

# VOWEL DURATION, COMPRESSION AND LENGTHENING IN STRESSED SYLLABLES IN ITALIAN

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## ABSTRACT

The focus of this study is on temporal organization, specifically of vowel duration, in stressed syllables in (standard) Italian. We investigate possible compression effects on the duration of stressed vowels according to word-position (final, penult and antepenult) and syllable type (open vs. closed) in this language. Our results show shortening in some contexts, e.g. closed syllables, and antepenultimate position, but not in all tested contexts. Compression effects do not surface in a fully linear fashion, with complications arising in word-final position where competing tendencies towards lengthening and shortening are found to co-occur. We consider the implications of our results for phonological descriptions of Italian.

**Keywords:** Italian, vowel duration, syllable compression, stress, lengthening

## 1. INTRODUCTION

The principal aim of this study is to examine the duration of stressed vowels in a range of inter-related contexts in Italian. Doing so allows us to determine the effects, if any, on Italian temporal structure of the following factors: (a) syllable structure (open vs. closed syllables); and (b) relative stress position in the word (final vs. penultimate vs. antepenultimate syllables), including possible compression effects of unstressed syllables to the right of the stressed syllable.

These issues have been previously investigated for Italian, e.g. [2, 3, 6, 10], and others. However, many matters remain uncertain (as described immediately below). Therefore, an additional aim of this new study is to reconsider some of these matters, thereby adding to the existing body of work on vowel length and duration in Italian.

We note firstly that the results of earlier studies examining the same questions in Italian have not been consistent. For instance, there is disagreement as to the extent, if any, of word-level compression

effects on stressed vowel duration (see [10] for overview). More recently, [3] and [10] have confirmed a regular phonetic compression effect as post-tonic syllables are added, at least in a comparison between penultimate and antepenultimate stress ('CVCV and 'CVCVCV). Such shortening is, however, not as marked in Italian as it is in English, which may be due to rhythmic differences [11]. There is, in general, less information on compression effects on word-final (CV'CV) vowels vs. other positions.

Moreover, questions remain about the general applicability of specific findings. There is, for instance, full agreement that stressed vowels in closed syllables in Italian are always much shorter in duration than stressed vowels in open syllables. However, judgments are for the most based on comparisons between open and closed syllables in penultimate position only. Whether stressed vowels in word-final or antepenultimate open syllables are also necessarily longer than vowels in closed syllables is unclear. This is an important point since phonological descriptions of Italian (e.g. [12]) consider stressed vowels in final position to be identical in terms of length/duration to vowels in closed syllables. Stressed antepenults and penults in open syllables are considered to be phonologically and phonetically equivalent (but see below), and, therefore much longer than stressed vowels in closed syllables.

Previous experimental studies have also varied significantly in terms of methodological approach, which substantially reduces our ability to make comparisons and draw useful conclusions about their results. Some studies have investigated words in isolation, while others have looked at items in carrier phrases. There is variable use of real vs. nonsense words, and the number of subjects is frequently very limited – often only 1 to 3 speakers. There is also significant variation in the regional origin of subjects, which is otherwise known to impact significantly on the pronunciation of Italian by 'native' speakers. In particular, we note that many studies on vowel duration and

compression in Italian, e.g. [2, 11], have relied on small numbers of speakers drawn from Northern Italy. In other cases, e.g. [10], speaker origin is not mentioned. From a historical perspective, standard Italian is based on Tuscan, a Centro-Southern variety of Italo-Romance. Centro-Southern Italo-Romance differs significantly from the Northern Italo-Romance traditionally spoken in Northern Italy, in terms of segmental and prosodic structures and processes [5]. In the North there is a tendency towards regular lengthening of word-final stressed vowels; loss of word-medial long consonants; and the complete absence of sandhi gemination at word-boundaries, e.g. /'pju 'latte/ ['pju 'latte] 'more milk' instead of normative ['pju l'latte] (otherwise known as *raddoppiamento sintattico* and typical of Centro-Southern Italian [1, 8, 9]). Speakers of Northern varieties typically transfer these patterns into their pronunciation of standard Italian. However, phonological accounts, and normative descriptions of standard Italian always describe it without these Northern features.

