

The productivity of velar stop epenthesis in Spanish verbs

1. Overview Some, but not all, of the 2nd and 3rd conjugation Spanish verbs exhibit a [k] or [g] between the stem and the suffix in the 1SG.PRS.IND and all PRS.SBJC forms (e.g. [kres-k-o] ‘I grow’, yet not in [mes-o] ‘I rock’). The verbs with these added velar stops have traditionally been considered irregular because no exceptionless phonological generalization has been identified which can predict which verbs exhibit the velar alternation (Lloyd 1987). This analysis presents a corpus study of Spanish verbs which shows that there are few exceptions to the generalization that [k,g] are epenthesized after stems ending in [r,l,n,s] and before suffixes beginning with a back vowel in the 2nd and 3rd conjugation alone. It follows from application of the Tolerance Principle (TP; Gorman & Yang 2019) that k/g-epenthesis is productive, and that it is the forms without velar epenthesis which in fact are memorized.

2. The puzzle Most Spanish verbs are termed “regular” (Harris 1972), where inflectional suffixes are combined with stems. I follow Clahsen et al (2002) in defining stems as combinations of theme vowels and roots. The verbal paradigm for regular verbs is exemplified by the 2nd conjugation verb, [mes-er] - ‘to rock’, in the present indicative and subjunctive tenses in Table 1 below. Among verbs termed irregular is a class of verbs in the 2nd and 3rd conjugation where a velar stop ([k] or [g]) appears between the stem and the desinence in the 1SG.PRS. and all of the present subjunctive, as is the case with [kres-er] - ‘to grow’, which is also shown in Table 1 below:

Table 1: Examples of verbs with and without a velar stop before a suffix

	[mes - e - r] - ‘to rock’		[kres - e - r] - ‘to grow’	
	Pr. Ind.	Pr. Subj.	Pr. Ind.	Pr. Subj.
1sg.	mes - ∅ - o	mes - a	kres - k - ∅ - o	kres - k - a
2sg.	mes - e - s	mes - a - s	kres - ∅ - e - s	kres - k - a - s
3sg.	mes - e	mes - a	kres - ∅ - e	kres - k - a
1pl.	mes - e - mos	mes - a - mos	kres - ∅ - e - mos	kres - k - a - mos
2pl.	mes - é - is	mes - á - is	kres - ∅ - é - is	kres - k - á - is
3pl.	mes - e - n	mes - a - n	kres - ∅ - e - n	kres - k - a - n

Given the existence of these contrasting verbs, the puzzle is the following: why does the velar appear in some, but not all of these verbs? Harris (1972) argues that velars are inserted in a specific class of verbs that are lexically marked with a diacritic, essentially forming an irregular class. But this analysis is unexplanatory from a phonological perspective because it does not help us predict which verbs have a velar and which ones do not. I present a corpus analysis that shows that verbs with the epenthetic velar stop constitute a class, and that re-conceptualizing them as such provides the best framework to solve the puzzle.

3. The corpus analysis The corpus was first created by extracting all 1SG.PRS. verbs from the combined lexicons of LEXESP (Sebastián et al, 2001) and Unimorph (Christo et al, 2018), which amounted to a total of 6168 verbs. Then, I removed 1st conjugation verbs because they exhibit no velar alternation. With the remaining 2nd and 3rd conjugation verbs, I removed verbs with shared prefixes to avoid inflating the counts of any of the relevant verb classes. Following Harris (1985), I assume that only stems should be considered lexically distinct to the exclusion of stems with shared prefixes. Then, I removed verbs with stems that do not end in [r,l,n,s], given that the sonorant coronals and [s] are the codas that are most frequently permitted in coda position (Harris 1983), while other obstruents are attested only in “guarded speech” (Nuñez-Cedeño 2007). Within

the group of verbs ending in [r], I also removed two additional types: (1) those with mobile diphthongs, given that they are in complementary distribution with those that exhibit velar alternation (e.g. [muer-o]/*[muer-g-o] - ‘I die’); and (2) those that end in a consonant cluster, given that velar insertion is phonotactically ungrammatical in these contexts (e.g. [abr-ir]/*[abr-g-o] - ‘I open’)¹. The final corpus consists of 117 verbs in the 2nd conjugation, and 42 verbs in the 3rd. I then tabulated the number of verbs ending in [r,l,n,s] with and without the velar stops, shown in Table 2 below.

Table 2: Counts of alternations with and without velar stops

Total counts with a velar stop:	Total counts without a velar stop
-r,l,n,s+k/g+suffix: 131	-r,l,n,s+∅+suffix: 28

4. The results I used Charles Yang’s Tolerance Principle to determine if the class of verbs without a velar stop is predicted to be productive (Gorman & Yang 2019). The TP is based on two variable quantities: the total number of verbs which a rule could apply to, N , and the number of verbs which the rule does not apply in spite of the fact that they have a compatible phonetic environment, e (Gorman & Yang 2019). More specifically, the TP formula shown below is based on the following logic: if e is less than or equal to the threshold, θ_N , then a rule is said to be productive, or to generalize (Gorman & Yang 2019).

$$e \leq \theta_N = \frac{N}{\ln N}$$

Thus, to determine if the class of verbs with a velar stop is productive, the total number of non-first conjugation verbs with stems ending in [r,l,n,s], $N = 159$, is divided by $\ln(N) = 5.069$ to get the threshold, $\theta_N = 31.37$. Because there are 28 exceptions, $e = 28$, to the generalization that stems ending in [r,l,n,s] must have a velar stop, a TP calculation reveals that this generalization is predicted to be productive, for $28 \leq 31.37$.

5. Concluding remarks Harris (1972) uses a phonological framework in isolation to argue that verbs with velar stop insertion are lexically bound and unproductive, but the results of the TP calculation described above suggest that the opposite may be true. Given that this phenomenon only happens in 2nd and 3rd conjugation verbs—to the exclusion of 1st conjugation verbs like [kas-o]/*[kas-k-o]-‘I marry’—future work should investigate the extent to which morphological conditioning is also playing a role.

References Clahsen, H. et al (2002). The development of regular and irregular verb inflection in Spanish child language. *Journal of child language*, 29(3), 591-622. • Gorman, K., & Yang, C. (2019). When nobody wins. *Competition in inflection and word-formation*, 169-193. • Harris, James W. (1972). Five classes of irregular verbs in Spanish. *Generative studies in Romance languages*, 247-271. • Harris, J. W. (1983). Syllable structure and stress in Spanish. *A nonlinear analysis. Linguistic Inquiry Monographs* Cambridge, Mass, (8), 1-158. • Harris, James W. (1985). Spanish Diphthongization and Stress: A Paradox Resolved. *Phonology* 2: 31-45. • Kirov, C. et al. (2018). UniMorph 2.0: universal morphology. • Lloyd, P. M. (1987). *From Latin to Spanish: Historical phonology and morphology of the Spanish language* (Vol. 173). American Philosophical Society. • Núñez-Cedeño, R. (2007). The acquisition of Spanish codas: A frequency/sonority approach. *Hispania*, 147-163. • Sebastián-Gallés, N. (2000). LEXESP: Léxico informatizado del español. Edicions Universitat Barcelona.

¹Vowel final stems that exhibit velar alternation were eliminated from the corpus because they are beyond the scope of this analysis. However, my preliminary investigation of these verbs suggests that there is a robust generalization that velar insertion only occurs with non-front stem-final vowels.