THE INTERACTION BETWEEN FINAL LENGTHENING AND ACCENTUAL LENGTHENING: DUTCH VERSUS ENGLISH

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ABSTRACT

Based on results from previous experiments, the hypothesis is tested that there is an interaction between final lengthening and accentual lengthening in Dutch, but not in English. To this end, a production experiment was run for both languages with accented and unaccented words in three positions in the phrase. The results confirm the above hypothesis. Furthermore, the distribution of final lengthening and accentual lengthening in disyllabic words with initial stress is investigated. To avoid an interaction between accentual lengthening and final lengthening, Dutch speakers could realize the former on the first syllable and the latter on the second. Instead, however, there is a lack of accentual lengthening in final position in disyllabic words as much as in monosyllabic words.

1. INTRODUCTION

In stress-accent languages such as Dutch and English, prosodic features are used to indicate which parts of the speech stream are most important, and to segment the continuous flow of speech into smaller units at several different levels. The boundaries signalled by prosodic features are referred to as prosodic boundaries, and the units delimited by these boundaries as prosodic constituents. When a syllable is marked by a conspicuous 'accent-lending' pitch movement, making it salient at the phrase level, it will be called accentuated.

In this paper, I will only be concerned with the use of duration to mark both accents and boundaries. Final lengthening marks prosodic boundaries, particularly the Intonational Phrase, by lengthening of the preboundary segments ([1], and references therein). It has also been claimed to mark smaller constituents like the (phonological) word, yet word-final lengthening is not nearly as clear and consistent as Intonational Phrase-final lengthening [2]. Accentual lengthening is defined as lengthening due to a pitch accent. It is a secondary cue to accent: the primary cue is intonation [3].

While final lengthening has regularly been the primary focus of phonetic studies, accentual lengthening has often only been investigated as one of several cues to accent. Furthermore, the two effects have often been studied separately (but see [4, 5] for exceptions); especially studies on cues to accent have been careful to avoid phrase-final positions, in order to avoid any interaction effects (e.g. [6]). In this paper, a production experiment will be described which investigates the interaction between final lengthening and accentual lengthening in Dutch and English.

2. THE PRODUCTION EXPERIMENT

The present investigation was invoked by the results of previous work on the domain of accentual lengthening, i.e. the unit which is durationally affected by a pitch accent, in English and Dutch [7, 8]. In (1), examples of the English [7] and the Dutch [8] materials are given, with accented syllables in capitals and the relevant material underlined:

(1) a. English
   I said ‘BAKE enforced’, not ‘BANK enforce’.
   I said ‘bake enforce’, not ‘bake reMORSE’.

b. Dutch
   Ik zei ‘PANda masten’, niet ‘HIND masten’.
   ‘I said panda masts, not hind masts’
   Ik zei ‘panda MASten’, niet ‘panda POORten’.
   ‘I said panda masts, not panda gateways’

Although these materials were not designed to investigate the lengthening of the accented syllables, what is crucial for the present purposes is that the materials contained words in phrase final position (enforce and masten in (1)) and in non-final position (bake and panda in (1)), and all occur in focused and non-focused position (i.e., are either accented or unaccented). Averaging over test items, the amount of accentual lengthening on the accented syllables was similar across these two positions in English, and also in more recent studies on (Scottish-)English using similar material, a fairly consistent accentual lengthening effect was found (ranging from 19% to 29%; [7, 9, 10, 11]). In Dutch, however, accented pan was lengthened by 25%, but accented mas only by 6% (averaged over items; pan and mas are only taken as examples). Assuming that the difference in the amounts of accentual lengthening found in Dutch is caused by the differences in position in the phrase, this suggests that there is an interaction between final lengthening and accentual lengthening in Dutch, but not in English. Note that even though these results are taken from a fairly large data set in both languages, strictly speaking the sets of syllables occurring in the two positions are not comparable; they differ segmentally, occur in different words, etc. In other words, the material was not designed to make such a comparison.

The present experiment is specifically designed to address the following research question:

Is there an interaction between final lengthening and accentual lengthening in Dutch, but not in English?

Besides this main research question, the distribution of both types of lengthening in disyllabic words with initial stress will be another issue addressed in this paper. Previous research has shown that final lengthening is progressively distributed across the preboundary segments, and is therefore mainly found in the final

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syllable [1, 12]. Accentual lengthening, on the other hand, may be spread across the entire word [6, 8]. In Dutch in particular, where we expect final lengthening to interfere with the realization of accentual lengthening, disyllabic words may offer the room needed to implement both types of lengthening (while monosyllabic words don’t), since accentual lengthening can be realized in the penultimate (stressed) syllable while final lengthening is realized in the final syllable. This predicts a weaker interaction effect in the disyllabic words than in the monosyllabic words, and a concentration of accentual lengthening in the first syllable of the disyllabic words in final position.

2.1. Material

Dutch and English carrier phrases were made up containing proper names in three positions, as exemplified in (2):

(2) Dutch:

Volgens mij sprak Ko met Jan over Mie.

I think that Joe told John about May.