## 2. STRESSED VOWEL LENGTH AND DURATION IN ITALIAN

In phonological terms, Italian is normally characterised as having a predictable distribution of vowel length in stressed position: vowels are long in word-medial open syllables, e.g. /'papa/ ['pa:pa] 'pope', /'papero/ ['pa:pero] 'gander', but are always short in closed syllables, e.g. /'pappa/ ['pappa] 'mush', and word-final final position, e.g. /pa'pa/ [pa'pa] 'dad' (see, e.g. [4, 5, 12] for details). The presence of unstressed syllables to the left or the right of the stressed syllables is not usually considered to have an effect on the phonological length of stressed vowels. However, in some varieties of Centro-Southern Italian, phonetic shortening of the antepenultimate vowel may lead to phonologically pertinent gemination of the following consonant, e.g. for /'stomako/ ['stommako] instead of expected ['sto:mako], as speakers apparently try to maintain even syllable weight (either 'CV: or 'CVC) across word-medial stressed positions.

In word-final position, stressed vowels are generally considered to be short, both phonologically and phonetically, in isolation or before another word. According to [9], this is the result of an 'empty' coda consonant in word-final position, surfacing as a glottal stop outside of *raddoppiamento sintattico* (cf. §1) contexts, but

see also [7] for discussion. Italian is typologically unusual in this respect because across languages word-final stressed vowels have predictably longer duration [9, 11]. This shortening runs counter to the word-level compression hypothesis that stressed vowel duration will be greatest in word-final position and will be compressed through the addition of a post-tonic unstressed syllable, i.e. all other things being equal, the stressed vowel in /'papa/ (+1 post-tonic syllable) will be shorter in duration than final /a/ in /pa'pa/. Matters are further complicated in Italian since some sources (e.g. [1, 2, 8]) claim that final stressed vowels need not surface as short, as they are subject to optional lengthening, i.e. /pa'pa/ [pa'pa] ~ [pa'pa:] in Italian as spoken in Centro-Southern Italy.

These conflicting facts and trends point to three different hypotheses with respect to possible interaction in Italian between word-final duration and word-level compression as post-tonic syllables are added: (1) following general cross-linguistic patterning, word-final stressed vowels will have greatest duration, which will fall in a linear and cumulative fashion on penultimate (+1 unstressed syllable) and antepenultimate (+2) positions; (2) if final vowels are short in Italian, as many sources insist, there will be no right-to-left compression effect – indeed, vowel duration should be significantly shorter in final position; or (3) optional lengthening in final position, if it occurs, will serve to cancel out any final shortening effect. If so, we should find no difference in overall duration values between final and penultimate stressed vowels. The results of this study will be useful in testing these three hypotheses by clarifying the situation with respect to final vowel duration.

## 3. METHODOLOGY

We recorded six speakers of Italian – all native to Central and Southern Italy (regional origin of subjects was considered critical, as noted above).

Real words were selected for recording. In each case the stressed vowel was /a/. We selected minimal pairs that would allow for direct comparison of: (a) open vs. closed syllable (/ 'papa/ 'pope' vs. / 'pappa/ 'mush?); and (b) different stressed syllable positions (/ 'papero/ 'gander' vs. /pa'pato/ 'papacy' and / 'papa/ 'pope', vs. /pa'pa/ 'dad'.

The use of a relatively larger sample of speakers in this study (6 subjects) was intended to

increase the reliability of results. Subjects were asked to insert test items into the carrier phrase *Dico \_\_\_\_\_ lentamente* 'I say \_\_\_\_\_ slowly' which was repeated four times for each item. We then measured, using Praat, the duration of stressed vowels across all contexts under examination. There were 24 tokens for each item in each recorded context. After results were averaged for each speaker and across speakers, we then conducted initial statistical analysis (t-tests) of overall results.

## 4. RESULTS

### 4.1. Stressed vowels in closed vs. open syllables

We first examined vowel duration in open and closed penultimate position.

