On the temporal domain of focal accent

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ABSTRACT

Accented words are longer than their unaccented counterparts. Our contribution studies the domain of this lengthening effect: is it the (stem) morpheme, the (complex) word, or the phrase? We present preliminary evidence, from the literature and from a recent experiment by ourselves, that the lengthening domain extends beyond the monomorphemic word, but not beyond the level of the compound.

INTRODUCTION

The function of pitch accents in languages such as English and Dutch is to focus the listener's attention on the contents of a specific linguistic domain (syllable, word, word group, or even a whole sentence). The principal phonetic correlate of focus is a prominence-lending change in pitch on the syllable that constitutes the prosodic head of the focus domain. Thus, when a whole word is in focus, as in *Did the police arREST or merely susPECT the butler?* (capitals indicate accent, underlining indicates focus), the speaker executes a conspicuous pitch change on the lexically stressed syllable of the words in focus. As a secondary effect, an accented word is linearly stretched in time by about 15% (i.e. across stressed and unstressed syllables alike) relative to a version of the same word spoken outside focus (Eefting, 1993; Sluijter, van Heuven and Neijt, 1992). It is not the case, however, that every content word in a larger focus domain should bear an accent. Speakers typically accentuate only the prosodic head of a word group that constitutes a larger focus domain. This option is called integrative accent. For example, the entire NP *the old man* is in focus in the utterance *Did you see the old MAN or the BAby?*, even though only the prosodic head of the NP (*man*) is accented. The realisation of the NP under integrative focus is exactly the same (temporally and melodically) as with narrow focus on the head only, as in *Did you see the old MAN or the old WOman?* It is therefore not the case that materials in focus are pronounced more slowly and deliberately than materials outside focus. Moreover, Sluijter et al. (1992) showed that pronouncing a single word with an accent on another syllable than the lexical stress yields linear time expansion of the entire word, albeit with a large shift in relative duration between the stressed and non-stressed syllables. These results can be summarised as follows: all the syllables (stressed and unstressed alike) in a word containing a pitch accent (whether on the stressed syllable or not) are stretched in time. An unaccented word, even when in focus, is not stretched (relative to its realisation outside focus).

In the present research we seek to establish the maximal domain for the time-expansion effect of accent in more detail. Specifically, we address the question whether the lengthening domain concerns the word level or the morpheme level. We shall pursue the answer by studying the effects of (i) narrow focus on the prosodic head of adjectival compounds versus (ii) integrative focus on the same compounds.

As in English, in Dutch compound adjectives the prosodic head is the rightmost stem morpheme. The crucial question is whether there is a timing difference between compounds with narrow focus on the final morpheme and with integrative focus on the entire compound, as in the following (English) question/answer pairs:

Q1. *Is that tea orange-flavoured or orange-scented?*
A1. *The tea is orange-flavoured.* (narrow focus on final stem morpheme)

Q2. *Is that tea orange-flavoured or plain?*
A2. *The tea is orange-flavoured.* (integrative focus on entire compound)

If the lengthening effect is word-based, the entire compound *orange-flavoured* should stretch in both A1 and A2, i.e. whether under narrow or under integrative focus. If, on the other hand, the domain of the lengthening effect is the stem morpheme, only the final morpheme that constitutes the prosodic head (*flavoured*) should lengthen. In order to determine the extent of the lengthening effect we shall adopt as a base-line condition a question/answer pair such as Q3/A3, where the compound adjective is spoken outside focus:

Q3. *Is the tea or the coffee orange-flavoured?*
A3. *The tea is orange-flavoured.* (no focus on any part of compound)

PRODUCTION EXPERIMENT

Among other words (which do not concern the question addressed in this paper), two Dutch compound adjectives (with monosyllabic and disyllabic stem morphemes, respectively) were included in non-final position in question/answer pairs, with (i) integrative focus on the entire compound, (ii) narrow focus on the prosodic head (final morpheme), and (iii) with no focus on the target (for examples cf. perception experiment). The six relevant words types were recorded twice by five speakers of standard Dutch, in different random orders. Each target was spoken as a lexical word and repeated once more in reiterant speech, replacing the lexical word by an otherwise identical sequence of syllables /na:/. *Knalgeel* /knAl#'Ge:l/ 'bright-yellow' was repeated as /na:'na:/; *donkerécru* /dONk@r#e:'kry:/ 'dark-écru' as /na:na:na:'na:/.

Table 1 presents the durations of the first and second parts of the compound adjectives (20 tokens per condition), as measured with a high-resolution digital waveform editor, for each of the relevant focus conditions.

