The prosodization of neoclassical elements in Brazilian Portuguese: evidence from vowel reduction

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Abstract

Neoclassical elements (NCEs), such as *agro* in *agronomy* and *psycho* in *psychology* have been assigned different morphological classifications: from affixes, to stems, to combining forms (see [1, 2]). Assuming that NCEs belong to any of these categories implies that they present a consistent behaviour throughout the language. However, NCEs combine with distinct types of structures, e.g., other NCEs, such as in *psycho-logy*, or independent words, such as in *psycho-linguistics*. In addition, NCEs also exhibit different phonological aspects according to the element to which they attach. In this preliminary study, we argue that differences in vowel reduction (VR) in the NCE-final /o/ indicate that NCEs in Brazilian Portuguese (BP) are prosodized in two ways: as regular prosodic words (PWds) when combined with another NCE, and as compounds (recursive PWds) when combined with an independent PWd.

1 Introduction

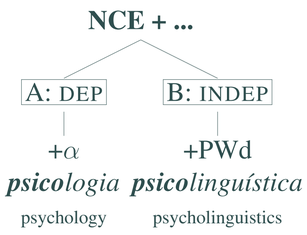
Neoclassical elements (NCEs)

NCEs (Greek or Latin radicals) are found in several European languages, having been highly productive in the 17th/18th centuries. In general, speakers seem to be sensitive to the distinction between NCEs and native elements ([3]). In Portuguese, these elements may be stressed and may combine with other neoclassical elements ('psico-logia' *psychology*, 'agro-nomia' *agronomy*).

Crosslinguistically, NCEs have been morphologically classified as:

- Affixes (how about words such as 'psicologia'?).
- Stems/radicals (but '*Elas deveriam cuidar das suas bios' *They should take care of their bios*).
- Combining forms (closed category, [1]).

In Brazilian Portuguese (BP), NCEs seem to have **distinct phonological behaviours**, depending on the form(s) with which they combine. Assuming a prosodic domain should present consistency in rule application, this may indicate NCEs have different types of prosodization. The phenomenon we examine here is **vowel reduction**. First, we divide forms with NCEs into two groups: **(A) NCE + dependent form**, and **(B) NCE + independent form.** The independent form corresponds to a PWd, whereas the dependent form may correspond to either an NCE or an element that cannot be instantiated independently in the language.



- **Hypothesis**: BP speakers differentiate groups A and B with regard to vowel reduction. In group (B), the NCE-final vowel is at a word boundary position. In group (A), the NCE-final vowel is word-internal.
- **Empirical prediction**: in group (B), where NCEs are followed by an independent form (PWd), we should observe **more** vowel reduction than in group (A), given that reduction is more common word-finally than word-internally in BP.
- **Theoretical implication**: in group (A), [NCE + α] will pattern as a single PWd, whereas in group (B), [NCE + PWd] will pattern as a recursive PWd.

Vowel reduction

In BP, /o,e/ $\rightarrow$ [u,i], especially in final position. Reduction is a gradient phenomenon by definition, and is a result of less articulatory effort. Reduced vowels are more centralized and/or raised than their non-reduced counterparts. Phonetically, both F1 and F2 are affected, but **F2 seems to be the main correlate** ([4, 5]).

- **Target**: NCE-final /o/ (Greek elements only), which can potentially reduce to [u] in both (A) and (B).
- **Predictions**: (B) 'psic[u]linguística' should be more natural/frequent than (A) 'psic[u]logia'.

2 Methods

Production task

BP speakers (n=5) produced NCE forms (from both (A) and (B)) in carrier sentences (n=64 sentences/speaker + fillers), with and without focus (=F):

- **What**$_F$ did Maria say in class? Maria said **X**$_F$ in class. (n=32)
- Did Maria say X **after**$_F$ class? No, Maria said X **in**$_F$ class, not after class. (n=32)

Dependent variable/response: F1 and F2.
Independent variables/predictors: group (A or B), focus (Y/N), distance from stressed syllable.

Statistical method: linear mixed-model regression + by-speaker and by-item random effects (`lmer()` in R).