**Table 1:** Stressed vowel duration before short and long /p pp/ respectively (std deviations in brackets)

	vowel duration (SD)
pàpa	170 (20)
pàppa	113 (8)

Our results show highly significant vowel shortening in closed syllables ( $p < 0.005$ ) – with the same pattern consistent across all speakers. While consonant duration is not a particular focus of this study, the geminate /pp/ (215 ms.) was always significantly longer, as expected, than singleton /p/ (102 ms.) within each speaker and for all six speakers combined ( $p < 0.005$ ).

### 4.2 Penultimate vs. final stressed vowel

With respect to stressed vowels in penultimate and final position, Table 2 shows they did not differ in duration, at least for all speakers combined ( $p > 0.05$ ).

**Table 2:** Stressed vowel duration in penultimate (pàpa) and final (papà) open syllables (std deviations in brackets).

Ss	LS	RA	DS	GR	RP	VG	av
pàpa	157 (14)	154 (17)	169 (14)	154 (11)	183 (16)	205 (16)	170 (20)
papà	177 (47)	168 (22)	192 (79)	182 (24)	146 (10)	182 (30)	174 (16)

These results (whereby stressed vowels in word-final and penultimate open syllables are equivalent) do not appear to be consistent with

phonological and other sources (cf. §2) in which word-final stressed vowels are described as short. We return to this important point in §5.

However, while all subjects had long vowels in penult positions, there was substantial inter- and intra- speaker variation in the case of stressed /a/ in final open position. Four speakers had longer final vowels, while penults were longer for the other two subjects. At the same time, very high standard deviations in word-final position (up to 79ms.) also point to an optional process of lengthening/shortening for speakers in that context.

### 4.3 Antepenultimate vs. other stressed vowels

In Table 3, we provide duration results for stressed vowels in trisyllabic words that differed in stress placement (antepenult vs. penult).

**Table 3:** Stressed vowel duration in antepenultimate and penultimate open syllables (std deviations in brackets).

Ss	LS	RA	DS	GR	RP	VG	Av
pàpero	152 (5)	143 (12)	156 (21)	98 (15)	131 (14)	174 (24)	142 (26)
papàto	169 (9)	162 (36)	192 (21)	166 (13)	172 (11)	228 (7)	181 (25)

Overall, there was a highly significant difference of 39 ms. ( $p = 0.002$ ), with vowels shorter in antepenult position. Shortening in the same direction was found for all speakers, although the extent of the effect varied: a distinction was clear for four subjects (DS, GR, RP, VG), but more marginal for two (LS & RA). Comparison between trisyllabic /'pàpero/ and disyllabic /'pàpa/ (170ms., cf. Table 2) also gave a significant result ( $p = 0.013$ ).

Comparing antepenultimate /a/ in /'pàpero/ (142 ms.) with final /a/ in /pà'pà/ (174 ms., see Table 2) also confirms significant shortening in antepenultimate position ( $p = 0.017$ ). Not surprisingly, an additional comparison between /'pàpero/ (142 ms.) and short /a/ in /'pàppa/ (113 ms., cf. Table 1) was also significant ( $p < 0.017$ ), for all speakers combined. However, we note that for one subject (GR), antepenultimate duration was noticeably lower (at 98 ms.), and equivalent to or even below vowel duration in (short) closed syllable position in /'pàppa/ (111 ms.) for this speaker.

## 5. DISCUSSION AND CONCLUSIONS

Our results confirm the impact of syllable structure on stressed vowel duration: vowels are much shorter in closed than in open syllables. The duration value (113 ms.) for the former also provides us with a useful baseline duration value for short vowels in stressed position in Italian.

As for possible right-to-left compression effects, some caution is needed given the complexities and competing hypotheses we pointed to in §2 regarding final vowel duration in Italian. At this stage, however, we can give partial confirmation of earlier findings of word-level compression (e.g. [10]): the addition of a post-tonic unstressed syllable has a significant effect on stressed vowel duration in Italian, at least in the case of antepenultimate (+2 post-tonic syllables) vs. penultimate stressed vowel (+1 post-tonic syllable) positions. The phonetic effect in our sample is greater than some have reported previously, e.g. [11] who noted a smaller, albeit significant, 19 ms. difference, while we find a reduction in antepenultimate vowel duration of 28 ~ 39 ms across the 6 speakers. For at least one speaker (GR), antepenultimate shortening is particularly marked – with duration values equivalent to that found in short closed syllable position. In phonological terms, the overall phonetic pattern supports the proposal in [4] that stressed vowels are half-long in antepenultimate open syllables.

