

Segmental durations as a correlate of Swedish word accents: Evidence from Stockholm and Scania Swedish

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Abstract

This study aims to scrutinize the role of segmental duration as a correlate of the two Swedish word accents, asking whether it is a robust correlate, independent of tonal complexity and phrase-level prosodic factors. To this end, we examined segmental durations of Accent 1 and Accent 2 words in two regional dialects, controlling for focus and phrase finality. Recordings from 24 speakers were analysed. The results showed that the vowel in the stressed syllable and the post-vocalic consonant were produced longer with Accent 2 than with Accent 1, irrespective of the speakers' dialect, focus condition and position in the utterance.

Introduction

Swedish exhibits a binary tonal word-accent distinction (Accent 1, Accent 2, henceforth A1 and A2) which is acoustically manifested in the fundamental frequency (f_0) contour. Further acoustic correlates beyond f_0 have hardly been acknowledged in the past, although minor differences in segmental durations between A1 and A2 have been observed in some previous studies (e.g., Elert, 1964; Heldner & Strangert, 2001; Svensson Lundmark et al., 2017).

The few previously reported duration data for A1 and A2 in Swedish are, we argue, not well in line with the numerous available reports on tone languages, which suggest that more complex tonal patterns are reflected by longer durations (e.g., Köhnlein, 2015, and references therein). For Swedish, however, previous research has not consequently revealed longer durations where it would be predicted based on tonal complexity. For instance, for Stockholm Swedish, Elert (1964) observed a longer post-stress consonant in A2 than in A1, but at the same time a longer stressed vowel in A1 than in A2, although longer durations would generally seem to be predictable for the more complex H*LH-pattern in A2 than for the (H)L*H in A1. Similar results to those of Elert (1964) were reported by Heldner and Strangert (2001), although they did not explicitly focus on segmental durations as a correlate of word accents. Their aim was instead to examine focal lengthening, which leads us to a possible explanation of the results by Elert (1964).

Thus, possibly, the Swedish word accents *per se* do not actually differ with respect to duration, but the small observable durational differences between A1 and A2 are, instead, a bi-product of phrase-level prosody. In particular, one could hypothesize that focal lengthening has a slightly stronger effect on the segmental material that is aligned with the focus marking H tone, than on remaining segments. This would mean that focal lengthening should have a stronger effect on the stressed syllable in A1 than in A2, and conversely a stronger effect on the post-stress syllable in A2 than in A1. We might thus, under focus, expect a longer stressed vowel in A1 than in A2 and a longer post-vocalic consonant (= onset of the post-stress syllable) in A2, which is what the results by Elert (1964) and Heldner and Strangert (2001) displayed.

Furthermore, if the alignment of the focus marking tone is what determines the segmental scope of focal lengthening, different lengthening patterns for different dialects could be predicted. In Scania Swedish, for instance, focus is typically not encoded through an additional tonal gesture as in Stockholm Swedish, but rather through the tonal pattern determined by the word accents: a H*L fall in A1, and a L*H rise in A2. Thus, for Scanian, our hypothesis would predict that, under focus, the stressed vowel might be lengthened in both A1 and A2, since the focus marking tonal pattern is aligned with the vowel in both cases. In addition, however, one could expect lengthening of the post-vocalic consonant in A2 (only),

because this consonant is typically included in the A2 L*H rise. In line with this prediction are the results by Svensson Lundmark et al. (2017), who found a durational differentiation of A1 and A2 for Scania Swedish, under focus, only in the post-vocalic consonant.

However, for a conclusive test of the hypothesized impact of focus on the durational differentiation between A1 and A2, focus as a factor should be experimentally controlled for (as in Heldner & Strangert, 2001). In this study, we therefore compare segmental durations for A1 and A2 in focal and non-focal conditions. As an additional control factor, we include different positions in the utterance, as it is well known that lengthening is not only triggered by focus but also only by phrase finality (e.g., Heldner & Strangert, 2001). Furthermore, we present two parallel analyses for two dialects of Swedish – Stockholm and Scania – which differ critically in the tonal composition of the word accents, as well as in how focus is marked tonally.