Judgement task

BP speakers (n=10) rated NCE forms (from both (A) and (B)) produced with and without reduction (n=30 + fillers). All items were randomized and judged twice by each speaker. The task was developed on Praat, and involved a 10-point scale.

Dependent variable/response: judgement (1-10).
Independent variable/predictors: group (A or B), distance from stressed syllable and response time.

Statistical method: ordinal regression + by-speaker and by-item random effects (`clmm()` in R).

3 Results

Production task

Figure 1: F1 values by group

Figure 2: F2 values by group

- F1 was not significantly different between the NCE constructions examined (Fig. 1). F2, however, did show a significant difference (Fig. 2, Table 1).
- The NCE-final /o/ in NCE+PWd constructions (indep, group (B)) had a higher F2 value, which indicates more centralization.
- Higher F2 values (see Table 1) as a consequence of reduction are consistent with other languages [4].
- The patterns in Figs. 1 and 2 are consistent across all speakers. Fig. 3 shows the distribution of F1-F2 values in both groups.

Figure 3: Density of F1-F2 values by group

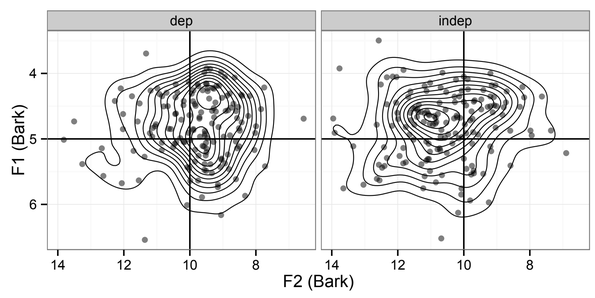


Table 1: Model coefficients

	$\hat{\beta}$	se($\hat{\beta}$)	t	p value
β_0	1226.27	91.34	13.426	< 0.001
`indep`	105	37.94	2.767	< 0.01

Judgement task

- As expected, all non-reduced forms (controls) were rated at ceiling.
- Reduced forms, however, showed a significant difference between groups (A) and (B). Given an NCE construction with /o/ reduction, the odds of a higher score go up by a factor of 3.26 (see Table 2) if the second member of the construction is independent (i.e., group (B)).

Figure 4: Judgement task scores for reduced forms by group

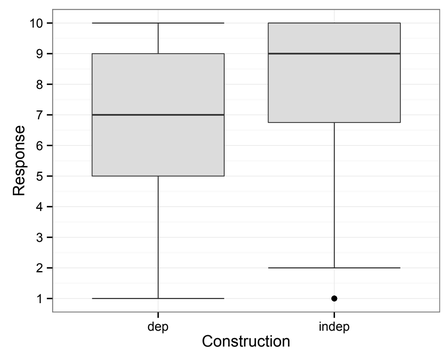


Table 2: Model coefficients

	$\hat{\beta}$	se($\hat{\beta}$)	z score	p value
`vr`	-3.46	0.30	-11.3	< 0.0001
`indep:vr`	1.18	0.31	2.9	< 0.004

4 Discussion

- In constructions of group A, the NCE-final /o/ behaves as a pretonic vowel, which is not usually reduced; thus, the NCE seems to be part of the radical. Constructions of group A are equivalent to simple PWds.
- In constructions of group B, the NCE /o/ behaves more like a final vowel in BP; thus, the NCE seems to be equivalent to a prefix. In compounds formed by a stressed prefix and a PWd ('vice-presidente' *vice-president*) or by two PWds ('cidade-satélite' *satellite city*) vowel reduction is attested (often categorical) at the right edge of both elements. Each element in these compounds is considered an independent PWd; in the case of NCEs, however, reduction is not categorical. Thus, NCEs in group B do not seem to have full PWd status (additionally, they cannot be instantiated independently in the language). If we consider that all elements in a prosodic representation are assigned a prosodic label, then NCEs in group B should be equivalent to Feet. Structures in group B, then, should be ultimately prosodized as recursive PWds.
- Our study suggests that NCEs may not have a prosodic status *a priori*–unlike, e.g., lexical words (PWd) and pronominal clitics (σ) in BP. Rather, their behaviour (and prosodic mapping) depends on the element to which it attaches.

References

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Acknowledgments

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