English:

I think that Joe told John about May.

The name positions will be referred to as ‘initial’ (1), ‘medial’ (2) and ‘final’ (3), even though position 1 is not really domain-initial; rather, the term ‘initial’ refers to its sequential position within the phrase (relative to the other proper names).

In each of these positions, four monosyllabic and four disyllabic names occurred in each language. Names were chosen such that the disyllabic names were like extensions of the monosyllabic names. The monosyllabic names were of the form CV(C), while the disyllabic names were of the form CVcv(c) (with capitals indicating lexical stress).

(3) DUTCH                  ENGLISH
Jan - Jannie  /'jɑn - 'jɑni/  John - Johnny
Peet - Peter   /'peet - 'peetər/  Mike - Michael
Mie - Mina     /'mi - 'mɪnx/  May - Macy
Ko - Kobus     /'ko - 'kɔbəs/  Joe - Joseph

All these names occurred in each of the three target positions. The carrier phrase contained either three monosyllabic names or three disyllabic names, so that the total number of syllables in the phrase was the same for each occurrence of any particular name.

A preceding question put narrow focus on only one of the three names. The name which was consequently accented is given in capitals in (4), giving English examples:

(4) a. Who told John about May?
   I think that JOE told John about May.
   Who did Joe tell about May?
   I think that Joe told John about May.
   Who did Joe tell John about?
   I think that Joe told John about MAY.

Any name in any position was thus once accented, and twice unaccented (i.e. when one of the other two names was accented).

In all, (8 names x 3 positions x 3 accent conditions =) 72 items were included for each language. Since every utterance contains three names, (72/3 =) 24 utterances were required for each language to obtain a complete set of stimuli.

2.2. Subjects and procedure

Six native Dutch speakers with no obvious regional accents or speech impairments participated in the Dutch part of the experiment. Six native speakers of RP-English participated in the English part of the experiment.

The utterances were quasi-randomized such that two utterances in sequence never had the same accent position. The test utterances were preceded and followed by a number of dummy sentences, which were taken from the test material. All utterances were preceded by a question, putting focus on one of the proper names, as in (4). The name which was to be accented was given in capitals. In the English experiment, some additional utterances were recorded with other names than the ones given in (3); these will not be discussed here.

Subjects were seated in a sound-insulated booth. The Dutch subjects’ speech was recorded onto DAT-tape, copied onto a computer disk and down-sampled to 16 kHz. The English subjects’ speech was recorded directly to disk, after being amplified, low-pass filtered at 7.8 kHz and sampled at 16 kHz.

After some practice utterances, subjects read the questions and the test sentences first in the order A-B, and then in the order B-A, with a minor break in between. They were instructed not to pause within utterances. The experiment was monitored by the author. In case of speech errors, speakers were asked to repeat the whole question-answer pair.

Most speakers produced the test utterances with a default ‘pointed hat’ (1&A, cf. [13]; or H*L, cf. [14]) on the accented name, without being told to do so; if a speaker did not, (s)he was interrupted and told explicitly what the desired intonation contour was. It is therefore reasonable to assume that intonation was comparable across speakers.

2.3. Results

The results for each language are based on (8 names x 3 positions x 3 accent conditions x 6 speakers x 2 repetitions =) 864 measurements in total (108 per name). Segmentation was done by hand. In the case of initial voiceless plosives (Peet-Peter, Ko-Kobus), the onset of the burst was taken as measuring point, thus excluding the preceding silent interval. In each position, the results of the two unaccented conditions are taken together, since they did not differ from one another (F[1,190]<1 in all three positions and in both languages).

Any name in any position was thus once accented, and twice unaccented (i.e. when one of the other two names was accented).
Table 1. Syllable durations and standard deviations in ms of the disyllabic names in final and non-final positions, broken down by accent condition. The accentual lengthening found in each syllable in final and non-final position is given in ms and in percentages.

<table>
<thead>
<tr>
<th></th>
<th>Dutch</th>
<th></th>
<th>English</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>first syllable</td>
<td>second syllable</td>
<td>first syllable</td>
<td>second syllable</td>
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<tr>
<td></td>
<td>duration</td>
<td>s.d.</td>
<td>duration</td>
<td>s.d.</td>
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<tr>
<td>final, unaccented</td>
<td>141.0</td>
<td>25.2</td>
<td>127.4</td>
<td>28.8</td>
</tr>
<tr>
<td>final, accented</td>
<td>160.9</td>
<td>22.8</td>
<td>156.8</td>
<td>31.1</td>
</tr>
<tr>
<td>accentual lengthening:</td>
<td>19.9 (14%)</td>
<td>29.4 (23%)</td>
<td>34.0 (21%)</td>
<td>31.6 (21%)</td>
</tr>
<tr>
<td>final, unaccented</td>
<td>172.7</td>
<td>28.2</td>
<td>238.0 ms</td>
<td>55.8</td>
</tr>
<tr>
<td>final, accented</td>
<td>172.3</td>
<td>23.6</td>
<td>252.1 ms</td>
<td>56.7</td>
</tr>
<tr>
<td>accentual lengthening:</td>
<td>-0.4 (0%)</td>
<td>14.1 (6%)</td>
<td>20.0 (11%)</td>
<td>31.0 (11%)</td>
</tr>
</tbody>
</table>