Matters are more complicated, however, with regard to word-final duration: there is no difference at all between /'papa/ (+1 post-tonic syllable) and /pa'pa/ (no post-tonic syllable). In §2 three possible hypotheses were outlined with regard to relative duration of final and penult vowels: (a) final >> penult; (b) penult >> final; or (c) final = penult. Our results provide greatest support for hypothesis (c) – the absence of an overall duration effect in any direction is explained by variable lengthening/shortening in final position. As noted in our discussion of Table 2 above, there is considerable variation across and within speakers: four speakers lengthen final vowels, while two subjects appear to shorten them. Moreover, high levels of intra-speaker variability are also evident in the same context, providing additional support for optional final lengthening/shortening (a similar pattern is evident in some earlier studies, e.g. [11]). This finding raises the question of whether phonological

accounts should treat word-final stressed vowels as phonologically long, and optionally shortened, or vice versa. The optionality of this process, in particular, is not in line with [9] and other accounts, which, as noted in §2, proposed that word-final stressed vowels always surface as short, whether before another word or phrase-finally.

Competing tendencies in final position ensure word-level compression by post-tonic syllable addition is not strictly linear and cumulative in Italian: our data show it is only clearly evident when 2 post-tonic syllables are attached. Further work is needed to understand why this restricted pattern might be the case. At this stage it is possible that (optional) final glottalization, as suggested by [9] (see also [7]), may account for this discrepancy.

## 6. REFERENCES

- [1] Absalom, M., Hajek, J. 1997. Raddoppimaneto sintattico: what happens when the theory is on too tight? In Bertinetto, P. M., Gaeta, L., Jetchev, G. & Michaels, D. (eds.) *Certamen Phonologicum III*. Turin: Rosenberg & Sellier, 159-179.
- [2] Bertinetto, P.M. 1981. *Strutture prosodiche dell'Italiano*. Florence: Accademia della Crusca.
- [3] D'Imperio, M. Rosenthal, S. 1999. Phonetics and phonology of main stress in Italian. *Phonology* 16: 1-28.
- [4] Hajek, J. 2000. How many moras? Overlength and maximal moraicity in Italy. In Repetti, L. (ed) *Phonological theory and the dialects of Italy*. Amsterdam: John Benjamins. 111-135.
- [5] Maiden, M. 1995. *A linguistic history of Italy*. London: Longman.
- [6] Marotta, G. 1985. *Modelli e misure ritmiche: la durata vocalica in italiano*. Bologna: Zanichelli.
- [7] Stevens, M., Hajek, J., Absalom, M. 2002. Raddoppiamento sintattico and glottalization phenomena in Italian: a first phonetic excursus. *Proc. SST 9* Melbourne: 154-159.
- [8] Stevens, M., Hajek, J. 2006. Blocking of word-boundary consonant lengthening in Sieneese Italian: some auditory and acoustic evidence. *Proc. SST 11* Auckland: 176-181.
- [9] Vayra, M. 1994. Phonetic explanations in phonology: laryngealization as the case for glottal stops in Italian word-final stressed syllables. In Dressler, W. U., Prinzhorn, M. & Rennison, J. R. (eds) *Phonologica 1992: Proc. 7<sup>th</sup> International Phonology Meeting*. Turin: Rosenberg & Sellier.
- [10] Vayra, M., Avesani, C., Fowler, C. A. 1999. On the phonetic basis of vowel-consonant coordination in Italian: a study of stress and "compensatory shortening". *Proc. 14<sup>th</sup> ICPHS* San Francisco: 495-498.
- [11] Vayra, M., Fowler, C. A., Avesani, C. 1987. Word-level coarticulation and shortening in Italian and English speech. *Studi di grammatica italiana* 13: 249-269.
- [12] Vogel, I. 1982. *La sillaba come unità fonologica*. Bologna: Zanichelli.