Table 1. *Duration (in ms) of morphemes and words in lexical and reiterant versions broken down by focus condition. Durational differences from base-line condition (no focus) are indicated in percent.*

	lexical			reiterant		
focus	1st part	2nd part	word	1st part	2nd part	word
no	295	266	561	217	279	496
narrow	+2%	+13%	+7%	+0%	+4%	+1%
integrative	+5%	+15%	+9%	+8%	+4%	+5%

Accented words (in focus) are longer than unaccented words, and the effects are stronger for lexical words than for the reiterant versions. Crucially, both the final morpheme (prosodic head) within the compound, and the initial non-head morpheme are elongated, which seems to point to the entire word as the basis of the lengthening

effect under accent. However, the lengthening of the initial non-head morpheme is stronger (by a factor 2) when the non-head morpheme is in (integrative) focus than when it is outside the narrow focus on the head.

We conclude from these results that the scope of the lengthening effect of accent extends to the complex word, and is not limited to the stem morpheme. In contradistinction to what was found earlier for monomorphemic words (Sluijter at al., 1992) compounds show a difference in temporal organisation between integrative and narrow focus: the non-head portion of the compound is stretched more under integrative focus. In the perception experiment to be discussed next, we shall consider the perceptual consequences of this difference in temporal organisation.

PERCEPTION EXPERIMENT

The answer portions of the recordings made above (second tokens of lexical versions only) were presented to 20 native Dutch listeners over headphones. Listeners were given answer sheets containing, for each answer sentence, written versions of the three questions that originally preceded the answer sentences so as to elicit the three different focus distributions. For example, when the stimulus answer sentence was *Ik heb die muur knalgeel geverfd* 'I have that wall bright-yellow painted', whether produced with narrow focus, with integrative focus or without focus on *knalgeel*, the listeners read three written questions:

(1) *Heb je die muur knalgeel of grijs geverfd?* (integrative focus)
'have you that wall bright-yellow or grey painted?'

(2) *Heb je die muur knalgeel of knalrood geverfd?* (narrow focus)
'have you that wall bright-yellow or bright-red painted?'

(3) *Heb je die muur knalgeel geverfd of behangen?* (no focus)
'Have you that wall bright-yellow painted or papered?'

The listeners' task was to decide for each spoken sentence on the tape whether it was most likely to be the answer to question type (1) asking for integrative focus on the target compound, or to question type (2) asking for narrow focus on the target, or to question type (3) asking for no focus on the target. Each stimulus type was presented twice in counterbalanced order. In all, 1200 responses were collected (5 speakers * 2 targets * 3 focus distributions * 2 orders * 20 listeners). The results of the perception experiment are summarised in table 2.

Table 2. *Frequency of perceived focus responses as a function of focus distribution intended by speaker.*

	perceived focus		
intended focus	integrative	narrow	no
integrative	157	243	0
narrow	117	283	0
no	0	0	400

Sentences with non-focused targets were matched with question type (3) without a single error. This performance will be due rather to the absence of a pitch accent on target rather than to its shorter duration. we shall not discuss this condition any

further. Still, even in the remaining part of the contingency table the distribution of the responses deviates significantly from chance, X^2=8.4 (p=.004), which indicates that our listeners were able, to some extent, to perceive the difference between integrative and narrow focus on the adjectival compounds as intended by the speakers. The effect is clearly speaker dependent (data not indicated in table 2). Speakers #3 and #4 hardly made any difference between narrow and integrative focus (no significant association between intended and perceived focus), speakers #1 and #5 have a moderate association, while speaker #2 is surprisingly successful (over 75% correct) in communicating his intended focus distribution.

We conclude from the results of this perception experiment that at least some speakers are able to make a communicatively relevant distinction in morphologically complex words between integrative focus on the entire compound and narrow focus on just the prosodic head within the compound. Note that listeners proved unable to make this distinction in similar listening tests using the monomorphemic tokens collected by Sluijter et al. (1992).

CONCLUSION

We conclude from the production and perception experiments reported above, that the domain of the lengthening effect of accent extends beyond the morpheme or the monomorphemic word: lengthening applies to all the segments in a compound word. However, other than what we found earlier in monomorphemic words, the lengthening effect is weaker for the non-head morpheme than for the head morpheme. Moreover, if the head morpheme is in narrow focus, the lengthening of the non-head if weaker still (by a factor 2 or more) than when both head and non-head morpheme are in focus. This difference between integrative versus narrow focus in Dutch compounds is communicatively relevant, at least for some speakers.

At least two caveats are in order here. First, the conclusions that were drawn above are partly based on data collected in our own experiments, and partly on data published in the literature. There is a risk involved in so far as different speakers and lexical materials were used in the various experiments. What is needed is a single, large-scale experiment in which all the relevant factors are are examined using carefully controlled materials and the same set of speakers across experimental conditions. Second, there need not be a causal relationship between the observed differences in temporal structure between integrative and narrow focus on adjectival compounds and the perception of the contrast. Further experiments are necessary in which acoustic parameters other than timing are kept under strict control.

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