The study

Subjects and materials

The analyses are based on recordings from 24 speakers in total (6 women and 6 men per dialect), and 36 utterances per speaker (12 conditions, 3 repetitions). Speakers were asked to read the following sentences, which were preceded by context questions in order to trigger different focus conditions (varying narrow focus on the three nouns in the phrase):

Boven hade vinet i bilen

‘The villain had the wine in the car’,

Boven hade viner i bilen

‘The villain had wines in the car’,

Boven hade vinet i bilar

‘The villain had the wine in cars’,

Boven hade viner i bilar

‘The villain had wines in cars’.

Hereby, the three nouns (villain, wine, car) are associated either with A1 (= def. sg. form) or A2 (= indef. pl.). Only the two last nouns in the phrases (*vinet/viner* and *bilen/bilar*), produced in A1 form and A2 form, were considered. These two nouns occur at different positions in the utterance (*vinet/r* = medial; *bilen/ar* = final), and are tested in focal and non-focal conditions: in pre-focal position (only *vinet/viner* – narrow focus on *bilen/ar*), in focal position (both *vinet/viner* and *bilen/bilar*), and in post-focal

position (both *vinet/viner* and *bilen/bilar* – narrow focus either on *boven* or on *vinet/viner*).

Data Analysis

The target words were segmented manually in PRAAT (Boersma & Weenink, 2018). Duration data were extracted for the vowel in the stressed syllable as well as the post-vocalic consonant from both target words (/i/ and /n/ in *vinet/r*; /i/ and /l/ in *bilen/ar*).

Data were analyzed using linear mixed regression models, separately for the two dependent variables (duration of vowel and duration of following consonant), and separately for the two sentence positions (*vinet/er* vs. *bilen/ar*) and dialects. The models included the predictors *word accent (WA) * focus* as fixed effects (where ‘*’ denotes an interaction term), and *speaker* as a random effect.

Each of the full models (*WA * focus + (1|speaker)*) was then compared to two different reduced models using likelihood ratio tests in order to evaluate the significance of the predictor *WA* and its interaction with *focus*.

Results

From Figures 1-8, it can be seen that the results reveal an overall stable and uniform effect of word accent on the duration of the vowel in the stressed syllable (/i:/ in *vin* and *bil*) and the subsequent consonant (either /n/ or /l/), irrespective of focus condition, position in utterance (*vin* vs. *bil*) and dialect: Both segments tend to be slightly longer in A2 than in A1 (except in the /l/ in post-focal *bilen* in Stockholm Swedish). Results of the likelihood ratio tests are included in the captions of Figure 1-8.

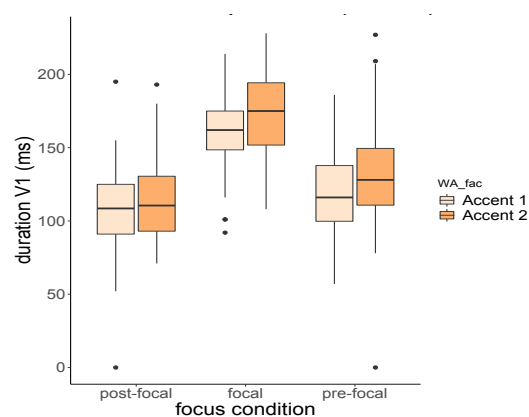


Figure 1. Duration of the vowel /i/ produced with A1 (in “*vinet*”) and A2 (in “*viner*”) in utterance medial position in Central Swedish (Interact. n.s., WA^{***} , $Diff WA = 10\text{ ms}$).

