

# Relative durations of post-vocalic consonants in read-aloud Spanish by native Swedish L2-learners

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## Abstract

*Prosody is said to be a persistent feature in foreign accents, particularly in the speech of adult learners. Native Swedish speakers have been reported to lengthen vowels in Spanish as well as post-vocalic consonants in English and German, more than native speakers of the respective languages. The aim of the present study is to examine whether native Swedish learners of Spanish produce increased post-vocalic consonant durations in a reading aloud exercise. The text contains certain words that could be expected to trigger complementary consonant lengthening in native Swedish speakers. The result shows that there is no general tendency for native Swedes to lengthen post-vocalic consonants more than native speakers of Spanish in the present speech material. There are examples of longer consonant durations in the speech of the native Swedish subjects, but it could be a coincidence. A conclusion is that the text used in the study, and probably Spanish as a language, contains few words that are ideal for triggering lengthening of post-vocalic consonants in native Swedish speakers.*

## Introduction

It has been suggested by Thorén (2008) that Swedish temporal prosody is a useful feature when teaching Swedish as a second language. Bannert (1987) found that allocation of stress is a crucial property with respect to intelligibility of Swedish and Fant and Kruckenberg (1994) concluded that duration is the most reliable acoustic correlate to stress and that stress affects the durations of both vowels and consonants. The Swedish quantity system is known to be realized as /V:C/ or /VC:/ in most regional varieties. The quantity distinction occurs only in stressed syllables, thereby giving stressed syllables longer duration than unstressed ones. The complementary length pattern is persistent in the sense that it affects how native Swedes pronounce English and German, resulting in longer post-vocalic consonant durations than those produced by

native speakers of English and German (Thorén, 2007). Both English and German have phonological contrasts involving duration: In the case of German a clear vowel quantity with minimal pairs such as *beten-betten* ‘beg-beds’. English distinguishes e.g. *beet-bit* but there is a debate whether this contrast should be defined as a spectral phonemic contrast between a tense and lax vowel, or as a quantity distinction signalled mainly by duration.

Aronsson (2013) found that Swedish learners of Spanish produced significantly longer vowels in stressed syllables compared to a group of native Spanish speakers. The present study examines some of the recordings of Aronsson (2013) in search of possible long post-vocalic consonants in the speech of the native Swedish learners of Spanish. The aim of the study is to find out whether the lengthening of stressed syllables found by Thorén (2007) is present also in the Spanish spoken by native Swedes. If the complementary /V:C-VC:/-pattern manifests itself in various L2s spoken by native Swedes, it would be an additional reason to suggest the complementary lengthening of stressed syllables as a core feature of Swedish pronunciation (cf. Thorén, 2008).

## Theoretical and methodological considerations

Two measurements are used here in an attempt to capture two aspects of Swedish speech rhythm: vowel duration divided by consonant duration (V/C) to reflect the complementary relation between a stressed vowel and a following consonant, consonant duration divided by word duration (C/W) to reflect how the duration of one segment can contribute to the duration of the syllable. Measuring syllable duration is however problematic as syllable boundaries cannot always be readily established, and especially when trying to meet syllabification demands from two languages simultaneously. The word (or the two last syllables) in words containing more than two syllables, is considered a reasonable compromise.

Had the present author been more familiar with Spanish phonology, the present material may not have been chosen for the study. Out of 22 potential /VC:/-words, only one, *dormilón* ‘sleepyhead’ seems to meet the criteria for an ideal potential /VC:/-word, since it has a short non-diphthong vowel as nucleus in a clearly stressed syllable, with a single post-vocalic consonant. Nine words in the sample had VCC-structure, i.e. they had 2 consonants following the stressed vowel. Behne and Czigler (1995) found that more duration is allocated to the first consonant than to the second consonant in VCC-words when effects of inherent durations were neutralized, but still less than to a single phonologically long consonant. Measuring VCC-words could thus be expected to yield less significant lengthening when pronounced by native Swedish speakers. In addition to this, the first consonant in 6 out of 9 VCC-words is a nasal, a category that showed less complementary lengthening in Thorén (2007), a condition that lowers the expectations also for the ‘ideal’ word *dormilón*. The words *Viejo*, *dijo*, *ojos* and *noche* have, according to Spanish phonology, a syllable boundary between the stressed (first) vowel and the following consonant. They are however included as they are regarded as possible /VC:/-candidates in the intuitive perception of a native Swede.

