A Case of Phonological Interference in Word Recognition Tasks

Gessiane Picanço
Universidade Federal do Pará / CNPq / FAPESPA

It is generally recognized that languages exhibit gaps in the distribution of segments within a word, morpheme or syllable, elsewhere known as phonotactics (Crystal 1980). It is also known that speakers are sensitive to phonotactic information (Greenberg & Jenkins 1964; McClelland & Elman 1986; Vitevitch & Luce 1998; Frisch *et al.* 1999; Luce & Pisoni 1998; Luce *et al.* 2000; Bailey & Hahn 2001; Hay *et al.* 2004). These studies have identified some core factors that influence spoken stimuli processing. One of them is the frequency with which a word occurs: recurrent words are easier to process than less recurrent words. Another is neighborhood density: similar sounding words are processed more slowly than those with fewer neighbors. There is also phonotactic probability: highly frequent phonological segments and sequences of segments are responded to faster than low probability segments and sequences of segments. All these integrate the two fundamental processes involved in spoken word recognition tasks: activation and competition (Luce & Pisoni 1998). This paper contributes to these investigations by testing the degree to which phonological factors dictate speakers' decisions about well-formedness of novel words. It reports the findings of an experiment concerning a pair of phonotactic restrictions in Mundurukú, an Amazonian language of Brazil, which share equivalent properties in terms of lexical statistics, neighborhood density and phonotactic probability. The question is: To what extent speakers rely on phonological evidence to make decisions about (im)possible words if lexical competition is neutralized?

Mundurukú exhibits an inspiring case of co-occurrence restrictions in the distribution of the fricatives /ʃ, s/, as in (1). Picanço (2005) counted 1,252 CV(C) syllables in a morpheme list (one occurrence per morpheme variant), and found that a sequence [ʃi] is just as frequent as [sə], whereas [si] is just as absent as [ʃə]; preceding other vowels, [ʃ] and [s] are contrastive and more or less evenly distributed.

(1) Distribution of [s] and [ʃ] in CV(C) syllables (in %)

a.	ʃi	*ʃə	ʃe	ʃa	ʃo	b.	*si	sə	se	sa	so
	3	0	1.36	0.64	0.16		0	2.8	0.88	0.96	1.04

The absence of sequences [si]/[ʃə], accompanied by the robustness of [ʃi]/[sə], suggests two phonological processes that neutralize their contrast in favor of [s] before [ə] and in favor of [ʃ] before [i].

(2) a. Depalatalization: /ʃ/ → [s] / _[ə] b. Palatalization: /s/ → [ʃ] / _[i]

Although (2) may be an obvious explanation for the divergence in the distribution of /ʃ, s/, this study draws attention to a fundamental difference between the restrictions *ʃə and *si: the systematic versus accidental nature of gaps. Alternations exist in the language that ban *ʃə in favor of [sə]. This is illustrated in (3) by partial reduplication with a fixed vowel /ə/. If a base contains /ʃ/, the illegal sequence [ʃə] created in the reduplicative morpheme undergoes depalatalization of /ʃ/, resulting in surface forms such as *ʃi-sə·* instead of **ʃi-ʃə.·* As for *si, the phonology gives no indication that it is illegal. Here speakers find, on one extreme, the absence of [si] in the native lexicon, and on the other, its occurrence in borrowings (e.g. *pasía* 'to walk', from Portuguese *passear*). This restriction is thus accidental. These gaps represent a good pair of sequential constraints to test speakers' knowledge of phonotactic information. First, the overall frequency with which [ʃ]/[s] occur in the language is equivalent. Second, the context where one is robust corresponds precisely to the context where the other is absent, and vice versa. However, crucially, the language categorically imposes a restriction on [ʃə], leaving [s] with no clear sign that it cannot be combined with [i]. For this experiment, 10 speakers were asked the judge the acceptability of pseudo-words containing sequences [ʃə]/[si]. The results, given in Figure 1, show that the systematic/accidental nature of gaps is not be a determining factor: pseudo-words with [si] were accepted as much as those with [ʃə], although acceptability for [ʃə] was slightly higher. These results pertain to the impact the phonology has on speech processing, suggesting that speakers may not make categorical distinctions even if word familiarity, phonotactic probability and neighborhood density are neutralized.

(3)	UR:	/i-poʃí-Cə(-C)/	/t-aʃíp-Cə(-C)/	/i-pak-Cə(-C)/
		3Su-be.heavy-RED	3Su-be.hot-RED	3Su-be.red-RED
a.	Reduplication	ipoʃí-ʃə·	taʃíp-ʃəp̚	ipak-pək̚
b.	/ʃ/ → [s] / __ [ə]	ipoʃí-sə·	taʃíp-səp̚	--
	SR:	[ipoʃísə̚]	[taʃípsəp̚]	[ipakpək]
		'It's not so heavy'	'It's not so hot'	'It's not so red'

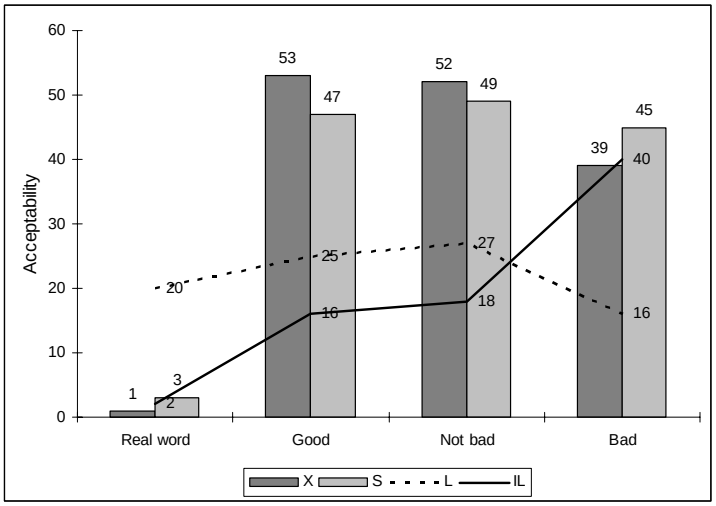

Figure 1. Overall acceptability responses for pseudo-words with sequences [si], represented in the graph by "s", and [ʃə], represented by "x". A solid line indicates the results for the control words containing illicit sequences (IL), and a dotted line for those with legal sequences (L).

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