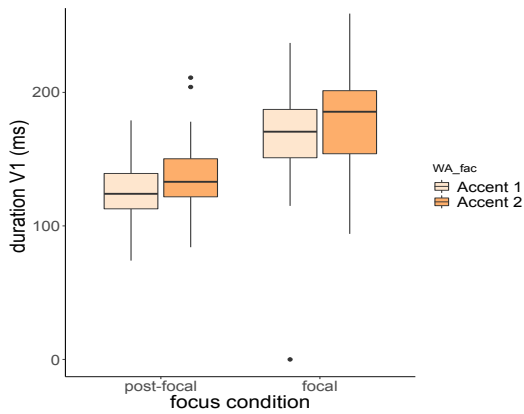


Figure 2. Duration of the vowel /i/ produced with A1 (in “bilen”) and A2 (in “bilar”) in utterance final position in Central Swedish (Interact. n.s, WA***, Diff WA =10 ms).

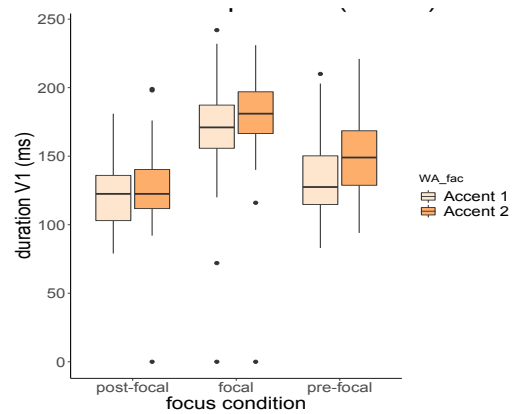


Figure 5. Duration of the vowel /i/ produced with A1 (in “vinet”) and A2 (in “viner”) in utterance medial position in South Swedish (Interact. n.s, WA***, Diff WA =14 ms).

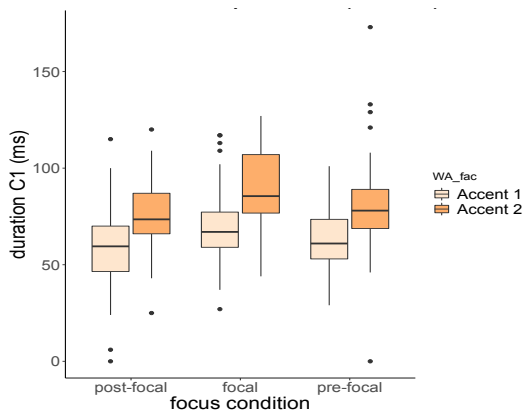


Figure 3. Duration of the consonant /n/ produced with A1 (in “vinet”) and A2 (in “viner”) in utterance medial position in Central Swedish (Interact. n.s, WA***, Diff WA =18 ms).

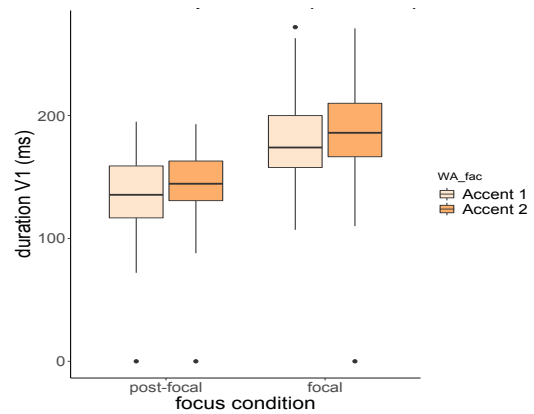


Figure 6 Duration of the vowel /i/ produced with A1 (in “bilen”) and A2 (in “bilar”) in utterance final position in South Swedish (Interact. n.s, WA*, Diff WA =7 ms).