Measuring the duration of the stressed vowel divided by the duration of the following consonant (V/C) is assumed to reflect how the L2-speaker treats the local relationship between vowel and consonant, thus realizing a possible perceived quantity category (cf. Elert, 1964). The ratio of the post-vocalic consonant divided by the duration of the word (C/W), is assumed to reflect the potential impact of a Swedish habit to always give more duration to mainly one segment in a stressed syllable.

## Method

The recorded material used in this study is part of a corpus described in Aronsson (2013) and is used here with permission. Below follows a brief description. For more details, see Aronsson (2013).

## Reading task

The text used in the study is a childrens’ story called *El viejo gallo* ‘the old rooster’. It contains 363 words and 22 of those were first chosen for measurement.

## Participants

The 8 native Swedish learners of Spanish were all in their first semester of university studies, which means that they had received formal instruction of approximately 250 hours in the Swedish school system. The 8 native Spanish speakers in the control group were from both South America and Spain.

## Recordings

The speech was recorded in a language lab with varying recording quality. Some of the measurements had to be omitted since segmentation could not be done satisfyingly, sometimes due to poor technical quality and sometimes due to indistinct articulation as well as the general problem of deciding boundaries between vowel and nasal/liquid.

## Material

Fourteen different words, out of originally 22 were measured. 9 were VCC, 4 were V.C but were judged as potential /VC:/. 1 word was a clear VC.

## Analysis

The speech material was analysed in Praat (Boersma & Weenink, 2013). Durations of words as well as vowel and post-vocalic consonant in stressed syllables were measured. If the vowel was a diphthong, only word and consonant durations were measured. Vowel duration divided by consonant duration was calculated as a measure of quantity realisation and consonant duration divided by word duration was calculated as a measure of stress induced lengthening. Words like *viejo*, *ojos* and *dijo* were regarded as possible /VC:/-words although there is a syllable boundary between vowel and following consonant according to conventional Spanish phonology. Nine words had a post-vocalic two-consonant-cluster, e.g. *alto*, that could be expected to trigger a /VC:C/ pattern in a native Swede. In the word *noche* only the occlusion phase was measured, making segmentation more secure.

Polysyllabic words like *momento*, *efectivamente*, *rapidamente*, *dormilón* were measured including only the 2 last syllables in an attempt to neutralize substantial differences in how the speakers initialized these words as well as differing proficiency in reading aloud.

## Result

As shown in *Tables 1 and 2*, the duration values do not suggest that the Swedish speakers in general lengthened post-vocalic consonants more than native speakers of Spanish. Low

values for V/C and high values for C/W would reflect the expected complementary pattern. The word *dormilón* is the only word in the present sample that has a single potential long post-vocalic consonant with no syllable

*Table 1. V/C-ratios and C/W-ratios (mean values) for the measured VCC-words. Grey filling indicates that ratios reflect longer relative consonant durations for the Swedish L2-speakers compared to the Spanish L1-speakers.*

	Alto	campo	(mo-)mento	tanto	mismo	(effectiva-)mente	(rapida-)mente	triste	Quenta
V/C	1,04	1,06	1,03	1,24	0,72	1,12	0,98	1,12	
L1	N=3	N=8	N=16	N=8	N=7	N=8	N=8	N=5	
V/C	1,41	0,95	1,04	1,26	0,57	0,96	0,96	0,75	
L2	N=3	N=8	N=10	N=8	N=6	N=5	N=5	N=5	
C/W	0,20	0,22	0,20	0,26	0,31	0,19	0,23	0,24	0,25
L1	N=6	N=8	N=16	N=8	N=7	N=8	N=8	N=5	N=7
C/W	0,18	0,21	0,16	0,23	0,28	0,21	0,19	0,28	0,21
L2	N=4	N=8	N=12	N=8	N=6	N=5	N=5	N=5	N=7

*Table 2. V/C-ratios and C/W-ratios (mean values) for potential /CV:/ words, single consonant after short stressed vowel. Grey filling as in Table 1.*