respectively: as is clear from Figure 1, names in final position are much longer than in non-final position, and accented names are longer than unaccented ones. There is also a significant interaction between position in the phrase and accent condition (F[2,858]=4.8; p=.008). One-way ANOVA’s show that a significant effect of accent condition is found only in initial and medial position (F[1,286]=46.5; p=.001 and F[1,286]=26.1; p=.001 respectively), but not in final position (F[1,286]=1.4; n.s.). Running separate analyses for the monosyllabic and disyllabic words reveals that the interaction between position in the phrase and accent condition is significant for both groups of names (monosyllabic: F[2,426]=5.7; p=.004, disyllabic: F[2,426]=4.5; p=.01).

In Figure 2, the same data are shown for English. As in Dutch, both position in the phrase and accent condition have a highly significant effect on the results (position: F[2,861]=288.8; p<.001, accent: F[1,862]=103.3; p<.001). Contrary to Dutch, however, there was no significant interaction between accent condition and position (F[2,858]<1), and indeed a significant effect of accent is found in all three positions (F[2,285]=26.4; p<.001 in initial position; F[2,285]=16.8; p<.001 in medial position and F[2,285]=12.1; p<.001 in final position).

2.3.2. Syllable durations in the disyllabic names. Disyllabic names were included in the material to see if speakers use the larger size of the word to place final lengthening and accentual lengthening on different syllables. In Table 1, the syllable durations of the disyllabic words are given per accent condition and position in the phrase, as well as the standard deviations and the amounts of accentual lengthening on each syllable. Since durations in initial and medial (i.e. non-final) positions are comparable, the phrase positions have been regrouped into +/- final. On the left, the results for the Dutch disyllabic names are given; on the right, the results are given for the English names.

In Dutch, the accentual lengthening effect in final position is
much smaller than in non-final position (0% - 6% vs. 14% - 23%), as was already observed in the previous section (Figure 1), and what’s more, the lengthening we do find in final position is realized in the second syllable (6%). These results do not agree with the suggestion that an interaction between final lengthening and accentual lengthening can be avoided in disyllabic words by placing the two effects in different syllables: if this were true, we would expect the accentual lengthening in final position to be realized on the first syllable, and not on the second syllable.

As a matter of fact, the amount of accentual lengthening on the first syllable is smaller than that on the second syllable in non-final position too (14% vs. 23%). The small effect of accent on the first syllable may be due to the exclusion of the silent interval of the onset plosives /p/ and /k/ from the measurements (in Kobus and Peter), because part of the accentual lengthening is probably realized in this interval. Indeed, the initial syllables of Mina and Jannie show a mean lengthening of 30% and 23% respectively in non-final position, while the first syllables of Kobus and Peter were each lengthened by only 4%. The silent interval of initial voiceless plosives was excluded from the measurements in all cases, so that it does not interfere with comparisons across conditions, but it does account for the seemingly small amount of accentual lengthening on the first syllable (both in non-final and in final position).

The English results, given on the right in Table 1, show that accentual lengthening is evenly distributed across the first and second syllables in this language. In non-final position, both syllables are lengthened by 21%. In final position, both syllables are lengthened by 11%. Expressed in percentages, it seems as if in English, too, we find less accentual lengthening in final position; indeed, Figure 2 clearly shows that the absolute amount of accentual lengthening is quite constant in English, but relatively speaking this amount is smaller in final position (since final lengthening gives longer unaccented durations).

3. CONCLUSIONS

Previous results suggested that there is an interaction between final lengthening and accentual lengthening in Dutch, but not in English. This was confirmed by the results of the present investigation. In Dutch, a significant accentual lengthening effect was found only in non-final positions, while in English the effect of accent (expressed in absolute terms) is consistent across positions.

The language-specific interaction between final lengthening and accentual lengthening may be related to differences in durational expandability (cf. [15], chapter 9) between English and Dutch. Figures 1 and 2 indicate that English words can be lengthened more than Dutch ones. The same has been observed at the phonemic level [16]: due to a phonological rule which lengthens vowels before voiced obstruents in English, the range of vowel durations is much larger in English than in Dutch.

In disyllabic words, both lengthening effects could have been realized without exceeding the durational limitations of Dutch segments by placing accentual lengthening in the first syllable and final lengthening in the second syllable. Instead, however, we find that the interaction between final lengthening and accentual lengthening is just as strong in disyllabic words as it is in mono-syllabic words. Furthermore, the remaining amount of accentual lengthening in final position is not concentrated in the penultimate syllable. Apparently, Dutch speakers do not strive after a realization of accentual lengthening in final position, but exhibit a near lack of accentual lengthening in final position across the board. Further research is needed to pinpoint how ‘non-final’ a word or syllable should be in order to be accentually lengthened to a normal degree.

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REFERENCES