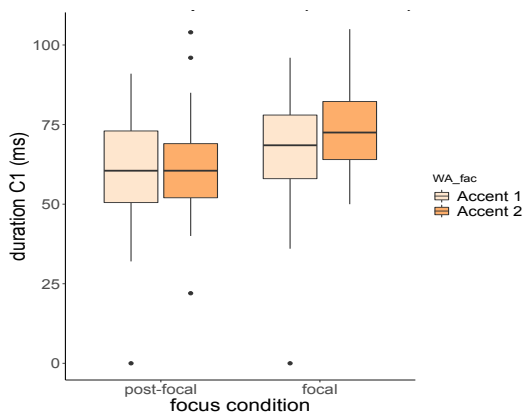


Figure 4. Duration of the consonant /l/ produced with A1 (in “bilen”) and A2 (in “bilar”) in utterance final position in Central Swedish (Interact. *, WA***, Diff WA =4 ms).

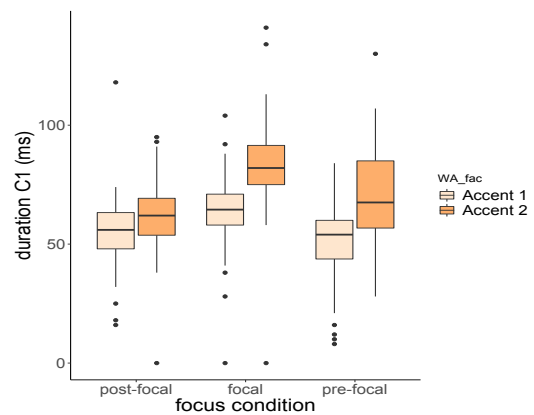


Figure 7. Duration of the consonant /n/ produced with A1 (in “vinet”) and A2 (in “viner”) in utterance medial position in South Swedish (Interact. ***, WA***, Diff WA =10 ms).

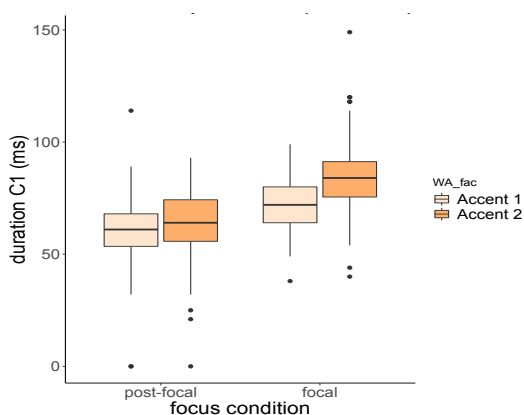


Figure 8. Duration of the consonant /l/ produced with A1 (in “bilen”) and A2 (in “bilar”) in utterance final position in South Swedish (Interact. *, WA***, Diff WA = 8 ms).

Discussion and conclusions

This study suggests that segmental durations constitute a systematic and robust correlate of the Swedish word accents, since longer durations were observed for Accent 2 than for Accent 1, irrespective of phrase-level factors. Furthermore, we found equivalent results for two different regional dialects which differ critically with respect to the tonal composition of the word accents. Thus, no obvious relationship of phone duration and tonal composition or complexity can be confirmed by the present results.

Tonal complexity, has, however, been identified as a common predictor of segmental durations in tone languages (e.g., Köhnlein, 2015). On the other hand, it has been argued that diachronic processes can eliminate durational differences originally conditioned by tonal complexity (Köhnlein, 2015). In a similar vein, we suggest, observable durational differences might have explanations beyond tonal complexity. For instance, the longer durations in Accent 2 might be a result of Accent 2 involving a lexical tone (Riad, 2006). This hypothesis could be tested in a future study by means of comparing Accent 2 words with lexical vs. post-lexical tone, as it has been suggested that Accent 2 is post-lexical in compounds (Myrberg & Riad, 2015; Riad, 2006).

Moreover, further phonological factors should be considered in future studies (such as the Swedish quantity distinction, cf. Heldner & Strangert, 2001), as well as further dialects exhibiting yet other variants of tonal patterning of the word accents. Finally, another question for future research is whether the small but significant durational differences between Accent 1 and Accent 2 are perceptually relevant, or if they rather reflect constraints of the speech production process.

Acknowledgments

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