Effects of VV-sequence deletion across word boundaries in Spanish

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Abstract

Spanish does not allow vowel deletion in unstressed syllables the way languages like English do. However, it may occur in contexts of VV-sequences across word boundaries, under durational reduction in connected speech. This paper explores the effects of vowel deletion on the perception of [-high] vowel sequences on 8 native speakers of Peninsular Spanish. The results are then compared to the speakers' pro-duction of those sequences. This double experiment suggests that, although match-ing between perception and production does not correlate, production cues are rele-vant to the perception of the words containing tautosyllabic vowels. Likewise, it is claimed that perceptual cues influence the production of vowel sequences, suggest-ing that perceptual distinctiveness is relevant to the understanding of acoustic and articulatory preferences.

Introduction

This study aims at contributing to the understanding of the articulatory, acoustic and perceptual cues that trigger deletion of vowels in VV-sequences. It reports the results of a psycholinguistic and an acoustic study of unstressed non-high vowel sequences in Spanish (all combinations of /a/, /e/ an /o/ vowels), in order to determine which vowel in the sequences is a preferred target for deletion. The purpose was to analyze them across word boundaries in three different contexts: in *content+content*, *function+content* and *content+function* word sequences. They were also analyzed within word boundaries, in order to compare the process of deletion across word boundaries with that at initial positions within words.

Experimental design

Eight native speakers of northern varieties of Peninsular Spanish participated in this experiment. The sample words used contained all unstressed vowel sequences and appeared adjacent to stressed syllables. The syllables containing the vowel sequences had simple onsets and were codaless. The words were either bisyllabic or trisyllabic, but not longer.

Production task

For this first task, a total of 22 samples created were implemented into a list of sentences of similar length (in *content+function* context sequences with V2 /e/ were omitted, because they require the following word to begin with a high vowel, which produces the V2 and the following high vowel to merge into diphthongization). In a sound-treated room, subjects read the list three times and were recorded with a professional-quality equipment (micro: head-mounted Shure SM10A; recording, CSL 4300B Kay Elemetrics). Prior to the recordings, subjects were trained to read the sentences with an allegretto rhythm (Harris 1969), in order to sound closer to connected speech than to a reading style.

In the data analysis, the acoustic manifestation of vowel deletion was observed and also whether V1 or V2 deletion occurred.

Psycholinguistic task

The 22 samples were recreated into two sets, one with V1 and the other with V2 extraction. These nonwords were then recorded by the author (also a native speaker of a northern variety of Peninsular Spanish) and implemented into an E-Prime computer program as sound stimuli. After the production task, subjects were asked to carry a lexical decision activity by listening to those stimuli and judging whether they sounded correct or incorrect Spanish to them, by pressing different buttons. The order of the stimuli for each subject was randomized. The E-Prime program recorded the subject's responses as well as the reaction time (i.e. the time from the end of the sound to the pressing of the button) for each stimulus.

Results

The data obtained from the psycholinguistic task refers to the judgment of correct responses and it is partially reflected in table 1. Across word boundaries, the percentage of correct responses is overall greater than that within word boundaries and also higher for V1 than for V2 deletion. Within word boundaries, the values of the correct responses are not significant enough to suggest a preference for one type of deletion.

Table 1: percentage of responses judged as correct within and across word boundaries, for all speakers.

		/ae/	/ao/	/ea/	/eo/	/oa/	/oe/
V1	within	12.5%	50%	0%	0%	12.5%	12.5%
	across	56.2%	66.6%	79.1%	50%	66.6%	93.7%
V2	within	12.5%	12.5%	12.5%	0%	12.5%	12.5%
	across	56.2%	62.5%	50%	25%	37.5%	68.7%

Reaction time (RT) measurements agree partially to the conclusions obtained from the judgment results. In order to exclude outliers, mean and standard deviation values were obtained from the correct responses, and all values higher or lower than the average +/- standard deviation were excluded. Thus, across word boundaries, significant RTs range from 31.3 ms. to 1.6 sc, showing overall the highest values in *function+content* contexts. In terms of vowel quality, there is some variation depending on the context where the vowel sequence occurs. There is a tendency for V1 deleted stimuli to have shorter RTs, and so does deletion of vowel /e/, regardless of its position. In *content+function* contexts, however, when the vowel /o/ is deleted either as V1 or V2, it also shows significantly longer RTs. Values within word boundaries showed not to be significant.

The data from the production task revealed a very low number of instances of deletion production overall (other types of hiatus resolution processes were preferred). They all occurred across word boundaries and targeted V1, especially in *content+function* contexts, where V1 deletion was performed with a much greater percentage than V2 deletion. Table 2 shows the general preference for V1 deletion across word sequences, when deletion occurred. Within word boundaries it was inexistent.

Table 2: percentage of deletion production across word boundaries, for all speakers.

	/ae/	/ao/	/ea/	/eo/	/oa/	/oe/
V1	2,8%	8,3%	50%	4,1%	37,5%	6,25%
V2	25%	0%	0%	0%	0%	6,25%

In terms of vowel quality, vowel /e/ seems to be a preferred candidate for deletion, although sequence /oe/ shows the same percentage of V1 and V2 deletion. In /ao/ and /oa/ sequences, on the other hand, there was no V2 deletion at all.

Discussion and conclusion

Overall results suggest that at the phonetic level prosodic boundaries trigger deletion: it is allowed across word boundaries and V1 deletion is preferred to V2 deletion; shorter RTs (which suggest less hesitation when answering to whether the stimuli sound "Spanish" or not) are more numerous when V1 is deleted. Although perceptual cues of vowels influence deletion production (deletion of /e/ is preferred regardless of its position), preservation of initial information of words and word type seem to be more prominent factors. The longer RTs of V1 deletion in ***function+content*** contexts and the greater number of V1 deletion production in ***content+function*** also suggest that restoration of final information in a content word is easier than information in initial position of a word or phonological phrase. Specifically, in VV-sequences that contain the vowel /o/, perceptual cues do not seem to trigger any deletion. Instead, acoustic and articulatory features are suggested to influence its behaviour. The results from this experiment show a trend that should be confirmed with a larger sample of data in the future.

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