88 ms) (Soriano et al. 2003) → **weakening**

5. The analysis

The constraints

- MAX(STR):** Assign z reward for every activity (x) that is present in the input and is associated to a segment in the output (y) (z = y).
- DEP(STR):** Assign z violation for every output segment that is associated with y strength and a corresponding input segment that is associated with x strength (z = y - x).
- REALIZE(STR):** assign z violation for every activity (y) that is present in the output but has no phonetic realization on an output segment (z = y).
- FULL!:** Assign z violation for every segment that has strength y < 1 in the output (z = 1 - y).
- ONE!:** Assign z violation for every segment that has strength y > 1 in the output (z = y - 1).
- ONE!-V#:** Assign z violation for every final vowel that has strength y > 1 in the output (z = y - 1).
- WEAK!-C-V₋:** Assign z violation for every post-vocalic consonant with strength y in the output (z = y).
- UNIFORMITY:** Assign one violation for each output segment that corresponds to more than 1 input segment.

The derivations

(5) **Gorgia:** *la casa* /la 'k_{0.7}asa/ → [la 'xa:za]

/la'k ₁ asa/	MAX(STR)	DEP(STR)	REALIZE(STR)	FULL!	ONE!	ONE!-V#	WEAK!-C-V ₋	H
weight	w=+20	w=-8	w=-30	w=-3	w=-2	w=-50	w=-30	
a. lak ₁ asa	1						1	-10
b. lak _{0.7} asa	0.7			0.3			0.7	-7.9

(6) **Stress-driven RF:** *città cara* /tʃi't:a 'k_{1.5}ara/ → [tʃi't:ak:a:ra]

/tʃi't:a ^{0.5} kara/	MAX(STR)	DEP(STR)	REALIZE(STR)	FULL!	ONE!	ONE!-V#	WEAK!-C-V ₋	H
weight	w=+20	w=-8	w=-30	w=-3	w=-2	w=-50	w=-30	
a. tʃi't:a ^{0.5} kara	2		0.5				1	-5
b. tʃi't:a ^{0.5} k _{1.5} ara	2.5	0.5			0.5		1.5	0
c. tʃi't:a _{1.5} kara	2.5	0.5			0.5	0.5	1	-10
d. tʃi't:a _{1.5} k _{0.7} ara	2.2	0.5		0.3	0.5	0.5	0.7	-7.9
e. tʃi't:a ^{0.5} k _{0.7} ara	1.7		0.5	0.3			0.7	-2.9

* The realization of strength overcomes the need for weak consonants.

(7) **Lexical RF:** *come va* /'kome 'v_{1.5}a/ → ['ko:me 'v:a]

/'kome ^{0.5} 'va/	MAX(STR)	DEP(STR)	REALIZE(STR)	FULL!	ONE!	ONE!-V#	WEAK!-C-V ₋	UNIF	H
weight	w=+20	w=-8	w=-30	w=-3	w=-2	w=-50	w=-30	w=-4	
a. 'kome ^{0.5} 'va	2		0.5				1		-5
b. 'kome ^{0.5} 'v _{1.5} a	2.5	0.5			0.5		1.5	1	-4
c. 'kome _{1.5} 'va	2.5	0.5			0.5	0.5	1	1	-14
d. 'kome _{1.5} 'v _{0.7} a	2.2	0.5		-0.9	0.5	0.5	0.7	1	-11.9

* The final root node corresponds to the final etymological consonant.

* RF-gemination is caused by associating to a segment some extra-strength that is originally associated either to an underlyingly weak segment or to the stressed syllable.