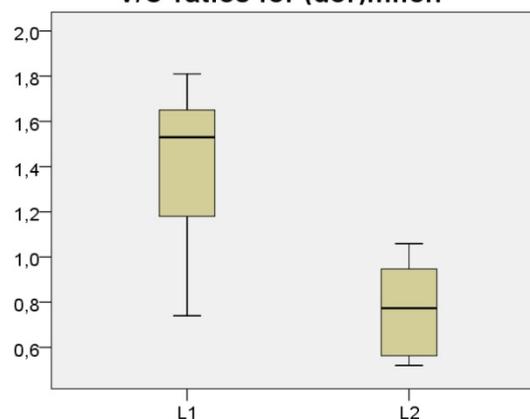
	viejo	Dijo	ojos	noche	(Dor) milón
V/C		0,71	0,61	1,77	1,39
L1		N=2	N=6	N=12	N=7
V/C		0,76	0,68	1,30	0,77
L2		N=4	N=5	N=11	N=7
C/W	0,33	0,44	0,30	0,19	0,23
L1	N=45	N=7	N=6	N=15	N=7
C/W	0,32	0,33	0,26	0,17	0,31
L2	N=41	N=6	N=5	N=12	N=7

boundary between V and C. This word also shows the highest degree of consonant lengthening expressed as V/C and C/W differences between L1 and L2 speakers. The box plot in *Figure 1* shows how L1 and L2 speakers realized the temporal relation between V and C, with lower values for the Swedish subjects (i.e. the two last syllables of the word). *Figure 2* shows consonant durations divided by word durations; higher for native Swedish speakers, reflecting the syllable-lengthening effect due to the duration of the post-vocalic consonant.

## Discussion

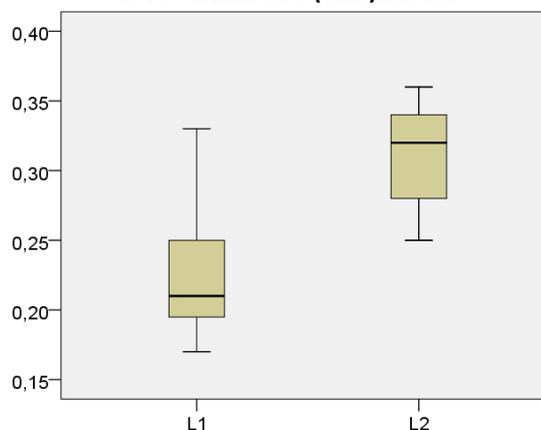
The result does not show any clear differences with respect to expected Swedish temporal patterns. A typical Swedish pattern would have shown overall lower values for C/V-ratios and

**V/C-ratios for (dor)milón**



*Figure 1. V/C-ratios for the word “dormilón” comparing durations of L1 and L2 speakers. N=7.*

**C/W-ratios for (dor)milón**



*Figure 2. Consonant durations divided by word durations for the word “dormilón”, comparing durations for L1 and L2 speakers. N=7.*

higher for C/W for the Swedish L2-speakers compared to Spanish L1-speakers. Both these differences between native Swedish and native Spanish speakers could be caused by extra-long post-vocalic consonants. Lower V/C-values can of course also be the result of extra short vowels, which indeed seems to be the case as mean absolute vowel durations in the L2-versions of *dormilón* are 26% shorter than in the L1-versions. A typical Swedish temporal pattern could also be manifested as extra lengthening of stressed syllables, and in the chosen words this extra duration is expected to be associated with the post-vocalic consonant, manifesting itself as higher C/W-ratio. An extra long consonant will in other words affect both V/C and C/W values. The mean absolute duration of the post-vocalic consonant in the L2 versions of *dormilón* is 25% longer than in the L1 version.

The present author – who has no knowledge of Spanish – could not detect any typical Swedish accent in more than 1 of the native Swedish speakers, although listeners with knowledge of Spanish report clear audible Swedish accent in all native Swedish subjects. This person however did not show more than marginally longer durations in postvocalic consonants than the rest of the L2-speakers.

It could be assumed that a group of native Swedish learners of Spanish who started learning the language as adults, would show more typical Swedish accent, manifested partly as longer post-vocalic consonants, but on the other hand, the speakers in Thorén (2007) had been 9–10 years old when they started to learn English, and they still had a measurable Swedish accent manifested as longer post-vocalic consonants. A possible explanation could be that Spanish phonotactics and prosody generate few structures that would typically trigger the Swedish complementary consonant length.

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